VILNIUS TECH
Vilnius Gediminas Technical University

12th International Scientific Conference

BUSINESS AND MANAGEMENT 2022

May 12–13, 2022, Vilnius, Lithuania

ISSN 2029-4441 / eISSN 2029-929X
ISBN 978-609-476-288-8 / eISBN 978-609-476-289-5
Article Number: bm.2022.728
https://doi.org/10.3846/bm.2022.728

ADVANCED ECONOMIC DEVELOPMENT *http://vilniustech.lt/bm*

ASSESSMENT OF THE FACTORS INFLUENCING THE DIGITALIZATION OF ECONOMIES IN THE BALTIC STATES

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Received 11 February 2022; accepted 29 March 2022

Abstract. Digitalization of the world economy is accompanied by a comprehensive digital transformation of all business processes. However, the speed of digital transformation varies across countries. The aim of the research was to identify the main factors influencing the pace of digitalization of economies in the three Baltic States. The research is based on Eurostat's data from 2014 to 2020. For evaluating the factors that may impact the level of digitalization of economies in Estonia, Latvia and Lithuania the authors carried out a Pearson correlation analysis, using SPSS software. The research results indicate that in the context of the digitalization of the economy, the factors directly linked to the level of GDP are the number of specialists involved in the R&D sector and use of the Internet for banking operations. The findings of the study are supposed to be used for the development of a policy for business digital transformation in the Baltic States.

Keywords: digitalization, digital economy, Baltic States.

JEL Classification: O1, O3, M2.

Introduction

Digitalization of all business processes is a key factor of the development of the modern economy. It is transforming business models and fostering innovation (OECD, 2019, 2021; United Nations Conference on Trade and Development [UNCTAD], 2019, 2021). Digital innovation is now re-designing enterprises and whole industries through offering additional opportunities for entrepreneurs and policy-makers (World Economic Forum, 2016, 2018). This is also indispensable in the context of the sustainable development of economy (United Nations [UN], 2015, 2021).

It is vital for all EU countries to stimulate business processes digitalization, as technological, security and sustainability challenges are reshaping the "global landscape", and there is a strong need to renew the basis for sustainable and inclusive growth and build up cohesion inside the EU (European Council, 2019; European Commission, 2019).

The processes of the digitalization of the world economy have a significant impact on the structure of the economies of all EU countries, including the Baltic States. Now, Latvia, as well as other Baltic States faces serious challenges such as emigration, decreasing population size, its aging, declining productivity, the COVID-19 pandemic consequences, etc. (OECD, 2021). Business digital transformation plays a key role in addressing these issues (ibid.).

The Baltic States, in quest of accomplishing success in the global marketplace, are pressed to properly exploit the potential offered by the digital economy in order to keep up with the digital progress; it is also important for each Baltic State to appropriately "position their advantages" in the international market and recognize the areas that have to be improved (Česnauskė, 2019).

The speed of digital transformation in the Baltic States varies across countries. However, as per the results of the study conducted by Česnauskė (2019), which was based on the Digital Economy and Society Index (DESI), all three countries do not fully use the opportunities provided by digital technologies.

The goal of the research presented in this paper is to identify the main factors influencing the pace of digitalization of economies of the three Baltic States. The research is based on *Eurostat's* data – the statistics from the "Digital Economy and Society" section.

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After a thorough analysis of the main trends associated with the digitalization of economies in the EU, the following indicators were chosen to identify the factors influencing the pace of the business digital transformation:

- Number of ICT specialists.
- Number of newly established enterprises in the ICT area.
- Share of the ICT sector in the GDP of the states.
- GDP per capita.
- Number of employees in the field of research and development (R&D).
- Use of the Internet for banking operations.
- Number of people with tertiary education in the country.

For evaluating the factors influencing the level of digitalization in the Baltic States, the authors carried out a Pearson correlation analysis, using SPSS software.

