DOI: 10.46541/978-86-7233-406-7_206

27th International Scientific Conference
Strategic Management
and Decision Support Systems
in Strategic Management
SM2022
Subotica (Serbia), 20th May, 2022

Margarita Janeska
Faculty of economics
Prilep, Republic of North Macedonia

mjaneska@yahoo.com

Dejan Zdraveski
Faculty of economics
Prilep, Republic of North Macedonia

dejan.zdraveski@uklo.edu.mk

Aleksandra Najdoska Aleksoska
Faculty of economics
Prilep, Republic of North Macedonia

THE LEVEL OF DIGITALIZATION BEFORE AND DURING THE COVID-19 PANDEMIC IN REPUBLIC OF NORTH MACEDONIA

Abstract: Information and communication technologies (ICT) play a leading role in the transformation of national economies. Their use covers various spheres of economic activities and creation of new opportunities for socio-economic development. Digital innovation, through digital technologies and digital business models, inevitably leads to organizational change paving the way for the digital transformation of organizations, bringing sustainable implications for all business aspects. Digital transformation is a prerequisite for active inclusion of Macedonian businesses in the European market whose digital form is subject to continuous monitoring and development by EU institutions.
The Covid-19 pandemic had a significant impact on the economy and society. It has significantly changed the role and perception of digitalization and accelerated its pace. Digital technologies have played an important role in the coordinated response to Covid-19 at EU level. Digital technologies are essential for sustaining economic and social life during a pandemic. They will be the key to a successful transition to a sustainable, post-pandemic economy and society. Investments in digital technologies, infrastructure and processes will make the Macedonian economy more competitive globally.
The main aim of this paper will to elaborate the key indicators for measuring the level of digitalization in the Republic of North Macedonia. A comparative analysis of the level of digital transformation in small and medium enterprises before and during the Covid-19 pandemic will also be made, in order to anticipate the opportunities in Republic of North Macedonia for all citizens and businesses to use the digital transformation for a better and more prosperous life.
Keywords: digitalization, socio-economic development, small and medium enterprises, innovation.

1. INTRODUCTION

The 21st century has brought great technological change. Every country, which wants to develop successfully and follow the world trends, should develop new ideas and be able to turn most of those ideas into business opportunities. Information and communication technologies (ICT) play a leading role in most of the changes that take place in the economy. Their application covers various aspects of economic activities and the creation of new opportunities for socio-economic development. For that reason, today it is impossible to imagine economic growth without the application of ICT.
Information and communication technology is a basic tool to support companies in developing the ability to adapt to various aspects of the technological revolution, such as the digitalization of society. Digitalization enables faster flow and growth of information, which requires more advanced and flexible ICT support. Many industries today are shifting to the digital world while offering products and services that are based on customer experiences.
Digitalization involves the application of digital technologies and data to transform the current business model, reshaping the way it works, thus creating new opportunities and product creation. Digital innovation, through digital technologies and digital business models, inevitably leads to organizational change paving the way for the digital transformation of companies and bringing deep and sustainable implications for all aspects of business. Digital

technology has capabilities that could not have been imagined until just a few years ago. Typical examples are: 5G, artificial intelligence, 3D printing, etc.
However, digital transformation is not a uniform process but is different for each organization. Today, there are companies that have accepted the concept of digital transformation and are successfully implementing it, companies that are in the planning stage of the digitalization process and companies that are simply "struggling" with the concept itself. All companies, regardless of sector or size, are affected by digitalization and interconnection. The development of technology and its daily changes and advances force companies to think "outside the box" and accept ICT as an important strategic approach, which they should apply in their businesses to achieve a competitive advantage in global markets.

