

DOI 10.20544/HORIZONS.A.30.1.22.P01
UDC 004:334.72.012.63/.64(497.7:497-15)“2016/2021“
004:334.72.012.63/.64(497.7:4-672EU)“2016/2021“

ANALYSIS OF DIGITALIZATION INDICATORS IN THE REPUBLIC OF NORTH MACEDONIA¹

Dejan Zdraveski, PhD

Faculty of economics, Prilep, Republic of North Macedonia
e-mail: dejan.zdraveski@uklo.edu.mk

Margarita Janeska, PhD

Faculty of Economics, Prilep, Republic of North Macedonia
e-mail: margarita.janeska@uklo.edu.mk

Abstract

Digitalization and digital transformation have a major impact on the sustainability and development of the economy and society. Digital technology is a fundamental force for change in this century, reshaping economies, government and civil society. It affects every aspect of the development of society. The need for digitalization became even more evident due to the KOVID-19 pandemic, because it pointed to the urgent need for mechanisms, tools and adapted regulation for a better organization and a fully functioning society. Different techniques are used to measure the level of digitalization: Digital Evolution Index (DEI), Networked Readiness Index (NRI), Digitization Index (DiGiX), Digital Intensity index (DII), Digital Economy and Society Index (DESI), ICT Development Index (IDI), IMD World Competitiveness etc. Each of these indexes has different methodological approaches and contains different dimensions, indicators and sub indicators for measuring the level of digitalization.

The main aim of this paper is to see if the digitalization index in Republic of North Macedonia can be measured and for which index. In this context, and based on existing data, digital indexes or individual indicators will be compared with some countries, as well as with some EU member states.

Keywords: Digitalization, digital transformation, digital society, indexes, development, North Macedonia.

¹ original research paper

INTRODUCTION

The processes of globalization that have taken place in recent years have a major impact on the functioning of society. These processes require businesses not only to survive but also to thrive in a competitive environment. The changes required companies to adapt to the new work environment and brought a high degree of uncertainty in their operations. Such changes required their effective integration that could only be achieved through the use of advanced tools offered by information technologies. Only through the use of such innovative tools offered by information technologies does it enable the business to remain competitive in today's digital economy. Hence, arises the importance of the digital transformation which today is the main driver of business development and society as a whole.

On the other hand, the past few decades are a period of explosive development of Information and Communication Technologies, and according to all forecasts, such development will continue at an accelerated pace. This development of Information and Communication Technologies offers many opportunities to individuals and companies but also challenges. ICT has enabled companies to develop completely new business models that have changed the way they operate. Moreover, such advanced technologies have enabled the digitalization of all aspects of society. The digital way of functioning today has a huge impact on individuals, companies and the whole society.

Today, digitalization is considered to be one of the key drivers of change in any society. Digitalization processes allow individuals, institutions and businesses to completely change the way they work and adapt to turbulent operating conditions. This was especially the case during the pandemic of the Covid 19 virus, where at certain times the whole society functioned through the use of such digital tools. From the education process, public life to the operation of businesses, information technologies have played a key role in overcoming the challenges posed by the pandemic. In such conditions, it has been seen that societies that are fully digitalized have much easier to deal with the problems that bring such crisis situations. It showed how important is the process of digital transformation of society and how much it can contribute to maintaining and improving the quality of life.

There are several different definitions of digitization which differ depending on the context. One of the most common associations with the term of digitization is the transformation from analog to digital. Researchers across different fields would define digitization as the transformation of

some type of analog or physical artifact into a digital artifact (Schalmo, Williams, 2018).

On the other side, digitalization is radically changing the fundamental assumptions of the way of life and organization of work in a postmodern society, which is becoming more globalized and more digitalized than ever before. In this context, understanding digitalization is vital for both individuals and any type of organization. One of the definitions of digitalization is given on the Gartner website. In their dictionary, they emphasized that digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business. (Gartner Glossary, 2022).

Digital transformation is the integration of digital technologies in all aspects of business. The accelerated implementation of technology and change lead to completely new markets, new customers, business models, business processes, opportunities and challenges that ultimately lead to a new economy.

