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Abbreviations

3D	Three Dimensional
AmCham	American Chamber
B&H	Bosnia and Herzegovina (in the Study, the full name and abbreviation are used interchangeably)
CCRS	Chamber of Commerce of Republika Srpska
CDT	Centar za digitalnu transformaciju
CRM	Customer Relationship Management
DESI	Digital Economy and Society Index
DMS	Document Management System
DSL	Digital Subscriber Line
DT	Digital transformation
DTEI	Digital Transformation Enablers Index
DTS	Digital Transformation Scoreboard
ERP	Enterprise Resource Planning
EU	European Union
EU27	European Union of 27 member states
FB&H	Federation of Bosnia and Herzegovina
FTCBH	Foreign Trade Chamber of Bosnia and Herzegovina
GCI	Global Cyber Security Index
GII	Global Innovation Index
GIZ	Gesellschaft für Internationale Zusammenarbeit
GPS	Global Positioning System
GTCI	Global Talent Competitiveness Index
IaaS	Infrastructure as a service
IKT	Information and communication technologies
ILO	International Labour Organization
IT	Information technology
ITU	International and Telecommunication Union
kb/s	Kilobyte/second
NACE	Nomenclature statistique des activités économiques dans la Communauté Européenne
PaaS	Platform as a service
RS	Republika Srpska
SaaS	Software as a service
SCM	Supply Chain Management
SME	Small and medium enterprises (in the text, the terms "company", "enterprise", "firm", "organization" are used for companies in general)
TEA	Total Early-Stage Entrepreneurial Activity
UK	United Kingdom
UNDP	United Nations Development Programme
USA	United States of America

Summary

The first step for creating strategies, policies, and action plans is establishing a methodologically correct measurement system, which will enable identifying and measuring key performance indicators in a specific area.

After the measurement system is established, it is necessary to repeat the measurement of key performance indicators in corresponding time intervals and monitor changes of the identified key performance indicators' values. Under the values of indicators calculated through measurements, strategical and operative and long-term and short-term measures are created, which should influence the improvement of measured indicators.

This process is iteratively repeated, and every following iteration gives a possibility to monitor the effects of established policies and taken measures. Simultaneously, the measurement system should be validated and evaluated with every subsequent iteration to be contextually adapted to the country's social-economic state and the observed region.

For the creation of this document, the following was carried out:

1. Identification of initiatives in digital transformation that run and lead the countries with advanced economies, primarily in the EU.
2. Identification of methodological frameworks that are used to track key performance indicators in the area of digital transformation.
3. Alignment (to the extent possible) with two methodological frameworks:
    a. The Digital Economy and Society Index (DESI) tracks Europe's overall digital performances, providing data on the state of digitalization of each EU member country, and helping them identify areas that require priority investment and action.
    b. Digital Transformation Scoreboard (DTS) of the European Commission, which aims to monitor the transformation of industries and companies, and which uses qualitative and quantitative data to research the adaption of digital technologies.
4. Gathering data from three data sources:
    a. Review of literature and publicly available secondary data, for example, Laws and legislation, as well as initiatives and programs at all levels of government in Bosnia and Herzegovina, The Digital Economy and Society Index (DESI)(European Commission, 2020), and related sources, Eurostat database, Digital Transformation Scoreboard and related sources.
    b. Qualitative research through semi-structured interviews which aim to comprehend better the level of digital transformation of companies in Bosnia and Herzegovina, as well as factors that act as predictors of digitalization, but also including factors that act as barriers.

c. Quantitative research through a survey conducted among companies in Bosnia and Herzegovina to analyze the acceptance of new digital technologies and their influence on business.

5. Conclusions were made by triangulation, which ensures the credibility and validity of the research result through the avoidance of bias arising from the use of one method and with the participation of four authors in the data analysis and the formulation of conclusions. In addition, two independent reviewers eventually did a review of the study.

In the study conclusion, the country profile is shown, which, like the DTS provides:

- A conclusion on the issue of the environment of Bosnia and Herzegovina and the drivers of digital transformation;
- Pointing out the country's strong and weak spots for improvement;
- A brief estimate of the country's position in relation to other European countries.

Finally, company profiling was conducted following all findings, and categories offering descriptions and characteristics were created.

As a result, the Study on Digital Transformation of Companies in Bosnia and Herzegovina presented the initial measuring system for the field of digital transformation of companies in Bosnia and Herzegovina, and the results of the analysis can be considered a baseline study.

INTRODUCTION

This chapter provides some background information on the field of digital business transformation, as well as a detailed explanation of the research and development methodology used in this study.

1. INTRODUCTION

Digital technologies are having a huge impact on the way of life, employment, relationships, and social interaction of a growing segment of the population. The term "Digital Transformation" (DT) refers to the profound changes occurring in all sectors of the economy and society due to the introduction and integration of digital technology into all aspects of human life. DT is expected to be a strategic policy topic, and there is an immediate need to identify and address current and potential economic and social issues by assessing impacts and identifying areas that require policy intervention.

Given the importance of digital transformation for the competitiveness of companies and the economy as a whole, this is one of the priorities of the European Union (EU). The European Parliament helps shape policies that will strengthen capacities in the implementation of new digital technologies, open new opportunities for businesses and consumers, develop digital skills of people and train workers and digitize public services, and intensively monitor the digital transformation of businesses in member states.

On the other hand, in B&H, there is no relevant report that would present the state of the digitalization of business. The Foreign Trade Chamber of Bosnia and Herzegovina (FTCBH) has set digital transformation as one of the priorities for the coming period because it is a prerequisite not only for increasing the economy's competitiveness but also for improving a number of other processes critical to Bosnia and Herzegovina's European path. It is estimated that digitalization in the chamber system will significantly contribute to the improvement of services to members and facilitate their business.

As candidates or potential candidates for EU membership, the economies of the Western Balkans (WB) must utilize DESI indicators to track the progress. The Regional Cooperation Council (RCC) has published a report reviewing the state of application of the Digital Economy and Society Index methodology in the Western Balkans, as well as the availability of datasets for calculating all DESI indicators and identifying the institutions responsible for data collection. It is also important to note that it is necessary to harmonize the methodology of a number of indicators with EU methodologies (Jordanoski and Nielsen, 2021).

In this regard, the aim of this Study is to contribute to the development of policies and mechanisms for the maturation of DT through the evaluation of the level of digitalization of business in B&H, as well as the identification of barriers and motivational factors. The study will place special emphasis on small and medium-sized enterprises (SMEs) in this iteration.

1.1. Methodology

The conceptual and methodological approach of the research will be harmonized with two international reports:

- The Digital Economy and Society Index (DESI) (European Commission, 2020)
- Digital Transformation Scoreboard 2018 EU (Probst et al., 2018).

The Digital Economy and Society Index (DESI) tracks overall European digital performance, as well as the progress of EU countries in digital competitiveness. By providing information on the state of digitization of each Member State, it helps them to identify areas that require priority investment and action.

DESI is a complex index that summarizes the relevant indicators of European digital performance and consists of 5 dimensions:

	Connectivity	Fixed broadband prices, fixed broadband coverage, mobile broadband, and broadband prices
	Human capital	Internet user skills and advanced skills
	Use of Internet	Use of internet services by citizens and internet transactions
	Integration of digital technology	Digitization of business and e-commerce
	Digital public services	e-Government

Figure 1. Dimensions of the DESI

Given that the aim of this study is to assess the level of digitalization of companies in B&H, the dimension "Integration of Digital Technology" was adopted for the Study (European Commission, 2020). The analysis for B&H was performed on the basis of publicly available Eurostat data and a comparative analysis with EU countries.

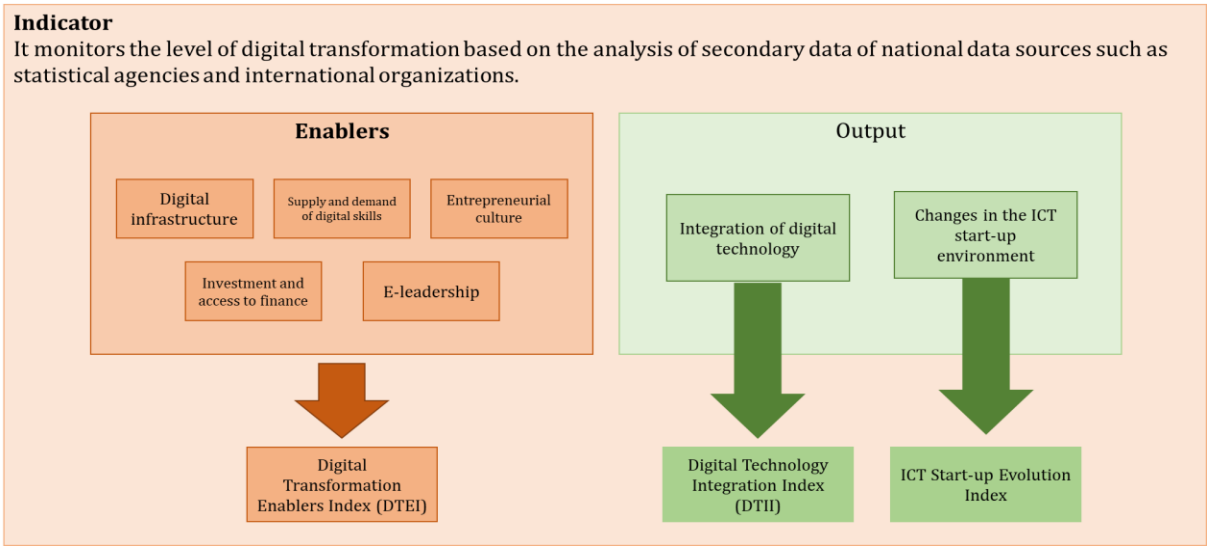
In addition, the Study included primary research, which, to the extent possible, was methodologically aligned with the European Commission's Digital Transformation Scoreboard (DTS), which aims to monitor the transformation of industries and companies. DTS uses qualitative and quantitative data

to analyse digital technology adoption, and the main goal is to create a country profile in terms of digital transformation and levels of digital technology adoption. However, it is important to note that a comparison with the results presented in this report is not possible, given that DTS 2018 is based on the adoption of digital technologies in only two non-IT sectors (agri-food and construction) in the EU Member States, while this study focuses to all industrial areas, in order to obtain a comprehensive analysis of the level of digital transformation of business operations in B&H.

DTS is based on qualitative and quantitative research and four data sources (Probst et al., 2018):

- *Survey* that collects data on the acceptance of new digital technologies by EU companies and the impact on the company's business.
- *Desk research and interviews* that provide a more complete picture of the issue at hand.
- *Real-time data* showing the use of a digital intelligence platform to measure the digital pulse as a digital performance indicator (KPI) of interest and acceptance of technologies in EU Member States.
- *National indicators* that represent the analysis of national data from state statistical institutes and international organizations.

The figure below presents all four approaches to DTS, highlighting the goal to be achieved, the key elements being explored, and the tools and dimensions used.



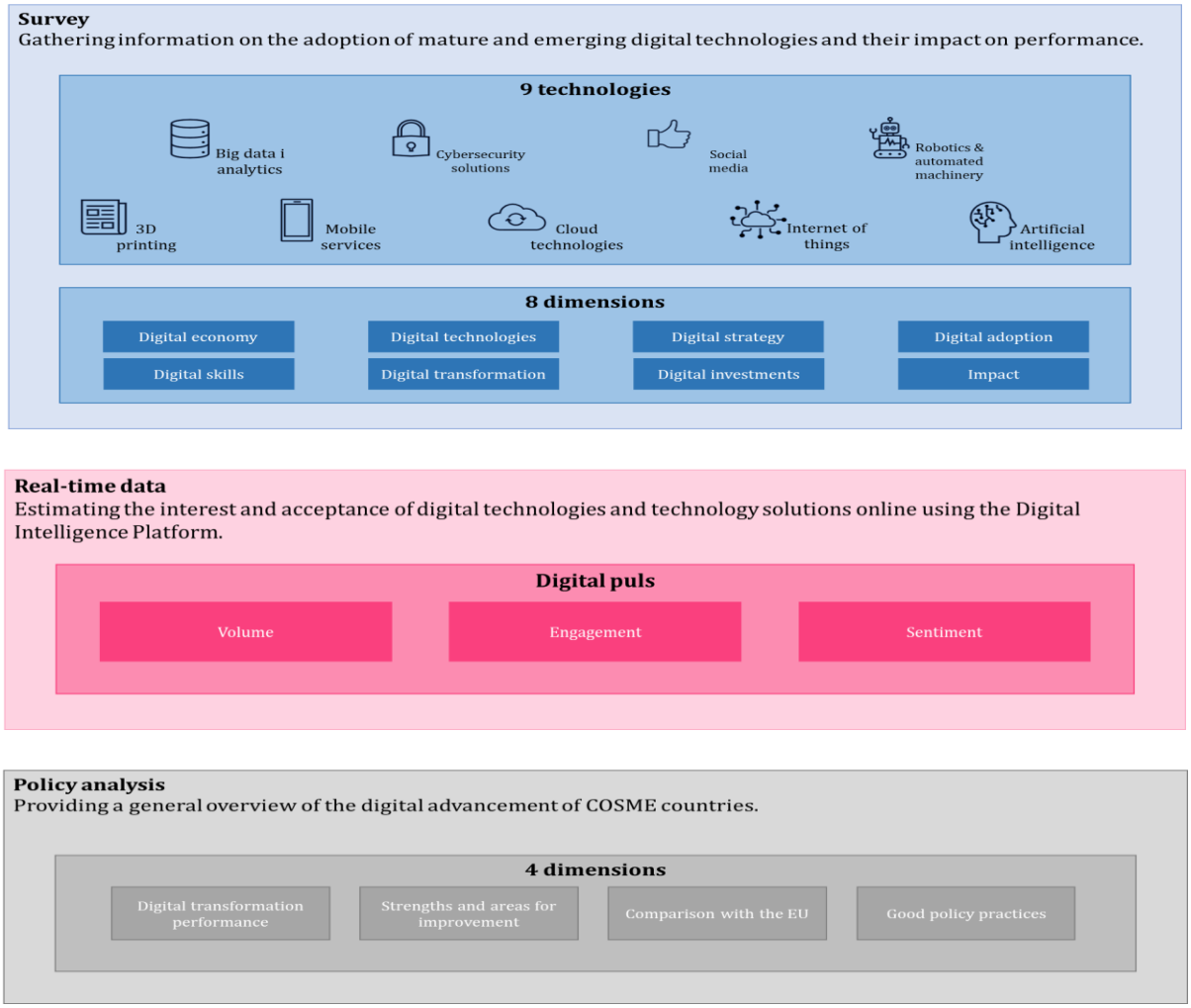


Figure 2. DTS 2018 framework

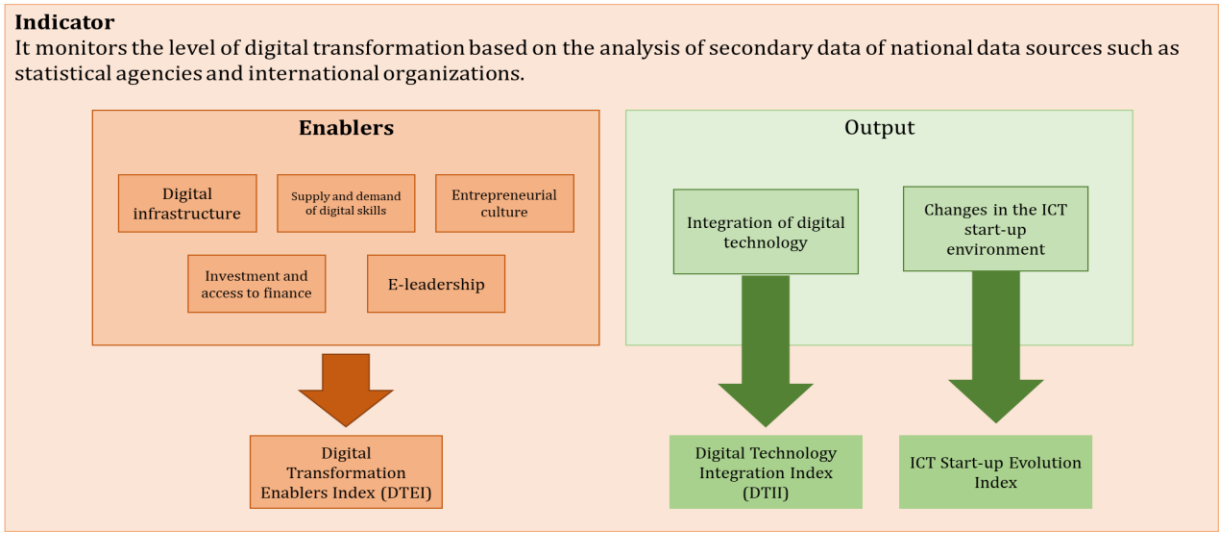
Source: Probst et al. (2018)

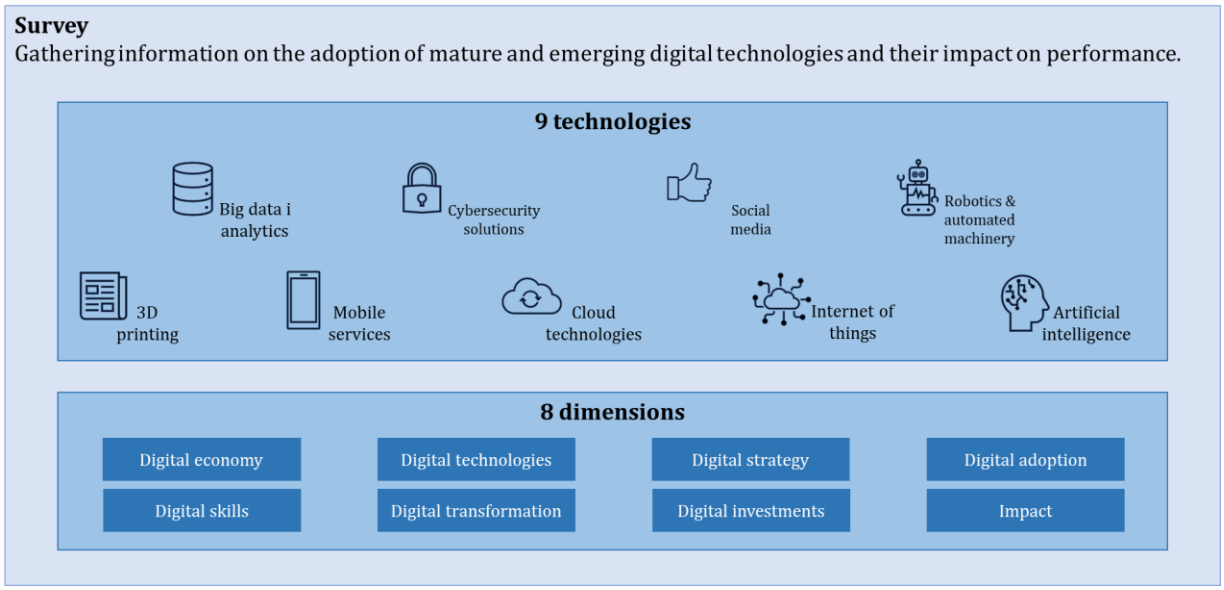
Relying on this methodological approach, the conclusions of this study are based on three types of sources:

- **Survey** conducted among companies in B&H with the aim of analyzing the adoption of new digital technologies and their impact on business.
- Review of available **secondary data**, as well as interviews with the aim of gaining a more complete understanding of the level of digital transformation of companies in Bosnia and Herzegovina, and the factors that act as predictors of digitalization, but also those that act as barriers.
- The **national indicators** used in this study are mainly extracted from the Eurostat database and other relevant international sources, taking into account that very little data is available at the national level.

The real-time data from the digital intelligence platform was not used in this study. Specifically, Probst et al. (2018) note that this approach to data analysis is new and that the results should be taken with caution because they reflect the uncertainty regarding the methodology and the exact nature of the algorithms used by the platform (p. 52). In addition, it is important to mention once again that DTS for 2018 presented the situation in only two industries, agri-food and construction, and that this study would approach a wider population of firms in B&H.

The customized methodological approach used in this Study is depicted in the figure below based on the preceding discussion.





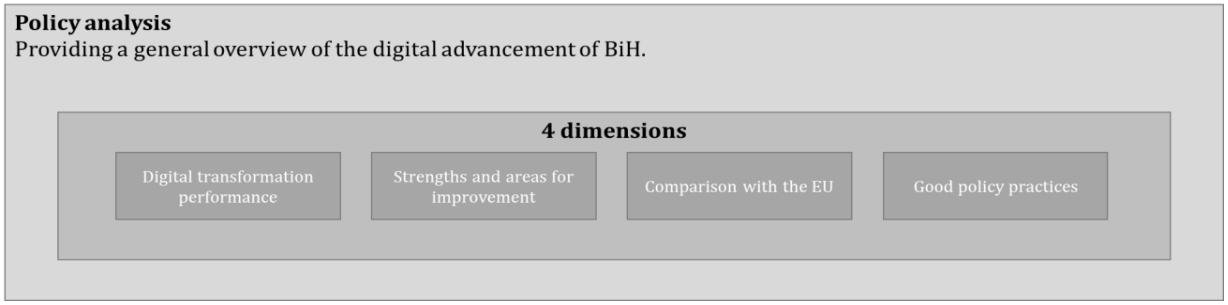


Figure 3. Methodological approach to research

The measures and the methodology that determines the framework of project indicators and data are presented in detail in Kincsö et al. (2020).

1.1.1. Secondary data

Secondary data are based on the following sources:

- Available professional and scientific literature,
- Laws and regulations at all levels of government in B&H, and initiatives and programs,
- The Digital Economy and Society Index (DESI) (European Commission, 2020) and related sources,
- Eurostat database,
- Digital Transformation Scoreboard (Probst et al., 2018) and related sources.

A study of existing literature and data was done in the first phase of the project to develop an initial picture of the level of digital transformation of enterprises in B&H. An overview of digital transformation legislation and programs, as well as other initiatives and projects highlighted in public discourse, is provided.

When it comes to national indicators, the most relevant statistics are those available through the Eurostat database, which are gathered under the DESI indicators on European digital performance and which track EU nations' development. Although B&H is not included in the summary report, data for the last two to three years are accessible in the Eurostat database and were utilized in this study. Following the European Commission's study (European Commission, 2020), and based on available data, a basic analysis of the integration of digital technologies in B&H was conducted, focusing on the aspects of business digitalization and e-commerce. Based on that, the basic conclusions about the potential ranking of B&H in relation to other European countries were drawn. Furthermore, the indicators that comprise the DTS 2018 are provided using data also from Eurostat and other relevant international sources.

1.1.2. Primary data

Primary data were collected by conducting two types of research:

1.1.2.1. Qualitative research

The main goal of this research is to provide a more complete understanding of the digital transformation of companies in B&H with special reference to small and medium enterprises (hereinafter: SMEs), as well as to identify predictors of digitalization, but also those that act as barriers. **Semi-structured interviews** with SME owners or authorized personnel were performed.

1.1.2.2. Quantitative research

The aim of the quantitative research is to analyze the acceptance of new digital technologies and their impact on the business of companies in B&H. Data were collected using a survey created following the recommendations of the DTS and validated by four experts in B&H.

The technologies covered by the analysis are (Probst et al., 2018):

1) Social media
   Social media provides insight into customer behavior and enables communication and exchange of information in real-time.
2) Mobile technologies
   Mobile devices are a technological advancement that transforms traditional business.
3) Cloud technologies
   Cloud technologies make business easier because data and documents can be accessed from anywhere.
4) Internet of Things (IoT)
5) Cybercrime protection technologies
6) Robotics and automated machines
   Industries are adopting robots for industrial purposes to improve product quality and reduce production costs.
7) Big data and data analytics
   Companies are starting to use big data and data analytics with the goal of making more efficient business decisions.
8) 3D printing
   3D printing will be ready to transform almost any industry. Recent developments have changed the way products are designed, developed, manufactured and distributed. Mass production remains the biggest challenge, but it is already being used to produce parts faster.

9) Artificial intelligence
Artificial intelligence will change the world and be ubiquitous in tomorrow's economy. The biggest gains in artificial intelligence are likely to focus on productivity, efficiency, automation and cost, enabling consumers and businesses to capitalize on the digital economy.

1.1.2.3. Data collection process and sample

Survey

Data were collected using the online tool LimeSurvey. The questionnaire was created following Probst et al. (2018), after which it was tested and validated by a panel of experts. The database of 4,570 contacts was created by random selection of companies from the Register of Companies of the Foreign Trade Chamber of B&H. The invitation to participate in the research, which contained a link to the questionnaire, was sent by e-mail. Data were collected during the period July-August 2021, and after the initial call, a reminder to participate in the survey was sent weekly. Ultimately, 1,060 people accessed the survey link, of which 211 completed the questionnaire in full. In other words, the sample consists of 211 companies operating in B&H. Taking into account the number of sent calls, the response rate is 4.6%, which is common in such surveys. The average age of the companies in the sample, measured by the number of years since its establishment, is 21.21 years. When it comes to the company's headquarters, 53% of companies are from the FB&H, 41% from the RS and 1% from the Brcko District. 57% of the companies in the sample operate exclusively on the B&H market, while 18% also operate on the European market.

Interviews

The request for the participation in research was sent to 50 companies, of which 15 agreed to the interview, ten (10) from the Federation of Bosnia and Herzegovina and five (5) from the Republika Srpska. The sample was not expanded because the saturation point with this number of interviews had been achieved.

Interviewing and data analysis were conducted through the following steps:

- Respondents were identified and contacted, and an interview was arranged;
- Respondents were interviewed by telephone, with an audio recording of the interview;
- Transcription of all interviews done.

A content analysis of the data was performed, and the results were presented as a supplement to the results obtained by analyzing the data collected by the survey method; second, coding of responses relevant to specific topics was performed, and an analysis of code occurrence frequencies was performed to draw a conclusion about the importance of individual codes for topics of interest.

Distribution by industry is as follows: four companies are engaged in trade, three are from manufacturing, three are from the field of mechanical and metal processing, and one each from the field of construction, forestry, industrial production, financial and insurance activities, health and social work activities.

In the processed sample, there is one start-up, five micro-companies with less than 10 employees, seven to 250 employees and three over 250 employees. In addition, seven companies are oriented to work on the B&H market, six are internationally recognized companies, and two work on the European market.

1.2. Triangulation of the results

In order to ensure the credibility and validity of the research results, the final conclusions were made by the method of triangulation. Triangulation by combining theory and data from several different sources helps to ensure that biases arising from the use of a single method are avoided. In addition, in order to avoid the bias of one author, four persons participated in data analysis and formulation of conclusions.

At the end of the study, the profile of the country was presented, which, following the example of DTS, provides:

- An overview of how the state supports digitalization;
- Highlighting country strengths and areas for improvement;
- A brief assessment of the location of the country in relation to other European countries.

Furthermore, after all of the findings, company profiling was carried out, and categories with the provided description and features were formed.

DIGITAL TRANSFORMATION CONCEPT

This chapter introduces the notion of digital transformations and provides broad information about the need for digital transformation. Furthermore, the phases of digitization, digitalization, and digital transformation are introduced, as well as their conceptual definitions. Finally, the underlying trends of digital transformation are summarized.

2. DIGITAL TRANSFORMATION CONCEPT

Digital transformation may be defined as a change in the way in which a company uses digital technologies for the development of a new digital business model and helps to create an added value for the company (Verhoef et al., 2021). Digital transformation is multidisciplinary by its nature since it involves changes related to the strategy, organization, IT, supply chains and marketing. In this respect, to do business successfully, it is necessary to better understand how companies can achieve a sustainable competitive advantage by transforming their business operations, which strategies they should adopt to improve their business operations and how they should change their organizational structure to support the new strategy.

2.1. Need for digital transformation

It is possible to identify three external factors that drive the need for digital transformation (Verhoef et al., 2021).

Above all, with the arrival of the World Wide Web and its adoption around the world, the demand for an increasing number of supporting technologies was becoming more pronounced (e.g., broadband Internet, smart phone, Web 2.0, cloud computing, speech recognition, network payment systems and cryptocurrencies), which strengthened the development of e-commerce. It is estimated that the omnipresence of big data and the appearance of new digital technologies such as artificial intelligence, blockchain, the Internet of things, and robotics will have far-reaching consequences on businesses. Although not all the mentioned technologies will be as powerful as expected, the arrival of new digital technologies clearly signalizes the need for a digital transformation of companies and their business operations. In addition to this, these new technologies may also impact the costs structure of companies because of persons being replaced by robots, virtual agents, or optimization of logistics flows and decrease in supply chain costs due to artificial intelligence and blockchain.