2. CONCEPTUAL FRAMEWROK OF DIGITALIZATION

Digitalization is an important technological trend that affects the development of society, economy and business. Its impact is so great that some authors even compare it to an industrial revolution. The era of digitalization is also called the "Fourth Industrial Revolution" or also known as Industry 4.0. The Fourth Industrial Revolution encompasses every aspect of modern living. The Fourth Industrial Revolution is a term coined by Klaus Schwab. According to him: We are on the brink of a technological revolution that will fundamentally change the way we live, work and treat each other. In its scope, scope and complexity, the transformation will be unlike anything else that humanity has previously experienced. We do not yet know how it will unfold, but one thing is clear: the answer must be integrated and comprehensive, involving all stakeholders in global politics, from the public and private sectors to academia and civil society (www.weforum.org). He also points out that the Fourth Industrial Revolution can compromise the traditional sources of human significance - work, community, family and identity - or it can elevate humanity to a new collective and moral consciousness based on a sense of shared destiny.
According to Gartner, 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 (www.gartner.com). From the last definition it can be concluded that digitalization is much more than the application of different digital technologies.
There are many definitions of digitalization in the literature. If we analyze them, we can say that digitalization refers to the changes related to the application of digital technology in all aspects of human life. These changes apply to multiple levels as well:(Parvianen, P., Tihinen, M., Kääriäinen, J., Teppola, S., 2017)

- Process level: introduction of new digital tools and streamlining of processes by reducing manual steps;
- Organization level: offering new services and rejecting outdated practices, as well as offering existing services in new ways;
- Business level: changing roles and value chains in ecosystems;
- Society level: changing the structures of society (type of work, ways of influencing decision-making, etc.)

The process of digitalization is a process of change in the organization from the old approaches to new ways of working and thinking through the use of digital, social, mobile and technological services. This process includes changes in the way the organization is managed, prefers different thinking, encourages innovation and development of new business models, incorporating digitalization tools and increased use of technology in order to improve the user experience of employees in the organization, customers, suppliers, partners and shareholders (Gorensek, T., Kohont, A., 2019). The impact of digitalization and the goals of digitalization on a company can be identified from three different perspectives: (Parvianen, P., Tihinen, M., Kääriäinen, J., Teppola, S., 2017)

- Internal efficiency - improved way of working through digital means and replanning of internal processes;
- External opportunities - new business opportunities in the existing business (new services, new customers, etc.);
- Complete change - digitalization causes a complete change of business.

Digita
lization affects business and corporate business. If the importance of digitalization is minimized, it can lead to a serious risk of losing its place in highly competitive markets.

3. DIGITIZATION, DIGITALIZATION AND DIGITAL TRANSFORMATION

Digitization, digitalization and digital transformation are three different terms that have been used for years, but quite often in the wrong sense. In addition, a brief overview of each of the terms will be made and they will be elaborated. The following figure shows their hierarchy:

Figure 1: Hierarchy by Digitazation, Digitalization and Digital transformation (Source: M.S.Gupta, 2020)

Digitization means the conversion of analog data (eg images, video, text) into digital format. Digitized data is used to automate processes and provide better accessibility. The digitization process does not optimize processes or data, but "digitization focuses on process standardization and automation in order to reduce costs (Risteski, S., Zdraveski, D., Janeska, M., 2019). Today, digitization is mainly used for storing and scanning documents as well as for digitizing business processes. In the production process, digitization enables the generation, collection and utilization of huge amounts of data. Information can be effortlessly disseminated at any time, resulting in virtualization of overall value creation.

Unlike digitization, which covers only the technical-technological conversion of analog data to digital format, digitalization is a process that covers all effects, influences and consequences, caused by the availability of digital information.

Digitalization is the process of converting interactions, communications, business processes, and business models into digital, often reduced to a mix of digital and physical, such as multichannel customer service, integrated marketing, or smart manufacturing with a mix of autonomous, semi-autonomous, or manual operations. In business, digitalization refers to enabling, improving, and transforming business operations, functions, models, processes, or activities using digital technologies and digitized data. This means that digitalization is based on digitization. While digitization describes analog information being transformed into digital format, digitalization is presented as a socio-technological process of application of digitization techniques, to the broader social and institutional context provided by the digital technology infrastructure.In this paper, the term digitalization will be used most often as a synonym for digital transformation.(Bican, P., Brem, A., 2020)

The most important thing for a company is that the process of its digital maturation should not end with digitization and digitalization. Companies that have gone through these two steps, if they want to be competitive and stay in business in the long run, need to take a step towards digital transformation.