DIGITALIZATION INDEXES AND THEIR INDICATORS

Internationally, various institutions and organizations have conceptualized and published various digitalization indexes. A unique and internationally accepted methodology for measuring the digitalization of countries has not been created. Most indexes are focused on metrics such as infrastructure and access indicators, but the most complex indicators begin to consider other components and dimensions related to the use of digital technologies and digital skills. In this paper, will be discussed the indicators of some digitalization indexes.

The Digital Evolution Index (DEI) measures the rate of change of the digital evolution of developed and developing countries and provides insight-based information to companies, investors. and governments. The index is based on four fundamental drivers: Conditions of supply, Demand conditions, Institutional environment, Innovation and change

The Network Readiness Index (NRI) measures and assesses the dynamics of a country's digital transformation and network connectivity. The NRI 2021 model reflects its core structure with four pillars: technology, people, governance and impact.

The basis of the NRI 2021 model consists of a total of 60 indicators in all 12 sub-pillars. The indicators are: Access, Content, Future Technologies, Individuals, Business, Governments, Trust, Regulation, Inclusion, Economy, Quality of Life, SDG Contribution.

Digitalization index (DiGiX) aims to capture the global evolution of digitalization by tracking this phenomenon in 99 countries. This index

combines 20 indicators grouped into six dimensions representing three pillars: supply (infrastructure and costs), demand (users, adoption by government and enterprises) and institutional environment. Each indicator has its own weighting indexes.

The Digital Intensity Index (DII) measures the use of various technologies at the enterprise level. This index is based on 12 key indicators, and a company's score (0 - 12) is determined by how much of the selected digital technologies the company uses. If 0-3 indicators are measured, the company has a very low digital intensity index, 4-6 has a low digital intensity, 7-9 is high and with 10-12 indicators the company has a very high digital intensity index. In parallel with the progress of technologies, the key indicators by which DII is measured are also changing. The set of criteria used by Eurostat is revised and adjusted every year in order to monitor the changes and stages of digital development, but the general idea remains the same: the index is intended to reflect the involvement of the enterprise in the digital transformation in terms of its various aspects.

The Digital Economy and Society Index (DESI) measures the progress of EU countries in terms of the digital economy and society. This index combines a set of relevant indicators of European digital policy and measures progress from 2014 to date. According to the 2021 report, the content of the DESI framework consists of 4 main dimensions, 10 sub-dimensions and 33 key indicators. The 4 main dimensions are: Human capital, Connectivity, Integration of digital technology, Digital public services.

The ICT Development Index (IDI) is a composite index that combines 11 indicators. This index is designed to be global and to reflect changes occurring in countries with different levels of development. It was developed by the International Telecommunication Union in 2008 in response to a request by member countries to establish an overall ICT index. The results were first reported in the Information Society Measurement Report (MISR) in 2009. It is used to track and compare the development of information and communication technology (ICT) between countries and over time.

IMD World Competitiveness, when making the rating, which is done annually by the World Competitiveness Center, takes into account four factors: economic performance, government efficiency, business efficiency and infrastructure, and thereby measures the prosperity and competitiveness of 64 nations. Each of these factors contains 5 sub-factors that highlight each aspect of the analyzed areas. In total, the world competitiveness ranking contains 20 such sub-factors.

This indicator is used by the business community to help create and validate investment plans and to assess locations for new operations.

Governments find important indicators to benchmark their policies against those of other countries, to assess performance over time, and to learn from the "success stories" of economies that have improved their competitiveness. Academics also use the data to better understand and analyze how countries compete in global markets. The indicators are the basis for assessing the readiness of countries to apply digital technologies by the IMD World Competitiveness Center.

ANALYSIS OF INDICATORS FOR MEASURING THE LEVEL OF DIGITALIZATION IN THE REPUBLIC OF NORTH MACEDONIA

The Republic of North Macedonia faces major challenges in its efforts to better integrate into the digital economy and take advantage of its significant benefits. Overcoming those challenges is a prerequisite not only for the initial digitalization process, but also for further keeping pace with the so-called industrial revolution 4.0 that has the potential to fundamentally change the economy, through technologies such as Big Data, Cloud Computing, Blockchain (cryptocurrencies, smart contracts, etc.), Internet of Things, Machine Learning, etc.