Secondly, new digital technologies contribute to a dramatic change of competitors. Competition has not only become global but the intensity of competition has been changed by large companies that dispose of enormous quantities of information (such as Amazon, Alphabet, Apple and Facebook in the USA or Alibaba and JD from China) that have become dominant in numerous industries.

Thirdly, the behavior of consumers is changing as a reaction to the digital revolution. Market figures show that consumers are starting to do their shopping online. New search tools and social media have made the consumers more connected, better informed, stronger and more active. Digital technologies enable consumers to create value together by designing and adapting the products, engaging in distribution activities, and helping other clients by sharing product reviews. Mobile phones have become an important factor in the behavior of today's consumers. Consumers are also strongly relying on apps and new artificial intelligence-based technologies. These new digital technologies will probably have an impact on the structural behavior of consumers and the use of

new digital technologies may therefore easily become the new norm and defy traditional business rules. If companies are unable to adapt to these changes, they become less attractive for clients and will probably be replaced by companies that are using such technologies.

2.2. Digital transformation phases

A digital change at an organization may be divided into three phases, from a relatively simple to a more complex change. This includes: digitization, digitalization and, finally, digital transformation (Verhoef et al., 2021). In recent years, almost all companies in most industries have been impacted by the technological environment due to digitization, which constitutes the transformation of physical contents into virtual contents, as well as due to digitalization, which constitutes the processing of digitalized contents (Smuts and Merwe, 2021).

Digitization is, therefore, coding analogue information into digital information so that computers can store, process, and transfer such information (Verhoef et al., 2021). Examples refer to the use of digital forms in relevant processes, surveys, or digital applications for internal financial statements. Digitization typically digitalizes the process of documenting but does not create added value for a company.

Figure 4. Digital transformation phases

Digitalization describes how IT or digital technologies may be used for a change of existing business processes. Digitalization is characterized by the automation of operations and business processes up to the level of integration and interoperability of information systems (Hadjitchoneva, 2020). For example, creating a new network or mobile communication channels enables buyers to easily connect with companies and change traditional interactions between a company and its buyer. In the case of digitalization, companies use digital technologies to optimize existing business processes by enabling more efficient coordination between processes and/or the creation of added value for users by improving user experience. Digitalization is therefore not only focused on cost-saving, but it also includes process improvements, which may improve the experience of buyers.

Digital transformation is the most widespread phase and describes changes throughout a company that leads to the development of a new business model. Companies compete and can achieve a competitive advantage through their business models, which are defined in a way the company creates and adds value to customers, which aims to make a profit.

Digital transformation enables human beings and autonomous devices to cooperate using information technology (IT), which is possible through big data, cloud computing, mobile and social technologies (Anthony Jnr, 2021). Digital transformation impacts whole companies and their business operations and goes beyond digitalization – a change of simple organizational processes and tasks. The process of change of the business logic of a company and ways in which added value is ensured are restructured. The use of IT is transformative, resulting in substantial changes to existing business processes, routines, and capacities, allowing companies to enter new markets or abandon existing ones. Moreover, digital transformation uses digital technology to enable cross-border interaction with suppliers, buyers, and competitors. Digital technology may thus assist in achieving competitive advantages through company transformation and the use of existing key competencies or the development of new ones.

2.3. Digital transformation trends

New development trends include the implementation of new digital technologies under the common name "Industry 4.0" or the fourth industrial revolution (Pihir et al., 2018). The rate of technological development in Industry 4.0 is exponential and, therefore, anticipating challenges and even benefits is much more difficult than what the world has experienced in previous industrial revolutions. The fourth industrial revolution also brings progress in the way in which technology, communication, data and analytics impact our lives, work and mutual relations (Twinomurinzi, 2020). An overview of certain new trends in digital transformation and their positive and negative impact is given in the text below (Pihir et al., 2018):

Technology	Description	Positive impacts	Negative impacts
Implantable technologies	Devices implemented into bodies, from pacemakers, and smart tattoos to "built-in "smartphones	Beneficial to health monitoring or locating missing children	Threat to privacy and data security
Wearable Internet	Technologies in mobile phones designed to fit in clothes and accessories	Self-sufficiency and better decision making	Threat to privacy and data security, addiction
Internet of things	Connecting to "everything "on the Internet via sensors and appropriate applications	Rise in productivity, improved quality of life, safety (of food, planes…), creation of new businesses, connection with the environment	Privacy concerns, loss of traditional jobs, security threats

Smart cities	Management of energy, material flows, logistics and traffic through sensors and data platforms	Rise in productivity, improved quality of life, lower rate of crime, increased mobility, better access to education	Privacy concerns, risk of system collapse, cyber-attacks
Big data	Management and use of huge amounts of data in automated decision making and real-time services customization	Better and faster decision making, cost savings, new job categories	Job losses, privacy concerns, questionable trust in data, questionable ownership of data
Driverless cars	Threat to privacy and data security, addiction	Improved safety, lesser impacts on the environment, improved mobility for the old and disabled	Job losses, cyber-attacks, lower revenue for public transportation
Robotics	Job losses, liability and accountability	Increased transparency, disintermediation of funds	Job losses, liability and dependence on machines
Blockchain	Distributed trust mechanism designed to keep track of transactions	Disintermediation of financial institutions explosion of tradable assets, increased transparency	Trust of people, fear of losing financial reality
Sharing economy	Exchange of physical goods, assets or services	Increased access to resources, better asset utilization	More contract labor, a decrease of grey economy, abuse of trust
3D printing	Creation of a physical object by printing it layer by layer from a drawing or model	Accelerated product development, rising demand for product designers, more personalized products	Job losses, piracy, uncontrolled production of body parts, an opportunity for printing objects with a high level of abuse like guns

Table 1. Trends in digital transformation

Source: Pihir et al. (2018)

All of these technologies have the potential to increase productivity and bring digital transformation to the organization, whether presented or used separately or as a combination, and the only challenge is the right choice of technology. New digital technologies can stimulate innovations and improve the performance of companies, but only if they are applied in the right place.

THE CONTEXT OF DIGITAL TRANSFORMATION IN BOSNIA AND HERZEGOVINA

Digital transformation of business is at the agenda of government institutions around the world. Precisely because of this, in order to understand the drivers and barriers as determinants of the current situation, it is necessary to understand the legal framework that addresses this area. In this regard, this chapter presents the legal framework and jurisdiction when it comes to the field of digital transformation. Furthermore, a summary of the most recognized initiatives and projects in the field is provided.

3. CONTEXT OF DIGITAL TRANSFORMATION IN BOSNIA AND HERZEGOVINA

3.1. Form of government and legal framework

Given its size, Bosnia and Herzegovina is probably one of the most complex countries in the world. It consists of two entities: Federation of Bosnia and Herzegovina (FB&H) and Republika Srpska (RS), and the administrative unit Brčko District (BD). In addition, the Federation of Bosnia and Herzegovina consists of 10 cantons. Bosnia and Herzegovina is not only characterised by a complex state structure, but also unclear competences for certain areas, so that it happens that laws that define the same legal matters are adopted both at the state level and at the level of entities or Brčko District. An example are laws defining the use of electronic signatures and electronic documents, which were adopted both at the state level but also at the level of entities and Brčko District.

3.2. Competences and legal framework

By adopting the Information Society Development Policy of Bosnia and Herzegovina for the period 2017 – 2022 and Information Security Management Policy at Institutions of Bosnia and Herzegovina for the period 2017 – 2022, Bosnia and Herzegovina clearly defined its strategic decision regarding the development of information society and improvement of information security on its territory. Although a very complex country in terms of its structure, Bosnia and Herzegovina adopted a certain number of laws and strategic documents that aim to promote and improve e-business.

It is necessary to emphasize the fact that the implementation of the above-mentioned strategic documents and laws is extremely slow, which considerably restricts digitalisation and e-business operations of small and medium enterprises.

Furthermore, during our research on legal regulations in Bosnia and Herzegovina, we concluded that the registry of adopted regulations was quite complex and that an analysis of legal regulations in any area would require a lot of time, so that it may be considered inadequate. Searching for the relevant regulations is extremely complicated and creating a list of regulations applicable to a company planning to start operating on the territory of Bosnia and Herzegovina may present a true challenge. A simplification of operations of companies clearly requires consolidation of all regulations in Bosnia and Herzegovina in a single database, regardless of the level of government, including a possibility to search the database online.

An overview of strategic documents, laws and bylaws identified during the analysis that was carried out, which could be considered as relevant for the analysis based on the DESI model, as well as competences by government levels, is given below.

3.2.1. Bosnia and Herzegovina

The Ministry of Communications and Transport of Bosnia and Herzegovina is competent for adopting legal regulations in the field of digitalisation and information security.

The Ministry of Communications and Transport of Bosnia and Herzegovina is competent, among others for: a) developing strategic and planning documents in the field of international and inter-entity communications, transport, infrastructure and IT; b) preparing contracts, agreements and other documents in the field of international and inter-entity communications and transport; and c) defining relations with international organisations in the field of international and inter-entity communications and transport.

However, although the Ministry of Transport and Communications of Bosnia and Herzegovina is in charge of adopting laws in the field of digitalisation, it frequently happens that the implementation of such laws is limited or impossible due to the fact that there are already existing laws that define processes in an explicit manner and that make it impossible to implement laws on digitalisation. A specific example is the implementation of the Law on Electronic Signature in Bosnia and Herzegovina and the Law on Electronic Documents in Bosnia and Herzegovina, which implementation is extremely limited specifically due to the existing legal framework, i.e., laws and bylaws.

- **Law on Electronic Signature of Bosnia and Herzegovina ("Official Gazette of Bosnia and Herzegovina", No. 91/06)**

The law defines the pre-requisites for the creation and use of electronic signatures and provision of services related to electronic signatures and authentication.

- **Law on Electronic Legal and Business Transactions ("Official Gazette of Bosnia and Herzegovina", No. 88/07)**

The law defines the legal framework for certain aspects of electronic legal and business transactions that includes undertaking and providing information society services, obligations of service providers regarding information, concluding contracts and the responsibility of service providers.

- **Law on Electronic Documents ("Official Gazette of Bosnia and Herzegovina", No. 58/14)**

The law defines the legal validity of electronic documents used in proceedings held by the administrative authorities of Bosnia and Herzegovina, other institutions of Bosnia and Herzegovina that are in charge of administrative duties and institutions with a public mandate (hereinafter: competent authorities) and regulates the use of electronic documents and other related issues.

Strategic documents at the state level in Bosnia and Herzegovina include:

- Information Society Development Policy of Bosnia and Herzegovina for the period 2017 – 2022 ("Official Gazette of Bosnia and Herzegovina", No. 42/17)
- Information Security Management Policy at Institutions of Bosnia and Herzegovina for the period 2017 – 2022 ("Official Gazette of Bosnia and Herzegovina", No. 38/17)

- eSEE Agenda + (Directorate for Economic Planning, Council of Ministers of Bosnia and Herzegovina, 2015)
- Strategic Framework for Bosnia and Herzegovina (Directorate for Economic Planning, Council of Ministers of Bosnia and Herzegovina, 2015)

3.2.2. Federation of Bosnia and Herzegovina

The Ministry of Transport and Communications of the Federation of Bosnia and Herzegovina is in charge of adopting laws in the field of IT.

By analysing the regulations adopted in this field, it may be observed that until today the competent ministry has adopted the laws that had already existed at the state level, as described in detail below.

- **Law on Electronic Documents of the Federation of Bosnia and Herzegovina (''Official Gazette of the Federation of Bosnia and Herzegovina'', No. 55/2013)**

The law regulates the rights of federal and cantonal administrative authorities and federal and cantonal administrative organisations, local self-government authorities, business companies, institutions and other legal entities and individuals to use electronic documents in business transactions and activities and in administrative proceedings held by the competent bodies in case of which electronic equipment and programmes may be used in the creation, transfer, receipt and storage of information in electronic form, legal validity of electronic documents, use and circulation of electronic documents.
The provisions of this law are not applicable in those cases when other laws regulate the use of paper documents.

- **Law on Electronic Signature of the Federation of Bosnia and Herzegovina (draft law adopted by the House of Peoples of the Federation of Bosnia and Herzegovina on February 27, 2020)**

The draft law regulates the right of legal entities and individuals to use electronic signatures in administrative, court and other proceedings, business and other transactions, as well as rights, obligations and responsibilities of legal entities and individuals that provide services related to the creation, verification and authentication of electronic signatures, electronic timestamp, electronic stamp, electronic recommended delivery and certificate for the authentication of websites on the territory of the Federation of Bosnia and Herzegovina, unless otherwise regulated by another law.

3.2.3. Republika Srpska

The Ministry of Scientific and Technological Development, Higher Education and Information Society of Republika Srpska is, among others, competent for the development of information society; development and monitoring of strategies in the mentioned field; fostering innovations and economic development through the use of new technologies; harmonisation of education policy with global technological trends; establishment and development of an e-government system; strategic and operating implementation of the concept of information security in Republika Srpska and inspection in this field; issues related to digital identities of legal entities and individuals in Republika Srpska, electronic presentation and signature, setting technological and IT standards; academic and

research network of Republika Srpska; expert verification and prior consent for IT and other technological equipment procurement for the government purposes, ministries, administrations and administrative organisations of Republika Srpska; coordination of technological and IT projects in the public sector; promotion of the use of new technologies and drafting of laws and bylaws which are within the competence of the Ministry.

As compared to the state level and Federation of Bosnia and Herzegovina, Republika Srpska has made some progress regarding the adoption and implementation of the legal framework. It also adopted an E-Government Development Strategy of Republika Srpska and a number of laws defining or facilitating electronic business and defining IT security and protection of critical infrastructure on the territory of Republika Srpska.

- **Law on Electronic Business Processes of Republika Srpska ("Official Gazette of Republika Srpska", No. 59/09)**

The law regulates the provision of information society services, responsibility of information society service providers, and and rules regarding the conclusion of contracts in electronic form.

- **Law on Electronic Documents, Electronic Identification, and Trusted Services in Electronic Business Processes ("Official Gazette of Republika Srpska", No. 94/2017)**

This law regulates electronic documents, electronic identification and trusted services in electronic business processes.

- **Law on Critical Infrastructure ("Official Gazette of Republika Srpska", No. 87/2018)**

This law regulates critical infrastructure of Republika Srpska, critical infrastructure sectors in Republika Srpska, critical infrastructure management, obligation to perform a risk analysis, security plans for buildings in the critical infrastructure sector, security coordinator and manager for critical infrastructure, cooperation in the field of critical infrastructure, handling protected data, monitoring the implementation of the law and sanctions.

- **Law on Information Security ("Official Gazette of Republika Srpska", No. 70/2011)**

This law regulates information security that is ensured by applying information security measures and standards. It defines the fundamental principles of information security, protection and validity of data in electronic form. The law also specifies information security measures and standards, data protection at the Government of RS and competent authorities for the adoption, implementation and monitoring of information security measures and standards. The adoption of this law constitutes a continuation of activities for creating the pre-requisites for the use and maintenance of information in a secure environment.

- **Law on Tax Procedure ("Official Gazette of Republika Srpska", No. 78/2020)**

This law regulates the organisation and competence of the Tax Authority of Republika Srpska, rights and obligations of tax payers, tax procedure, payment of taxes, regular and forced collection of taxes and other cases of cessation of tax obligations, tax control, special control, legal remedy procedures and tax-related monitoring in Republika Srpska.

3.2.4. Brčko District

Assembly of the Brčko District of Bosnia and Herzegovina adopted the Law on Electronic Signature of the Brčko District of Bosnia and Herzegovina at their 60th session which was held on March 11, 2020.

- **Law on Electronic Signature of Brčko District of Bosnia and Herzegovina ("Official Gazette of Brčko District of Bosnia and Herzegovina", No. 11/2020)**

This law regulates the pre-requisites for the use of electronic signatures, electronic stamps, electronic timestamps and recommended electronic delivery services in legal transactions, administrative, court and other proceedings in Brčko District of Bosnia and Herzegovina.

3.2.5. Conclusion regarding legal regulations

Although the Law on Electronic Signature of Bosnia and Herzegovina was adopted as early as in 2006, its implementation has not been fully achieved. One of the key reasons for the delay is the establishment of the Office for Supervision and Accreditation of Certifiers at the Ministry of Transport and Communications of Bosnia and Herzegovina, which was established on January 15, 2018. With the establishment of the Office for Supervision and Accreditation of Certifiers, the preconditions for full implementation of the Law on Electronic Signature have been achieved, and a register of certifiers has been established in which only one company is registered, HALCOM, the only one authorized to issue a qualified electronic certificate.

It is necessary to note that the current Law on Electronic Signature in Bosnia and Herzegovina is in compliance with the Directive 1999/93/EC, and it needs to be harmonised with the Regulation 910/2014 of the European Parliament and Council of Europe. Given the fact that the EU recognises only a national supervisory body, it is necessary to harmonise regulations at lower government levels, because in a contrary case, an electronic signature issued based on entity laws would not meet the requirement of interoperability, and it would be impossible to use it abroad.

An analysis of regulations in terms of DESI leads to the conclusion that regulations adopted at all government levels partially regulated activities that impact electronic business processes of SMEs, mostly through bylaws (rulebooks, regulations), except in the case of the Republika Srpska, which regulated it through law.

Sublegal acts (bylaw) regulating the above-mentioned issues includes the following:

- At the level of Bosnia and Herzegovina
  - Rulebook on Payment of Indirect Taxes and Other Income and Fees that are collected by Indirect Taxation Authority ("Official Gazette of Bosnia and Herzegovina", No. 21/20 dated April 30, 2020)

- Decision on Pricing of Services Regarding the Issuance and Usage of Qualified Electronic Certificates ("Official Gazette of Bosnia and Herzegovina", No. 78/20 dated December 4, 2020)

- At the level of the Federation of Bosnia and Herzegovina
  - Rulebook on the Submission of Tax Returns ("Official Gazette of the Federation of Bosnia and Herzegovina", No. 66/02, 54/03, 74/04, 38/09, 7/11, 53/12 and 87/20)
  - Rulebook on the Application of the Law on Income Tax ("Official Gazette of the Federation of Bosnia and Herzegovina", No. 88/16, 11/17, 96/17, 94/19 and 87/20)
  - Rulebook on the Submission of Registration Applications and Registration Changes in the Single Contribution Registration, Control and Collection System ("Official Gazette of the Federation of Bosnia and Herzegovina", No. 73/09, 38/10, 77/10, 9/11, 1/13, 83/14, 1/15, 48/16, 25/17, 53/19 and 93/19)
- At the level of Republika Srpska
  - Rulebook on Registration Procedure and Identification of Tax Payers ("Official Gazette of Republika Srpska", No. 94/2017)

3.3. Other digital transformation promotion activities

In addition to policies and strategies as well as laws and secondary legislation that state-level and entity-level governments are in charge of, there are also other projects and activities that include digitalisation or digital transformation in Bosnia and Herzegovina especially those initiated by international organisations. The overall objective of the project is to improve the level of digitalisation of companies and public administration in Bosnia and Herzegovina.

The United Nations Development Programme (UNDP) is actively involved in this field, and one of the projects implemented by UNDP is the project ''Digital Transformation in the Public Sector in Bosnia and Herzegovina (2020-2024)''. The objective of the project is to provide support to the authorities in Bosnia and Herzegovina on their way towards a digital future by promoting new opportunities and using technologies and innovations for more effective and inclusive management and provision of public services. This project has three key objectives: to improve the legal and political environment that speeds up digital transformation in the public sector, to improve person-oriented e-governance and e-services in an inclusive manner, and to build capacities and increase open innovations in the public sector through an exchange of knowledge and networking. UNDP and the British Embassy to Bosnia and Herzegovina organised the first online conference ''Authorities of Bosnia and Herzegovina on the Path Towards Digital Transformation'' for the purpose of ensuring a space for dialogue and exchange of experiences and best practices and fostering digitalisation of administration, supporting the digital economy and encouraging the development of an information society.

In addition to the above, **Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH** is remarkably active in the field of digitalisation. Over the past two years, it mostly contributed to developing digital transformation in Bosnia and Herzegovina through the project ''Innovations and Digitalisation of Small and Medium Enterprises in Bosnia and Herzegovina''. Project activities raise awareness of digitalisation potential and develop an innovative spirit among small and medium enterprises, especially in traditional sectors such as sales, the metal and wood processing industry, agriculture and tourism. Also, the project develops services at the level of service providers that may improve innovations and digitalisation among small and medium enterprises, and such actors are directly related to SMEs. The public sector is also included in the support and pre-requisites for the development of tools and policies that encourage SMEs to initiate innovation and digitalisation processes are created at the relevant administrative levels. In the first half of implementation, the project included more than 570 SMEs, organised more than 450 B2B meetings, more than 40 virtual events with more than 1,400 unique participants, and raised the awareness of a significant number of public servants regarding the opportunities for integrating innovations and digitalisation in their work and the support provided to the development of three public documents at different public administration levels in Bosnia and Herzegovina. It is also important to point out that the project created an online platform for connecting SMEs with the IT sector (www.b2bit.ba), supported a comprehensive dialogue on digitalisation and digital transformation processes through events such as Sarajevo Unlimited, Forward Conference and Connecto, and directly supported the establishment of the Centre for Digital Transformation at the Chamber of Commerce of Republika Srpska.

Furthermore, the Banking and Finance Committee of the **American Chamber in Bosnia and Herzegovina (AMCham B&H)** organised a round table discussion "Digital Transformation in Bosnia and Herzegovina". Some of the topics of this round table discussion were financial innovations in the framework of digital transformation, data protection in the context of digital transformation, and digital signature and its application. It was concluded that the AmCham B&H and regulators and government representatives would attempt to establish a group that will work intensively on eliminating obstacles hindering a successful digital transformation in Bosnia and Herzegovina.

In addition to international organisations, some local stakeholders also organised panels and discussions to raise the awareness of the necessity of digital transformation of the society in Bosnia and Herzegovina.

The Foreign Trade Chamber of Bosnia and Herzegovina (FTC) contributed to this issue by working on a programme for the development of an information society in Bosnia and Herzegovina for the purpose of promoting the national economy and providing support in the harmonisation of business operation with modern trends of both the European Union and the world. The Tiimiss Conference, which included 13 thematic units on priorities of the society and its digitalisation, was organised in cooperation with the company GlobalGPS NJ d.o.o. The key purpose of this conference was to provide an overview of the situation in Bosnia and Herzegovina regarding digitalisation and the use of ICT and initiate activities that will become a driver for change in society. FTC also published an edition entitled "Digital Transformation of Bosnia and Herzegovina" that consists of 13 individual studies covering all important spheres of social life.

The European Union initiated a project, EU4Business, in order to strengthen the economy of Bosnia and Herzegovina, in particular micro, small and medium enterprises in Bosnia and Herzegovina. The project supports the development of entrepreneurship, export-oriented sectors, tourism, agriculture and rural development. EU4Business is co-financed by the European Union and Federal Republic of Germany and jointly implemented by GIZ, ILO and UNDP in the period from April 2018 to March 2022. The **Chamber of Commerce of Republika Srpska** obtained grant funds in the framework of the project EU4Business and started implementing the project "Centre for Digitalisation, Improvement of Competitiveness and Innovations at SMEs – DigIT". The Digital Transformation Centre of the Chamber of Commerce of Republika Srpska (DTCCCRS) was established in the framework of this project. The above-mentioned centre provides business support regarding digital transformation, consultancy services, organises trainings for employees from the private sector aiming at the acquisition of additional knowledge and skills, organises trainings for consultants related to expert analyses and digital strategies at business companies. As part of the above-mentioned activities, a training session organised by the Digital Transformation Centre of the Chamber of Commerce of Republika Srpska for consultants was completed in April 2021. Trainings related to the Introductory Module and Module A: Digital Transformation (Business Models and Processes) and Module B: E-Commerce/E-Marketing and Social Media were also held. The Digital Transformation Centre of the Chamber of Commerce of Republika Srpska and ICT Hub organised a hackathon on the topic of "Sales Digitalisation" in April 2021. The hackathon was organised with the support and in cooperation with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in the framework of the project "Innovation and Digitalisation in Small and Medium Enterprises in Bosnia and Herzegovina" that GIZ is implementing on behalf of the German Government.

Datalab BH organised a panel discussion entitled "State of Digitalisation and Vision of Digital Future of the Economy of Bosnia and Herzegovina". Panelists agreed that this process was an important step towards better services in all segments of the society of Bosnia and Herzegovina and that digitalisation ensured better services in medicine, education, judiciary, public administration, the media, police, and all other spheres of life.

Finally, the state of digitalisation or digital transformation in Bosnia and Herzegovina is very bad and the country is lagging behind both EU Member States and countries in the region. Although digital technologies are transforming the global economy, Bosnia and Herzegovina has not yet experienced all development benefits of digital technologies, such as inclusive and sustainable growth, improved management and fast service delivery. Bosnia and Herzegovina is facing the risk of slow or poor adoption of such innovations, which may have adverse effects on industries, the public sector and individuals, or the country as a whole.

Regulators and all state and entity-level governments are expected to react faster and better in order to prevent a slowdown or halt in technological developments. The legislator should invest additional efforts and improve regulations related to the use of digital signatures, cloud services, personal data protection, access to data registers, etc., in order to adapt the regulatory framework to global trends.

DIGITAL TRANSFORMATION ENABLERS AND DIGITAL INTEGRATION

Following the recognized conceptualizations of the European Union, this chapter presents the situation in B&H in terms of digital transformation enablers, as well as the level of integration of digital technologies. **Secondary data** from mainly international institutions such as Eurostat, the Global Competitiveness Index, the Global Talent Competitiveness Index and the Global Entrepreneurship Monitor were presented. The presented data are briefly discussed in terms of comparison with other European countries, especially countries in the region.

4. DIGITAL TRANSFORMATION ENABLERS AND DIGITAL INTEGRATION

In this section, it is presented an analysis of the available secondary data according to the DTS approach, which is presented in the figure below. The analysis focuses on current trends in digital technology integration and the factors that enable it to do so.

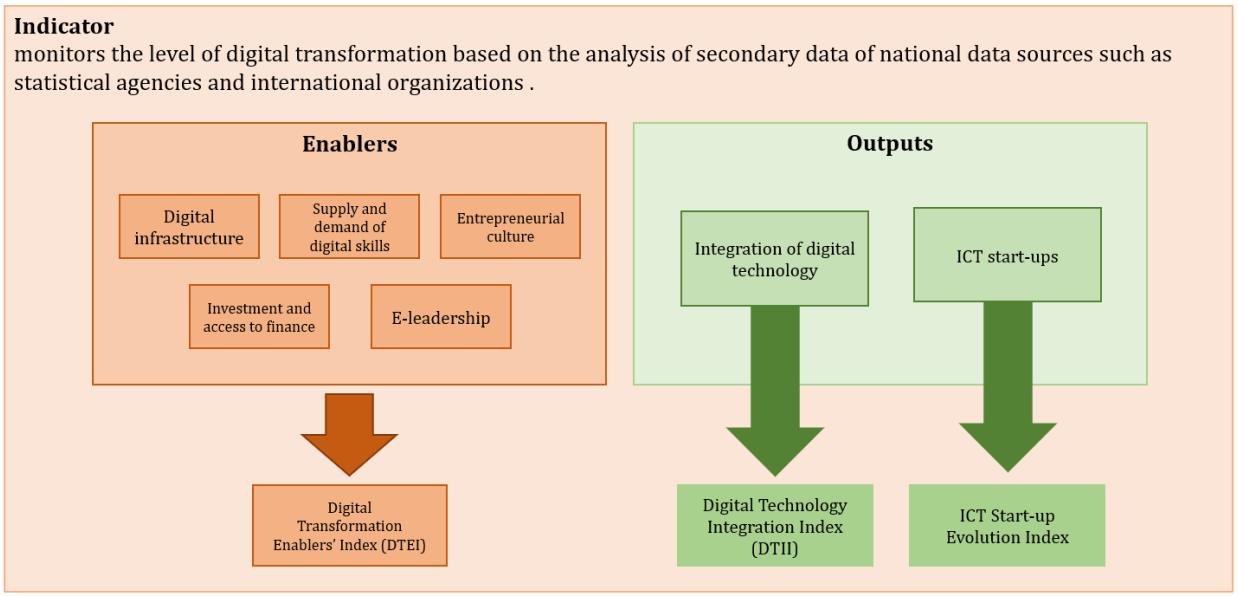


Figure 5. Methodological approach to the presentation of secondary data

Source: Probst et al. (2018)

4.1. Digital transformation enablers

According to DTS 2018, digital transformation enablers are the following:

- Digital infrastructure,
- Supply and demand of digital skills,
- Entrepreneurial culture,
- Investment and access to finance,
- E-leadership.