Digital transformation is a transformation made possible by digitalization, but digital transformation as a way to move into digital business is much broader than digitalization. Digital transformation is a completely new use of digital technology that solves new complex problems. This series of digital solutions can lead to new types of creative innovation, rather than just upgrading what already exists.

According to the European Commission, digital transformation covers both the integration of digital technologies by European enterprises and the impact on society of new technologies, such as the Internet of Things (IoT), cloud computing, innovative digital platforms and blockchain technologies. (European Commission, 2019)

Digital transformation has become a strategic imperative for businesses. Digital transformation is a process that aims to align the business process and cultural transformation with the changing needs of the business environment.

According to the forecasts of the European Commission, the transformative industrial and technological revolution" will be one of the key world trends by 2030. All aspects of society - such as politics, governance, education, science, lifestyle, collective intelligence networks, open systems and health, including the transformation of the human genome - will be transformed by technological breakthroughs. (ESPAS, 2015)

4. DIGITALIZATION INDEX

The main indexes that characterize the world digitalization are: Digital Evolution Index (DEI), Networked Readiness Index (NRI), Digitization Index (DiGiX), The Digital Economy & Society Index (DESI), ICT Development Index (IDI), IMD World Competitiveness etc. Each of these indexes has different methodological approaches to determining the level of digitalization and contains different factors that help to examine. In this paper, each of the listed indexes will be briefly elaborated.

Digital Evolution Index - DEI analyzes the basic drivers that drive a country's digitalization: supply conditions, demand conditions, the institutional environment, and innovation and change. To get a comprehensive overview of the digital readiness and competitiveness of countries, these core drivers are divided into 12 components, measured by a total of 108 indicators. (Chakravorti, B., Chaturvedi, R., 2017)

Networked Readiness Index - NRI is an indicator that characterizes the level of development of information and communication technologies in countries around the world. With NRI, countries are assessed in four categories of indicators: (1) the overall environment for the creation and use of technology (political, regulatory, business and

innovative), (2) network preparedness in terms of ICT infrastructure, availability and skills, (3) the willingness of key stakeholders (individuals, businesses, governments) to use ICT and (4) the economic and social impact of new technologies (Baller, S., Battista, A., Dutta, S., Lanvin, B., 2016). The NRI index shows what different actors in society, both public and private, can do to contribute to a country's network readiness.
DiGiX assesses the factors, the behavior of agents and institutions that enable the country to make full use of ICT, to increase competitiveness and prosperity. It is a complex index that summarizes the relevant digital performance indicators of 100 countries. It is based on 6 components: infrastructure, household adoption, business adoption, costs, regulation and maintenance (Camara, N., Tuesta, D., 2017)
ICT Development Index - IDI, is designed to be global and reflect changes in countries at different levels of ICT development. It contains 11 indicators, which monitor and compare the development of ICT between countries. The main aim of IDI is to measure the level of ICT development, the progress of ICT development in developed and developing countries, the digital gap, i.e., the differences between countries in terms of levels of ICT development and development potential of ICT as well as the level to which countries can use it to improve their own growth and development.
The Digital Economy and Society Index (DESI) measures the progress of EU countries in terms of digital economy and society. This index combines a set of relevant European digital policy indicators and measures progress from 2014 to date. According to the 2021 report, the structure of DESI consists of 4 main areas, 10 sub-areas and 33 key indicators. The four main areas are: human capital, connectivity, digital technology integration and the development of digital public services (European Commission: DESI 2021).
In general, comparing the ratings of the countries, according to different methods and indicators, we can see that the TOP-10 countries in terms of digitalization for each index have different ratings, because the overall calculation of the digitalization of the economy is done according to different indicators.

5. DIGITAL ECONOMY AND SOCIETY INDEKS IN NORTH MACEDONIA BEFORE AND DURING THE COVID-19 PANDEMIC

Given that the Republic of North Macedonia is a candidate country for EU membership, the methodology for determining the DESI index for the Republic of North Macedonia, in this paper, derives from the methodology for EU DESI. In the process of analysis will be used secondary data, which originate from relevant sources, i.e., data from the State Statistical Office of RS Macedonia, from 2016 to 2021, as well as from the European database Eurostat in order to make a comparative analysis in terms of individual subdimensions, i.e., indicators before and during the Covid-19 pandemic. For some indicators there is no data for individual years, and for some there is no data at all. According to the DESI methodology some indicators presented missing observations for some countries. Values for those observations were estimated using different methodologies, such as:

- using available figures from the previous year
- using available figures from the following year
- using proxy indicators to identify trends to complete time series.