In the analysis, secondary data will be used, which originate from relevant sources, that is, from the State Statistical Office of RSM, which refer to the application of ICT in small and medium-sized enterprises, noting that data for key indicators are missing for one or more years. Also, the data offered by the State Statistical Office is limited to a very small number of indicators.

In this section, a specific analysis and comparison will be made of each of the individual indicators that will be considered (those indicators for which there are official data). What should be noted in this section is that according to the data available to the State Statistical Office of RSM, there is no measurement of the indicators for SMEs, but the measures apply individually to small and medium-sized enterprises. Well, in this section, the individual measurement of the indicators for small and medium enterprises will be considered. Key indicators for the period from 2016 to 2021 will be analyzed.

In the Figure 1 is shown employees that used computer, Internet and portable devices in enterprises by number of employees. From that picture it can be concluded that this indicator shows a different trend in relation to the use of the three components by the number of employees.

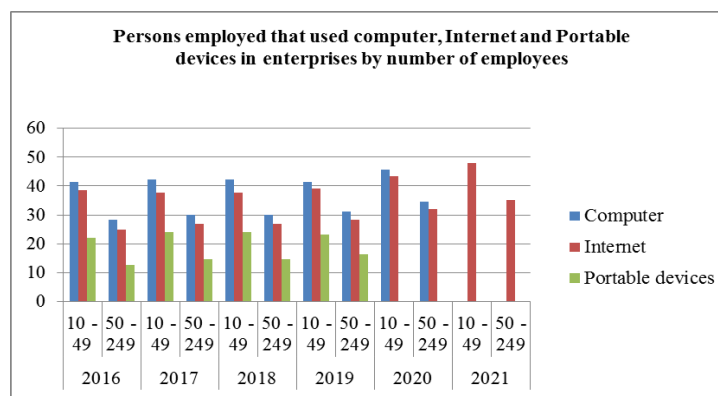


Figure 1. Employees that used computer, Internet and portable devices

The use of a computer by employees in both small and medium-sized enterprises maintains the trend from 2016 to 2020 (for 2021 there is no data). The use of the Internet by employees in both small and medium-sized enterprises shows an upward trend. Namely, among small enterprises, from 38.5% in 2016, the percentage has increased to 48% in 2021, while among medium-sized enterprises, from 25% in 2016, the percentage has increased to 35% in 2021. The use of portable devices in small enterprises shows a downward trend from 2016 to 2019 (there is no data for 2020 and 2021), while for the same period in medium-sized enterprises, an insignificant upward trend is observed. What can be noticed about this indicator is that, both for computers and for the Internet and portable devices, the use by employees of small enterprises is greater.

From the indicator "Having a web site or homepage" shown in Figure 2 it is noted that in the considered period of 6 years there is no significant progress, even a decrease in the percentage of small enterprises that had a homepage or web page is noticed. Among small enterprises in 2016, it was 49.6%, and in 2021 it was 44.6%, while among medium-sized enterprises, during these six years, a growth of 5.1% was recorded. If taken as a whole for all SMEs, it is noticeable that in this indicator in 2021 there is a decrease compared to the previous years 2020 and 2019. The total number of SMEs that reported owning a website or homepage in 2021 is less than 50% of all SMEs, compared to 2020.

The data available to the RSM State Statistical Office for the "Use any social media" indicator are from an older date. From 2017 onwards, there are no new data. According to what is available, it can be said that in the period from 2015 to 2017, almost more than half of small and medium

enterprises reported that they use social media in their work. This indicator is shown in Figure 3.