Based on the mentioned enablers, DTS 2018 calculates the Digital Transformation Enablers Index – DTEI, which is developed by a linear combination of each of the DT start-up indices. DTEI enables

the ranking of EU countries. Data for DTEI were downloaded from relevant online sources (listed below) during August 2021.

4.1.1. Digital infrastructure

The availability of digital infrastructure is an enabler of digital transformation and consists of indicators presented in the table below.

Indicator	Data source
Enterprises using DSL or other fixed broadband connection	Eurostat
Internet bandwidth	Global Competitiveness Index
Percentage of enterprises who have ERP software package to share information between different functional areas	Eurostat
Percentage of enterprises using Customer Relationship Management to analyse information about clients for marketing purposes	Eurostat

Table 2. Digital infrastructure dimension indicators

Source: Probst et al. (2018)

4.1.1.1. Enterprises using DSL or other fixed broadband connection

This indicator presents the percentage of companies using DSL or other forms of broadband connection through which they gain access to the Internet. The analysis included companies that employ 10 or more employees (without financial sector).

Figure 6 presents the extent of use of DSL or other fixed broadband internet connection in European countries. Regarding this indicator, the largest percentage of companies that use the Internet come from Denmark (100%) and France (99%). It is interesting to note that B&H is ranked in the top 5th in terms of companys' access to the Internet, with 98% of companies that have Internet access. The chart shows that even some of the EU member states are low positioned, so for example, Romania is in the last place with 81%, while Hungary is penultimate with 83% of companies that have Internet access. This indicator has not been measured for companies operating in Iceland.

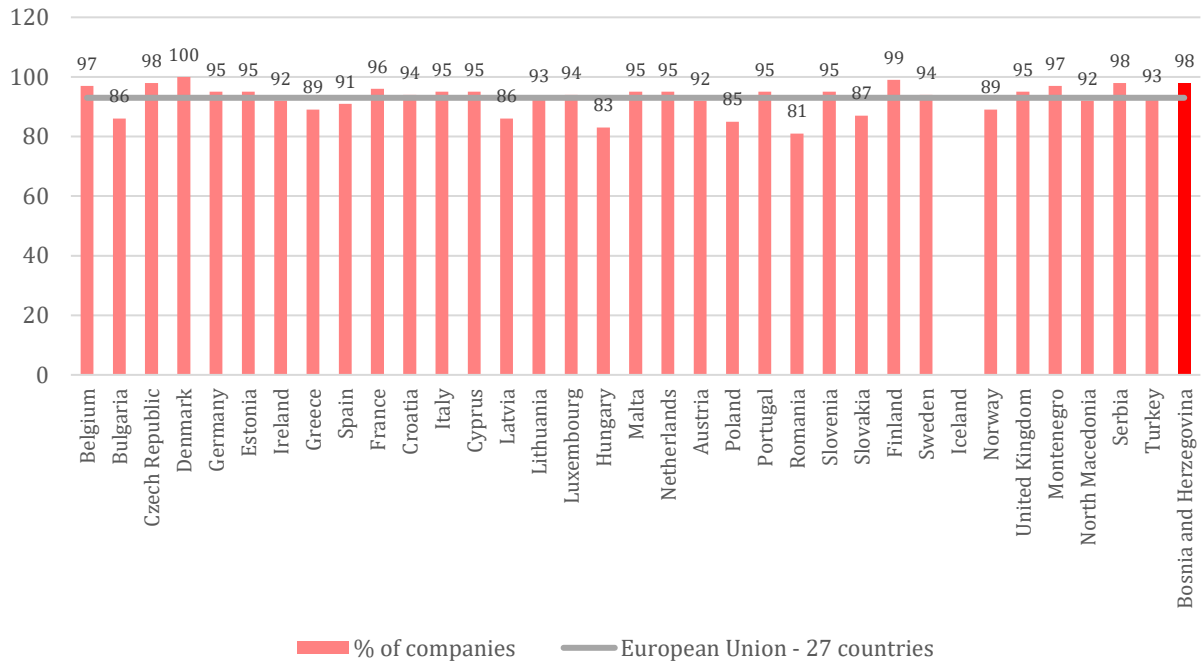


Figure 6. Enterprises using DSL or other fixed broadband connection (without financial sector)

Source: Eurostat (data for 2020)

4.1.1.2. Internet bandwidth

This indicator tells us about internet speeds in countries measured in kbps per user, last measured in 2016. In terms of infrastructure, Iceland is ahead of all European countries and it provides the highest speeds, 519.87 kbps. The average of all European countries was about 100 kb / s. The chart shows that Bosnia and Herzegovina belong almost to the very back when it comes to internet speed. Albania, Estonia, Hungary, Serbia, and North Macedonia are behind Bosnia and Herzegovina. It is interesting that Montenegro is in 35th place.

It is important to note that GCI 2020 does not report this indicator at all.

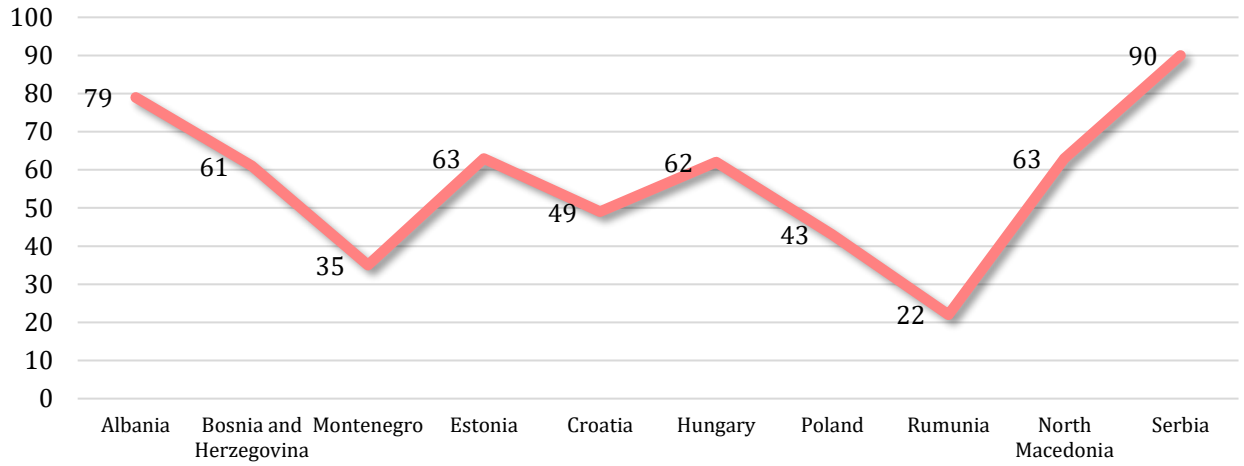


Figure 7. Ranking of countries according to Internet bandwidth (total of 138 countries in total)

Source: Schwab and Sala-i-Martin (2016)

4.1.1.3. Percentage of enterprises who have ERP software package to share information between different functional areas

This indicator is presented in the section of DESI indicators of digital technology integration (see 4.2.1.1. Electronic data exchange).

4.1.1.4. Percentage of enterprises using Customer Relationship Management to analyze information about clients for marketing purposes

This indicator shows the percentage of companies that use software solutions for e.g., Customer Relationship Management (CRM) and thus achieve a better market position and better cooperation with customers. The analysis included companies that employ 10 or more employees (without financial sector).

Figure 8 shows that the most mature customer relationship management is in Finland and the Netherlands, where 26% of companies use CRM solutions. The overall situation in the EU (including 27 countries) is shown by a gray horizontal line and amounts to 19% of companies. The graph shows that only 9% of companies in Bosnia and Herzegovina use CRM solutions, which positions B&H at the penultimate place. It is interesting that Hungary is the last on the list, with only 7% of companies that use CRM solutions in their work.

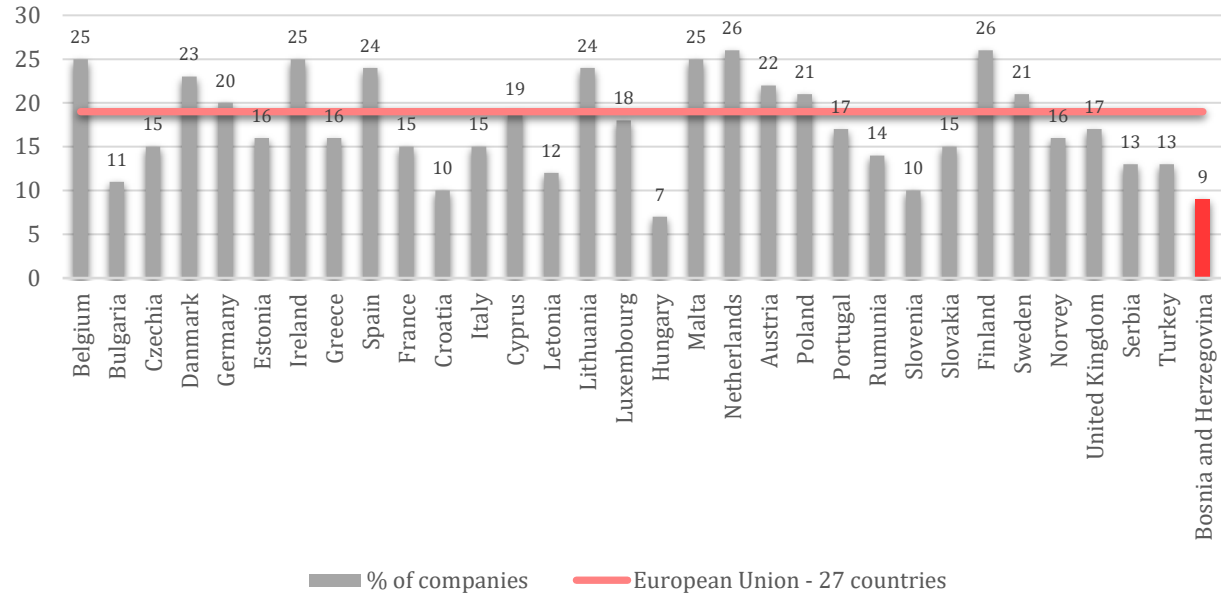


Figure 8. Enterprises using CRM to analyse information about clients for marketing purposes

Source: Eurostat (data for 2019)

In conclusion, when it comes to the digital infrastructure indicator, Bosnia and Herzegovina, compared to other European countries, is at the bottom of the table. Although highly ranked by the number of companies using the Internet, however, in terms of bandwidth parameters, B&H lags behind most European countries, and a very small percentage of companies use ERP to integrate business processes and CRM to analyze customer data.

4.1.2. Supply and demand of digital skills

Supply and demand of digital skills indicator presents the availability of digital skills within the population of the country and consists of the following indicators:

Indicator	Data source
Innovation output (derived by aggregating two output pillars: Knowledge & technology output and creativity output)	Global Talent Competitiveness Index
Ease of finding skilled employees	Global Talent Competitiveness Index
Enterprises that employ ICT specialists and had hard-to-fill vacancies for ICT specialists	Eurostat
Persons employed, which were provided a portable device that allows a mobile connection to the internet for business use	Eurostat

Table 3. Indicators of dimension Supply and demand of digital skills

Source: Probst et al. (2018)

For the first two indicators, data were downloaded from GTCI, while for the other two, Eurostat was used.

4.1.2.1. Innovation output

The innovation output is one of the two sub-indices of the Global Innovation Index (GII), which is derived by aggregating two indicators/pillars: knowledge and technology output and creative output. The first pillar covers elements of knowledge creation, impact, and diffusion, while the second pillar includes creative intangibles, creative goods and services, and online creativity (Lanvin and Monteiro, 2020). The figure below presents a comparison of B&H with countries in the region and beyond (which do not belong to the economically leading EU countries). B&H is in the 78th position with a score of 24.52. Of the analyzed countries, only Albania is behind B&H. Given that this indicator shows the extent to which ideas from innovative sectors are able to reach the market, providing better jobs and making the country more competitive, the unfavorable position of B&H indicates that, for social progress, it is necessary to approach the education system and improvement of talent competitiveness systematically.

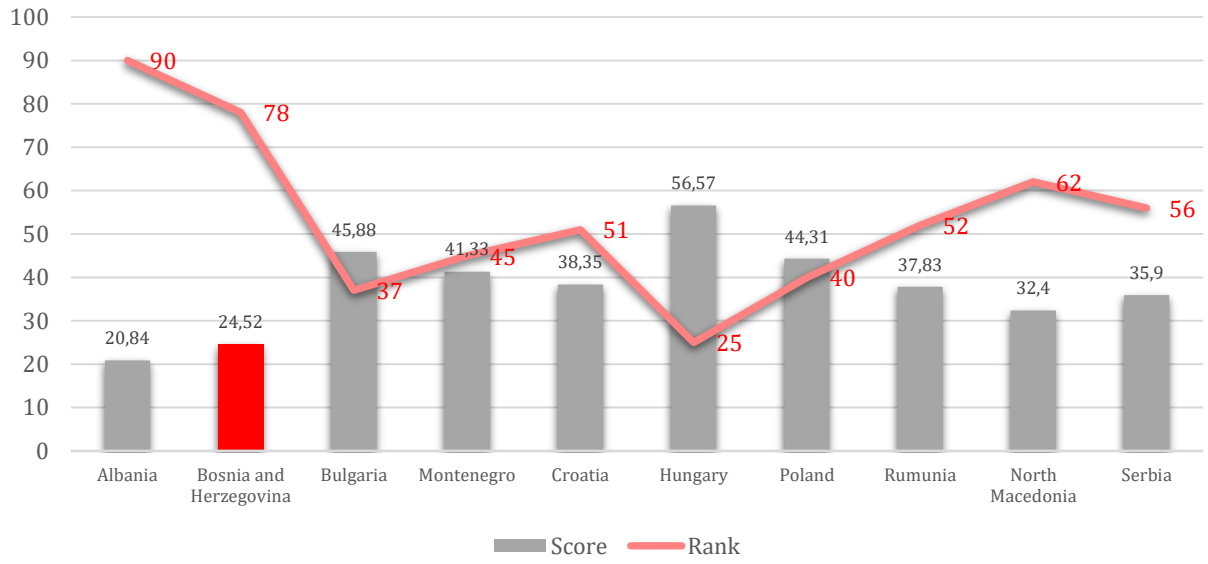


Figure 9. Innovation output

Source: Global Talent Competitiveness Index (Lanvin and Monteiro, 2020)

4.1.2.2. Ease of finding skilled employees

This indicator shows the extent to which companies can find people with the skills needed to fill a position. The leading countries, according to this indicator, are the USA, Israel, Finland, Malaysia, Norway, Switzerland, Germany, and the UK (in that order) (Lanvin and Monteiro, 2020). B&H is ranked 124th on this indicator, with a score of 32.75. Romania and Hungary are behind B&H.

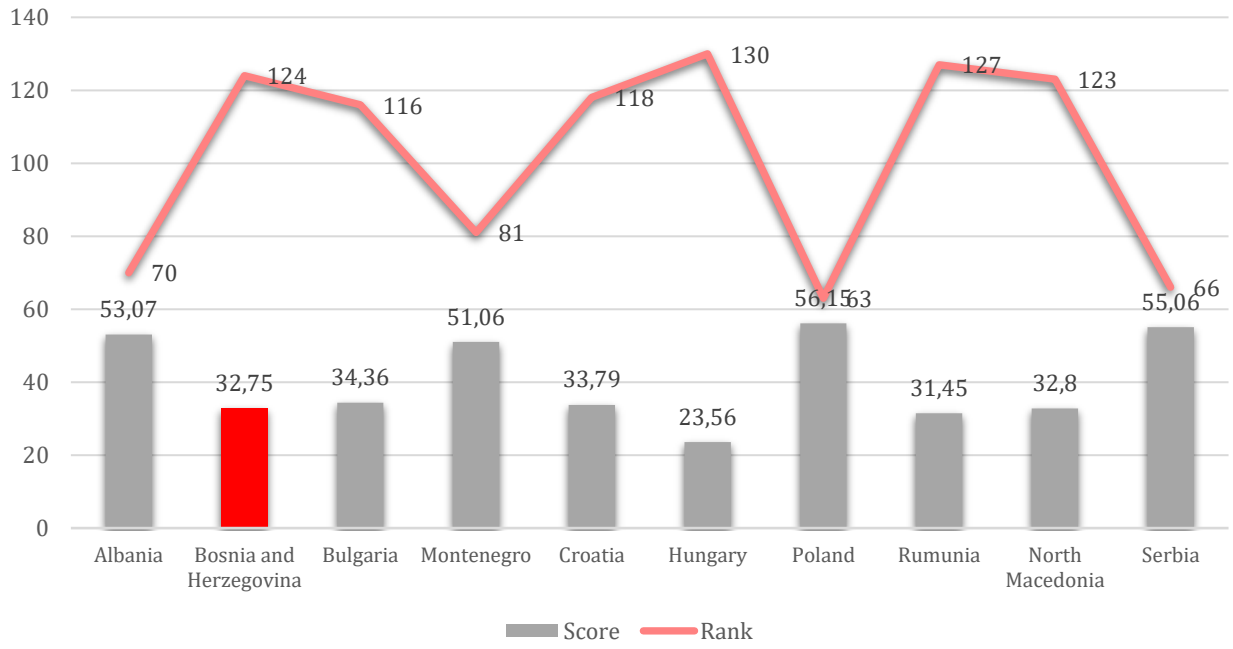


Figure 10. Ease of finding skilled employees

Source: Global Talent Competitiveness Index (Lanvin and Monteiro, 2020)

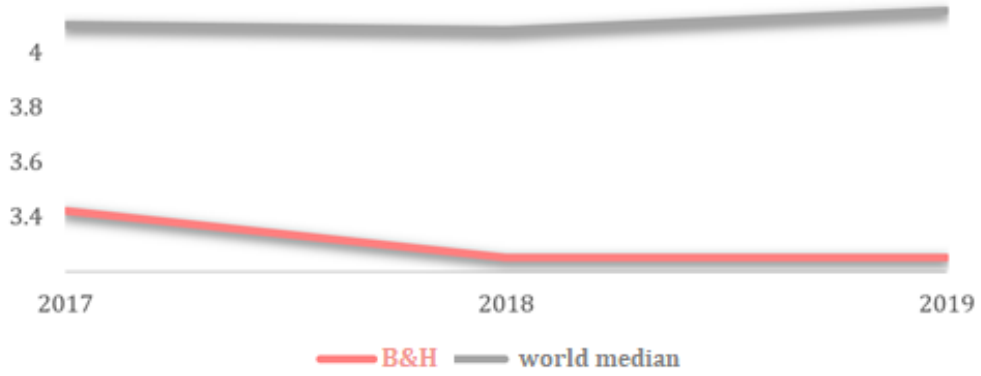


Figure 11. Ease of finding qualified employees in B&H in relation to the world median

Source: The World Bank[1]

Figure 11 shows where B&H stands in relation to the world median of the ease of finding qualified employees score. The results indicate that it is very difficult to find skilled workers in B&H to fill the vacancies. This result is interesting given the high unemployment rate, especially of young people,

[1] http://data.worldbank.org/ [access: 21.08.2021.]

and indicates the need for additional analysis and creation of retraining programs, but also better planning of enrollment policies in higher education.

4.1.2.3. Enterprises that employ ICT specialists and had hard-to-fill vacancies for ICT specialists

Eurostat defines ICT professionals as "*workers who have the ability to develop, operate and maintain ICT systems, and for whom ICT constitute the main part of their job*". A workforce with the skills of ICT professionals, which has the potential to sustain and grow the digital economy, is a key element for successful digital transformation. According to a Eurostat report, in the EU, difficulties in finding ICT experts correlate with the size of the company, i.e., the larger the company, the more it encounters the problem of filling the jobs of ICT professionals. As many as 29% of large companies had difficulty filling the jobs of ICT professionals. In 2020, 19% of EU companies employed ICT professionals. Among the EU Member States, Ireland and Belgium have the largest share of companies employing ICT professionals, with 30% each. Italy, with 13%, is at the bottom of the table of EU members. When it comes to B&H, 11% of companies employ ICT experts, which positions B&H behind neighboring countries: Croatia (20%), Serbia (15%) and Montenegro (16%)[2].

Figure 12. Enterprises that employ ICT specialists and had hard-to-fill vacancies for ICT specialists

Source: Eurostat (data for 2020)

[2] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=ICT_specialists_-_statistics_on_hard-to-fill_vacancies_in_enterprises [access: 21.08.2021.]

Aside from having a modest percentage of enterprises that employ ICT experts, B&H is in line with the EU average when it comes to difficulties in hiring ICT experts. Namely, 5% of companies have encountered this problem, which is less than in Belgium, Finland, Luxembourg, Denmark, Sweden, etc. Although this data may indicate a good position of B&H, in the interpretation, it is necessary to consider that a small percentage of companies employ ICT experts. Given that Belgium has the largest share of companies that employ ICT professionals, the fact that most companies had a problem filling these jobs does not speak in favor of a significant lack of professional staff in the field of IT.

4.1.2.4. Persons employed, which were provided a portable device that allows a mobile connection to the internet for business use

19% of companies in B&H have provided a portable device that provides a mobile connection to the Internet for business use to their employees, which B&H positions at the end of the table. Behind B&H are only Cyprus and Bulgaria.

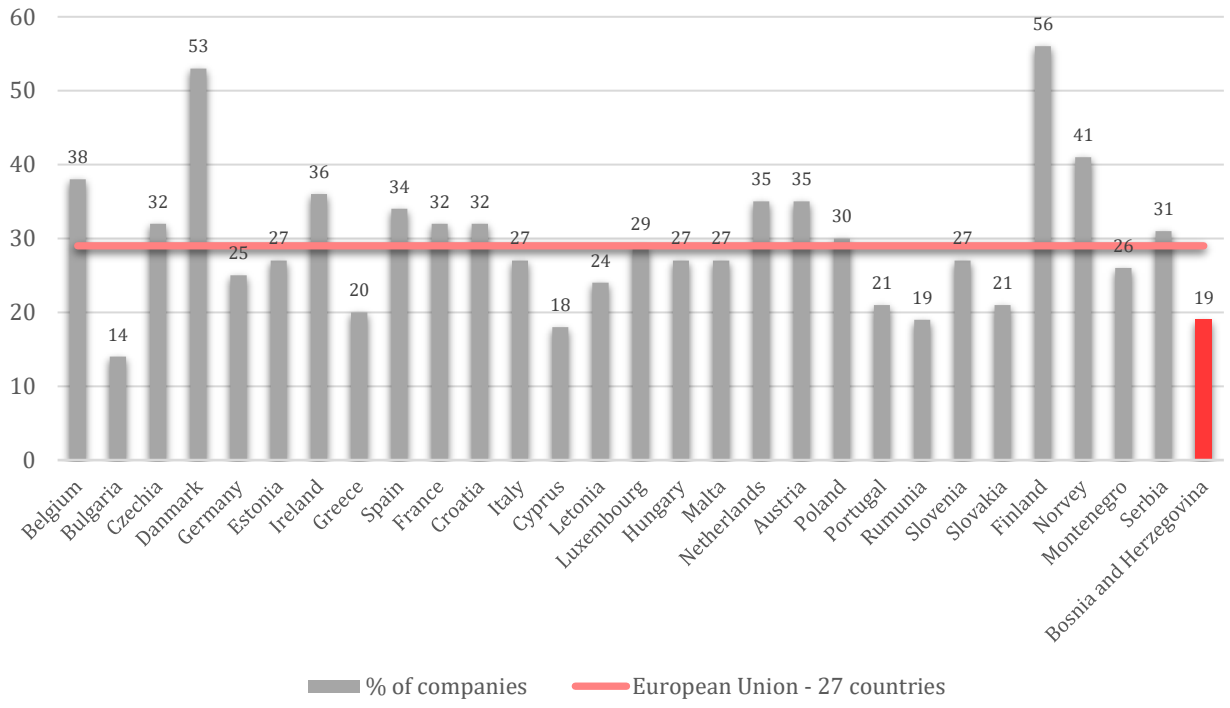


Figure 13. Persons employed, which were provided a portable device that allows a mobile connection to the internet for business use

Source: Eurostat (data for 2020)

In conclusion, in terms of **supply and demand for digital skills**, the Global Talent Competitiveness Index (GTCI) for 2020 positions B&H at 101st position (total score is 32.88) out of a total of 132 countries included in the analysis. For comparison, Switzerland is in the first position, followed by the USA, Singapore, Sweden, Denmark, the Netherlands, Finland, Luxembourg, Norway, Austria, Germany and the UK. When it comes to neighboring countries, Slovenia is in 31st place, Montenegro in 53rd, Serbia in 58th, Croatia in 59th, Albania in 76th, and North Macedonia in 89th (Lanvin and Monteiro, 2020). This practically indicates that B&H is far behind all countries in the region when it comes to talent competitiveness, which is a very devastating figure. In addition, B&H is at the bottom of the table, which ranks countries according to the percentage of employment of ICT experts, as well as the percentage of companies that have provided employees with portable devices that enable mobile internet connection for business use. The only situation is a little better when filling the positions of ICT experts, where a smaller number of companies in B&H had difficulties than other European countries.

4.1.3. Entrepreneurial culture

Entrepreneurial culture shows the business acceptability of the environment and the level of entrepreneurial culture and consists of the following indicators:

Indicator	Data source
Activity: Total Early-Stage Entrepreneurial Activity (TEA)	Global Entrepreneurship Monitor
Self-Perceptions: Entrepreneurial Intentions	Global Entrepreneurship Monitor
Societal Values: Entrepreneurship as a Good Career Choice	Global Entrepreneurship Monitor

Table 4. Indicators of the dimension of entrepreneurial culture

Source: Probst et al. (2018)

4.1.3.1. Total Early-Stage Entrepreneurial Activity (TEA)

Total Early-Stage Entrepreneurial Activity (TEA) in B&H is 3,29%

Total Early-Stage Entrepreneurial Activity (TEA) is the percentage of the population aged 18 to 64 who is either an emerging entrepreneur or a business owner. The last available data for B&H is from 2017, according to which 3.29% of the population is an entrepreneur. In the same year, that percentage in Croatia was 8.92%, while in 2020, it was 10.47%. No recent data are available for Montenegro after 2010 when the entrepreneurial activity rate was 14.94%.

4.1.3.2. Entrepreneurial Intentions

Rate of Entrepreneurial Intentions in B&H is 4,55%

An indicator of early entrepreneurial intentions (Entrepreneurial Intention) is the percentage of the population aged 18 to 64 who intend to become an entrepreneur. Many studies have confirmed that intention influences action and is a prediction of entrepreneurial activity. The last available data for B&H is from 2017, according to which 4.55% of the population expressed entrepreneurial intentions. It is interesting that this result is significantly lower compared to the period 2012-2014 when entrepreneurial intentions were about 21%. In Croatia, in 2017, the percentage of entrepreneurial intentions was 17.54%.

4.1.3.3. Entrepreneurship as a Good Career Choice

Entrepreneurship as a desirable career choice means the percentage of the population aged 18 to 64 who consider entrepreneurship a good and desirable career choice. 62.66% BH population entrepreneurship is considered a desirable career choice. This data is very interesting if it is combined with the share of those who intend to become entrepreneurs and with the total number of entrepreneurs. Namely, although many people consider entrepreneurship an attractive career, only a small number decide to become one. In Croatia, that percentage is 62.19%.