The calculations in this paper used the min-max normalization which is presented in the methodology of the European Commission for the calculation of DESI. The four dimensions of the Digital Compass are of equal importance, which is reflected in the equal weights of each dimension.

Table 1: Four dimensions of the Digital Compass

Dimension	Weight
1 Human capital	25%
2 Connectivity	25%
4 Integration of digital technology	25%
5 Digital public services	25%

Human capital and digital skills are key to any digital society and digital transformation. Two elements are essential. First, the number of ICT specialists and ICT graduates per year shows the potential for human resources of each economy in relation to the further development of the digital society. Second, the digital skills of all non-ICT-related citizens and professionals enable the acquisition of Internet access, digital public services, and the integration of digital technologies. Pandemic has shown that the digital skills of non-ICT professionals in public administration (e.g., teachers, healthcare professionals, public administration, etc.) are essential to business continuity by following physical distance recommendations as well as integrating new technologies (e.g., distance learning, telemedicine, work from home, etc.).
Modern digital infrastructure is a major prerequisite for any digital transformation of governments, the economy and society in general. Access to and use of a fast and secure broadband network is essential to enable online delivery of key economic and social services. This proved to be more than necessary during the pandemic.

The integration of digital technology into businesses is an important aspect of the digital transformation of the economy. Businesses are constantly adopting new technologies and providing information about their products and services online. The pandemic has shown that adjusting SMEs has not been so easy compared to governments and corporations. Many SMEs discontinued their work and activities during the restrictions.
Digital transformation of the production and delivery of public services is an important element of the modernization and digitalization of the public sector. In this regard, the pandemic has shown the benefits of economies with well-established digital infrastructure and a functioning e-government.
From the analysis of the data it can be concluded that out of 33 indicators defined in the methodology of the European Commission, in the State Statistical Office of Macedonia there are 14 indicators for which a comparison can be made in the years before and during the Covid-19 pandemic (which represents a very small percentage, about 42.4%), as follows: 7 indicators for the dimension Human Capital, 2 indicators for the dimension Connectivity, 4 indicators for the dimension Integration of Digital Technology and one indicator for the dimension Digital Public Services.

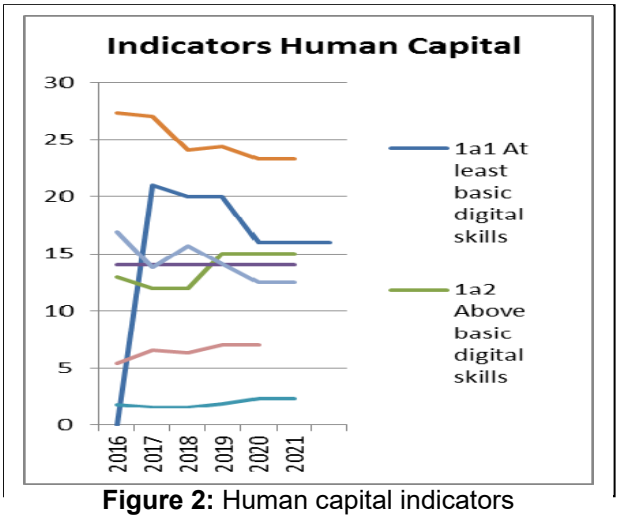

Figure 2: Human capital indicators
(Source: www.stat.gov.mk; www.ec.europa.eu/eurostat)