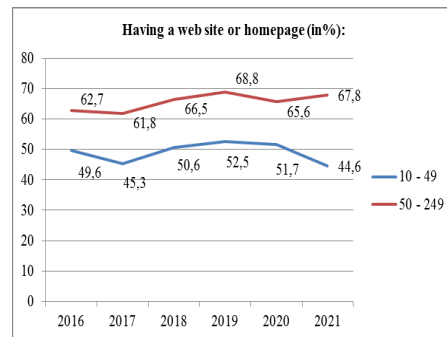


Figure 2. Having a web site or homepage

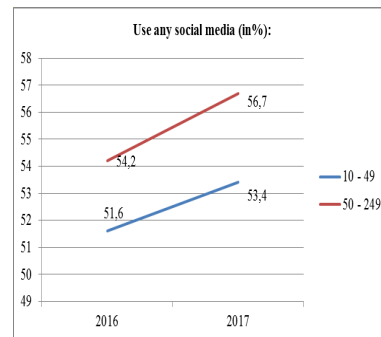


Figure 3. Use social media

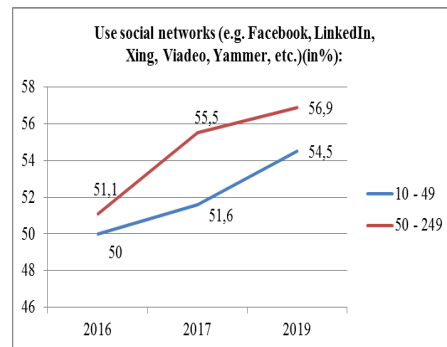


Figure 4. Use social network

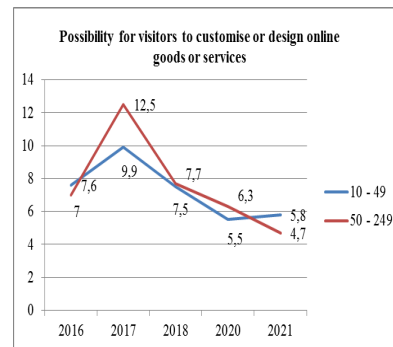


Figure 5. Possibility to visitors to customize or design on-line goods or services

From the Figure 4 where the indicator "Use social networks (e.g. Facebook, LinkedIn, Xing, Viadeo, Yammer, etc.)" is presented, an upward trend can be observed among small businesses, which in 2016 was 50%, and in 2019 54.5%, and among medium-sized enterprises, which in 2016 was 51.1%, and in 2019 56.9% (for 2018, 2020 and 2021 there are no data).

The indicator "Possibility for visitors to customize or design online goods or services" both among small and medium enterprises has a downward trend, and the values are at a very low level.

From Figure 6, where the indicator "Tracking or status of orders placed" is presented, it can be concluded that the same as the previous indicator has a decreasing trend among small and medium-sized enterprises, and the values are at a very low level.

The indicator "Personalized content in the website for regular/recurrent visitors" both among small and medium-sized enterprises has a significant downward trend, and the values are at a very low level. Namely, from 15.1% in 2016 among small enterprises, in 2021 it decreased to 6.1%, and from 16.1% in 2016 among medium-sized enterprises, in 2021 it decreased to 6%.