62.66% BH population considers entrepreneurship an attractive career choice

The conclusion regarding the **entrepreneurial culture** is that although entrepreneurship is considered an attractive occupation, still very few people intend to become or become entrepreneurs. The reasons for this can be found in many factors, ranging from macroeconomic, those related to the process of founding companies, to the business environment, but also the personal characteristics of individuals. This may be due to the complex administrative environment that makes it difficult to open a new company and even more difficult to close it if the venture fails..

4.1.4. Investment and access to finance

Investments and access to finance include investments in digitalization-related activities and how access to finance is facilitated, and consists of the following indicators:

Indicator	Data source
Business enterprise R&D expenditure in all NACE activities from high-tech sectors	Eurostat
Direct investment in the reporting economy (inward) in the Information and communication sector (sector J) (NACE Rev. 2)	Eurostat
Total Tax rate (percentage of Commercial Profits)	Global Competitiveness Index
Venture Capital Availability	Global Competitiveness Index
Ease of Raising Money Through Local Equity Markets	Global Competitiveness Index
Ease of access to loans	Global Competitiveness Index

Table 5. Indicators of the dimension of investment and access to finance

Source: Probst et al. (2018)

4.1.4.1. Investments in research and development

The latest data on investments in research and development of enterprises in all NACE activities in the high technology sector available for B&H is the one from 2014 and amounted to EUR 6.811 million. This data placed B&H at the bottom of the Eurostat table. Only Montenegro, with EUR 4.16 million, was behind B&H. For comparison, in the first place was the USA with 256,475,725 EUR. The highest ranked European country is Germany with EUR 56,996.5 million. Most countries have seen an increase in investment since 2014, while data are not available for B&H[3].

4.1.4.2. Direct investments in the IT sector

This data for B&H is not available in the Eurostat database. The inflow of foreign direct investments in Bosnia and Herzegovina in 2019 amounted to 699 million KM, according to the Central Bank of Bosnia and Herzegovina (CBBH). Sorted by activities, most investments were made in the area of production of coke and refined petroleum products (KM 202 million), financial services (banking sector, KM 154 million), and in the area of wholesale trade (KM 92 million). 12% was invested in the telecommunications sector, while data for the IT sector are not available[4].

4.1.4.3. Total tax rate

The total tax rate measures the amount of taxes and mandatory contributions that the company pays in the second year of operation, expressed as a share of commercial profit.

[3] http://appsso.eurostat.ec.europa.eu/nui/show.do [access: 21.08.2021.]
[4] http://www.fipa.gov.ba/informacije/statistike/investicije/FDI%20Position%20and%20Performance_February%202021_E.pdf [access: 21.08.2021.]

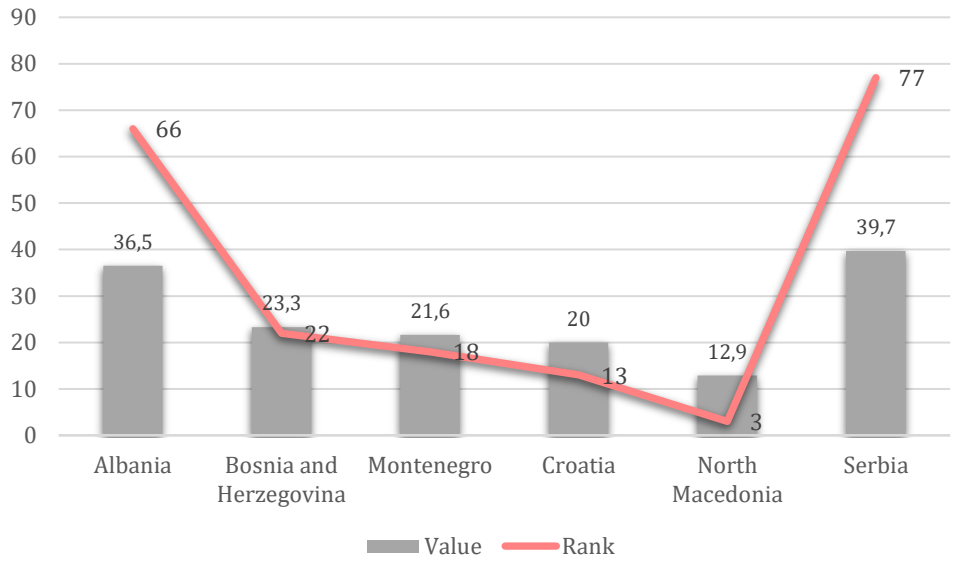


Figure 14. The rank of countries according to the total tax rate (a total of 138 countries)

Source: Schwab and Sala-i-Martin (2016)

The total amount of taxes is the sum of five different types of taxes and contributions payable after accounting for deductions and exemptions: profit or corporate income tax, social contributions and labor taxes paid by the employer, property taxes, turnover taxes, and other small taxes (Schwab and Sala-i-Martin, 2016). It is an integral part of the pillars of commodity market efficiency. It is interesting to note that these data are not presented in the report for 2019.

In B&H, companies pay 23.3% of the commercial profit of taxes and mandatory contributions. This rate is higher in Albania and Serbia. On the other hand, in Austria, this rate is 51.7%, in Belgium 58.4%, in Bulgaria 27%. According to this indicator, B&H is in the 22nd position.

4.1.4.4. Availability of venture capital

This indicator is an integral part of the eighth pillar, the development of the financial market, and it refers to how easy it is for entrepreneurs with innovative and risky projects to find venture capital.. B&H ranks 101st when it comes to the availability of venture capital. However, the situation is very similar in other countries in the region.

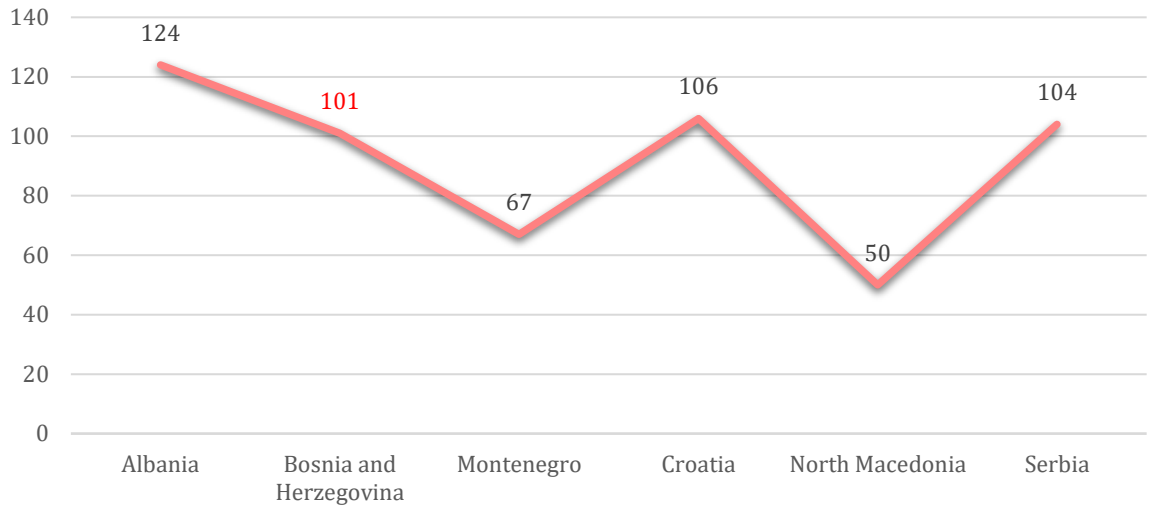


Figure 15. Country rank according to venture capital availability (138 countries in total)

Source: Schwab and Sala-i-Martin (2016)

4.1.4.5. Ease of Raising Money Through Local Equity Markets

This indicator is also an integral part of the eighth pillar, the development of the financial market, and refers to the extent to which companies can raise money by issuing shares and/or bonds on the capital market. According to this indicator, B&H is at the 118th position, while other neighboring countries are more positioned, except for Albania, which is in the 138th position.

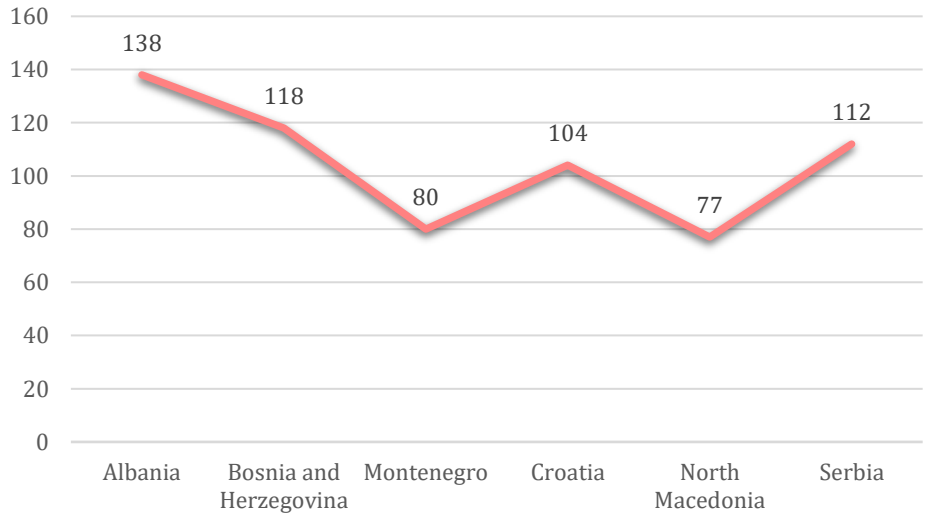


Figure 16. Country rank according to raising money through local equity markets (138 countries in total)

Source: Schwab and Sala-i-Martin (2016)

4.1.4.6. Ease of access to loans

This indicator is an integral part of the eighth pillar, the development of the financial market, and it refers to how easy it is for companies to get a loan from a bank. According to this indicator, B&H is at the 68th position, which shows that it is easier to get a loan in B&H than in Serbia, Croatia or Montenegro.

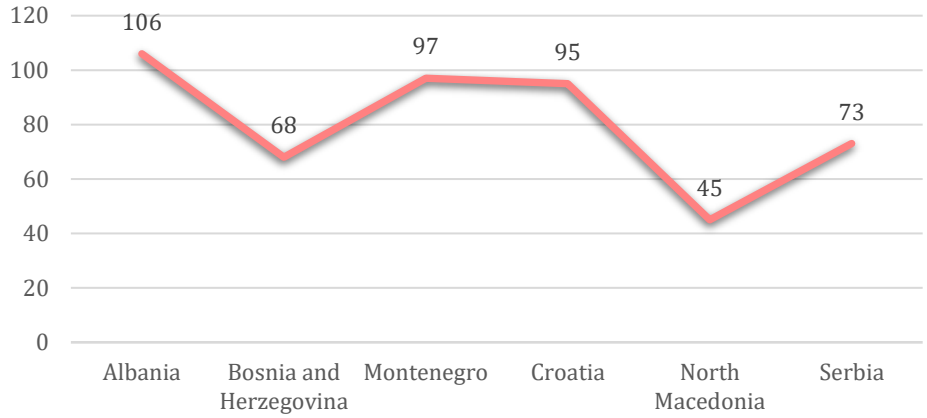


Figure 17. Country rank according to ease of access to loans (138 countries in total)

Source: Schwab and Sala-i-Martin (2016)

The conclusion regarding **investments and access to finance** when it comes to B&H is that it is relatively easy to get a loan (especially compared to other countries in the region). However, when it comes to R&D investment, venture capital availability, and stock market capitalization, Bosnia and Herzegovina lags behind most neighboring countries. It is interesting that the total tax rate (share in commercial profit) is much lower than in developed European economies.

4.1.5. e-Leadership

E-leadership shows the extent to which education and training are available to facilitate the acquisition of digital skills and consists of the following indicators:

Indicator	Data source
Percentage of enterprises that provided training to ICT/IT specialists to develop/upgrade their ICT skills	Eurostat
High-Level Skills: Workforce with tertiary education	Global Talent Competitiveness Index
Enterprises giving portable devices for a mobile connection to the internet to their employees	Eurostat

Table 6. E-leadership dimension indicators

Source: Probst et al. (2018)

4.1.5.1. Enterprises that provided training to ICT/IT specialists to develop/upgrade their ICT skills

Figure 18 shows the percentage of companies that have trained ICT / IT professionals to develop/upgrade their ICT skills in European countries, for all companies, without the financial sector. The highest percentage of companies that trained their ICT / IT professionals is in Finland (38%), followed by Norway and Belgium (33%), and by Sweden (32%) and Denmark (30%). The overall situation in the EU, which includes 27 countries in 2020, is shown by a gray horizontal line and amounts to 20% of companies. It is interesting that B&H is not at the bottom with its 15% of companies that have trained ICT / IT professionals, but Latvia (14%), Greece and Northern Macedonia (12%), Turkey (11%), Bulgaria 7%), and Romania (6%). It is important to note that data for Iceland are missing.

15% of companies in B&H have trained their ICT / IT experts to develop / upgrade their ICT skills. Only 6 European countries have smaller % of companies than B&H.

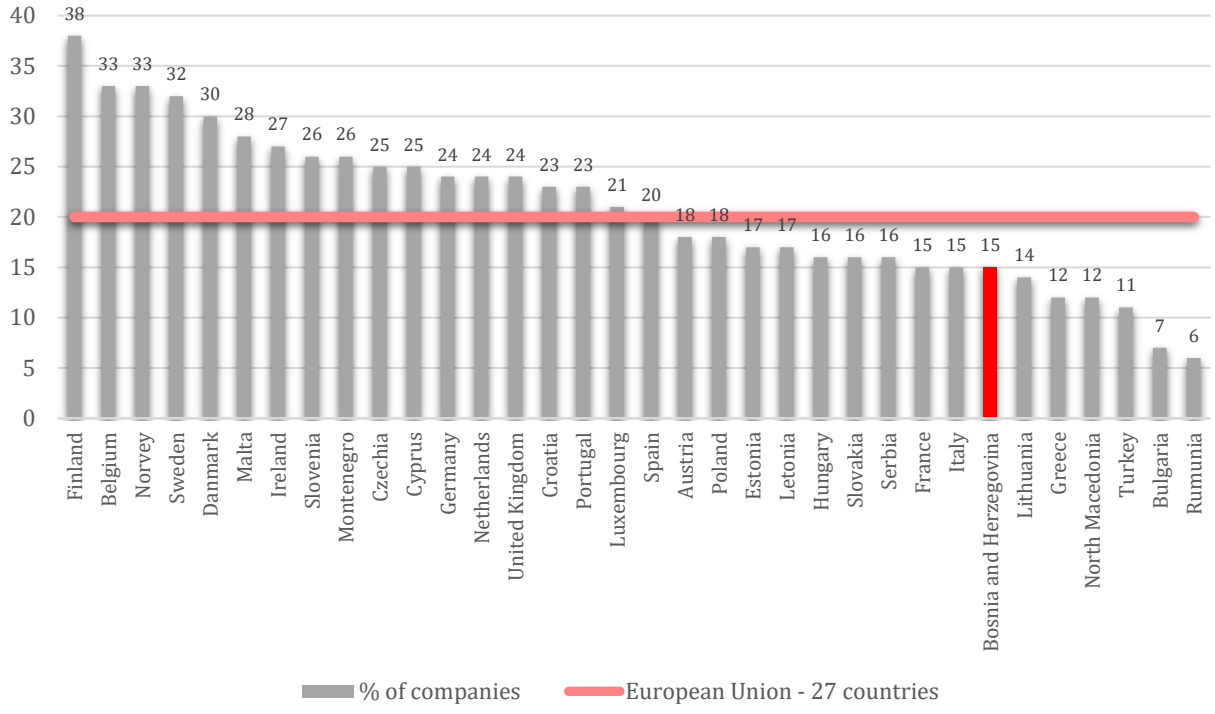


Figure 18. Percentage of enterprises that provided training to ICT/IT specialists to develop/upgrade their ICT skills

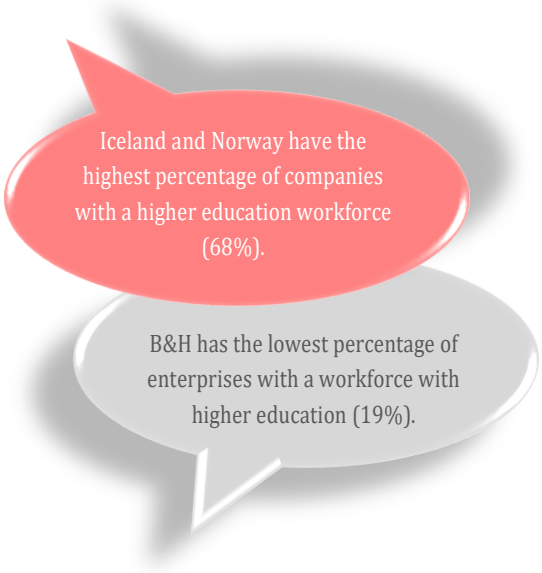
Source: Eurostat (data for 2020)

Skills and e-leadership are considered key indicators for the digital transformation of traditional companies.

Highly sophisticated skills, referred to as Global Knowledge Skills (or GK skills) refer to the knowledge of workers in professional, managerial or leadership roles that require creativity and problem solving. Their economic impact is assessed by indicators of innovation, entrepreneurship and the development of high value industry (Lanvin and Evans, 2017). The mix of talent needed by organizations to face the major paradigm shift brought about by digitalization goes far beyond having a Chief Information Officer and a Chief Technology Officer. The European Union considers e-skills to be a unique combination of advanced technical skills (for example, in big data and business analytics) on the one hand and high-level soft skills on the other, the ability to lead multicultural, multinational teams; in the era of social networks, encouraging digital innovation and business models based on digital platforms, and reorganizing functions such as purchasing, selling or even calculating salaries, related to digital tools).

4.1.5.2. High-Level Skills: Workforce with tertiary education

Figure 19 shows the percentage of enterprises with a higher education workforce. Iceland and Norway have the highest percentage of companies with a higher education workforce (68%). They are followed by Sweden and the United Kingdom with 66%. The overall situation in the EU, which includes 27 countries in 2020, is shown by a gray horizontal line and amounts to 32% of companies. B&H is at the very bottom, i.e., the last, with the lowest percentage of enterprises with a workforce with higher education (19%).



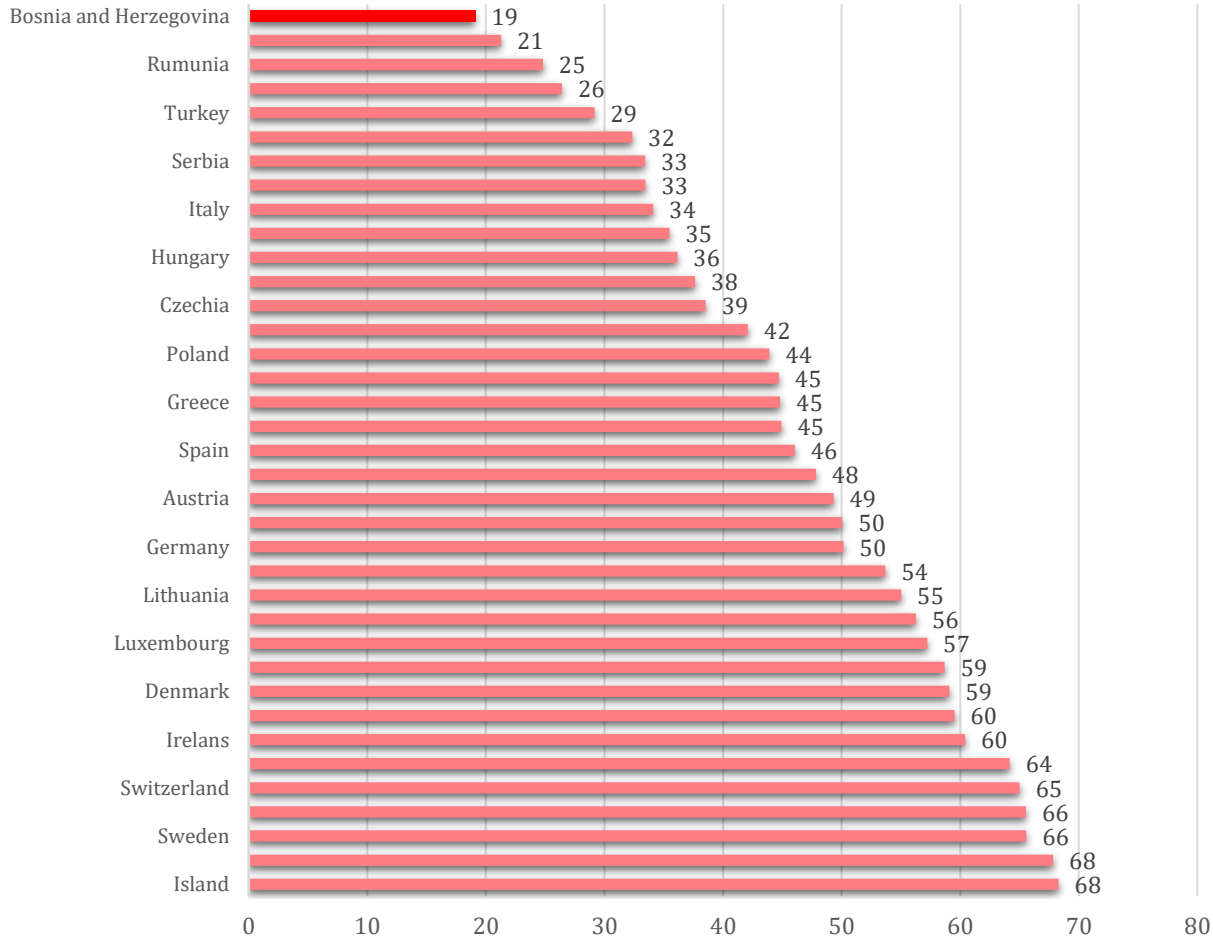


Figure 19. Percentage of enterprises with a workforce with higher education

Source: Global Talent Competitiveness Index (data for 2020)

4.1.5.3. Enterprises giving portable devices for a mobile connection to the internet to their employees

Figure 20 shows companies that provide their employees with portable devices for mobile internet connection in European countries, for all companies, without the financial sector. The largest percentage of companies that provide their employees with portable devices for mobile internet connection is in Finland (97%), Czech Republic (90%) and neighboring Croatia (86%). The overall situation in the EU, which includes 27 countries in 2020, is

B&H is close to the average of the total situation in the EU (70%), ie 66% of companies in B&H provide their employees with portable devices for mobile internet connection.

shown by a gray horizontal line and amounts to 70% of companies. B&H is close to the average of the total situation in the EU, ie 66% of companies in B&H provide their employees with portable devices for mobile internet connection. Behind B&H are Cyprus and Slovakia (64%), Italy and Romania (63%), followed by Greece (58%) and Bulgaria (53%). Data for the following six countries are missing: Lithuania, Sweden, Iceland, the United Kingdom, North Macedonia and Turkey.

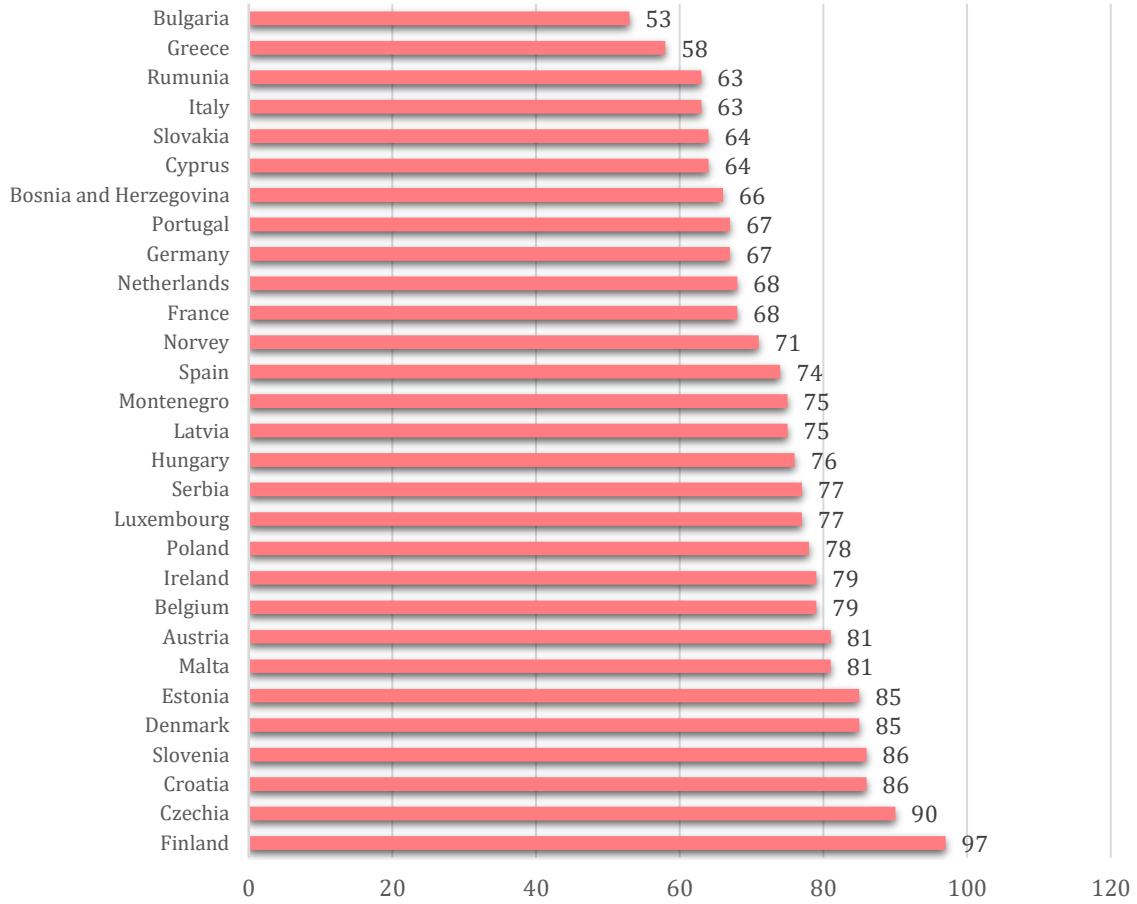


Figure 20. Enterprises giving portable devices for a mobile connection to the internet to their employees

Source: Eurostat (data for 2020)

When it comes to the **e-leadership** indicator, Bosnia and Herzegovina is at the bottom of the table. According to data on the percentage of companies that have trained ICT / IT professionals to develop/upgrade their ICT skills and the percentage of companies that provide their employees with mobile devices for mobile internet connection, B&H is not at the bottom of the list. However, in terms of the percentage of enterprises with a higher educated staff, B&H is the lowest rated country.

4.2. Integration of digital technologies

Digital technologies open many possibilities for companies; they enable enterprises to get a competitive advantage, enhance their products and services, and expand their markets. The extent of Integration of digital technologies in the DESI index measures the level of digitalization of an enterprise or e-commerce. Every DESI indicator has a structure of three levels. The structure of the indicator "Integration of digital technologies "is shown in the picture beneath.

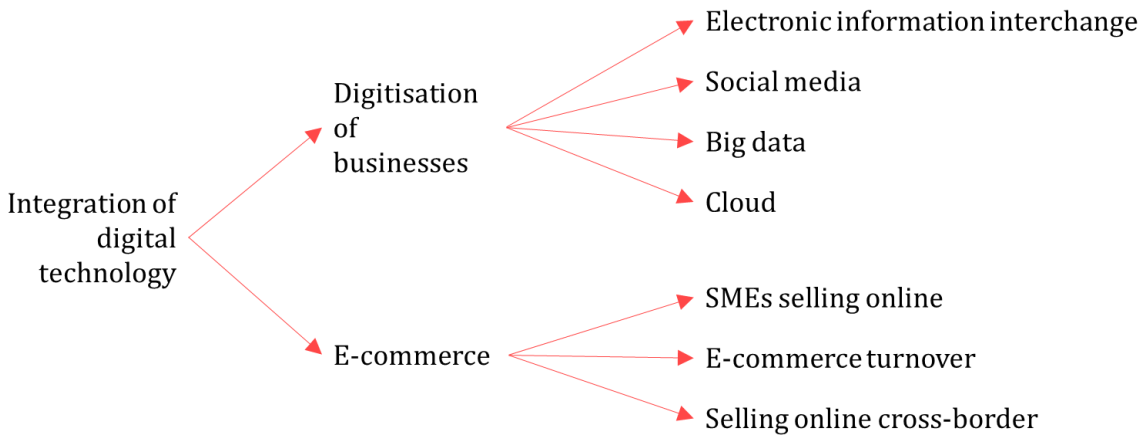


Figure 21. Structure of DESI dimension "Integration of digital technologies."

