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THE FEATURES OF BUSINESS DIGITIZATION DEVELOPMENT INDICATORS IN SELECTED ECONOMIES

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Abstract
Digitization increases operations efficiency, innovative processes, value creation and delivery in business activity. Many developed countries use digital transformation as one of the strategies for improving their enterprises operations. Business digitization highly depends on country financial investments to network physical infrastructure, relevant skills, various regulations, use and adoption of technologies. However, there are still large differences in business digitization across countries. The aim of the study is to perform a comparative analysis of business digitization development indicators in Lithuania and Bulgaria. The aim was reached by performing a theoretical justification of the concept of business digitization and to identify the main conditions and development indicators of business digitization, and by conducting a comparative evaluation study of business digitization development indexes and indicators. The overview of literature of business digitalization was conducted and it was found that the difference between Industry 4.0 and Industry 3.0 is that the latter was based on the global transition of specimen data from analogue to digital signals, and the Industry 4.0 develops on Industry 3.0. Also, it was found that the development of business digitalization is closely related to the country's level of digitalization, which depends on several conditions, such as: digitalization-related government decisions, regulation, communication infrastructure and availability, skills, financial incentives, and the use of technology. The research was conducted by comparing five dimensions of Digital Economy and Society Index (DESI) 2022 that are: Connectivity, Digital skills, Use of Internet, Integration of Digital Technology, Digital Public Service, and three dimensions of ICT Development Index (IDI) 2017 that are: Access, Usage and Skills. The results of DESI 2022 and IDI 2017 showed that Lithuania in both indexes ranks higher than Bulgaria, and the weakest area in Lithuania is DESI 2022 dimension of Connectivity. Thus, more targeted investments for the development of 5G network development and accessibility is needed for better adoption and development of intelligent technologies that are the future of all businesses, and society.
KEYWORDS: Business digitization, digitization development indicators, DESI, IDI, Industry 4.0.

Introduction

Nowadays, digitization plays key role in businesses life. It increases operations efficiency, innovative processes, value creation and delivery (Akpan & Ibidunni, 2021). Many developed countries use digital transformation as one of the strategies for improving their enterprises operations. It is important to mention, that the level of business digitization depends not only on companies themselves, but also on country financial investments to network physical infrastructure, relevant skills, various regulations, use and adoption of technologies. However, there are still large differences in business digitization across countries and in order to better understand the prospects of business digitization in the country, it is important to distinguish the main evaluation indicators and compare them between countries of different economic strength.

The aim is to perform a comparative analysis of business digitization development indicators in Lithuania and Bulgaria.

The main objectives are:

1. To perform a theoretical justification of the concept of business digitization and to identify the main conditions and development indicators of business digitization.
2. Conduct a comparative evaluation study of business digitization development indexes and indicators.

Theoretical background

Industrial development processes nowadays are an extremely complex field, which requires multifaceted scientific knowledge, continuous complex researches that are focused on various new challenges caused by globalization processes (Tofan & Jakubavičius, 2018). Different interpretations of the concept of digitization can be found in the scientific literature. Buck and Eder (2018) digitization described as “the increasing penetration and adaptation of digital technologies in society and economy as well as the associated changes in behavior”. Slezák, Barotová, Červenková, and Svačková (2021) state, that the concept of digitization refers to the use of information and digital technologies, which allows to simplify and improve the processes of communication, information transfer, and data storage. Moreover, digitization means that not the processes are digitizing, but the information (Bloomberg, 2018).

The researchers argue that the different interpretations limit the development of the unification and standardization processes required for industrial digitization (Tofan & Jakubavičius, 2018). The concept of industrial digitization is directly related to the fourth industrial revolution, which is often referred to as "Industry 4.0" in the literature (Tofan & Jakubavičius, 2018).