1. Impact of digitalization on the modern economy

The world economy is becoming more and more digital; increasing investment in digital technologies and knowledge-based capital is deeply transforming the society and stimulating social prosperity (OECD, 2016a) in the context of smart sustainable and inclusive growth (European Commission, 2010). Since the digital economy supports economic growth and inclusive development, it is vital for any country not to overlook the digital revolution (OECD, 2016b). Going through a wide-ranging digital transformation is crucial for remaining competitive in the uncertain global (Sacolick, 2017).

Nowadays, in the frame of digital economy, digital business is considered to be a predominant economic segment (Wirtz, 2021). Fast digitalization is influencing all aspects of modern society, including the way customers and businesses communicate and how customer value is generated (UNCTAD, 2021). In the meantime, digitalization has changed many consumers into the so-called "prosumers" through the creation of content on digital platforms and use of peer-to-peer (P2P) networks (OECD, 2016b). Digitalisation is also associated with disseminating of knowledge at an extraordinary rate (ibid.).

There is no universally accepted definition of the term "digital economy"; although, the concept of digital economy is linked with digital technologies, information networks and the economic and social activities carried out over these networks (OECD, 2016b). The digital economy can be also defined as the "share of total economic output" originated from numerous comprehensive digital inputs: digital skills, digital equipment, intermediate digital goods and services utilized in manufacturing (Knickrehm et al., 2016).

Digitalization (digital transformation) of economy is regarded as the "process of spreading of a general-purpose technology" (European Council, 2019).

From the business viewpoint, digital transformation can be also termed as "organizational change" realized by applying business models based on digital technologies for enhancing organizational performance (Wade, 2015). In the agenda of organizational change, value is generated in close cooperation with consumers over digital ecosystems and digital platforms (Vaska et al., 2021).

Digitalization of business operations stimulate the development of state-of-the-art technologies to be integrated into these revised business models (Chaffey, 2011; Chaffey et al., 2019). As the economy is becoming digital – as one of the key catalysts of sustainable growth, digitalisation of products and services opens excellent opportunities for innovation and creation of new jobs and businesses (European Commission, 2013).

The drivers fostering the emergence of digital economy – novel business processes, systems and sectors – are of economic and political character; however, they have origins in technological innovation that in turn, is shaped by broader forces (Bukht & Heeks, 2018). Digital transformation of economy is related to the wide use of digital technologies, which considerably changes both customers' behaviours and customers' needs (Verhoef et al., 2021).

As the cost of advanced technologies is dropping, new cutting-edge applications become accessible in the global market (World Economic Forum, 2018). Nevertheless, companies that go digital require more than just increased investment into current digital technologies; they ought to essentially renovate the way they do business, employing the so-called "lean approach" to all business processes and improving their employees' digital skills (World Economic Forum, 2016). It should be done in the frame of a scaling-up digital strategy characterized by increased scope of business operations and aimed at accomplishing a competitive advantage (Stukalina, 2021).

The digital technologies embrace Artificial Intelligence (AI), cloud computing, blockchain technology, digital currency (cryptocurrency), data analytics, Cyber-Physical Systems, Internet of Things (IoT), robotics, Big Data, Smart Factory technologies, etc. (Gilchrist, 2016; Machado & Davim, 2018; Maheshwari, 2019; Jabłoński & Jabłoński, 2020; Strømmen-Bakhtiar, 2020; Khan et al., 2021).

Though, digital transformation does not include the technological aspect only; it presupposes generating a "competitive digital capability" enabling the enterprise's leadership in the particular sector of the national economy (Herbert, 2017; Vaz, 2021).

The importance of digital transformation of the economy is confirmed by the adoption of the above digital technologies by a huge number of consumers, companies and local governments worldwide, though at varying rates across countries and sectors of the national economy (OECD, 2016b). Countries at any stage of their economic development may utilize digital technologies to speed up the delivery of wide-ranging and high-quality education, healthcare, financial services and government services, entertainment; the more countries develop and establish the grounds of their digital economies, the more they are

likely to become suppliers of digitally-enabled products and services in the very competitive global "digital ecosystem" (OECD, 2016b).