Source: (European Commission, 2020)

In the table beneath, the definitions of every indicator that constructs the dimension "Integration of digital technologies" are presented.

Indicator	Description	Measure	Unit of measure
Electronic information interchange	Enterprises that use ERP software packages for the exchange of information between different functional fields (e.g., accounting, planning, production, marketing)	All enterprises (without the financial sector, 10+ employees)	% of enterprise
Social media	Enterprises that use two or more of the following social media: social networks, business blog or microblog, web pages for the exchange of multimedia content, tools for the exchange of knowledge based on wiki. The use of social media means that the enterprise has a user profile, an account, or a user license, depending on the requirements and the type of social media.	All enterprises (without the financial sector, 10+ employees)	% of enterprise

Big data	Enterprises that analyze big data from any data source	All enterprises (without the financial sector, 10+ employees)	% of enterprise
Cloud	Enterprises that purchase at least one of the following cloud computing services: enterprise database hosting, accounting software applications, CRM software, computing power)	All enterprises (without the financial sector, 10+ employees)	% enterprise
SMEs selling online	SMEs that sell online (at least 1% of the total turnover).	SME (without the financial sector, 10-249 employees)	% of SMEs
E-commerce turnover	Total e-commerce turnover of the SME.	SME (without the financial sector, 10-249 employees)	% of turnover
Selling online cross-border	SMEs that made electronic sales into other countries of the EU.	SME (without the financial sector, 10-249 employees)	% of SMEs

Table 7. Definitions and method of measuring indicators of the dimension "Integration of digital technology"

Source: European Commission (2020)

The analysis for Bosnia and Herzegovina is presented below in accordance with the indicated structure. A comparative analysis was undertaken for each indicator with the aim of better understanding B&H's position in respect to other European countries. The data is acquired from the Eurostat website (data updated on 11.03.2021)[5].

4.2.1. Digitization of business

As already mentioned, digitization of business in the EU is measured using 4 basic indicators (definitions indicated in Table 2):

- Electronic information interchange,
- Social media,
- Big data,
- Cloud.

[5] Community survey on ICT usage and eCommerce in Enterprises - https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database [access: 10.05.2021]

4.2.1.1. Electronic information interchange

This indicator shows the percentage of enterprises that use ERP software packages to exchange information between different functional areas (e.g., accounting, planning, production, marketing). All enterprises that have 10+ employees are included in the analysis (excluding the financial sector).

24% of enterprises in Bosnia and Herzegovina use the ERP software package to exchange information between different functional areas. Only in four European countries is it a smaller % of enterprises.

Figure 22 shows the state of Integration of internal processes in European countries. The highest percentage of enterprises that use ERP to exchange information between different functional areas is in Belgium (53%) and Denmark (50%), followed by France, Lithuania, and the Netherlands with 48%. The overall state in the EU (including 27 countries) is shown by the gray horizontal line and amounts to 36% of enterprises.

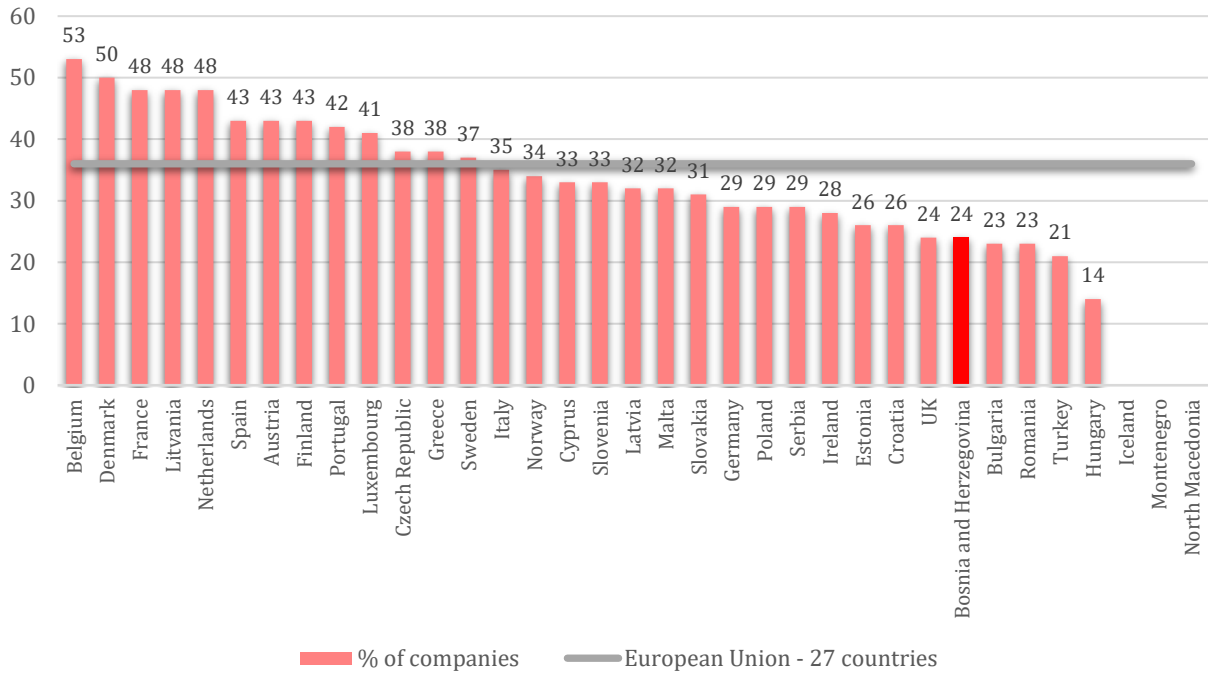


Figure 22. Integration of internal processes

Source: Eurostat (data for 2019)

In Bosnia and Herzegovina, 24% of all enterprises already have integrated internal processes; therefore, B&H is positioned at the very bottom of European countries when it comes to this indicator. Only Turkey, Romania, Hungary, and Bulgaria are positioned below B&H. Interestingly, Hungary is last on the list, with only 14% of enterprises with integrated internal processes. However, it is important to mention note that data for Iceland, Montenegro, and North Macedonia are missing.

When it comes to electronic information sharing using ERP systems, it is important to note that large organizations deploy ERP more frequently than SMEs. Furthermore, SMEs are less likely than large enterprises to employ CRM systems to analyze customer data for marketing reasons (33 percent vs. 62 percent at the EU level) (European Commission, 2020).

4.2.1.2. Social media

This indicator depicts the percentage of firms that utilize two or more social media platforms (from the list below): social networks, business blog or microblog, web pages for the exchange of multimedia content, tools for exchange of knowledge based on wiki. The use of social media means that the enterprise has a user profile, account, or user license, depending on the requirements and the type of social media. The analysis includes all enterprises with 10 or more employees (excluding the financial sector).

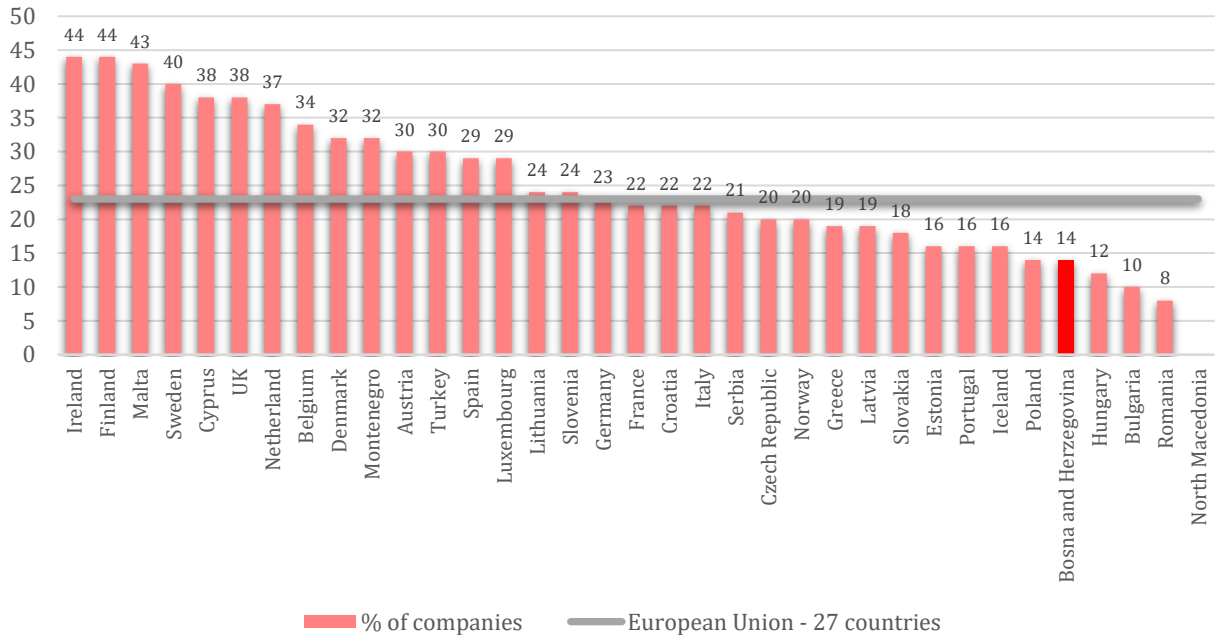
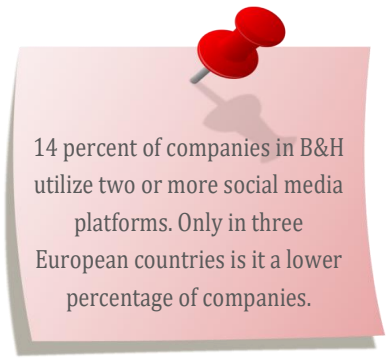


Figure 23. Social media

Source: Eurostat (data for 2019)



B&H is once again at the bottom of the table when it comes to the use of social media (2+). Specifically, 14% of companies use at least two social media platforms (i.e., they have a user profile, account or user license). Hungary, Bulgaria, and Romania are once again lagging Bosnia and Herzegovina. It is interesting that the situation in Montenegro, when it comes to this indicator, is above the overall situation in the EU (23%). On the other hand, Croatia and Serbia are both barely below the EU average.

In picture 23, displayed is the data showing the use of different types of social media in Bosnia and Herzegovina, the state in the EU27, and the countries with the best and worst positions.

	Type of social media	State in B&H	EU-27	Max	Min
	Usage of a business blog or microblog (e.g., Twitter, Present.ly, etc.)	6%	10%	33% Ireland	4% Hungary and Bulgaria
	Usage of a web page to exchange multimedia content (e.g., YouTube, Flickr, Picasa, SlideShare, etc.)	13%	21%	41% Finland	7% Romania
	Usage of wiki-based knowledge sharing tools	3%	6%	13% Austria	1% Iceland
	Usage of any social media	49%	50%	84% Malta	33% Romania
	Have a website and use some sort of social media	39%	46%	75% Malta	25% Romania

Figure 24. Percentage of enterprises according to the type of social media

Source: Eurostat (data for 2019)

Similar to the last indicator, when it comes– to activity on social media, large enterprises outperform SMEs (78 percent vs. 52 percent in the EU) (European Commission, 20202).

4.2.1.3. Big data

Companies worldwide are constantly adapting to new technologies for gathering, storing, and analyzing data, especially considering the emergence of different data sources and the exponential growth of data. Data is collected in real-time, from various sources and in different formats, and the enterprises use them to enhance the process of decision making. Special emphasis is placed on data related to the customers and their needs and whose analysis contributes to the readiness of the company to improve its offer and thus gain customer loyalty continuously.

It is clear that large enterprises are fully utilizing the advantages of big data analytics, whilst small and medium enterprises still have room to improve (30% vs. 12. % in the EU).

The DESI "Big data" indicator shows the percentage of enterprises that analyze big data from any data source.

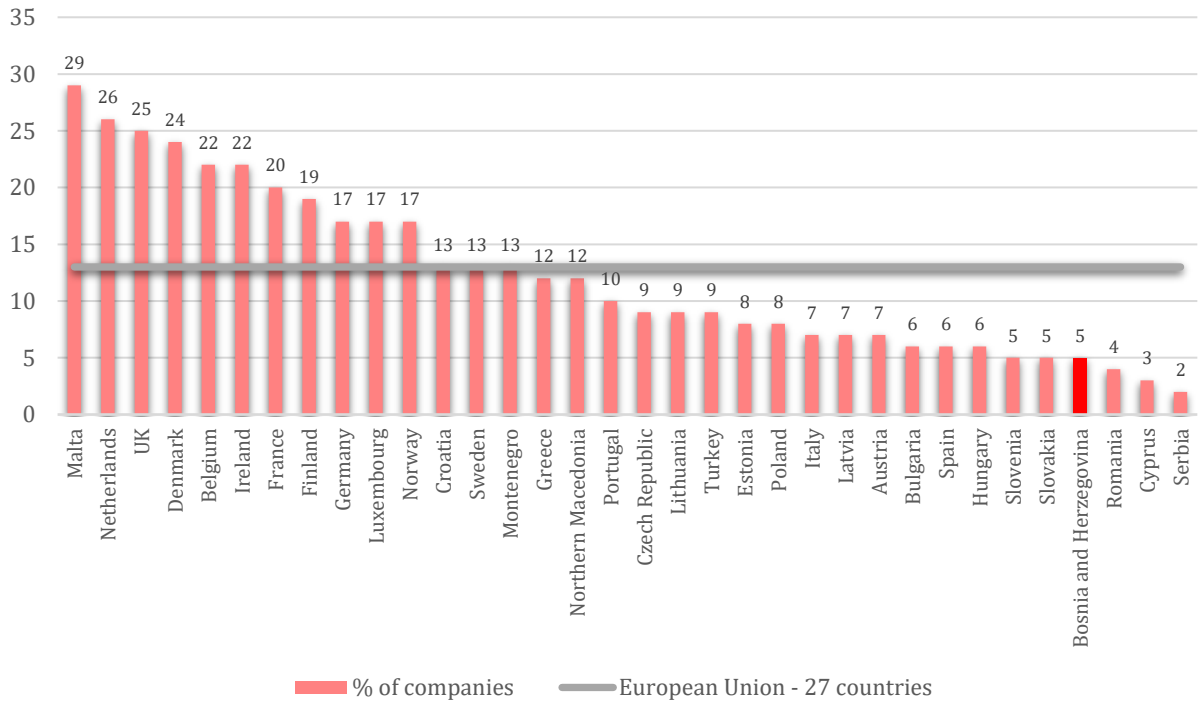


Figure 25. Big data (any source of data)

Source: Eurostat (data for 2020)

There are 5% of companies in B&H that analyze big data from any data source. Malta is leading, with 29% of enterprises using big data, while Romania, Cyprus, and Serbia are behind B&H. Montenegro, Croatia, and North Macedonia are positioned close to the overall state in the EU, which amounts to 13% of enterprises. When it comes to the use of big data, in B&H, only 5% of enterprises analyze big data generated from social media (in the EU, it is 7%), 3% of companies analyze big data from the geolocation of mobile devices (in the EU it is 7%), and only 2% of companies analyse big data from smart devices or sensors (in the EU, it is 3%).

4.2.1.4. Cloud

This indicator shows the percentage of enterprises purchasing at least one of the following cloud computing services: enterprise database hosting, accounting software applications, CRM software, computing power). All enterprises that have 10+ employees are included in the analysis (excluding the financial sector).

The use of e-mail as a cloud service is present with 7% of companies, while in the EU-27, it is the case with 27% of enterprises. At the top of the list is Finland, with 64%, while Bosnia and Herzegovina and Romania are at the bottom with 7% of companies. 5% of firms in Bosnia and Herzegovina purchase Office software (e.g., Word, Excel, etc.) as a cloud service (21% of enterprises in the EU-27 – Finland still leads with 59%, with B&H and Romania lagging with 5 percent).

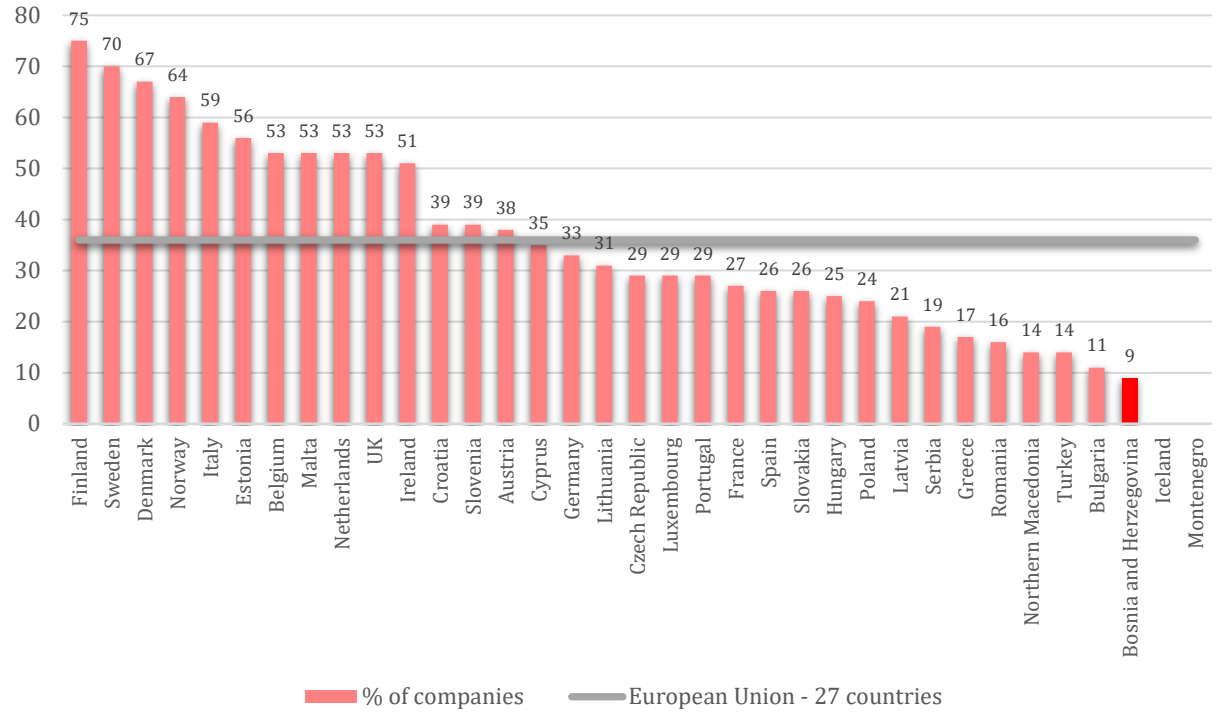


Figure 26. Use of cloud services

Source: Eurostat (data for 2020)

The purchase of enterprise database hosting as a cloud service is present in 5% of enterprises in Bosnia and Herzegovina and 17% when it comes to the EU-27 (at the top is Denmark with 47% of enterprises, while the last are B&H and Romania with 5%). When it comes to buying storage as a cloud service, Romania is again last with 5% of enterprises, while in B&H, it is 6% of companies. The first is again Finland with 59% of companies,, and the overall state in the EU-27 is 24% of enterprises. Software applications for finance or accounting are present in 4% of companies in B&H and 16% of enterprises in the EU-27 (Sweden is leading with 45%, and B&H and Bulgaria are last with 4% of enterprises). Only 1% of companies in Bosnia and Herzegovina utilize CRM as a cloud service, while this is the case with 31% of companies in Finland and Norway (10% of companies in the EU-27). Finally, computing power for running enterprise software as a CC service is present with 3% of companies in B&H (9% in the EU, 29% in Sweden, which is at the top of the list and 2% in Bulgaria, which is at the bottom).

Generally observed, Figure 26 depicts that B&H is the country with the lowest number of enterprises using some of the aforementioned cloud services. In B&H, just 9% of companies utilize at least one cloud service, unlike in other countries, such as for example in Finland, which accounts for approximately 75% of all companies.

4.2.2. E-commerce

As mentioned above, dimension "e-commerce" dimension within the EU DESI index is measured using three basic indicators (definitions provided in Table 2):

- SMEs selling online,
- E-commerce turnover,
- Selling online cross-border.

4.2.2.1. SMEs selling online

This indicator depicts the percentage of small and medium-sized firms (SMEs) who sell via the Internet and generate at least 1% of their total turnover. The analysis includes all enterprises with 10 to 249 employees (excluding the financial sector).

In B&H, the percentage of SMEs selling online decreased in 2020, which was unexpected considering the current business circumstances.

Figures 27 and 28 show the percentages of enterprises that generate at least 1% of e-commerce turnover (Figure 27 refers to small enterprises and Figure 28 to medium-sized enterprises). It is interesting to observe the changes in the past three years, especially considering that the beginning of 2020 and the emergency situation caused by the corona virus contributed to the intensification of the digital transformation process in companies, as well as additional efforts to promote e-commerce. The red line represents data for the year 2018; columns represent the data for the year 2019, while the grey area in the background reflects the date for the year 2020. A grey area being above the column, and the line points to the growth of the number of enterprises (the order of countries follows the list from the highest number of enterprises to the lowest, taking into account data for 2020).

17% of small enterprises had sales over the Internet in 2020.

25% of medium-sized enterprises had sales over the Internet in 2020.

It is interesting that B&H records a decline in 2020, while a large number of countries show an increased percentage of small businesses that generate income through e-commerce. If we look only at the data for 2020, Denmark, Ireland and Iceland are at the top of the list with 36%, 35% and 34% of companies that generate at least 1% of e-commerce revenue. At the bottom of the table are Bulgaria, Turkey and Northern Macedonia (data for 2020 are not available for Greece and Montenegro). B&H is slightly below the EU-27 (in B&H 17% of companies, and 19% in the EU-27). However, when it comes to medium-sized enterprises, there has

been an increase in most countries. Data for B&H show that it is slightly below the EU-27, and ahead of 10 European countries. In other words, we conclude that the state of the pandemic contributed to the increase of the number of medium-sized enterprises in Bosnia and Herzegovina that trade online, while small businesses have not been as successful in adapting to the new situation. That was somewhat expected, considering that the smaller enterprises do not prioritize investment into IT and processes of digital business transformation, which was imperative in adapting to the pandemic business conditions.

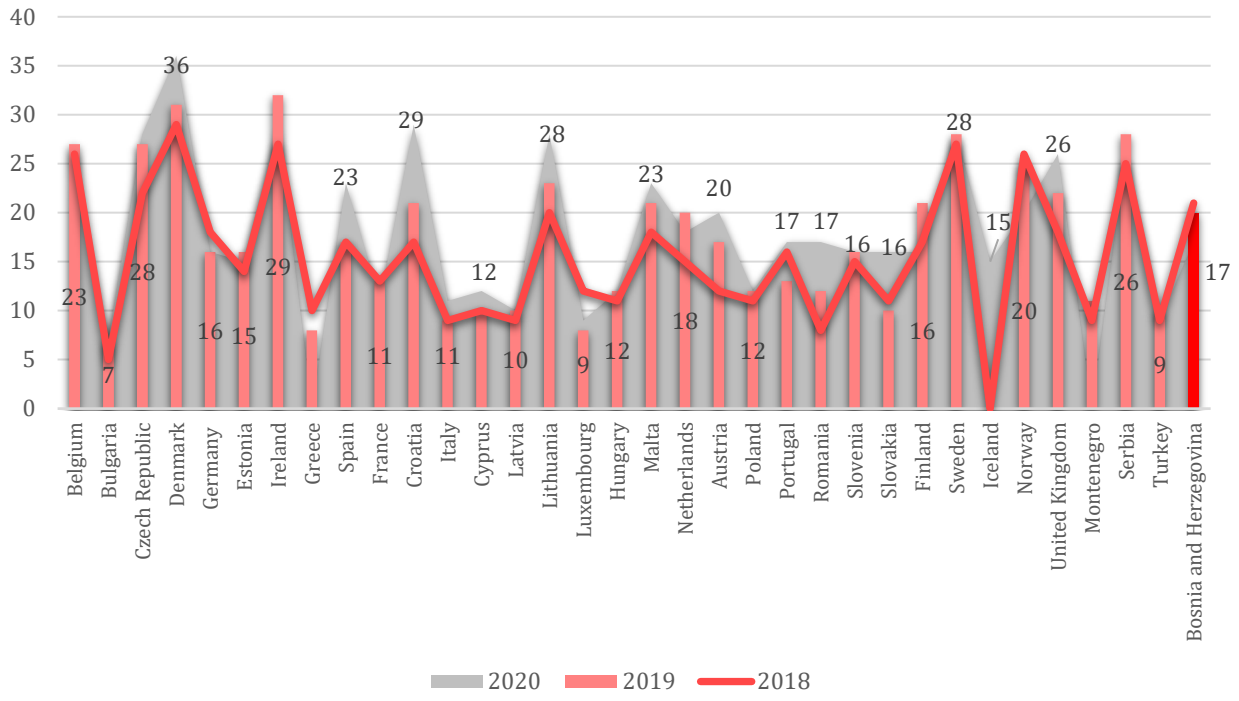


Figure 27. Small enterprises with e-commerce

Source: Eurostat (data for three consecutive years)

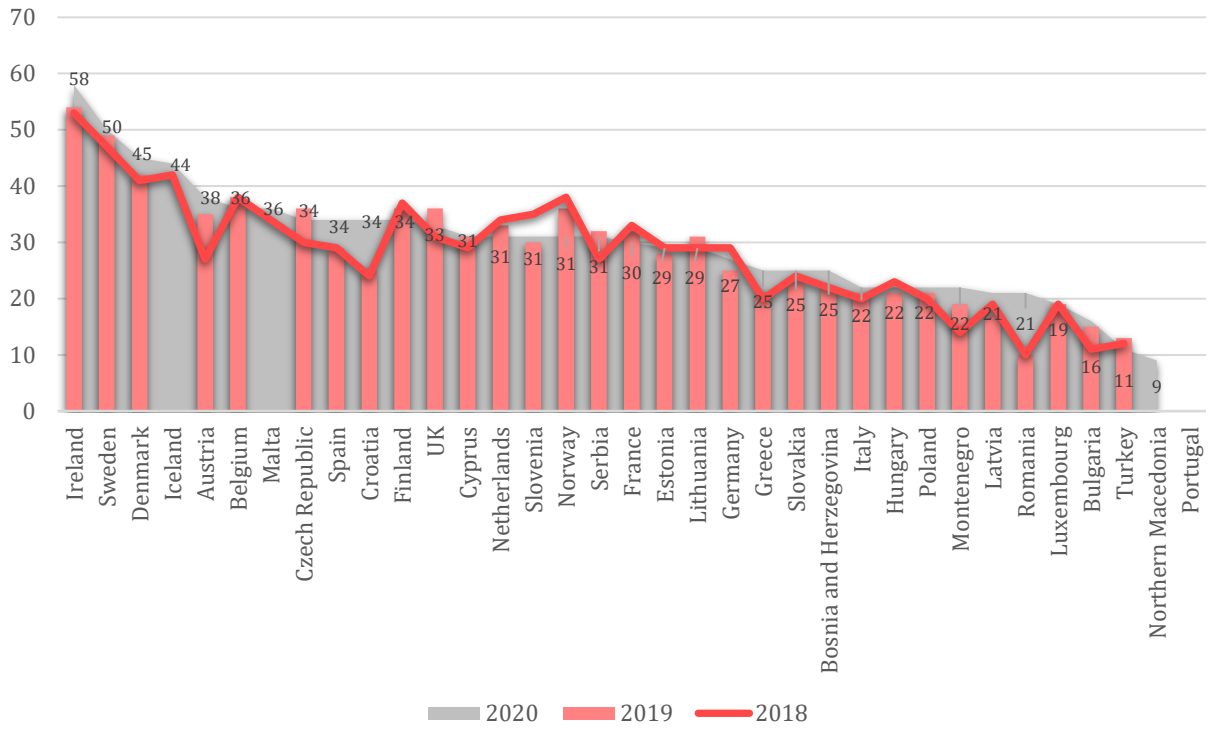


Figure 28. Medium-sized enterprises with e-commerce

Source: Eurostat (data for three consecutive years)

4.2.2.2. E-commerce turnover

Data is available for the SMEs and all enterprises in Bosnia and Herzegovina and is shown in picture 29. In Bosnia and Herzegovina, we can conclude a drop in enterprises with e-commerce sales of at least 1% turnover in 2020. Nevertheless, Bosnia and Herzegovina is not at the bottom of the list, as is the case with some other indicators of business digitization, which shows that enterprises in Bosnia and Herzegovina have a positive attitude toward online trade. Interestingly, we see a decrease in the number of enterprises that sell online in 2020 in Belgium, Serbia, Finland, and Norway.