According to Sepashvili, E. (2020), the realization of an innovation-based approach is the main key for creating

a modern competitive economy and achieving irreversible economic growth, and for that it is necessary to form a national innovation system adapted to the specific country's economic, political, social, and cultural characteristics. The Fourth Industrial Revolution (Industry 4.0) was mainly driven by the emergence and mass-generalization of the Internet (Neamţu, Hapenciuc, & Bejinaru, 2019). Based on that the authors Tofan, T. and Jakubavičius, A. (2018) distinguish the following main characteristics of the Fourth Industrial Revolution:

- Ubiquitous mobile Internet;
- Smaller, cheaper and more powerful sensors;
- Artificial intelligence;
- Self-automatic learning of smart machines and devices.

However, the difference between Industry 4.0 and Industry 3.0 is that the latter was based on the global transition of specimen data from analogue to digital signals (Nelson & Ellis, 2018) began in the 1980s and the Industry 4.0 actually develops on Industry 3.0. This development is manifested in attempts to make production facilities communicate with each other with the help of information technology (Tofan & Jakubavičius, 2018). Because of the main characteristics of Industry 4.0 the latest technologies and innovations are spreading much faster and on a larger scale than during Industry 3.0, which still takes place in some parts of the world (Tofan & Jakubavičius, 2018).

The one of the main advantages of digitization for companies is instant access to information and the ability to exchange between people as well as plugged-in applications such as cloud, analytic and social tools, and other mobile devices (Buck & Eder, 2018). The authors Tofan and Jakubavičius (2018) claim that companies must commit to digitization changes at all levels from production planning to sales. Digitization also enables effective management of relationships with customers and suppliers.

The realization of innovation-based approach is the key principle for achieving economic growth and creating a competitive economy (Sepashvili, 2020). In order to increase the competitiveness of the economy through the digitization of the industry, adequate government sector solutions are necessary to reduce the risk and negative consequences of such processes, which are associated with a decrease in the need for labour in production and service processes (Tofan & Jakubavičius, 2018). Ranchordás (2022) finds that governments throughout the world have already made significant investments in the digitization of public services, information, administration, and integration of services. Various authors also claim that the main condition for technological development and transformation are innovative development and science-based growth.

Sepashvili (2020) has highlighted key conditions of business digitization that are:

1. The overall environment for the use and development of technology, including political, regulatory, business and innovation factors;
2. Network physical infrastructure for information and communication technologies (ICT) use, and relevant skills;
3. Adoption/use of technology by government, private sector/business and individuals/consumers;
4. Economic and social impact of modern technologies.

Neamţu and others (2019) finds two indexes that analyse the Information and Communications Technology (ICT) situation and their impact on the business sector – the State ICT Development Index (IDI) and Digital Economy and Society Index (DESI). IDI reflects a country's digitization level (Özsoy, Ergüzel, Ersoy, & Saygılı, 2022) or in other words, allow us to see the overview of countries attractiveness for current investments and for foreign investors, and DESI shows government investments size in digitizing the economic activities of market players.

IDI has three main dimensions: Access, Usage and Skills (Chand, 2020), while DESI has five main dimensions: Connectivity, Digital skills, Use of Internet, Integration of Digital Technology, and Digital Public Service (Jovanović, Dlačić, & Okanović, 2018). Thus, these are the main indexes for country's evaluation in the context of digitization. According to Statista Research Department (2021), internet and digital platforms are the key factors for both small and medium business, and consumer's purchase decision. Nowadays more and more consumers turn to digital platforms for researching various products and services, and businesses already recognize and use this opportunity in the digital environment.

Methodology

In order to compare the development of business digitalization in economies, it is necessary to distinguish the main indicators of the development of business digitalization. Analysing scientific articles and journals, four main conditions for business digitization were identified, and based on these categories it was chosen to divide indicators of business digitization into four groups:

1. Indicators of business environment;
2. Indicators of physical infrastructure and skills for ICT use;
3. Indicators of use of technologies by public institutions, private sector companies and individuals;
4. Indicators of economic and social impact of modern technologies.

These conditions are overviewed under DESI and IDI main dimensions and indicators, since DESI overviews government investments into digitizing economics, and IDI overview countries overall digitization level.