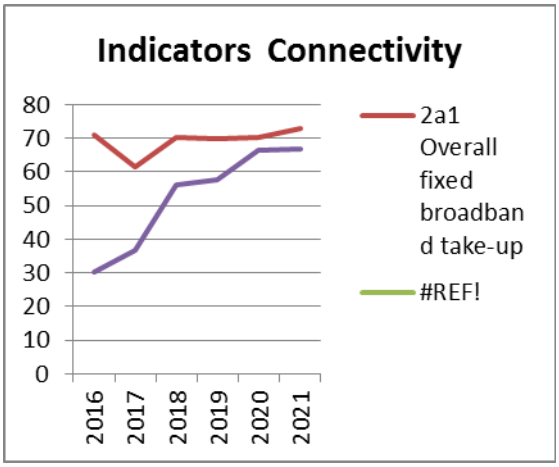

Figure 3: Conectivity Indicators
(Source: www.stat.gov.mk; www.ec.europa.eu/eurostat)

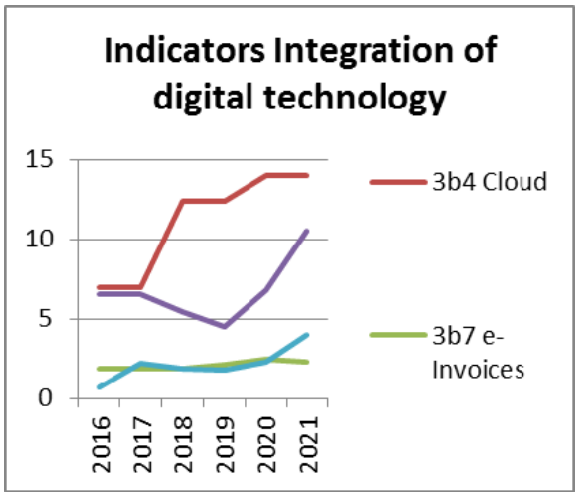

Figure 4: Integration of digital technolgy indicators
(Source: www.stat.gov.mk; www.ec.europa.eu/eurostat)

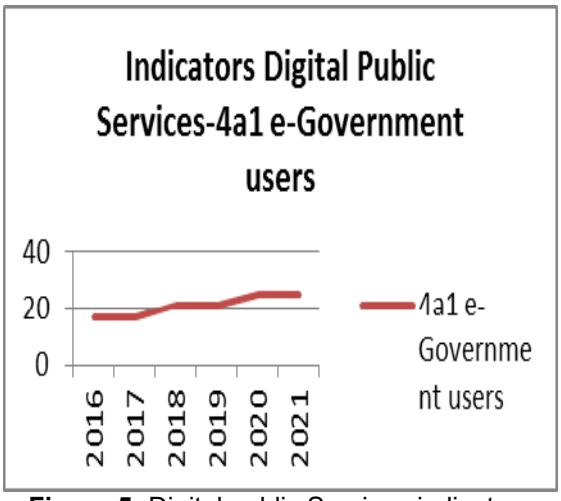

Figure 5: Digital public Services indicators
(Source: www.stat.gov.mk; www.ec.europa.eu/eurostat)

From the analysis it can be concluded that during the pandemic the indicators Above basic digital skills and ICT specialists from the dimension Human Capital, Overall fixed broadband take-up and Mobile broadband take-up from the dimension Connectivity, e- Invoices, SMEs selling online, Cloud and e-Commerce turnover of the dimension Integration of Digital Technology and e-Government users of the dimension Digital Public Services are growing.
Although there are partial data for other indicators, they do not allow the required comparison to be performed and therefore the DESI index will be calculated only for those indicators that were taken into account in the analysis.
The DESI Index of the Human Capital dimension in 2020 has the same level as in 2019, while in 2021 although it has a higher value, it cannot be said that during the pandemic this index increased, because it has the same value as in 2016. DESI for the other 3 dimensions has growth in 2020 and 2021 compared to DESI for these dimensions before the

pandemic. The DESI index for the Connectivity dimension has the highest growth during the pandemic. The DESI index of the individual dimensions in the individual years are shown in the following graphs:

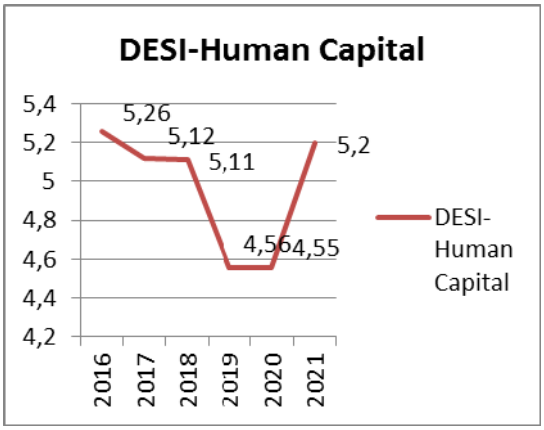

Figure 6: Index DESI for Human capital
(Source: www.stat.gov.mk; www.ec.europa.eu/eurostat)

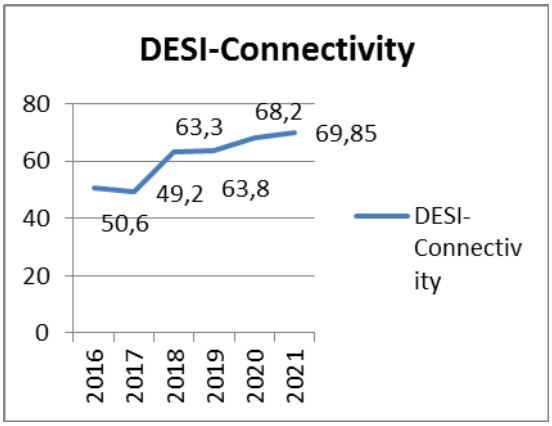

Figure 7: Index DESI for Connectivity
(Source: www.stat.gov.mk; www.ec.europa.eu/eurostat)

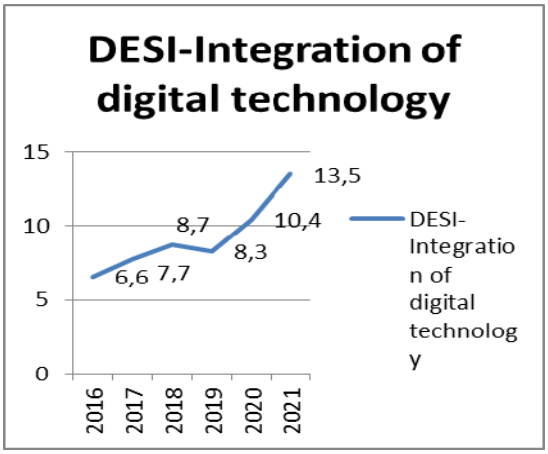

Figure 8: Index DESI fir Integration of digital technology
(Source: www.stat.gov.mk; www.ec.europa.eu/eurostat)

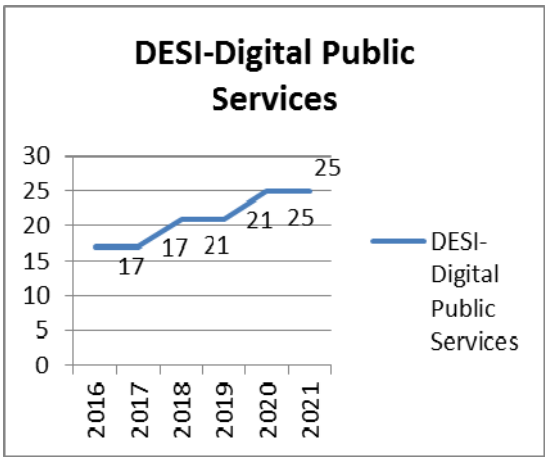

Figure 9: Index DESI for Digital public services
(Source: www.stat.gov.mk; www.ec.europa.eu/eurostat)

The indexes are shown in the following graph, from which it can be seen that the lowest is the Human Capital index, and the highest is the Connectivity index:

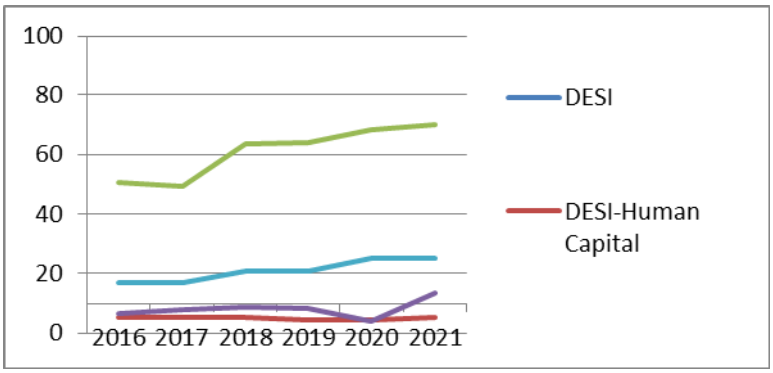

Figure 10. Summary of DESI indexes
(Source: www.stat.gov.mk; www.ec.europa.eu/eurostat)