In Bosnia and Herzegovina, 19% of enterprises sold over the Internet in 2020, and thus generated at least 1% of revenue.

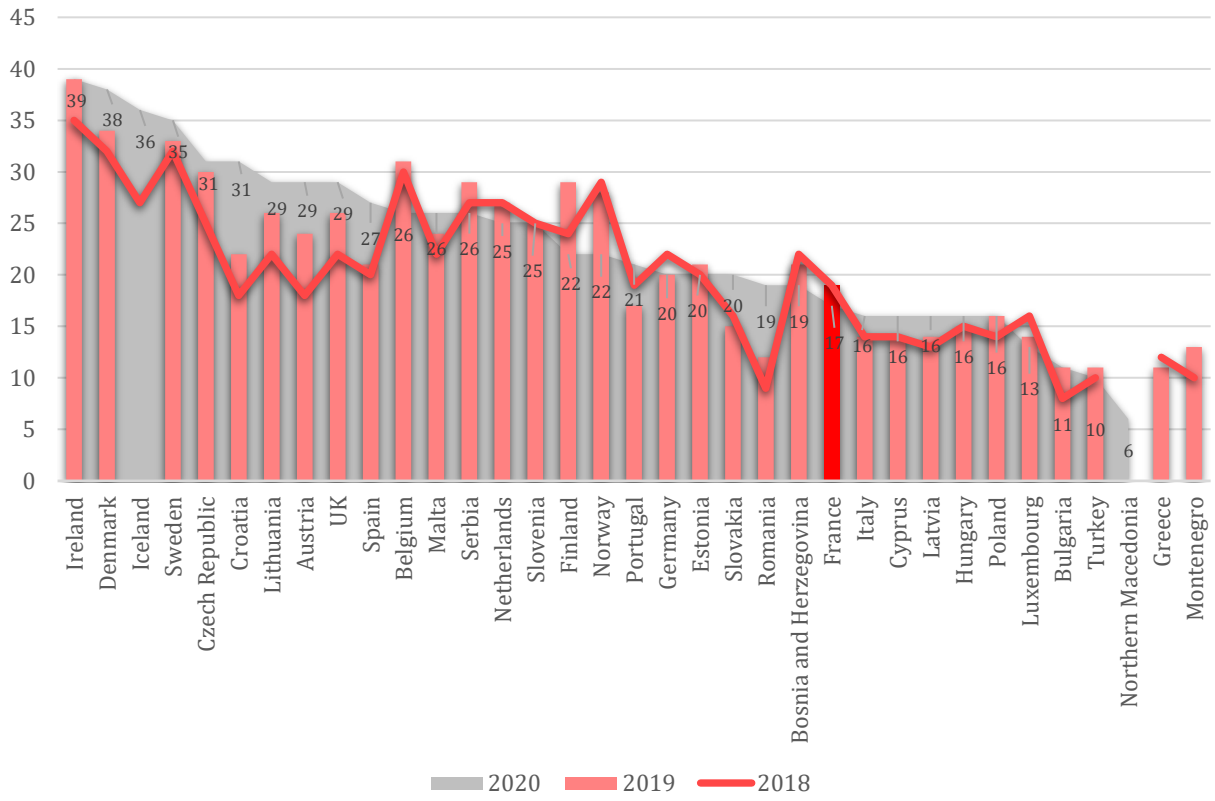


Figure 29. Enterprises with e-commerce (all enterprises)

Source: Eurostat (data for three consecutive years)

4.2.2.3. E-commerce turnover

This indicator shows the percentage of e-commerce in the total turnover of SMEs. The analysis includes all enterprises that have from 10 to 249 employees (excluding the financial sector).

Pictures 30 and 31 show the percentages of e-commerce in the turnover of SMEs (picture 30 relates to small enterprises, while picture 31 relates to medium-sized ones). Again, it is interesting to see changes in the past three years. The red line represents data for the year 2018; columns represent the data for the year 2019, while the grey area in the background reflects the date for the year 2020. A grey area above the column and the line points to the growth of the number of enterprises (the order of countries follows the list from the highest number of enterprises to the lowest, in relation to data for the year 2020). Discontinuation of the line points to the absence of data for the country in question (Malta and Iceland).

Results show that the percentage of e-commerce sales in the total turnover of small enterprises in Bosnia and Herzegovina amounts to 5%, while 14% in Denmark. Furthermore, in Bulgaria and Cyprus, it is just 2%. In Bosnia and Herzegovina, we see an evident trend of decreased revenue since

2018. Still, the most dramatic decrease in revenue from e-commerce is seen in Ireland (from 29% in 2019 to 13% in 2020).

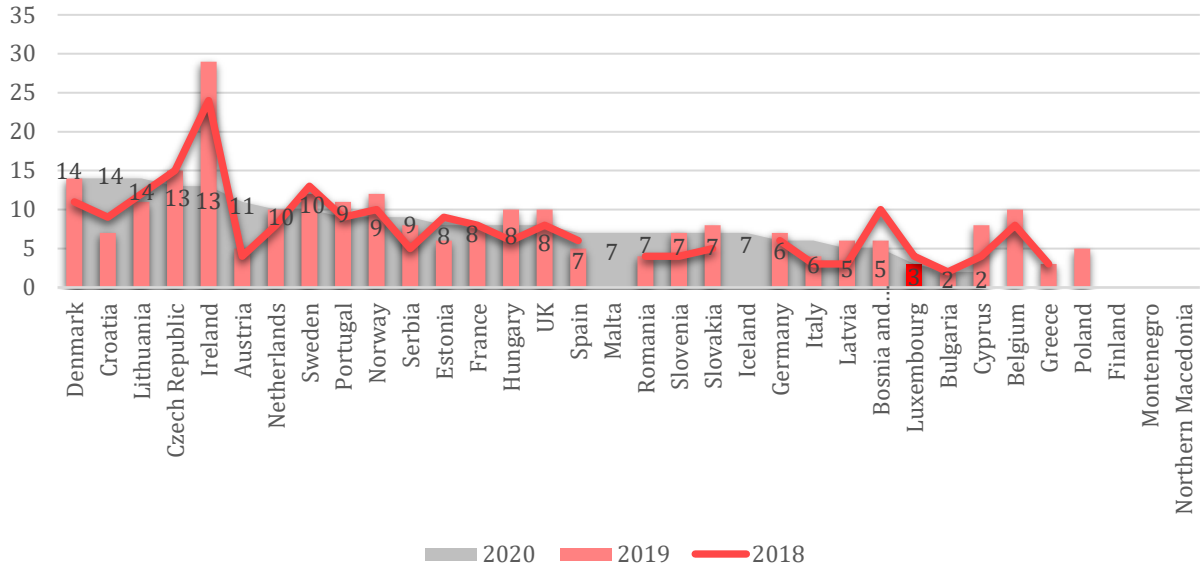


Figure 30. E-commerce revenue (small enterprises, without the financial sector)

Source: Eurostat (data for three consecutive years)

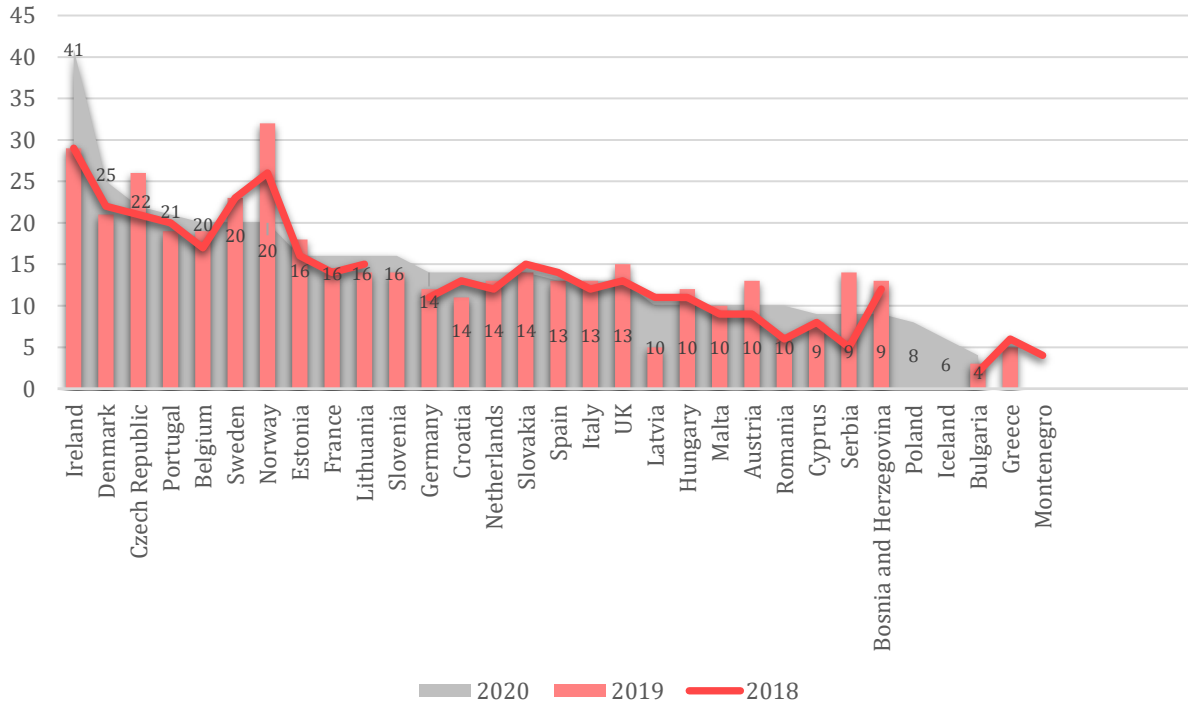


Figure 31. E-commerce revenue (medium-sized enterprises, without the financial sector)

Source: Eurostat (data for three consecutive years)

When it comes to the total revenue of medium-sized enterprises from e-commerce in Bosnia and Herzegovina, it is 9% of the turnover. Leading on the list for the year 2020 is Ireland with 41%, while Iceland (6%) and Bulgaria (4%) are at the bottom. Interestingly, one year before, Norway was at the top, seeing a dramatic decrease in e-commerce revenue in 2020. In Bosnia and Herzegovina, a fall in e-commerce revenue is also noted.

5% of small enterprise turnover and 9% of medium-sized entrprise turnover in Bosnia and Herzegovina comes from any e-commerce (in 2020).

4.2.2.4. Overall state of e-commerce revenue

Other than for the SMEs, data is also available for all enterprises in Bosnia and Herzegovina and is presented in picture 32. As with the SMEs, a drop in e-commerce turnover is evident in 2020. However, it is interesting that in the analysis of the percentage of enterprises that generate at least 1% of income from e-commerce, Bosnia and Herzegovina was not at the bottom of the table, while that is not the case with sale revenue. This points to the fact that the value of e-commerce sales is lower in Bosnia and Herzegovina than in other countries.

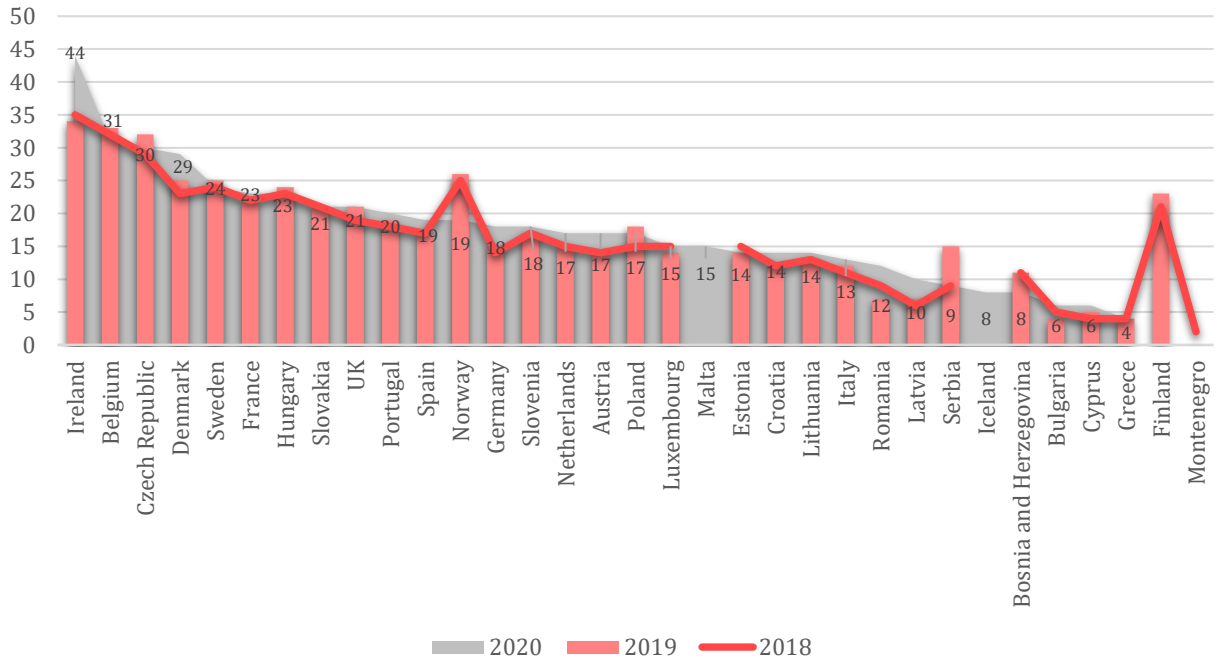


Figure 32. Value of e-commerce sales (all enterprises)

Source: Eurostat (data for three consecutive years)

4.2.2.5. Enterprises that buy online

Besides Internet sales, to comprehend digital transformation maturity in enterprises, it is interesting to analyze enterprise purchases done over the Internet. Firstly, a comparative analysis for all enterprises is presented below, and then for small and medium-sized ones (the financial sector is excluded from the analysis). Unfortunately, all three analyzes show that Bosnia and Herzegovina is last on the list based on the percentage of enterprises that complete purchases over the Internet.

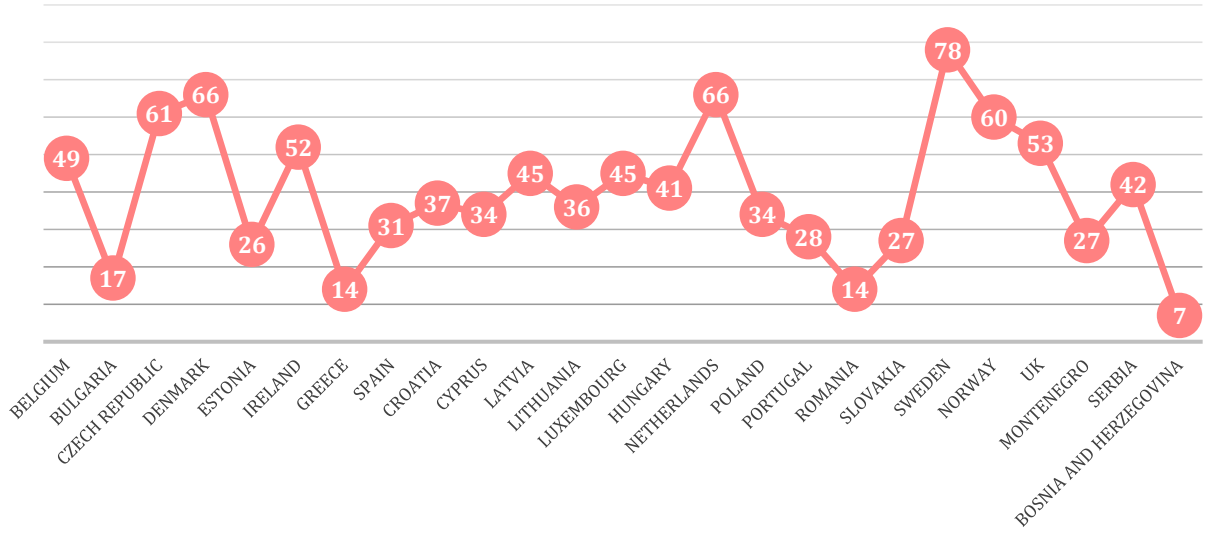


Figure 33. Enterprises purchasing online (all enterprises, without the financial sector)

Source: Eurostat (data for 2018)

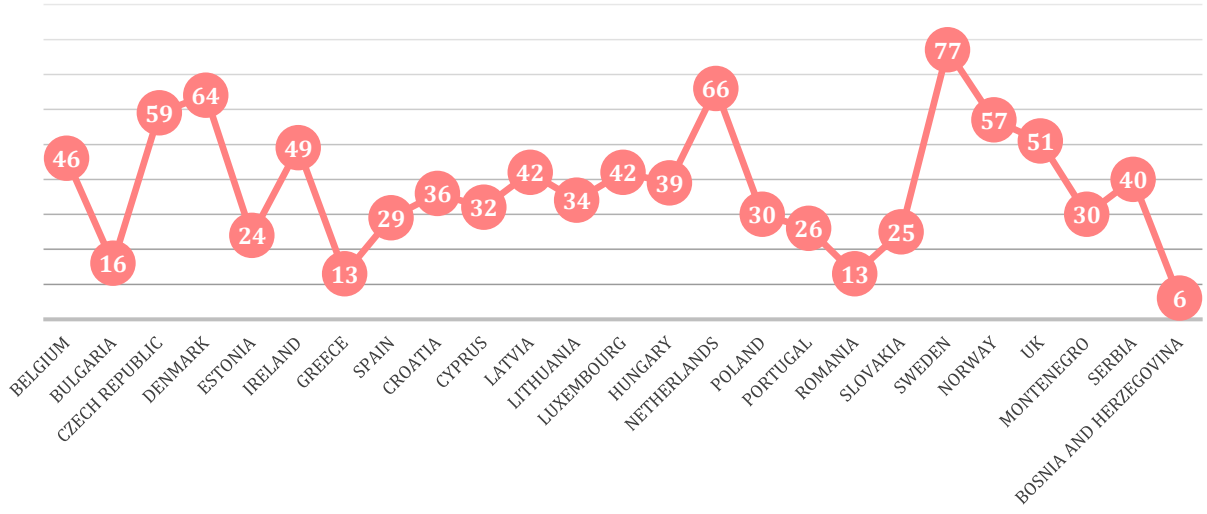


Figure 34. Enterprises purchasing online (small enterprises, without the financial sector)

Source: Eurostat (data for 2018)

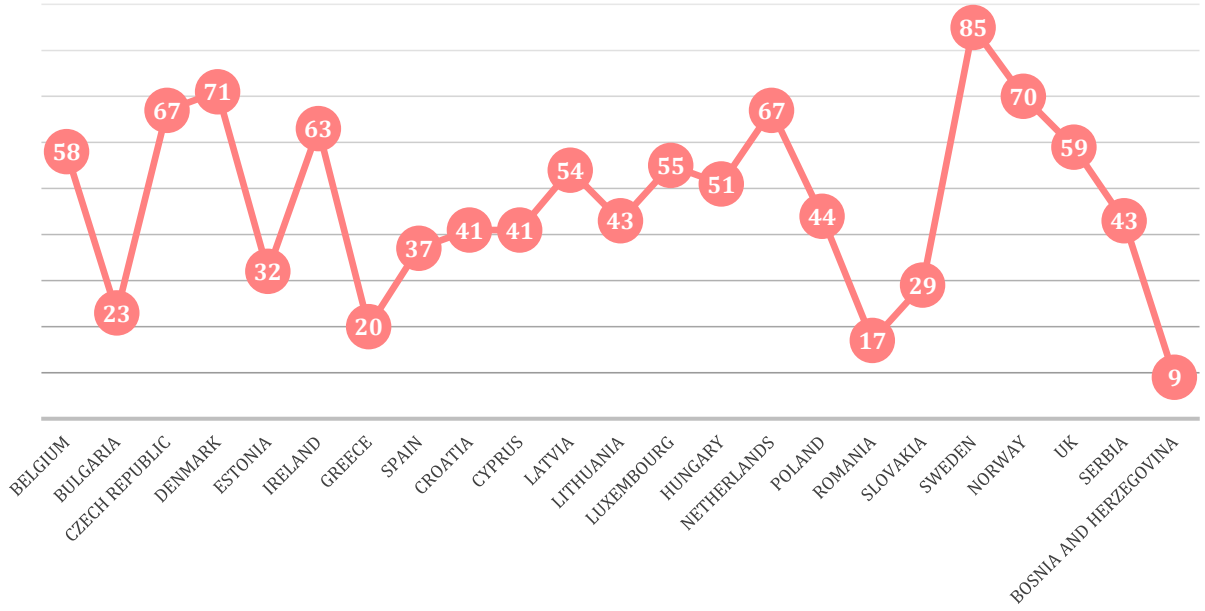
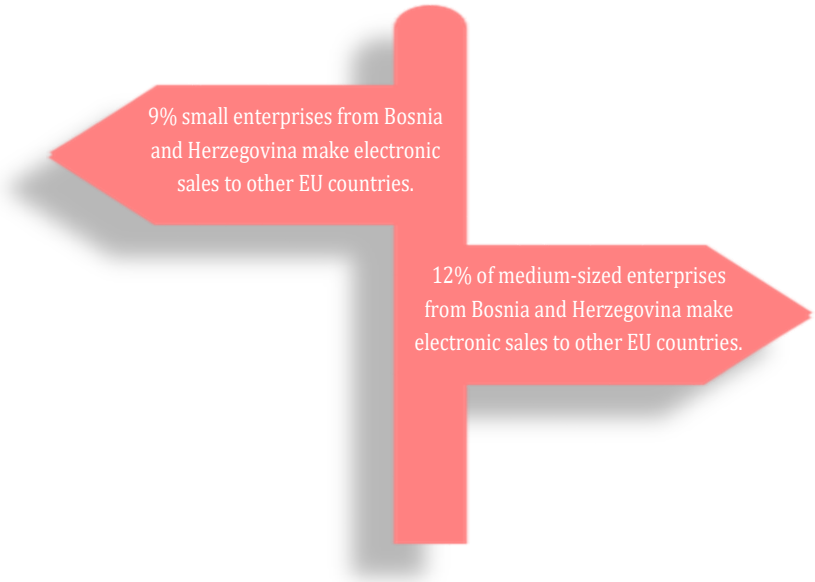


Figure 35. Enterprises purchasing online (medium-sized enterprises, without the financial sector)

Source: Eurostat (data for 2018)

4.2.3. Cross-border Internet trade

This indicator shows the percentage of small and medium-sized enterprises (SME) that make electronic sales to other countries of the EU. The financial sector is excluded from the analysis.



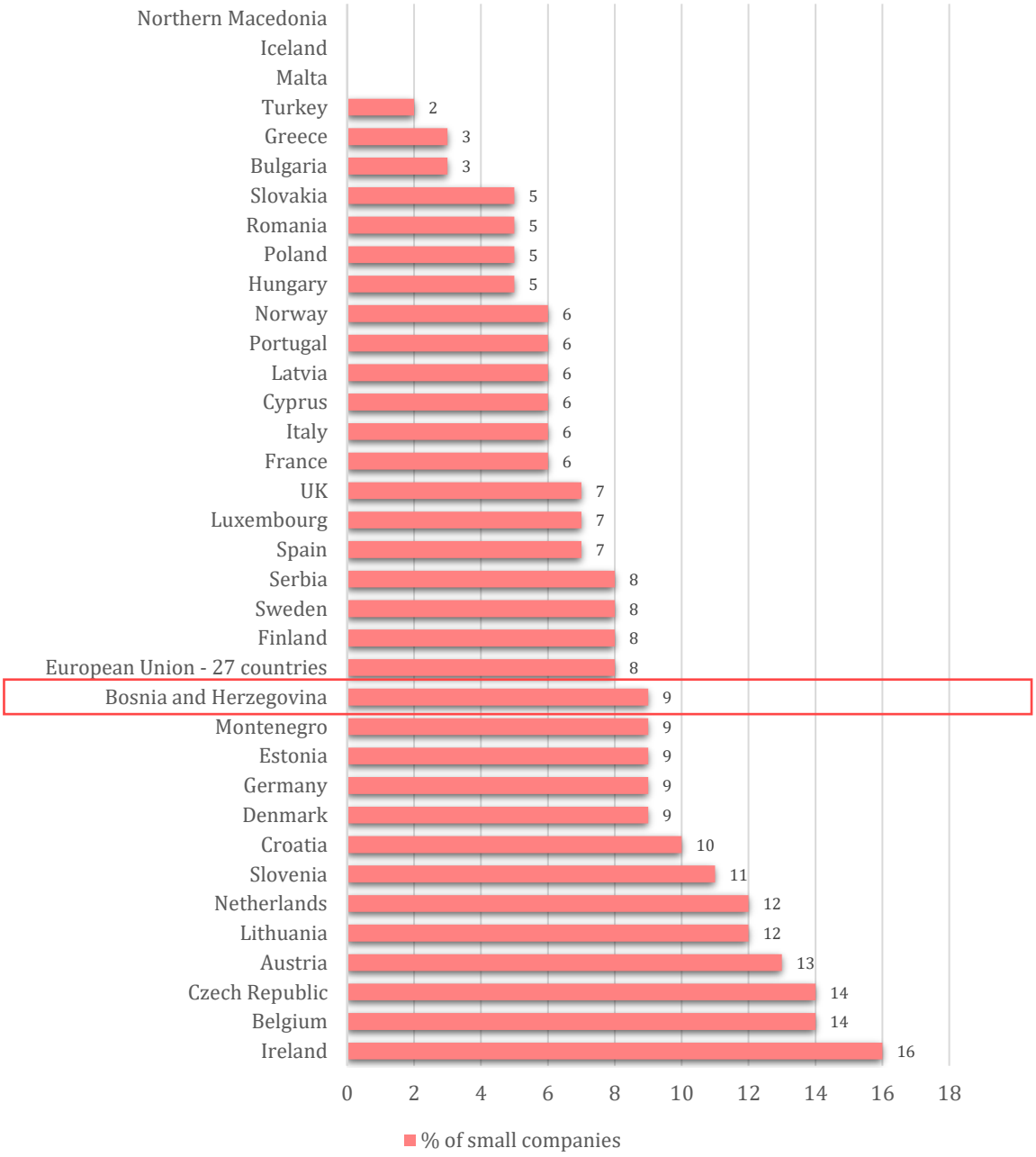


Figure 36. Small enterprises that buy over the Internet (without the financial sector)

Source: Eurostat (data for 2019)

Figure 36 depicts the percentage of small enterprises that make cross-border electronic sales (to other EU countries). Analysis shows that 9% of small enterprises from Bosnia and Herzegovina make electronic sales to other EU countries, which puts it above the EU-27. When we look at other countries from this region, we see that Croatia and Montenegro are in front, while Serbia is behind Bosnia and Herzegovina.

Figure 37. Medium-sized enterprises that buy over the Internet (without the financial sector)

Source: Eurostat (data for 2019)

In contrast to small enterprises, the situation is worse when comparing Bosnia and Herzegovina to other European countries. 12% of medium-sized enterprises in Bosnia and Herzegovina make cross-border sales (to other EU countries). Ireland is leading when it comes to this indicator, while Bulgaria and Turkey come last.

4.2.4. Conclusion about the Integration of digital technologies in Bosnia and Herzegovina

In picture 38 is DESI indicator of the Integration of digital technologies taken from the European Commission report for 2020. According to the report, Ireland, Finland, Belgium, Netherlands, Denmark, and Sweden are most successful, with more than 55 points. On the other end of the spectrum, we find Bulgaria, Romania, Hungary, Poland, Greece, and Latvia with ratings lower than 35 points, significantly below the average of 43 points for the EU. If we included Bosnia and Herzegovina in the analysis, it would come before or after Hungary or Poland. This is just an estimate based on the databases from 2019 and 2020 because the analysis for the EU is made on data from 2020. Not all data for Bosnia and Herzegovina for this year is available (thus, for some indicators, data from 2019 was considered).