The study will analyse the DESI 2022 and IDI 2017 indicators of country and business digitization development in Lithuania and compare it with Bulgaria. Bulgaria was chosen for the comparative analysis, which has a market size similar to that of Lithuania, belongs to the same region - the EU, and is considered to be an economically weaker country than Lithuania. The comparative analysis of the countries will allow predicting new opportunities for the development of the Lithuanian economy through the digitalization of business.

Results

According to European Commission (2022) Digital Economy and Society Index (DESI) 2022 overview in Lithuania and Bulgaria, Lithuania has a score of 52,7 and the rank 14 out of 27 EU Member states (EU score is 52,3), while Bulgaria's score 37,7 and rank 26. While analysing DESI it is important to go through all its dimensions to better understand country's capacities and the weakest areas starting with the dimension of human capital.

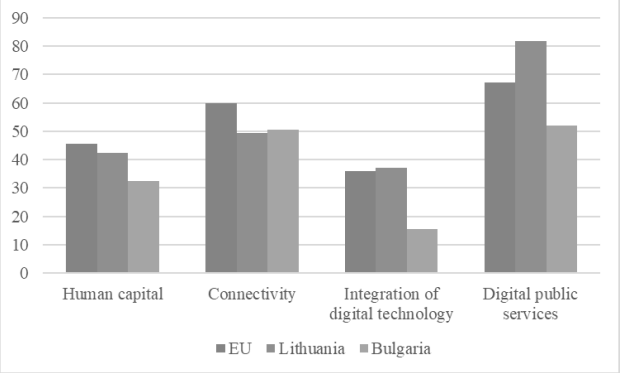

Fig. 1. DESI 2022 dimensions and ranking
Source: Eurostat – European Commission (2022)

According to European Commission (2022) DESI 2022 human capital results that are visible in the **Fig. 1**., Lithuania's score is 42,5 while the score in Bulgaria is 32,6 and EU 45,7.

Table 1. DESI 2022 of Human capital

	DESI 2022		
	EU	**Lithuania**	**Bulgaria**
At least basic digital skills	54%	49%	31%
Above basic digital skills	26%	23%	8%
At least basic digital content creation skills	66%	61%	44%
ICT specialists	4,5%	3,8%	3,5%
Female ICT specialists	19%	24%	28%
Enterprises providing ICT training	20%	14%	7%
ICT graduates	3,9%	4%	4,6%

Source: Eurostat – European Commission (2022)

In human capital dimension Lithuania ranks 20th place of 27 EU Member states. The results in the **Table 1** shows that 49% of all population in Lithuania has basic digital skills, while in Bulgaria is 31% and 54% in EU. A significant difference between Lithuania and Bulgaria can be seen on data of digital skills that are above basics – 23% and 8% respectively (average in EU is 26%). However more than a half of population in Lithuania (61%) and almost half of population in Bulgaria (44%) have at least basic digital content creation skills (versus 66% in EU). Moreover, the percentage of female ICT specialists out of all ICT specialists in both Lithuania and Bulgaria is higher than the EU average, 24%, 28%, 19%, respectively, as well as the percentage of ICT graduates (4%, 4,6% and 3,9%). The final feature of human capital dimension is enterprises providing ICT training and the results show that only 7% of companies provided ICT trainings to their employees which is half less than Lithuanian companies investment in their employees ICT trainings, while EU average is 20%.

The next dimension of DESI is connectivity which scores in Lithuania and Bulgaria are quite similar 49,4 and 50,7 respectively, in comparison to the EU average of 59,9 (**Fig. 1**). In this dimension Bulgaria ranks 19th and Lithuania only 23rd, thus the deeper analysis of the main indicators of connectivity is needed to better understand the areas where Lithuania needs more investments.