According to the European Commission Report 2021, each dimension has the same weight factor of 0.25, DESI values after the individual years show that during the pandemic it is higher compared to its values before the pandemic. The total DESI by individual years is shown in the following figure:

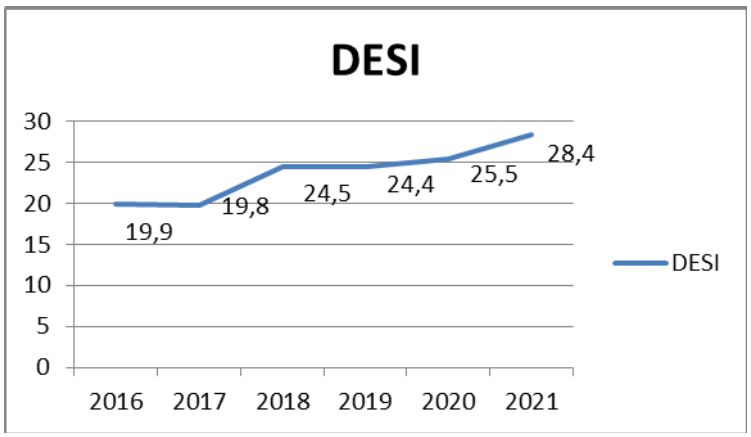

Figure 11: Total DESI by years
(Source: www.stat.gov.mk; www.ec.europa.eu/eurostat)

According to the results of this research, only the Human Capital dimension during the pandemic has an index that is approximately the same as the one before the pandemic. This means that the emphasis on improving the level of digitalization should be placed on improving basic and advanced digital skills. This applies especially to basic software skills and increasing the number of companies providing ICT skills training. Undoubtedly, the future lies in digitalization and digital skills. In particular, in the context of globalization for small countries such as the Republic of North Macedonia, the development of digital skills, as a key segment of digitalization is important both to improve the quality of services in our country and to increase competitiveness.

6. CONCLUSION

The COVID-19 pandemic has had a significant impact on the economy and society. It significantly changed the role and perception of digitalization in our economy, because it turned out that in a pandemic, digitalization has a decisive role in maintaining continuity in business operations. Numerous digital initiatives have emerged in the Republic of North Macedonia, as well as in all other countries affected by the coronavirus pandemic. Such digital services included informing the population, enabling employees to work from home, offering e-services to citizens and companies, providing access to digital training for primary and secondary school students, and providing health support, and so on.
The Republic of North Macedonia faces major challenges in its efforts to better integrate into the digital economy and reap its significant benefits. When it comes to the digitalization process, the Republic of North Macedonia most often ranks in the second half of the world according to the assessments of relevant international organizations and shows particularly poor results in terms of aspects related to the digitalization of the economy. However, digitalization is no longer a choice that only large companies can afford, but also a necessity for SMEs to adapt to the new reality and keep pace with global economic trends. It is a precondition for active inclusion of Macedonian business entities in the single European market whose digital form is subject to continuous monitoring and improvement by EU institutions. For that purpose, the so-called "Digital Initiative" by the organization Macedonia 2025 which will be realized through a broad partnership with the business and political community, as well as the scientific community, represented through the Macedonian Academy of Sciences and Arts in order to accelerate the process of digitalization and promotion of digital skills of Macedonian citizens and businesses.
Considering the shortcomings that exist in terms of the development of individual indicators, and even more in terms of lack of official adequate data on them, the main pillars of the National Strategy for ICT 2021 - 2025 in RS Macedonia correspond to the dimensions of EU DESI, to achieve compliance of the digital transformation of RSM with EU policies and directives. This should lead to the adjustment of the country's statistical reporting mechanisms in order to meet the DESI-related indicators. The aim is to link the outcomes of the strategy with measurable progress in the country's digitalization, which can be easily compared to other EU member states.