Figure 38. Integration of internal processes

Source: European Commission (2020), *page 63*

Countries leading in the digitization of business (38 – 4a) are Finland, Netherlands, and Belgium, while Bulgaria, Hungary, Poland, Romania, Latvia, and Slovakia are on the other end of the ladder, adapting e-business technologies significantly slower. If Bosnia and Herzegovina was included in the analysis, it would be found at the end of the ladder with other countries mentioned above.

Ireland, Czech Republic, Denmark, Belgium, and Sweden are the leading five countries in e-commerce (38 – 4b). On the other hand, Bulgaria, Greece, Luxembourg, and Romania have the worst scores and are found at the bottom of the table. Again, Bosnia and Herzegovina would also be at the bottom here, with a low number of points in the area of electronic commerce.

The presented data for Bosnia and Herzegovina shows that the situation in Bosnia and Herzegovina, when it comes to the digital transformation of business operations, is at a low level compared to other European countries. Bosnia and Herzegovina is located on the bottom of the business digitalization ladder, alongside Poland, Hungary, and Romania. The situation with SMEs is particularly unenviable. One of the main obstacles to the digitalization of SMEs **is the gap in digital knowledge caused by the low level of digital literacy among owners, managers, and employees** (European Commission, 2020). European Commission (2020) emphasizes **a big difference in the Integration of digital technologies by enterprises depending on the size** and sector. Enterprises became more and more digitalized before the pandemic, especially the big companies. 38,5% of large companies already relied on advanced cloud services, and 32,7% used big data analytics (European Commission, 2020). However, the vast majority of SMEs still have not utilized the advantages of these technologies, with only 17% of them using cloud services and only 12% using big data analytics. Furthermore, it is stated in the report that there is a considerable gap between large companies and SMEs, not only with the application of advanced technologies in business but also for basic digital solutions, such as a software package for planning enterprise resources (ERP) and e-commerce. In this regard, a particular priority of digitization efforts should be focused on small and medium-sized enterprises.

4.3. Evolution of ICT start-up environment

The evolution of ICT start-up environment consists of the following indicators:

Indicator	Data source
ICT growth rate (NACE Rev. 2)	Eurostat
Share of employees in ICT enterprises (NACE Rev. 2)	Eurostat
Changes in the share of ICT SMEs in the total number of SMEs	Eurostat
Changes in the share of value-added of the ICT sector (NACE Rev. 2) as a percentage of GDP	Eurostat

Table 8. Indicators of the dimension evolution of ICT start-up environment

Source: Probst et al. (2018)

Data for Bosnia and Herzegovina that are essential for calculating the indicator evolution of the ICT start-up environment are not available in the Eurostat database.

Entrepreneurship in Bosnia and Herzegovina's ecosystem is in most cases motivated by the lack of ability and the need for employment, so unfortunately not by innovation (ITU, 2018). Furthermore, entrepreneurship is rarely focused on high-tech industries or innovations but instead focuses on conventional solutions and satisfying basic needs.

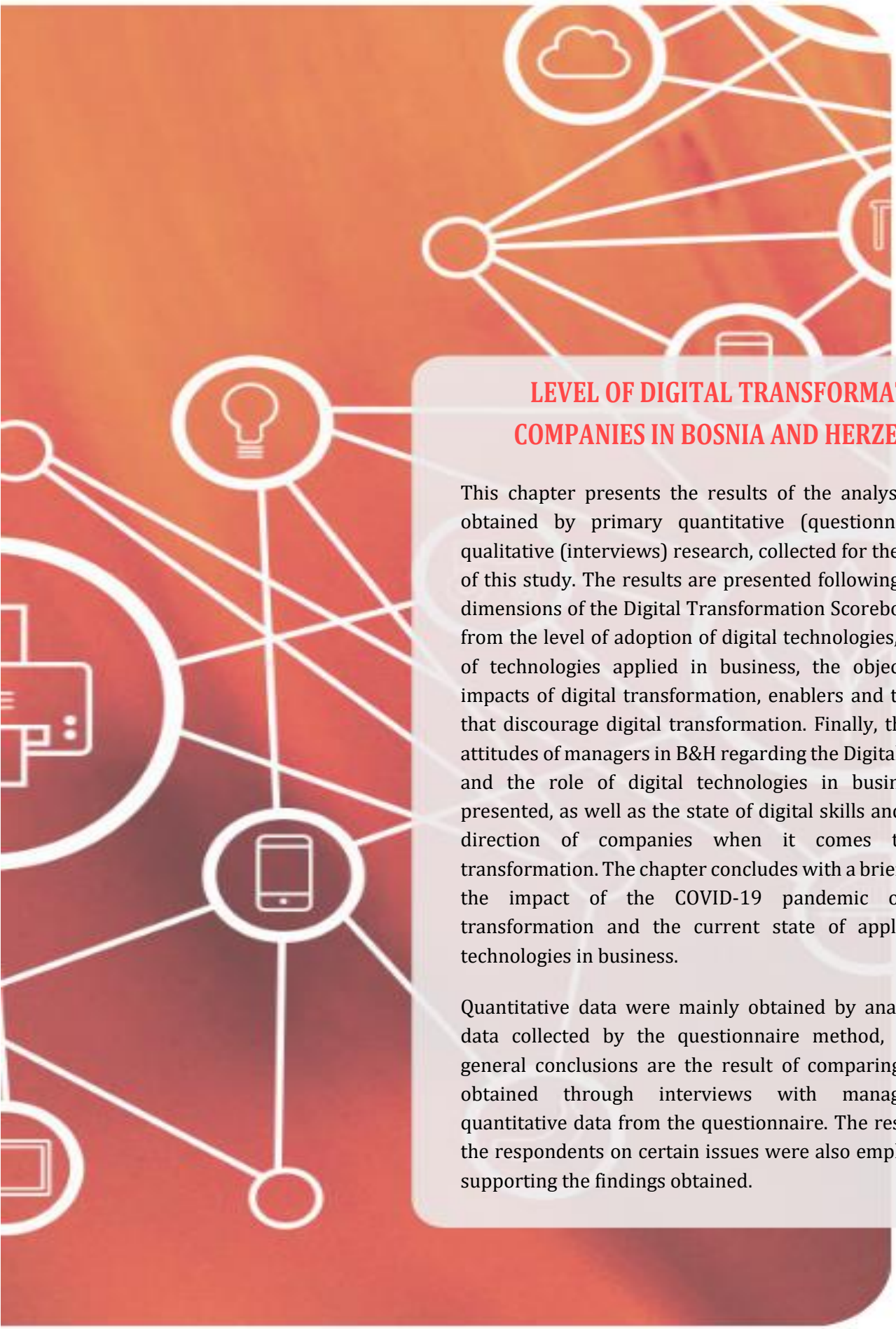
Although information technologies are the driving force of every country globally, Bosnia and Herzegovina, as a developing country, faces the constraints that make up the digital innovation system and is developing slowly. A few ICT business incubators and technological centers offer advisory support regarding entrepreneurship and offer for ICT start-ups. Moreover, we can see the cooperation between business incubators and universities, but there is still much room to improve.

Young entrepreneurs too often give up on their initial ideas and go back to working in big companies instead of using their initial failures as a platform for learning and personal development. Bosnia and Herzegovina lack an integral and strategic approach in promoting innovations and entrepreneurial culture. New entrepreneurs often emerge from ICT companies; however, the culture in Bosnia and Herzegovina and the environment influence young people to stay in their comfort zone, look for regular employment, or a job in the public sector. The level of risk aversion is really high. The ecosystem helps foster an entrepreneurial attitude through workshops and other initiatives in the public and private sectors, and efforts are being made to promote entrepreneurial skills and cultures.

Unfortunately, young entrepreneurs abandon up on their original ideas all too often.

The culture in B&H and the environment influence young people to stay in their comfort zone, look for regular employment, or a job in the public sector

The political and regulatory environment is structurally segmented at the state, entity, cantonal and local levels, without efficient coordination across different bodies. The institutional framework for supporting small and medium-sized enterprises does not exist on the state level, so there is a lack of financial resources to promote innovation inside small and medium-sized enterprises. Start-ups and small and medium-sized enterprises are mainly involved in various international B2B markets (ITU, 2018).



LEVEL OF DIGITAL TRANSFORMATION OF COMPANIES IN BOSNIA AND HERZEGOVINA

This chapter presents the results of the analysis of data obtained by primary quantitative (questionnaire) and qualitative (interviews) research, collected for the purposes of this study. The results are presented following the basic dimensions of the Digital Transformation Scoreboard 2018, from the level of adoption of digital technologies, the types of technologies applied in business, the objectives and impacts of digital transformation, enablers and the factors that discourage digital transformation. Finally, the general attitudes of managers in B&H regarding the Digital Economy and the role of digital technologies in business were presented, as well as the state of digital skills and strategic direction of companies when it comes to digital transformation. The chapter concludes with a brief review of the impact of the COVID-19 pandemic on digital transformation and the current state of application of technologies in business.

Quantitative data were mainly obtained by analyzing the data collected by the questionnaire method, while the general conclusions are the result of comparing the data obtained through interviews with managers and quantitative data from the questionnaire. The responses of the respondents on certain issues were also emphasized as supporting the findings obtained.

5. LEVEL OF DIGITAL TRANSFORMATION OF COMPANIES IN BOSNIA AND HERZEGOVINA

In this part, the analysis of data obtained by primary quantitative (questionnaire) and qualitative (interviews) research is presented, in line with the DTS methodology depicted in the image below. The analysis focuses on the level of digitalization and adoption of digital technologies.

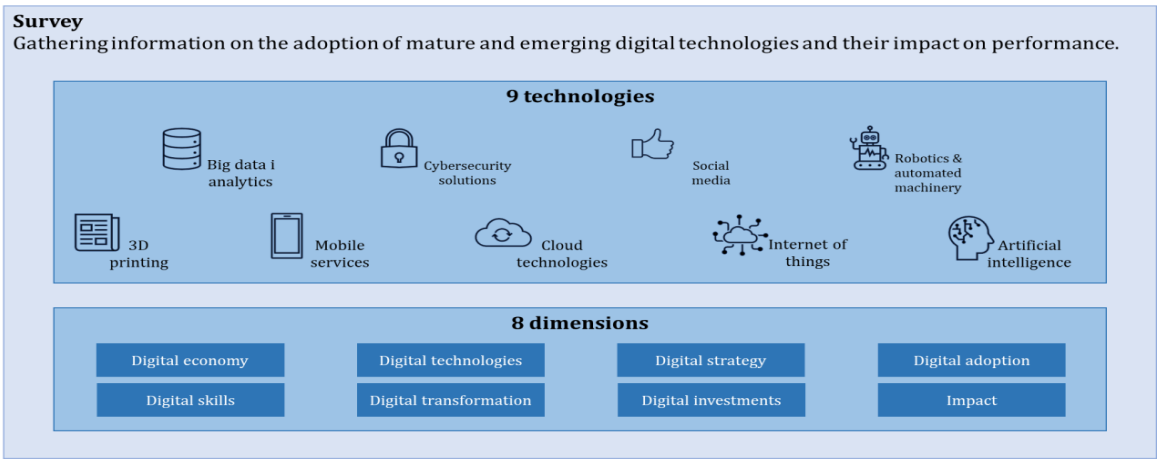


Figure 39. Methodological approach to the presentation of primary data

Source: Probst et al. (2018)

5.1. Digital adoption and digital transformation

The questionnaire approach was used to obtain data on the use of digital technology by companies in Bosnia and Herzegovina. The research was based on 9 technologies split into 8 aspects, as described by Probst et al. (2018). The technologies are listed in the text above, and the observed dimensions are:

- Digital economy
- Digital technologies
- Digital strategy
- Digital adoption
- Digital skills
- Digital transformation
- Digital investments
- Impact.

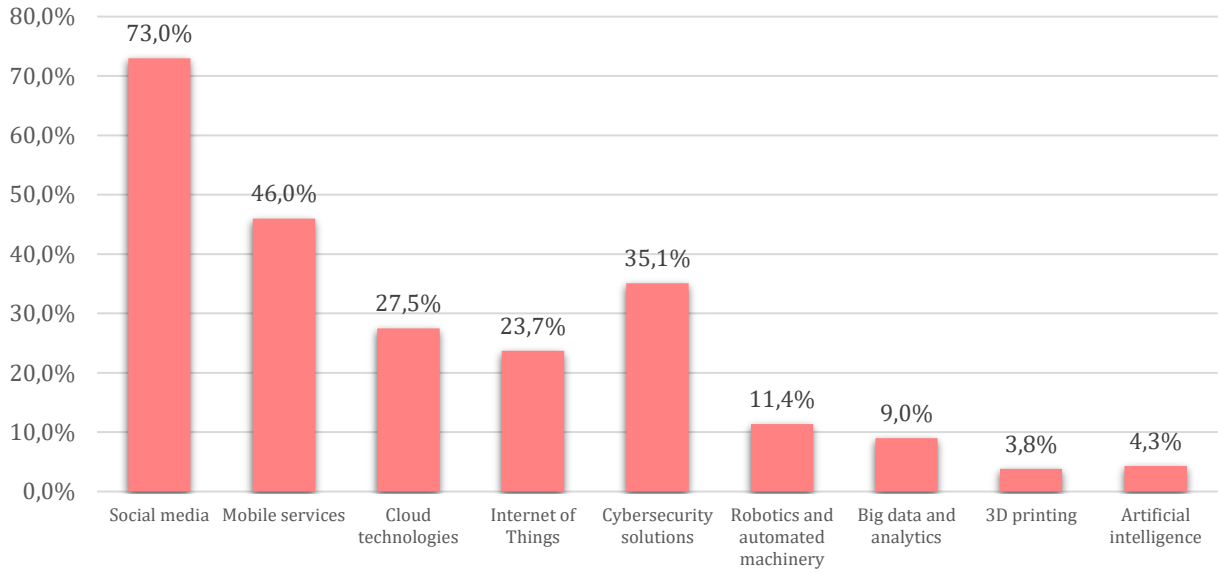


Figure 40. The level of technology adoption among all research participants

Among the nine digital technologies, social media, cybersecurity technologies, mobile services, and cloud services are the most widely used. Social media is also dominant in the two observed DTS sectors, indicating a greater emphasis on the user experience through social listening in order to obtain a deeper understanding of customer behavior and preferences (Probst et al., 2018). Furthermore, the report emphasizes cloud service adoption, which is interpreted as the widespread usage of business models based on services such as SaaS, PaaS, and IaaS that provide flexibility, resilience, security, and hardware cost reduction. It is worth noting that 4% of businesses said that they do not utilize any of the technologies.

5.2. Digital technologies

As previously stated, statistics on the adoption of nine different types of digital technologies were obtained following the DTS. Below is an analysis of primary data obtained by using questionnaires and conducting interviews.

5.2.1. Social media

The results of the research show that social media is the technology most often adopted by companies in B&H, but mostly by companies with less than 10 employees and then large companies. It is interesting that the results are similar in the DTS report for the EU. However, if we connect the result with the fact that only 14% of companies in B&H use 2 or more social media, we can conclude that most companies are based on only one social media and that updating data and interactions through social media is not continuous. The most commonly used network is Facebook, followed by Instagram. Companies that have adopted social networks cite the adoption of new clients as the most common effect. Companies that are not present on social networks most often do business with other companies (B2B) and do not see the need to promote through social media.

53% of companies that have adopted social media believe that digital technologies have contributed to the adoption of new customers

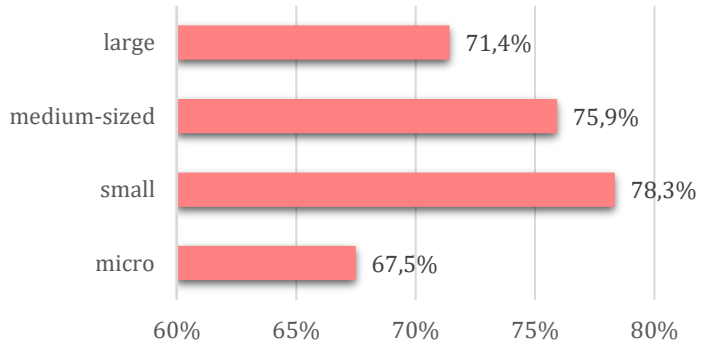


Figure 41. Adoption of social media according to the size of the company

„We have a sales sector where colleagues engage with clients, and production is specialized; consumers find us because we can do that part of production that is tougher to locate; therefore we don't have a problem with advertising since the one who needs us finds us." – large company, metal industry.

5.2.2. Mobile services

When it comes to mobile technologies, large companies are the ones that adopt them the most (71.4%). Smartphones, tablets, smart watches, and other internet-connected wearable devices are the most often used, as is a GPS tracker for sales and distribution personnel. The figure below depicts the percentage of companies that have adopted mobile technologies in their operations.

Mobile technologies are used by 46% of businesses, with large companies having the highest adoption rate

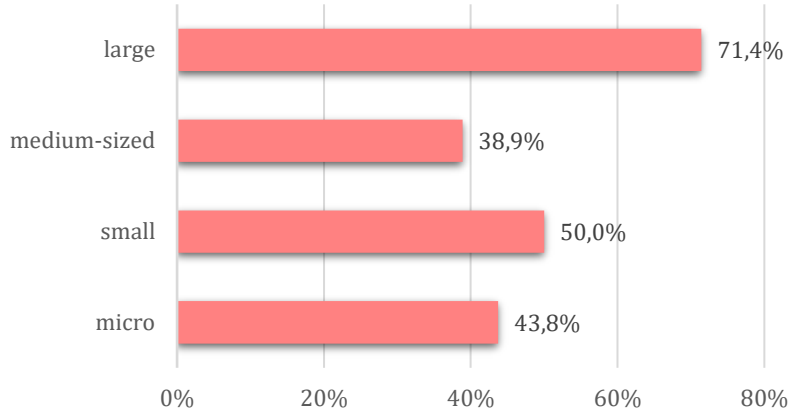


Figure 42. Adoption of mobile technologies according to the size of the company

5.2.3. Cloud technologies

Among the surveyed companies, cloud technologies were mostly adopted by large companies (57.1% of them), followed by micro companies (48.8%), and medium (40.7%) and small (35%). It is important to note that, unlike the questions in the DESI digital integration index, these results show the use of some of the cloud-based technologies rather than the purchase of at least one of the services.

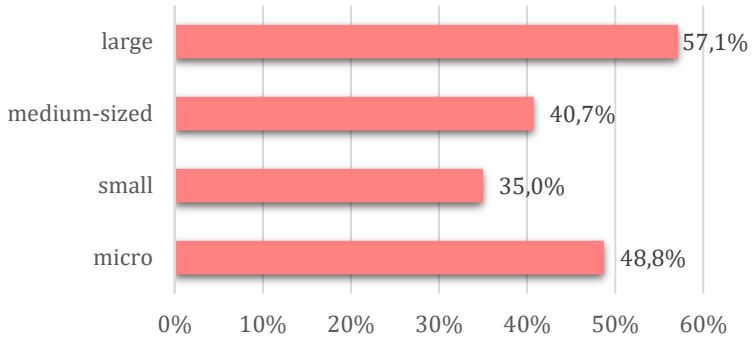


Figure 43. Adoption of cloud technologies according to the size of the company

Companies most commonly use Office365 and cloud storage to store data. However, ignorance of the benefits of cloud services is prevalent, particularly among micro and small businesses, as corroborated by the interviewee's statement:

„ We do not use the cloud. We need 2-3 seminars to learn a little more about it“ – micro company, manufacturing industry.

5.2.4. Internet of Things

The Internet of Things (IoT) is an emerging technology that is transforming the world in which we live and work (Probst et al., 2018). Among the surveyed companies, IoT technologies were mostly adopted by medium-sized companies (companies with 50 to 249 employees) (28.2%), 28.6% of companies utilize some of the IoT-based technologies, while the adoption rate is approximately the same among micro and small companies.

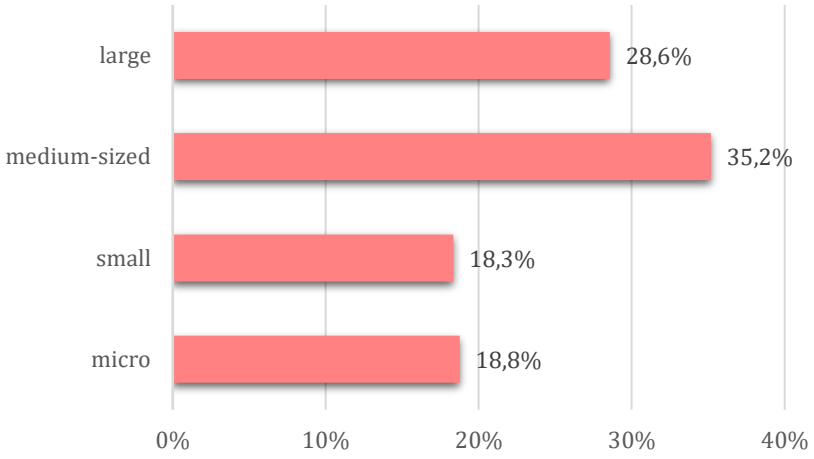


Figure 44. Adoption of IoT according to the size of the company

It is worth noting that some managers are completely unfamiliar with the concept of IoT:

„ I've heard of the term, but I don't know much about it. We don't use it, but I've heard of it" – medium-seized company, manufacturing industry.

However, IoT is commonly utilized in the manufacturing industry (most often in the metal industry) and as a result of the digitalisation of the production process and investment in contemporary production machines.

„… We invested approximately 4-5 million EUR in the digitalization and automation of the production system. Old technologies have been completely abolished…. the whole production system is automated, people are still there, but there is no more mechanics and no one needs to start the processing manually; it is now all automated with sensors, from measuring temperatures, applying layers, etc." – large company, manufacturing (metal) industry.

„We plan to use IoT in the future. We have a plan this year if we can connect welding machines to a server that provides data on how much someone worked, cares about the health of workers, how much CO2 emissions and the harmfulness of those gases in general. We are still in contact with the

manufacturer of these machines, so we will see what we will do and how we will accomplish it" – medium-sized company, metal industry.

5.2.5. Cybersecurity solutions

According to a sample of respondents to this Study, the adoption of cybercrime protection technologies shows a positive correlation with company size. Namely, the larger the company, the more likely it is to adopt some of the cyber security technologies. Thus, 85.7% of large companies in the sample implemented some kind of protection, while this is the case with 31.3% of micro companies. These results show the need to raise company awareness of the importance of protection against cybercrime, especially taking the EU path of B&H and binding GDPR standard for all companies in the EU.

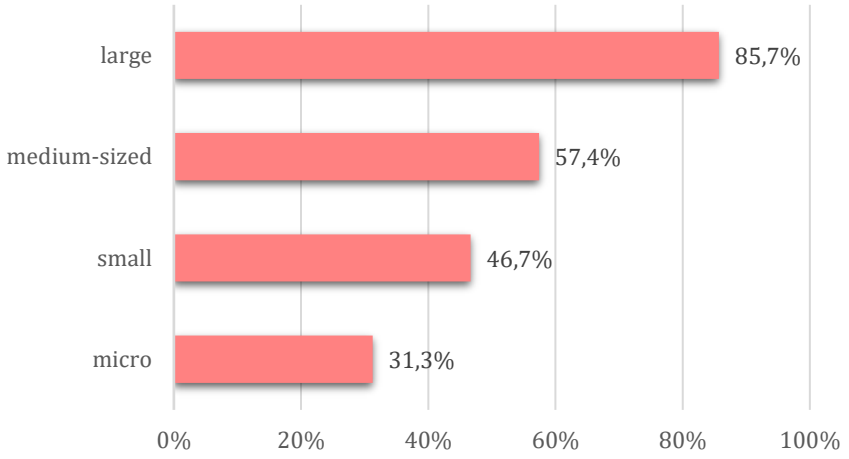


Figure 45. Adoption of cybersecurity solutions according to the size of the company

Companies most often use antivirus software and firewalls as protection.

5.2.6. Robotics and automated machinery

Robotics is most prevalent in medium-sized companies (20.4% of them), most often those engaged in production and are more likely to operate in a B2B environment.

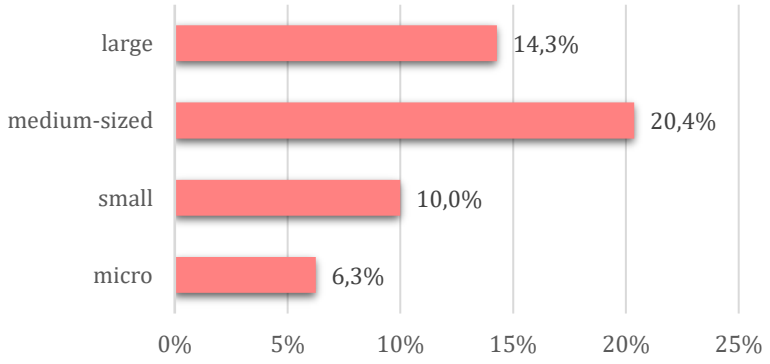


Figure 46. Adoption of robotics according to the size of the company

„We use in production. Some of the more complex and best robots are those that paint train windows. We tried it by hand before, we tried it on the existing lines, and it wasn't always a good consistency... Let's say it was a big project and it had a good effect on the quality" – large company, manufacturing industry.

„We are currently in the robotization phase of two machines; we are doing this through the EU4business project and should start in September. We have already procured a robot; now we need to prepare the machines, make a slightly different schedule, to obtain two machines" – medium-sized company, manufacturing industry.

5.2.7. Big data and analytics

Big data and data analytics enable companies to leverage data to generate information and knowledge, so providing a more solid foundation for decision making. According to the survey results, only 9% of businesses use big data and analytics, with organizations with 10 to 49 people (15%) and those with 50 to 249 employees (15%) having the greatest adoption rate (13 percent). On the other hand, only a small percentage of large (7.1%) and micro (5%) businesses use data analytics.

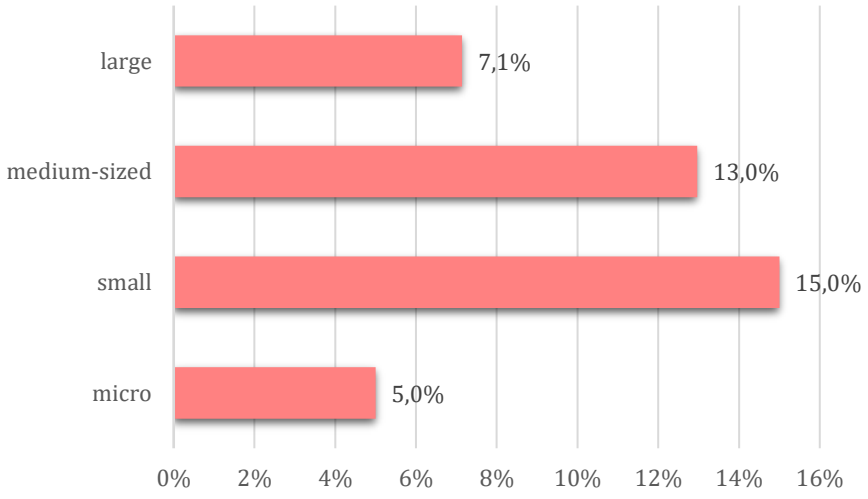


Figure 47. Adoption of big data and analytics according to the size of the company

The response obtained in an interview with one of the managers best reflects the condition of big data adoption and data analysis in B&H:

„ We have nothing to use; what we have is mostly some of the internal data that we analyze through Excel spreadsheets" – medium-sized company, construction.

5.2.8. 3D printing

3D printing has enormous potential to disrupt the established way products are designed, developed, and manufactured (Probst et al., 2018). While the DTM results for the EU show that 3D printing technology is widely used in large companies, research undertaken for the purposes of this Study shows that this technology is mostly used in medium-sized companies. Namely, 9.3% of medium and 5% of small companies use 3D printing, while this is the case with less than 1% of micro and large companies. 3D printing had the lowest adoption rate among B&H enterprises of the nine technologies studied.