Table 2. DESI 2022 of Connectivity

	DESI 2022		
	EU	**Lithuania**	**Bulgaria**
Overall fixed broadband take-up	78%	67%	63%
At least 100 Mbps fixed broadband take-up	41%	36%	22%
At least 1 Gbps take-up	7,58%	0,72%	0,42%
Fast broadband (NGA) coverage	90%	85%	93%
Fixed Very High Capacity Network (VHCN) coverage	70%	78%	85%
Fibre to the premises (FTTP) coverage	50%	78%	85%
5G spectrum	56%	5%	25%
5G coverage	66%	33%	40%
Mobile broadband take-up	87%	85%	73%
Broadband price index	73	89	86

Source: Eurostat – European Commission (2022)

Table 2 shows that VHCN, FTTP coverage indicators, and Broadband price index in both Lithuania (78%, 78%, 89) and Bulgaria (85%, 85%, 86) are higher than EU average accordingly of 70%, 50% and 73. VHCN is provided by FTTP technology and indicates, that VHCN covers higher percentage of households in Bulgaria than in Lithuania. The connectivity situation is better in Bulgaria than in Lithuania also because the NGA coverage, 5G spectrum and coverage are also higher in Bulgaria, accordingly 93%, 25%, 40%, while in Lithuania they cover 85%, 5% and 33% (versus EU average of 90%, 56%, 66%). According to Attaran (2021), 5G's really fast connection and low-latency are needed for intelligent automation such as AI, digital reality, blockchain, etc. In addition, overall fixed broadband, and mobile broadband take-ups in Lithuania (67%, 85%) and Bulgaria (85%, 73%) rank high, but still lower than EU average (78%, 87%). However, both Lithuania and Bulgaria rank very low in at least 1 Gbps take-up (0,72% and 0,42%), and at least 100 Mbps fixed broadband take-up (36% and 22%), compared to EU average of 7,58% and 41%. According to European Commission (2022) results, the main problem in Lithuania is than rural areas are still lagging behind urbanized areas despite that connectivity has increased over years.

Integration of digital technology sub-index is the lowest of all four sub-indexes. Lithuania ranks 13th with the score 37,2 compared with Bulgaria, which ranks 26th with the score 15,5 (versus EU average score of 36,1). All indicators of DESI 2022 Integration of digital technology are provided in **Table 3**.

Table 3. DESI 2022 of Integration of digital technology

	DESI 2022		
	EU	**Lithuania**	**Bulgaria**
SMEs with at least a basic level of digital intensity	55%	57%	25%
Electronic information sharing	38%	45%	22%
Social media	29%	22%	13%
Big data	14%	11%	6%
Cloud	34%	28%	10%
Arteficial Intelligence (AI)	8%	4%	3%
ICT for environmental sustainability	66%	74%	68%
e-Invoices	32%	27%	10%
SMEs selling online	18%	32%	10%
e-Commerce turnover	12%	18%	4%
Selling online cross-border	9%	12%	4%

Source: Eurostat – European Commission (2022)

Lithuania performs slightly above the EU average in most of the indicators of this sub-index (**Fig. 1**). In Lithuania there are even 57% SMEs with at least a basic level of digital intensity, 32% of SMEs selling online, of which 12% are selling online cross-border, while in Bulgaria indicators are 25%, 10% and 4% (versus EU average of 55%, 18%, 9%). Also, e-Commerce turnover, electronic information sharing and even ICT for environmental sustainability in Lithuania (18%, 45%, 74%) are noticeably higher than EU average (12%, 38%, 66%), while in Bulgaria e-Commerce turnover and electronic information sharing indicators are significantly lower (4%, 22%), and ICT for environmental sustainability percentage (68%) is a bit lower than in Lithuania, however a bit higher than EU average. Meanwhile, only 22% of enterprises in Lithuania use social media, 11% of them take up Big data, 28% Cloud solutions, only 4% is integrating AI technologies into their operations, and 32% use e-Invoices system. In Bulgaria these percentages are even lower – accordingly 13%, 6%, 10%, 3% and 10%, while the average in EU is 29%, 14%, 34%, 8% and 32%. It can be noted that those businesses who adopted digitization, generates massive data every nanosecond, thus without Big data analysis it becomes challenging to manage a combination of structured and unstructured data (Garg, Popli, & Sarao, 2021). Despite that Lithuania performs better than EU average there is still a bit of a gap while taking into consideration such modern technologies as Big data, Cloud, AI, however Lithuania is waiting for additional financial support for development of AI products and services, and for 5G connectivity.