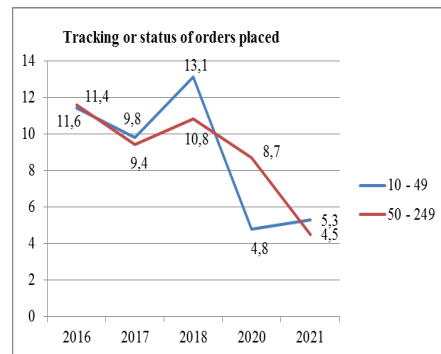


Figure 6. Tracking or status of orders placed

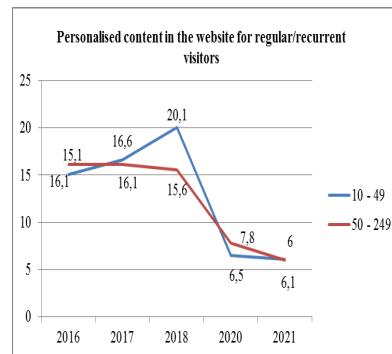


Figure 7. Personalised content in the website for regular/recurrent visitors

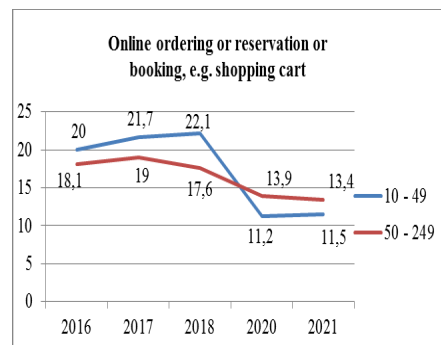


Figure 8. On-line ordering or reservation or booking

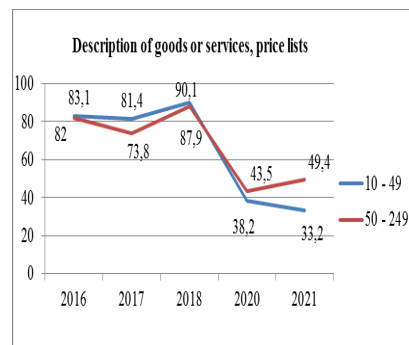


Figure 9. Description of goods or services, price lists

Figure 8 shows the indicator "Online ordering or reservation or booking, e.g. shopping cart" which, both in small and medium-sized enterprises, has a decreasing trend. Namely, from 20% in 2016 among small enterprises, in 2021 it decreased to 11.5%, and from 18.1% in 2016 among medium-sized enterprises, in 2021 it decreased to 13.4%.

The indicator "Description of goods or services, price lists", also among small and medium-sized enterprises, has a significant downward trend, and the values are at a very low level. Namely, from 83.1% in 2016 among small enterprises, in 2021 it decreased to 33.2%, and from 82% in 2016 among medium-sized enterprises, in 2021 it decreased to 49.4%.

The indicator "Fastest broadband connection is at least 30 Mb/s" is shown in Figure 10 and is the indicator that records the greatest growth. While for the period between 2016 and 2019 no significant changes are observed, in the period between 2019 and 2020 there is a large growth. During this period, the number of small and medium-sized enterprises that have a maximum contracted download speed of the fastest Internet connection of at least 30 Mb/s is doubling (in small enterprises, this increase is from 31.3% in 2019 to 76.3% in 2021, which is more than double, and in medium enterprises the increase is from 41.8% in 2019 to 77.2% in 2021 which is almost double). The doubling of the number of enterprises using super-fast Internet is primarily due to the fact that their competitors are already switching to ultra-fast Internet and have a maximum contracted download speed of the fastest Internet connection of at least 100 Mb/s.

From Figure 11 for the indicator "Enterprises who have purchased cloud computing services" it can be concluded that from 2016-2018 there is a growing trend, but after 2018 there are no official data for this indicator.