Through digitalizing their business operations companies, working in various sectors of the national economy, are able to boost customer value in the context of markets internationalization and growing request for better-quality products and services (Chaffey, 2011; Morabito, 2016; Presser et al., 2018; Aagaard, 2018; Chaffey et al., 2019).

The digital economy is distributed unevenly, including inter-regional distribution (Bukht & Heeks, 2018). In different countries, they use different approaches to stimulate digital transformation of the local business. Besides, there are various internal factors that may influence the pace and level of digitalization of the local economy.

In terms of being engaged in the digital economy and profiting from it, the USA and China stand out, accounting for 94 percent of investments in AI start-ups (from 2016 to 2020), 70 percent of the world's top AI researchers, and about 90 percent of the market capitalization of the world's major digital platforms (UNCTAD, 2021).

In the Baltic States, the pace of adoption and use of digital technologies is increasing too; though, this pace varies across them. In Section 2, the authors describe the main trends associated with the digitalization of economies in the Baltic States based on Eurostat's data (from 2014 to 2020).

2. Main trends associated with the digitalization of economies in the Baltic States

Over five years, the amount of ICT companies in Latvia and Estonia was increasing (Table 1).

Table 1. Percentage of enterprises employing ICT specialists: SMEs (10-249 employees, financial sector excluded) (source: Eurostat, https://ec.europa.eu/eurostat/web/digital-economy-and-society/data)

	2015	2016	2017	2018	2019	2020
Estonia	13	13	14	12	14	15
Latvia	16	16	12	14	19	19
Lithuania	14	14	16	15	14	14

The increase in the number of companies in the ICT sector is reflected in the GDP of the three countries. In Latvia, the sector's contribution in 2019 was more than 5%, and demonstrates annual increase; in Estonia, this indicator in 2019 was 5.98%. In Lithuania it was the lowest compared to Latvia and Estonia – 3.5% (Table 2).

Table 2. Percentage of the ICT sector on GDP (source: Eurostat, https://ec.europa.eu/eurostat/databrowser/view/tin00074/default/table?lang=en)

	2014	2015	2016	2017	2018	2019
Estonia	4.79	4.7	4.85	5.11	5.38	5.98
Latvia	3.74	4.15	4.53	4.69	4.92	5.41
Lithuania	2.57	2.93	2.95	3.01	3.13	3.5

In Table 3, the number of newly established enterprises in the ICT sector is presented (in the analyzed period, from 2014 to 2020).

Table 3. Newly established enterprises in the ICT sector (source: Eurostat, https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do)

	2014	2015	2016	2017	2018	2019
Estonia	587	561	695	980	1213	1216
Latvia	950	1246	1102	896	1023	973
Lithuania	1626	1112	1245	1427	1520	1658

As seen from Table 3, in the analyzed period, an increase of newly established companies in the ICT sector was observed in the Baltic States.

At the same time, it should be mentioned that in Latvia, a decrease in the number of new enterprises in 2019 was observed compared to 2018.

In Lithuania, for the same period, the growth of companies in the ICT sector reached 9%. In Estonia, a positive dynamics was also observed.

The indicator, reflecting the level of digitalization of the country in terms of Internet purchases by individuals is presented in Table 4.

Table 4. Internet purchases by individuals in the 12 months as a percentage of individuals (source: Eurostat, https://ec.europa.eu/eurostat/databrowser/view/teiis700/default/table?lang=en)

	2015	2016	2017	2018	2019
Estonia	59	56	58	61	68
Latvia	38	44	46	45	47
Lithuania	32	33	38	43	48

The data from Table 4 shows that in Estonia, the indicator is above the EU average by more than 10 percent in 2019, but in Lithuania and Latvia, it is almost 22 percent lower than the EU average, i.e., the gap is 30 percent.

The next indicator is the amount of individuals, using the Internet for Internet banking; it can characterize the level of literacy in the use of technologies (Table 5).