The fourth sub-index of DESI 2022 is Digital public services and Lithuania's score (81,8) of this sub-index is significantly higher than Bulgaria's score (51,9) and EU average (67,3) (**Fig. 1**). Due to such scores Lithuania ranks 10th and Bulgaria ranks 25th of 27 EU countries.

Table 4. DESI 2022 of Digital public services

	DESI 2022		
	EU	**Lithuania**	**Bulgaria**
e-Government users	65%	70%	34%
Pre-filled forms	64	92	58
Digital public services for citizens	75	82	59
Digital public services for businesses	82	93	76
Open data	81%	89%	78%

Source: Eurostat – European Commission (2022)

Table 4 reflects five main indicators of Digital public services and shows that Lithuania performs significantly better than Bulgaria and EU average in terms of providing digital public services for both businesses (score 93 in Lithuania, 76 in Bulgaria, 82 in EU) and individuals (accordingly 82, 59, 75). The percentages of e-Government users and Open data in Lithuania are also pretty high – 70% and 89%, while in Bulgaria there are only 34% and 78% (versus EU average of 65% and 81%). Also, the score of Pre-filled forms in Lithuania is significantly higher than in Bulgaria and EU average, accordingly 92, 58 and 64. All these indicators show Lithuania's progress in this dimension, but greater improvements are necessary in order to increase the competitiveness of the country and businesses internationally.

Next, the digitization level of Lithuania and Bulgaria will be compared by comparing tree main dimensions of IDI 2017 (**Fig. 2**).

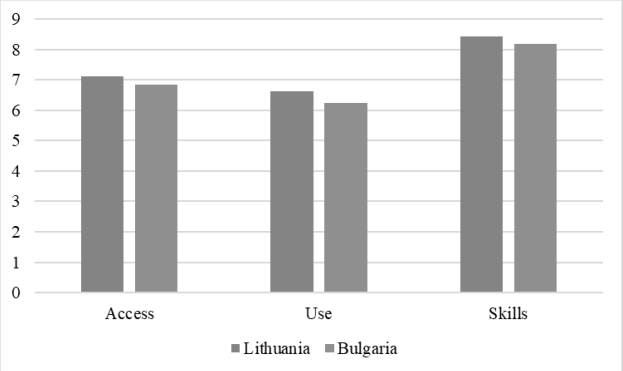

Fig. 2. IDI 2017 dimensions and values in Lithuania and Bulgaria
Source: ITU | 2017 Global ICT Development Index

Lithuania ranks 41st of 176 countries in the world with IDI 2017 total value 7,19 and Bulgaria ranks 50th with value 6,86. **Fig. 2** shows, that values in all three IDI 2017 dimensions are higher in Lithuania than in Bulgaria.

Table 5. IDI 2017 of Access

	IDI 2017	
	Lithuania	**Bulgaria**
Fixed-telephone subscriptions per 100 inhabitants	17,77	20,96
Mobile-cellular telephone subscriptions per 100 inhabitants	140,71	127,23
International internet bandwidth per Internet user (Bit/s)	198564,36	175869,19
Households with computer	70,46%	60,22%
Households with Internet access	71,75%	63,54%

Source: ITU | 2017 Global ICT Development Index

The value of IDI 2017 Access dimension in Lithuania is 7,11 while in Bulgaria – 6,83. According to **Table 5**, 17,77 inhabitants in Lithuania and 20,96 inhabitants in Bulgaria out of 100 have Fixed-telephone subscriptions. Also, even 140,71 inhabitants in Lithuania and 127,23 inhabitants in Bulgaria out of 100 have Mobile-cellular telephone subscriptions, which shows that the mobile access is good in both countries. However, in 2017 70,46% in Lithuania and 60,22% households in Bulgaria had computers and 71,75% in Lithuania and 63,54% of them had internet access, which suggest that not all business can reach their consumers online. According to Haefner and Sternberg (2020), the effect of the Internet is inseparably connected to digitization, thus the high level of Internet access is important for higher level of digitization, which also creates many opportunities for innovation. However, taking into consideration global COVID-19 pandemic and the lock-down in both Lithuania and Bulgaria, which led to communication online it is expected that the situation with the use of computers and internet access can be noticeably better in 2022.