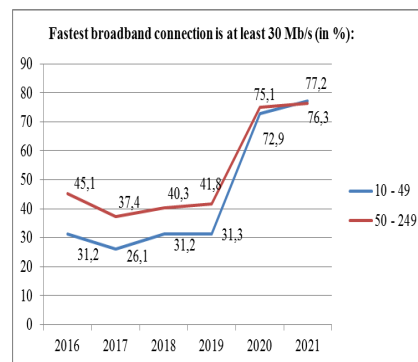


Figure 10. Fastest broadband connection

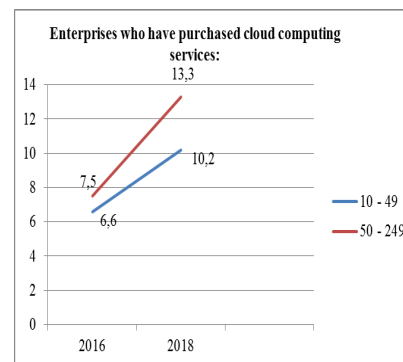


Figure 11. Enterprises who have purchased cloud computing services

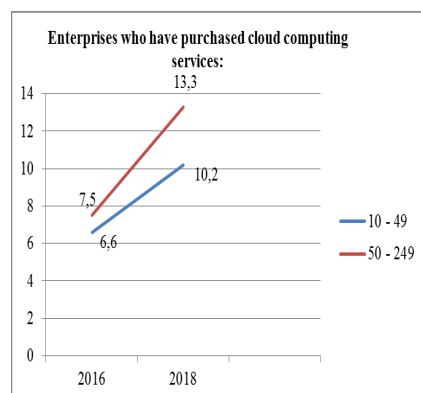


Figure 12. Enterprise employed ICT specialist

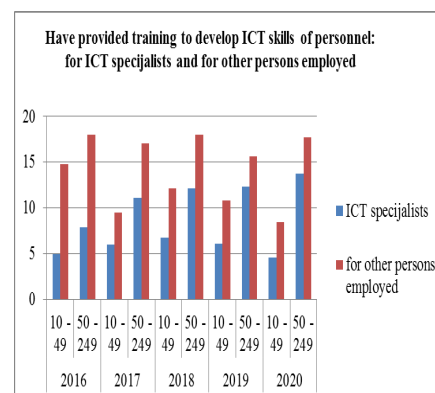


Figure 13. Training to develop ICT skills

As for the indicator "Enterprise employed ICT specialists", which is shown in Figure 12, it is decreasing in the considered period. According to the data for this indicator, it can be concluded that small and medium enterprises have different strategies when it comes to the employment of ICT specialists in their enterprise. While medium-sized enterprises maintain a continuity in the employment of ICT specialists, which is 23.5% in 2016. and 26% in 2020, a continuous decrease was observed among small enterprises, namely 11.3% in 2016. to only 8% in 2020. This means that small enterprises with up to 50 employees are not very interested and do not invest in hiring specialists from the ICT field.

From Figure 13, where the indicator "Have provided training to develop ICT skills of personnel" is presented, it can be concluded that in the case of small enterprises, there is a decrease in the considered period (for the year 2021 there are no data) both for ICT specialists and for other employees. while, in medium-sized enterprises, there is a growing trend for ICT specialists, and for the rest of the employees in 2021, the same level as in 2016 is maintained. This indicator has higher values for employees in medium compared to small enterprises.

The indicator "E-sales: have received orders via computer networks", which is shown in Figure 14, is increasing. If in 2019 only 2.9% of small and 6.3% of medium-sized enterprises achieved sales, in 2021 that percentage increased to 8.8% for small and 13% for medium-sized enterprises.

Figure 15 shows the indicator "Web sales: received orders for products or services via a website", which, like the previous indicator, is increasing. If in 2019 only 2.7% of small and 6% of medium-sized enterprises made web sales, that percentage increases to 8.5% for small and 11.7% for medium-sized enterprises in 2021.

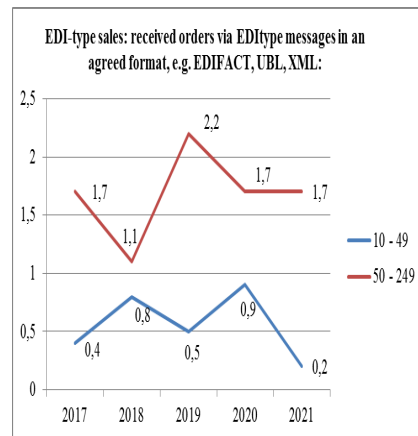


Figure 14. E-sales: have received orders via computers network

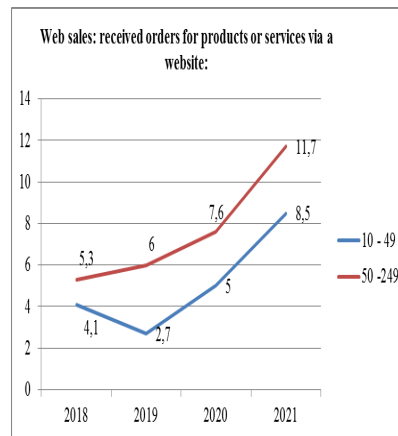


Figure 15. Web sales: received orders for products via a website

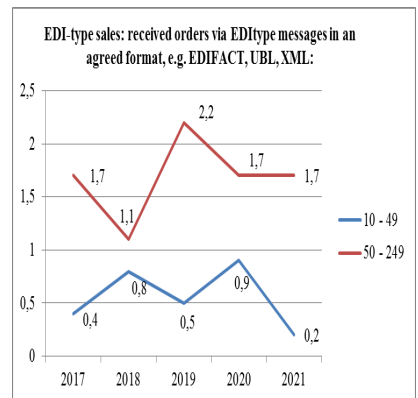


Figure 16. EDI-type sales: received orders via EDI type messages

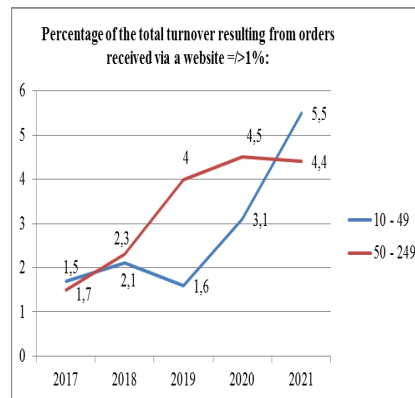


Figure 17. Percentage of the total turnover resulting from orders received via a website

As can be seen from the chart Figure 16 for the "Edi-type sales: received orders via EDI type messages" indicator, there are oscillations in the

considered period. However, despite the annual ups and downs, in 2021 medium-sized enterprises remain the same percentage of 1.7% as in 2017, in contrast, in small enterprises that also record annual ups and downs, in 2021 with only 0.2% is a decrease compared to 2017 when there was 0.4%, but still a more characteristic decrease is observed from 2021 compared to 2020 when edi - sales were represented by 0.9%.