Table 5. Individuals using the Internet for Internet banking (source: Eurostat, https://ec.europa.eu/eurostat/databrowser/view/tin00099/default/table?lang=en)

	2016	2017	2018	2019	2020
Estonia	79	79	80	81	80
Latvia	62	61	66	72	76
Lithuania	54	56	61	65	68

The above data shows that Internet banking is actively used in the Baltic countries. If one compares to the EU average of 58% in 2020, then in Estonia the same indicator is 80%, but in Latvia – 76%. In Lithuania, the lowest indicator from the Baltic countries, but this is 17% higher than the EU average in 2020.

Another indicator that reflects the pace of digitalization is staff involved in research and development (Table 6).

Table 6. Research and development personnel, by sectors of performance, % of population (source: Eurostat, https://ec.europa.eu/eurostat/databrowser/view/tsc00002/default/table?lang=en)

	2015	2016	2017	2018	2019	2020
Estonia	0.8618	0.8618	0.9095	0.9284	0.9615	0.9732
Latvia	0.5772	0.535	0.5685	0.6144	0.6363	0.7028
Lithuania	0.7397	0.7623	0.8222	0.8461	0.9179	1.0117

The data from Table 6 demonstrates that in Latvia, compared to other Baltic States, there is the smallest percentage of staff in the research and development sector. In Lithuania, this indicator amounted to more than one percent – 1.0117 in 2020; in Estonia – 0.9732%, while in Latvia – almost 20% less.

In "A European strategy for smart, sustainable and inclusive growth" (European Commission, 2010) special attention was paid to the level of higher education in the country, which is vital for promoting research activities in the agenda of digitalization. Considering that digitalization is associated with innovations, high technologies in the country, the level of higher education in the states should be included in the analyzed indicators (Table 7).

Table 7. People with tertiary education (age group 30-34), % (source: Eurostat, https://ec.europa.eu/eurostat/databrowser/view/tgs00105/default/table?lang=en)

	2015	2016	2017	2018	2019	2020
Estonia	45.3	45.4	48.4	47.2	46.2	44.3
Latvia	41.3	42.8	43.8	42.7	45.7	49.2
Lithuania	57.6	58.7	58.0	57.6	57.8	59.6

The goal of the EU by 2020 is to achieve an average level of higher education among the population of up to 34 years – 40%. However, the Baltic countries exceeded this indicator, as evidenced by the data from Table 7.

One of the main indicators characterizing the level of economic development of the state is gross domestic product. In Table 8, the data on the Baltic countries from 2015 to 2020, in terms of GDP per capita, is provided.

Table 8. Gross domestic product per capita at market prices, EUR (source: Eurostat, https://ec.europa.eu/eurostat/databrowser/view/tec00001/default/table?lang=en)

	2015	2016	2017	2018	2019	2020
Estonia	15 710	16 530	18 120	19 570	20 930	20 190
Latvia	12 430	12 950	13 900	15 130	16 020	15 530
Lithuania	12 860	13 560	14 950	16 250	17 490	17 710

Thus, the resulting indicator of the economic development of the state can be assessed as: the highest GDP per capita of the population of the Baltic countries, in Estonia – 20190 euros, which is 32.3% less than the EU average. GDP per capita in Lithuania in 2020 amounted to 17710 euros and this is 41% less than the EU average, but in Latvia GDP per capita in market prices for 2020 amounted to 15530 euros, which is less than the European average.

In Section 3, the authors present the results of assessing the factors influencing the level of digitalization in the Baltic States.

3. Assessment of the factors influencing the level of digitalization in the Baltic States

The assessment of the main factors influencing the level of digitalization in the Baltic States was made by performing a Pearson correlation analysis, using SPSS software.

The following designations have been introduced for analysis: the ICT sector in GDP (ICT), establishment of enterprises in information and communication technology (New), Internet purchases by individuals (Purchases), individuals using the Internet for internet banking (Banking), research and development personnel (Personnel), number of people under the age of up to 34 years old with higher education (education), gross domestic product at market prices (GDP).