The Use dimension of IDI 2017 summarizes ICT intensity and usage in countries (Chand, 2020).

Table 6. IDI 2017 of Use

	IDI 2017	
	Lithuania	**Bulgaria**
Individuals using the Internet	74,38%	59,83%
Fixed (wired)-broadband subscriptions per 100 inhabitants	28,70	23,25
Active mobile-broadband subscriptions per 100 inhabitants	76,80	88,38

Source: ITU | 2017 Global ICT Development Index

According to **Table 6**, 74,38% in Lithuania and in Bulgaria only 59,83% of individuals use the Internet via fixed or mobile network. Also, in Lithuania 76,80 and in Bulgaria even more – 88,38 out of 100 inhabitants have Active mobile-broadband subscriptions, while only 28,70 in Lithuania and 23,25 inhabitants in Bulgaria out of 100 have fixed-broadband subscriptions.

Skills dimension consists of three indicators that are Mean years of schooling, secondary and tertiary gross enrolment (**Table 7**).

Table 7. IDI 2017 of Skills

	IDI 2017	
	Lithuania	**Bulgaria**
Mean years of schooling	12,70	10,80
Secondary gross enrolment ratio	106,82	99,02
Tertiary gross enrolment ratio	68,53	73,93

Source: ITU | 2017 Global ICT Development Index

The average number of completed years of education in Lithuania is 12,70 years, while in Bulgaria the average is only 10,70 years. The ratio of secondary gross enrolment in both countries is higher (accordingly 106,82 and 99,02) than the ratio of tertiary gross enrolment (68,53 and 73,93). The data indicates that more individuals in Lithuania and in Bulgaria enrolled in the secondary education, however more individuals enrolled in tertiary education in Bulgaria than in Lithuania.

Summarizing DESI 2022 and IDI 2017 it can be stated that Lithuania is advancing well in the provision of digital services compared to Bulgaria, which allows to improve business digitization even more. It is known that COVID-19 global pandemic forced countries and businesses to invest and move to a higher level of digitization even faster. However, in both Lithuania and Bulgaria even greater improvements and investments are needed to make those digital services more user friendly and accessible for both individuals and businesses.

Conclusions

The overview of theoretical aspects of business digitalization shows that the development of business digitalization is closely related to the country's level of digitalization. It was found out that country's digitization depends on a number of conditions, such as digitalization-related government decisions, regulation, communication infrastructure and availability, capabilities, financial incentives, and the use of technology.

Based on these conditions, a comparative analysis of Lithuania and Bulgaria was performed in order to predict new opportunities for the development of the Lithuanian economy in the context of business digitization. The study results of DESI 2022 and IDI 2017 in Lithuania and Bulgaria showed that Lithuania in both indexes ranks higher than Bulgaria which also belongs to EU. Lithuania's scores in DESI 2022 dimensions of Integration of digital technology and Digital public services are even higher than EU average while Bulgaria's scores in all four dimensions are lower than EU average. It was also noticed, that in Connectivity Lithuania ranks lower than Bulgaria mainly because of the higher percentages of households of NGA, VHCN, FTTP and 5G coverages in Bulgaria, that allow to adopt intelligent automation faster.

Summary of IDI 2017 in Lithuania and Bulgaria shows that Lithuania ranks better position in terms of attractiveness to foreign investors than Bulgaria which is really important considering that foreign investors come in with modern technologies, and countries with the better ranking of Internet access, use and relevant skills can adopt these technologies faster. Thus, the overall results show Lithuania's growing progress in terms of business digitization that also plays the key role in economic growth, however more input in the dimension of Connectivity is needed, such as targeted investments for the development of 5G network development which is considered as the one of the most important conditions for better adoption and development of intelligent technologies that are the future of all businesses, and society.

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