The indicator "Percentage of the total turnover resulting from orders received via a website" has recorded continuous growth since 2019. The data shows that 5.5% of small and 4.4% of medium-sized enterprises in 2021 make web sales in relation to total sales, compared to 2019, when the percentage was 1.6% for small and 4% for medium-sized enterprises .

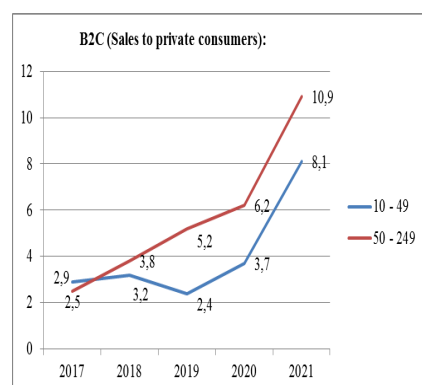


Figure 18. Business-to-Consumers sales

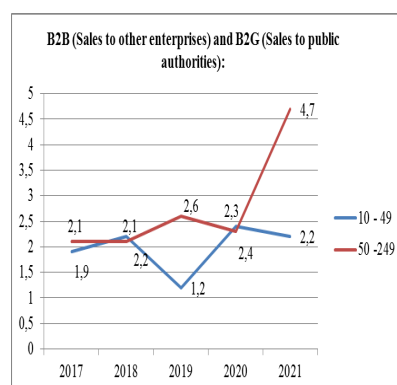


Figure 19. Business-to-Business and Business-to-Government sales

The "B2C" indicator shown in Figure 18 shows a significant increase, from 2.9% among small and 2.5% among medium-sized enterprises in 2017 to 8.1% among small and 10.9% among medium-sized enterprises in 2021 year.

Figure 19 shows the "B2B and B2G" indicator, which shows an insignificant increase among small enterprises, from 1.9% in 2017 to 2.2% in 2021, while a more significant increase is observed among medium-sized enterprises, which from 2.1% in 2017 to 4.7% in 2021.

According to the data presented, it can be concluded that the key indicators related to e-commerce, except for the indicator related to edi-sales, in all other indicators in 2021 there is a growth compared to 2019. This is primarily due to the health crisis caused by the global pandemic with the Covid19 virus.

European Commission in its report on the progress of the Republic of North Macedonia, published in October 2020, notes a 20% increase in the volume of electronic commerce (electronic commerce as a whole, not only SMEs) compared to the previous year, which is undoubtedly due to the pandemic and the health crisis and the processes of adaptation to the new situation by both companies and consumers. This shows that in conditions of extraordinary circumstances, the Macedonian economy together with the stakeholders have the capacity to adapt. As for the reviewed key indicators that relate to the digitalization of business, progress has been observed over the years. However, it is obvious that this is not enough and the question is constantly being asked where are the SMEs from the Republic of North Macedonia in relation to the countries of the Western Balkans and in relation to the EU countries.

What should be emphasized is that SMEs should take advantage of this period and continue with the changes, adjustments and adaptation that have been started, all in order to continue with an increased pace in the digitalization process and not allow stagnation or even more regression of the already started processes.

CONCLUSION

Digitalization of small and medium-sized enterprises is of great importance not only for enterprises but also for the development of the economic, social and general situation in the country. Digital transformation completely changes the way that companies operate and is a necessary process especially for small and medium-sized enterprises, which will contribute to the development and offering of better and more innovative products and services on the market. With the process of digital transformation, SMEs increase their competitiveness not only on the national market, but also beyond. Namely, digitalization is no longer a choice that only large companies can afford, but a necessity for SMEs to adapt to the new reality and keep pace with global economic trends.