The performed correlation analysis, based on the data from Estonia, shows that there exists a relationship between the following five indicators: establishment of enterprises in information and communication technology (New), Internet purchases by individuals (Purchases), individuals using the internet for internet banking (Banking), research and development personnel (Personnel), and gross domestic product at market prices (GDP).

The indicators suggested by the authors for the analysis: the ICT sector in GDP, the number of people under the age of 34 years with higher education showed a low level of correlation or its value turned out to be negative. Therefore, the authors excluded them from Table 9, where the results of the analysis are presented.

Table 9. Pearson correlation for Estonia (source: calculated by the authors)

	New	Purchases	Banking	Personnel	GDP
New	1	.686	.793	.951*	.970**
Purchases	.686	1	.957*	.855	.825
Banking	.793	.957*	1	.823*	.892*
Personnel	.951*	.855	.823*	1	.966**
GDP	.970**	.825	.892*	.966**	1

Notes: *. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed.

According to the results of the calculations presented in Table 9, it was found that there is a significant correlation between the opening of new enterprises and the number of staff in the research and development sector;

the number of purchases for individuals is associated with the use of Internet banking.

The use of banking services influences on the level of the country's GDP, as well as the number of staff in the RD sector. New firms formed and the staff involved has an influence on the level of GDP. Thus, the newly formed companies, staff, and used banking services and the level of purchases on the Internet influence the level of digitalization in Estonia.

The level of higher education in the country didn't reveal a significant impact on the indicators mentioned by the authors. The results of the analysis of the calculated indicators of the Pearson correlation in Latvia are presented in Table 10.

Table 10. Pearson correlation for Latvia (source: calculated by the authors)

	New	Purchases	Banking	Personnel	GDP	Education
New	1	–.683	.533	.483	.011	.084
Purchases	–.683	1	.647	.351	.778	.851
Banking	.533	.647	1	.949*	.836	.883*
Personnel	.483	.351	.949*	1	.796	.847*
GDP	.011	.778	.936	.796	1	.725
Education	.084	.851	.883*	.847*	.725	1

Note: *. Correlation is significant at the 0.05 level (2-tailed).

Thus, after performing Pearson cross correlation analysis, it was revealed that between the amount of banking operations, staff working in R&D, the level of GDP per capita there is a high correlation, which is in the range of 0.845–0.949. The level of higher education in the country influences the number of internet banking and the number of staff, working in RD that wasn't revealed in Estonia.

In Table 11, the results of the calculation of correlation, according to the suggested indicators, influencing the level of digitalization in Lithuania, are presented.

Table 11. Pearson correlation for Lithuania (source: calculated by the authors)

	New	Purchases	Banking	Personnel	GDP
New	1	.969**	.915*	.978**	.987**
Purchases	.969**	1	.984**	.988**	.995**
Banking	.915*	.984**	1	.970**	.963**
Personnel	.978**	.988**	.970**	1	.943**
GDP	.987**	.995**	.963**	.943**	1
Education	1	.969**	.915*	.978**	.987**

Notes: *. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

As seen from Table 11, the calculation of Pearson correlation coefficient on the similar indicators in Lithuania shows that there is a close relationship, the same as in Estonia, between the following indicators: the establishment of new enterprises, the number of new staff in the research and development sector; the number of purchases, for individuals is associated with the use of Internet banking.

A high correlation with the level of GDP per capita is also observed – the correlation is in the range of 0.915-0.995.

4. Discussion

In this Section, the results of Pearson correlation analysis are discussed. The results are presented in the form of three diagrams demonstrating relationships between different factors that may influence the level of digitalization in a particular country.

In Figure 1, pictorial representation of the relationships between the factors influencing the level of digitalization in Estonia is provided.