REFERENCES

Baller, S., Battista, A., Dutta, S., Lanvin, B., The Networked Readiness Index 2016, Innovating in the Digital Economy, The Global Information Technology Report 2016, p.3

Bican, P., Brem, A., Digital Business Model, Digital Transformation, Digital Entrepreneurship: Is There A Sustainable "Digital"? 2020 p.2

Camara, N., Tuesta, D.,: DiGiX: the Digitization Index, 2017

Chakravorti, B., Chaturvedi, R., Digital Planet 2017: How Competitiveness and Trust in Digital Economies Vary Across the World, p.16

Eling, M., Lehmann, M. (2018): The impact of digitalization on the insurance value chain and the insurability of risks. Geneva Pap. R. I.-ISS 43(3)

ESPAS (2015), Global trends to 2030: Can the EU meet challenges ahead? https://ec.europa.eu/epsc/sites/epsc/files/espas-report-2015.pdf

European Commission: DESI 2021, Digital Economy and Society Index, Thematic chapter

European Commission. (2019). Digital transformation. https://ec.europa.eu/growth/industry/policy/digitaltransformation_en

Gebre-Mariam, M., Bygstad, B. (2019): Digitalization mechanisms of health management information systems in developing countries. Inf. Organ. 29(1), 1–22

Gorensek, T., Kohont, A., Conceptualization of digitalization: Opportunities and challenges for organizations in the Euro –Mediterranean area, 2019

Kravchenko, O., Leshchenko, M., Marushchak, D., Vdovychenko, Y., Boguslavska, S., The digitalization as a global trend and growth factor of the modern economy, SHS Web of Conferences 65, 2019 p. 2

M. C. Gupta, (2020), What is Digitization, Digitalization and Digital transformation, Article Advisory Group, https://www.arcweb.com/blog/what-digitization-digitalization-digital-transformation

Maxwell, L., McCain, T. (1997): Gateway or gatekeeper: the implications of copyright and digitalization on education. Commun. Educ. 46(3)

Orji, C.I. 2019. Digital business transformation: towards an integrated capability framework for digitization and business value generation. Journal of Global Business & Technology, 15(1)

Parvianen, P., Tihinen, M., Kääriäinen, J., Teppola, S., Tackling the digitalization challenge: how to benefit from digitalization in practice - International Journal of Information Systems and Project Management, Vol. 5, No. 1, 2017, 63-77, 64

Risteski, S., Zdraveski, D., Janeska, M., Digitalization of small and medium enterprises in the Republic of North Macedonia, Digital transformation of the economy and society: shaping the future 202 -217, p.207

Savic D. (2019), From Digitization, through Digitalization, to Digital Transformation, The Grey Journal Volume 16, Number 1, Spring 2020 https://www.researchgate.net/publication/340183219_From_Digitization_and_Digitalization_to_Digital_Transformation_A_Case_for_Grey_Literature_Management#fullTextFileContentSchwab

K. (2018), The Fourth Industrial Revolution, WorldEconomic Forum, Geneva

https://www.gartner.com/en/information-technology/glossary/digitalization#:~:text=Digitalization%20is%20the%20use%20of,moving%20to%20a%20digital%20business

Srai, J., Lorentz, H. (2019): Developing design principles for the digitalization of purchasing and supply management. J. Purch. Supply Manag. 25(1)

Schumacher, A., Sihn,W., Erol, S., Automation, digitization and digitalization and their implications for manufacturing processes, International scientific Conference Bucharest, Romania, October 2016

Xu, M., David, J.M., Kim, S.H., The Fourth Industrial Revolution: Opportunities and Challenges, International Journal of Financial Research, Vol. 9, No. 2; 2018

https://digital-strategy.ec.europa.eu/en/policies/desi;

https://www.stat.gov.mk/PrethodniSoopstenijaOblast.aspx?id=76&rbrObl=27;

https://ec.europa.eu/eurostat/databrowser/view/ISOC_EB_BD__custom_2376158/default/table?lang=en.