From the figure shown, a general conclusion can be drawn which indicators are available for measuring the level of digitalization of SMEs in the Republic of North Macedonia, for which of them there is no data in the last year and what is their trend.

From the analysis of the indicators related to the digitization of SMEs in Macedonia, which are officially published on the website of the State Statistical Office, it can be concluded that there are only 22 measurable indicators, of which there is no data for 2021 for 7 indicators. Considering that there are different indexes of digitalization with different number and

types of indicators, it can be said that the largest number of the analyzed indicators are incorporated in the Digital Intensity Index and 6 indicators related to electronic commerce. Namely, out of 12 key indicators for measuring DII according to the report from the European Commission from 2021, 8 indicators can be used. Whereas, a very small number of indicators can be used to measure the DESI index, which measures the progress of EU countries in terms of the digital economy and society. Of the 33 key indicators of this index, only 8 can be used by the State Statistics Office.

When it comes to the trend of the presented and analyzed indicators, it can be concluded that for 7 indicators an upward trend was observed in both small and medium-sized enterprises, while the same or decreasing trend was observed in the rest of the indicators.

The general conclusion is that although some initial steps have been taken in this domain in our country, but the implementation of digitalization is still at a relatively low level, but it is a desirable situation for companies in its necessary dimensions.

In the Republic of North Macedonia there are institutions, such as the Ministry of Information Society, which is competent for appointing certain agencies and to monitor individual dimensions, sub-dimensions and indicators for measuring the level of digitalization. Such agencies are the Agency for Electronic Communications, the National Broadband Competent Office, etc. They should ensure continuous provision of data and improvement of the situation regarding the development of digitalization in all areas. They should provide measurable data for all indicators in order to be able to monitor progress in the digitalization of SMEs in our country and to be able to make a comparative analysis both with the countries of the Western Balkans and with the EU member states. With the existence of such overall data, it will be known exactly what measures should be taken to improve the level of digitalization in the Republic of North Macedonia.

REFERENCES

1. Schalmo D.R.A, Williams C.A. (2018). Digital Transformation Now! Guiding to successful digitalization of your business model, Springer, 2018
2. Smirnov E.N. (2018). "Evolution of innovative development and prerequisite of digitalization and digital transformations of the world economy", Russ. J. of Innovat. Econ., vol. 4, no. 8, pp. 553–563
3. Tilson D, and all. (2010). Digital Infrastructures: The Missing IS Research Agenda

4. Gorenssek, T., Kohont, A. (2019), Conceptualization of digitalization: Opportunities and challenges for organizations in the Euro – Mediterranean area
5. Westerman G., Bonnet D., McAfee A. (2014), Leading digital: Turning technology into business transformation, Harvard Business Press
6. Richard G. L., Kenneth I. C., and Clifford T. B. (2005). Economic Transformations General Purpose Technologies and Long-Term Economic Growth
7. European Commission (2020), Final Report: Shaping The Digital Transformation in Europe, <https://digital-strategy.ec.europa.eu/en/library/shaping-digital-transformation-europe> accessed 01 July 2022
8. Chakravorti, B., Chaturvedi, R. (2017). How Competitiveness and Trust in Digital Economies Vary Across the World, p.16
9. European commission, Digital Economy and Society Index (DESI) 2021, Integration of digital technology
10. European Commission, North Macedonia 2020 Report, Accompanying the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Communication on EU Enlargement Policy 2020

Internet sources:

- <https://www.gartner.com/en/information-technology/glossary/digitalization>, accessed 20 June 2022.
- http://makstat.stat.gov.mk/PXWeb/pxweb/mk/MakStat/MakStat__InfOpstestvo_DelovniSubjekti/?rxid=b9de61e7-24f8-464e-8c67-499824c5c57e
- <https://networkreadinessindex.org/> accessed 23 May 2022.
- https://www.bbvaresearch.com/wpcontent/uploads/2022/06/DiGiX_2022_Update_A_Multidimensional_Index_of_Digitization.pdf
- https://www.researchgate.net/publication/220079905_Digital_Infrastructures_The_Missing_IS_Research_Agenda, accessed 10 May 2022.
- https://sites.tufts.edu/digitalplanet/files/2020/03/DEI-LAC_Executive-Summary_27Nov2018.pdf, accessed 07 June 2022.