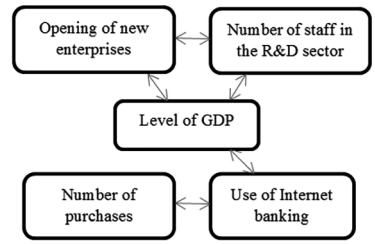

Figure 1. Relationships between the factors influencing the level of digitalization in Estonia (source: authors' construction)

As seen from the Figure 1, in Estonia, the level of GDP in the context of the digitalization of the economy is directly linked with the following factors:

– Opening (establishing) of new enterprises.
– Number of staff involved in the R&D sector.
– Use of Internet (by individuals) for banking operations.

In Figure 2, pictorial representation of the relationships between the factors influencing the level of digitalization in Latvia is provided.

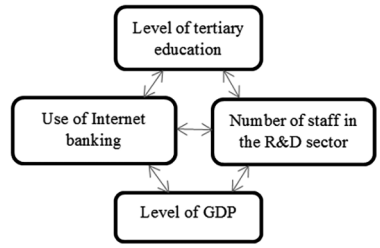

Figure 2. Relationships between the factors influencing the level of digitalization in Latvia (source: authors' construction)

As seen from the Figure 2, in Latvia, the level of GDP in the context of the digitalization of the economy is directly linked with the following factors:

– Number of staff involved in the R&D sector.
– Use of Internet (by individuals) for banking operations.

At the same time, in Latvia, the level of GDP is indirectly linked with the level of tertiary education – through the number of staff involved in the R&D sector, and use of Internet for banking operations. It should be noted that this is characteristic only for Latvia by contrast to Estonia and Lithuania.

In Figure 3, pictorial representation of the relationships between the factors influencing the level of digitalization in Lithuania is provided.

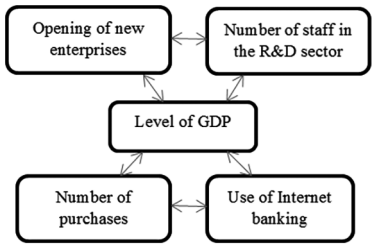

Figure 3. Relationships between the factors influencing the level of digitalization in Lithuania (source: authors' construction)

As seen from the Figure 3, in Lithuania, the level of GDP in the context of the digitalization of the economy is directly linked with the following factors:

– Number of staff involved in the R&D sector.
– Use of Internet (by individuals) for banking operations.
– Opening (establishing) of new enterprises.
– Number of Internet purchases.

As seen from the above Figures, the common factors influencing the level of digitalization in the Baltic States are as follows:

– Number of staff involved in the R&D sector.
– Use of Internet (by individuals) for banking operations.

In view of the above, it is assumed that all three Baltic States have made substantial progress in terms of the digitalization of their economies.

At the same time, the pace of digital transformation is not the same, depending on a number of infuential factors that may affect business decision-making. The two common factors – "number of staff involved in the R&D sector" and "use of Internet (by individuals) for banking operations" are identified as region-wide factors, while some factors are identified as country-specific factors: "opening (establishing) of new enterprises", "number of Internet purchases", "level of tertiary education".

Conclusions

Drawn from the results of the study the authors have made the following conclusions.

– The contemporary economy is becoming digital, being as one of the main drivers of sustainable growth and inclusive development of any country.
– Digitalisation of all business operations provides great opportunities for business innovations and stimulates the creation of new jobs.
– The significance of digital transformation of the national economy is confirmed by the implementation of digital technologies by a growing number of enterprises and consumers of various products and services.
– The digital economy is distributed unevenly in different countries, as there are various internal factors that may influence the pace and level of digitalization of the local economy.
– In the Baltic States, the pace of adoption and use of digital technologies varies across the countries as well.
– The factors, which were found to have a significant impact on the pace of the digitalization economies in the Baltic States, are associated with the dominant trends in the EU countries in the agenda of business digital transformation.
– The research results indicate that in the context of the digitalization of the economies of the Baltic States, the factors directly linked to the level of GDP are the number of specialists involved in the R&D sector and use of Internet for banking operations.

The findings of the study are supposed to be used for the development of a policy for business digital transformation in the Baltic States. However, further research with a broader research base is recommended.

Disclosure statement

The authors do not have any competing financial, professional, or personal interests from other parties.

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