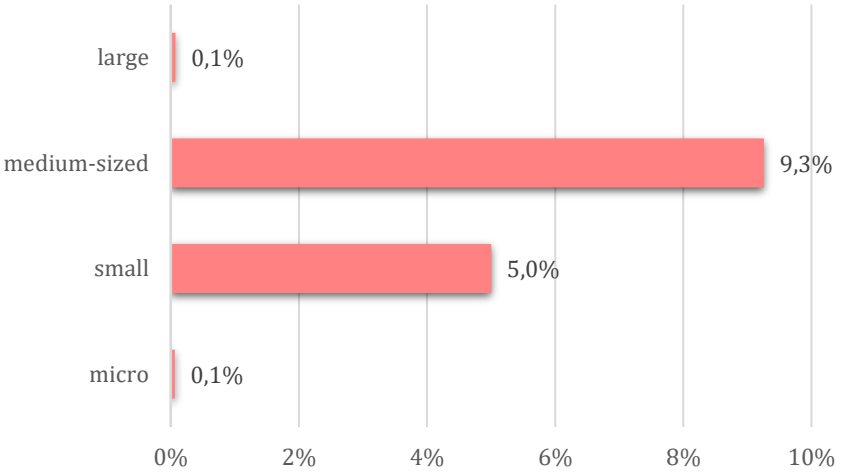


Figure 48. Adoption of 3D printing technology according to the size of the company

3D printing companies most often use it for prototyping and product modeling:

„*We have not yet introduced 3D printing technology. We've been thinking about it, and we have one development team working on that part as well. We are not yet, but we are also thinking in that direction of modeling, i.e., making simulations of the products themselves*" – large company, metal industry.

5.2.9. Artificial intelligence

The adoption of artificial intelligence positively correlates with the size of the company. The larger the company, the more likely it is to adopt some of the artificial intelligence technologies. 7.1% of large, 7.4% of medium and 5% of small companies use some of the technologies of artificial intelligence. As for the micro companies in the sample, artificial intelligence was adopted by 2.5% of companies.

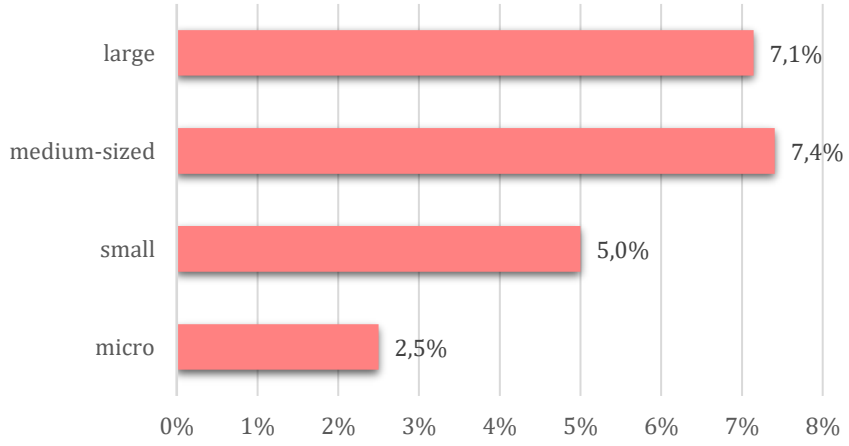


Figure 49. Adopting artificial intelligence according to the size of the company

5.3. Impact and goals of digital transformation

When asked what the main goals of their company in the adoption of some of the digital technologies were, most companies answered "better connection with customers". Then, improving services, improving competitiveness, improving sales and marketing strategies, as well as privacy and data protection are factors that drive the digital transformation of business.

73% of companies invest in digital technologies with the aim of better connecting with customers

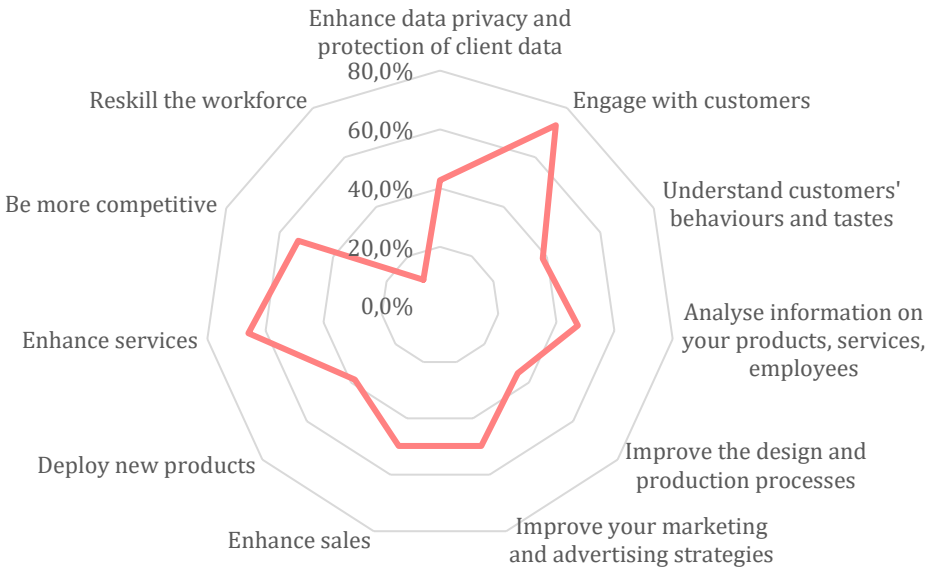


Figure 50. Purpose of adopting digital technology

Based on the findings, we conclude that the primary purpose of digital technology adoption is to „ increase sales by improving the marketing strategy through better connections with customers “ (Probst et al., 2018).

Increasing sales by improving marketing strategies through better connections with customers are the basic drivers of digital transformation

The main reasons why companies adopt digital technologies can be grouped into the following two categories (Probst et al., 2018):

- To improve external business functions: customer relationship management system or strategies, optimizing and systematizing relationships and operational marketing to improve sales volume;
- To improve internal functions: quality assurance and project management.

When asked whether the adoption of digital technologies resulted in positive results for the company's business, 65.9% of managers answered yes, while 3.3% answered no. Only those respondents who stated that digitalization resulted in positive results stated specific advantages. The majority of them believe that the greatest obvious outcomes will come from gaining new clients and improving business models.

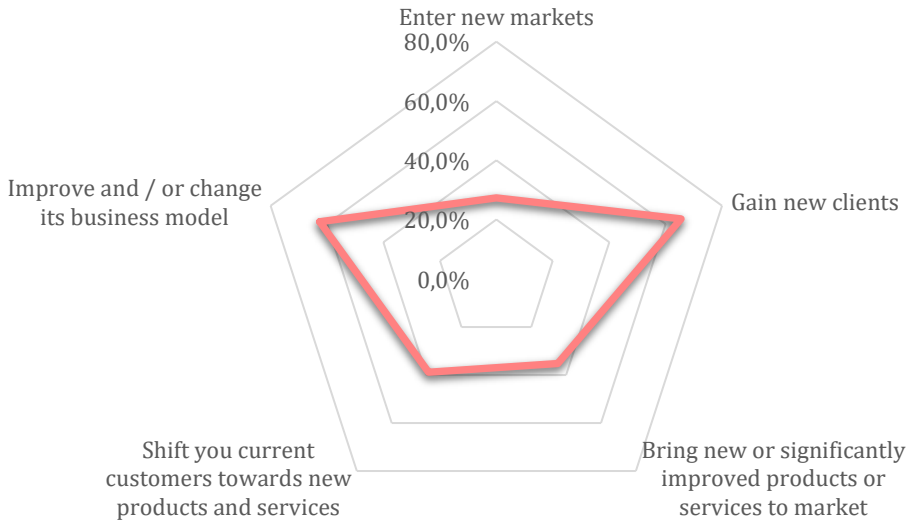


Figure 51. Outcomes of digitalisation

The results show that the most visible effects are in business management, and quality assurance and project management, i.e., improved internal processes.

The effects of the adoption of digital technologies are mostly reflected in more efficient business management (44.5% of companies)

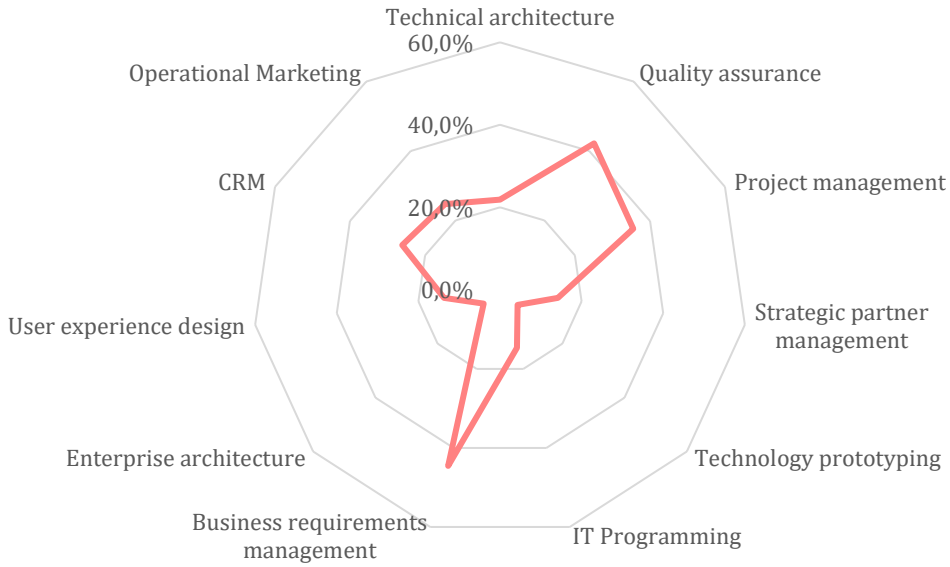


Figure 52. Business functions affected by technology adoption

It is worth noting that most firms' technology adoption goals are primarily external (Figure 50), while the reported impacts are mostly internal (Figure 52). Analysis of data collected by the questionnaire shows that production is an organizational function that is most often improved by the adoption of digital technologies, followed by sales, management functions, as well as administration ("*Invoicing, processing, payment to suppliers, billing monitoring, bidding*" - Construction).

Figure 53. Business functions enhanced by the adoption of some of the digital technologies

46.5% of companies investing in digital technologies recorded an increase in annual turnover

The economic effects of technology adoption are observed through the impact on annual turnover as well as operating costs. 46.5% of companies stated that the effect is reflected in the increase in annual turnover in the last three years after the adoption of the technology (excluding the pandemic effect), whereas 28.9 percent reported no positive effects. According to 2.8 percent of businesses, turnover has decreased.

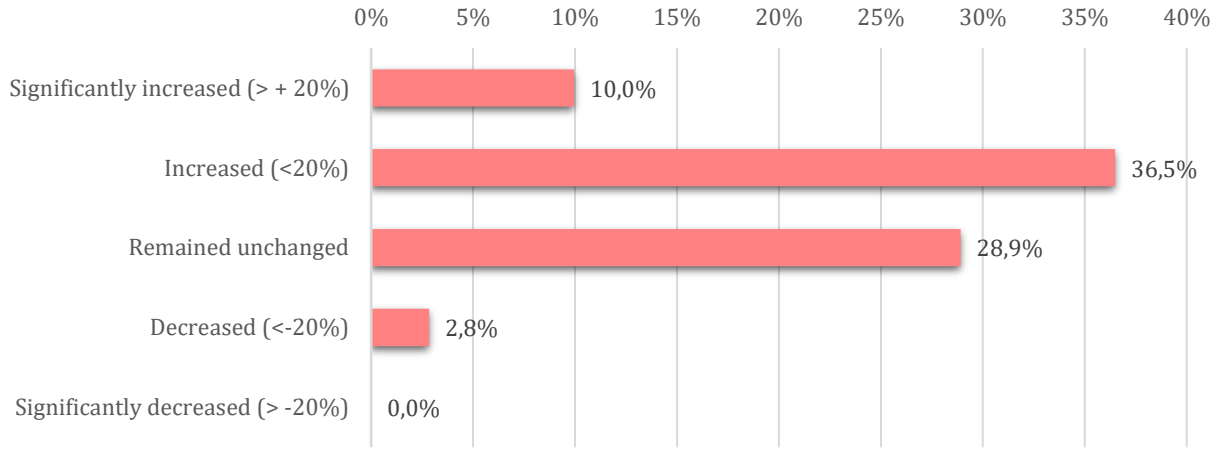


Figure 54. The impact of technology adoption on annual turnover

As a result of technology adoption, 19.4 percent of organizations reported lower operational costs, while nearly 22 percent reported an increase. This increase can be explained by the potential investment in skills development, training and process adaptation (Probst et al., 2018). However, for the majority of companies (31.3%), operating expenses remained unchanged.

Operating costs were reduced in 19.4 percent of enterprises that invested in digital technologies

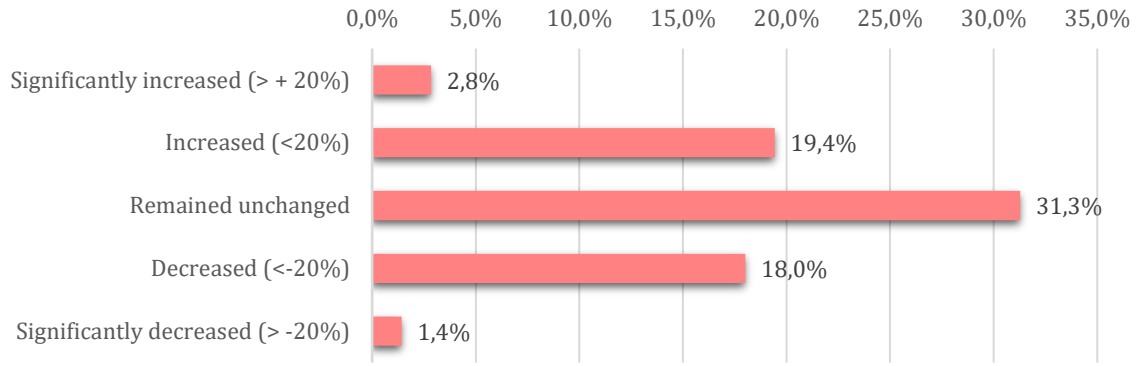


Figure 55. Impact of technology adoption on operating costs

The DTS also cites the ubiquitous debate about the destruction of jobs and jobs as opposed to their creation, which is seen as a consequence of digitalisation. In the report, they state that the adoption of digital technologies does not necessarily lead to job destruction (Probst et al., 2018), and that the adoption of digital solutions has generally enabled companies to either retain the number of employees or increase them. When it comes to the situation in B&H, as many as 21.3% of companies have created new positions, while only 1.4% of companies have reduced the number of employees. However, the majority of companies (67.8%) retained the same number of employees. As stated in the DTS, the development of IT and the emergence of new skills require continuous improvement/retraining to meet the needs of the evolving digital economy (Probst et al., 2018).

89.1% of companies investing in digital technologies have retained or increased the number of employees

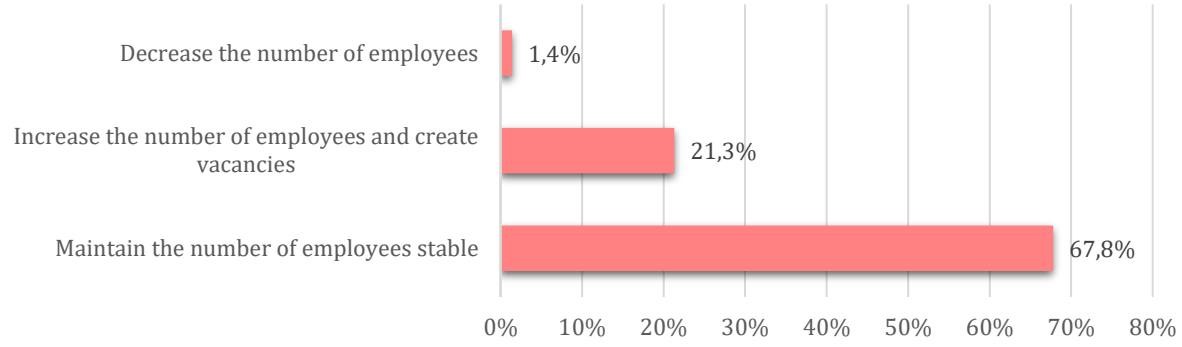


Figure 56. The impact of the adoption of digital technologies on employee numbers

5.3.1. Barriers to digital transformation

Companies that have not adopted digital technologies cited a lack of skills among employees, and the need for high investment, as well as insufficient education about available technologies as the main reasons or barriers.

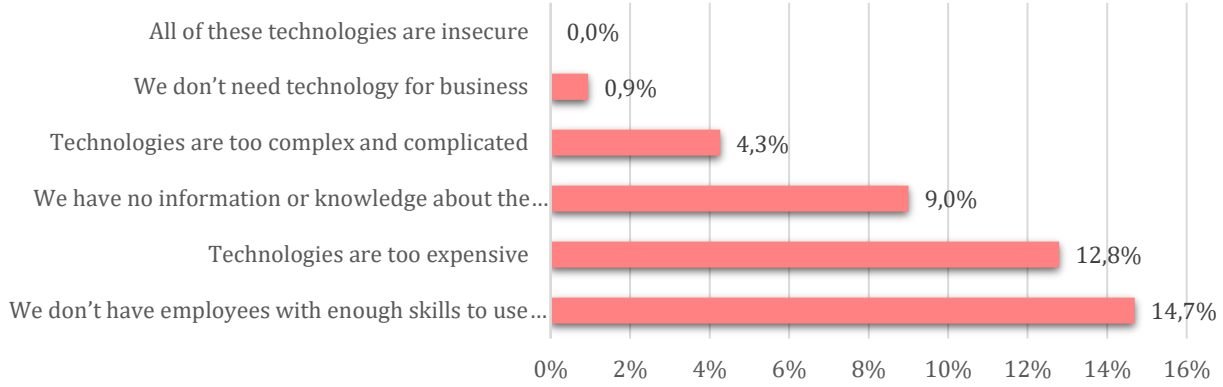


Figure 57. Barriers to digital transformation

In addition to the above, some of the respondents gave answers such as: "*We simply do not need technologies*" and "*Tradition*". It is interesting to note that this question was answered by as many as 29.4% of the sample, implying that recently a third of the sample did not adopt any of these technologies (the question was: Please indicate why you have not implemented any digital technologies in your firm recently).

By analyzing the responses obtained through the interviews, a word cloud was created, shown in the image below. The analysis was performed by coding the response, and the word size shows the repetition frequency of the specified code.

Figure 58. What problems do companies in B&H most often face when it comes to the digitalisation of business

According to the findings, the most prevalent issue that businesses encounter when it comes to digitalization is employee resistance to innovation. Many earlier research have revealed this problem. Respondents specifically referenced resistance among elderly employees.

„...Basically, whenever something new is introduced into the organization, there is always initial resistance from the employees, regardless of whether it is management or production. Because everyone is believed to be a little endangered because you can monitor work activities. Nobody sees it as a chance at first, but rather as endangering someone directly and jeopardizing someone" – Manufacturing industry

„In general, these are the company culture, business culture, and the human aspect in the adaptation and use of these technologies and tools. As for other things, such as budget, management, commitment, we have it all. However, as with any ERP or system, it takes a little longer to bring it to life, and you must invest some time and effort in training and control. Simply until people become accustomed to it" – Wood industry

5.4. Digital economy

The digital economy is an economy that is focused and based on digital technology. It basically encompasses all corporate, economic, social and cultural activities that are facilitated through the

web and the use of other digital technologies. The beginning of the 21st century has been marked by the tremendous growth of digital platforms and their transformative role in everyday life and the business environment. The digital economy has led to many new trends and resulted in many start-up ideas, emerging entirely new business models. Almost all the largest companies in the world (Amazon, Google) are from the digital world. The digital economy and the ubiquity of digital interactions create numerous opportunities for companies in all sectors.

So, this economy is a way to take advantage of the opportunities and benefits of digital technologies. Benefits range from faster communication to completely new ways of doing business and new business models.

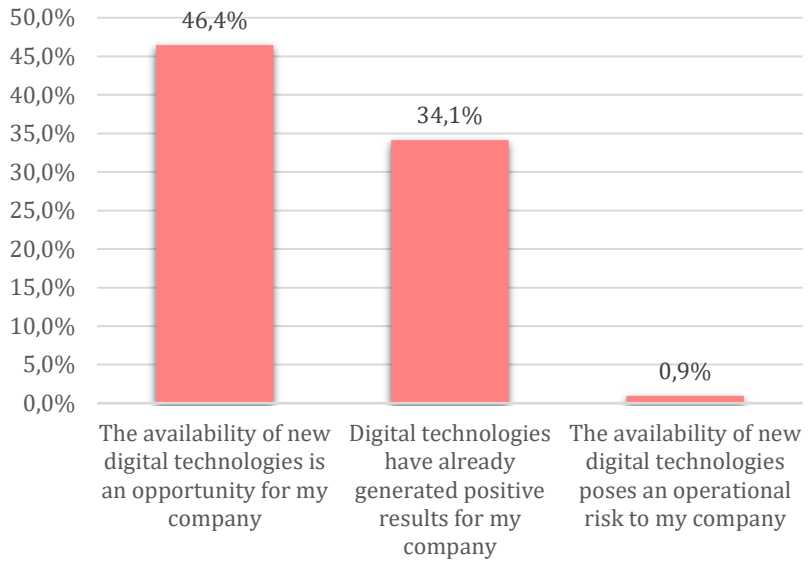


Figure 59. Perception of the effects of digital technologies on business

According to the survey results, 46.4 percent of enterprises believe that digital technologies provide a business opportunity, while 34.1 percent of businesses have already seen the benefits of digitalization. Only 0.9% of digital technology companies consider it a business risk. Furthermore, it is clear that a number of managers have seen the adoption of digital technologies as a requirement rather than a possible benefit:

„There must be a possibility, who will be the first, who will be the best... Going in that direction is unquestionably beneficial. Those who do not follow will perish. It is, in fact, necessary. It's not that you're going to profit right now, but if you don't follow, you'll fail. So it is under compulsion to adopt technology" – Construction

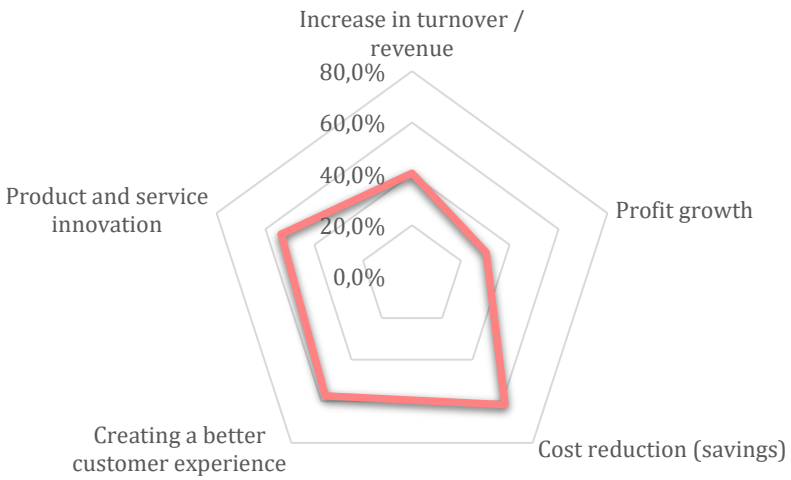


Figure 60. Attitudes about the most prevalent benefits of digitalization

When it comes to the most common benefits of digitalization, most managers are of the opinion that it is about reducing costs and creating a better customer experience. This is followed by the innovation of products and services, and only then the increase in turnover, sales and profits.

5.5. Digitization and investment strategy

16% of companies have an innovation and digitalization strategy

As many as 62% of companies do not have an innovation and digitalization strategy, while 16% of companies have such a strategy. 11% of companies have an employee in charge of digitalization and informatization, while 11% of companies have a department/employee that deals with the development of new products/services using digital technologies.

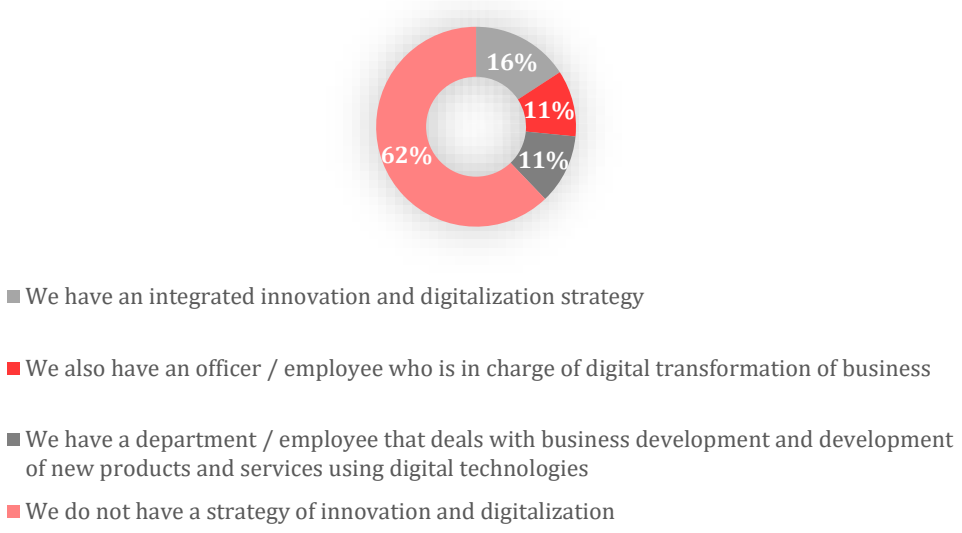


Figure 61. Having a strategy of innovation and digital transformation

Companies are investing in digital technologies to improve their operations and remain competitive. 43% of companies invest with the aim of developing new products or services facilitated by digital technologies, while 57% with the aim of enhancing production processes using technology.

„We don't invest much in this technology" – Construction

It is important to note that **most companies invest less than 5% of annual turnover** in digitalization, but also the improvement of digital competencies of employees.

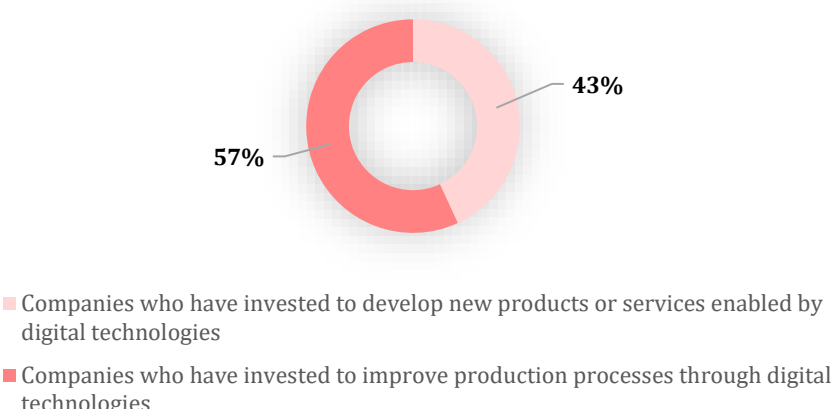


Figure 62. Purposes of investment in digital technologies

Some of the benefits of digitalization and the use of digital technologies in the business noted by respondents include:

„The biggest advantage for our company is fast communication with business partners and the possibility for everyone in the industry around the world to see our work“ – Manufacturing

„Easier access to new customers, better customer information“ – Manufacturing

„Business improvement, process and business optimization, better resource management, availability of information, improved knowledge on customers, etc.“ – Tellecomunications

„Improved client relations, particularly in the hospitality business, might be one of the benefits of digitalization. It would also increase the speed and quality of service. It may also have an impact on improved strategy development: better data equals easier analysis“ – Hotel industry

„Our company was founded on the principles of digital technology 21 years ago. There are numerous opportunities for savings, more productive and efficient work, and we do not perceive any dangers“ - Online service portal

„Business process automation, quality increase with cost optimization“ - Manufacturing

Respondents identified the following risks and challenges to business as a result of the rise of the digital economy:

„Insufficient training of existing staff / Low level of IT literacy of employees“ – This response was given by numerous organizations (especially from the public sector)

„Greater exposure to cyber attacks“ – More companies from different sectors

„Cheaper human services and replacement with software solutions, alienation and weak socialization between business partners, weakening long-term relationships with customers and suppliers, entering the world market and globalization, which is still a risky and unknown category for us“ - Accounting, finance, consulting

„Obligation to increase security measures on a regular basis“ – Agriculture

„The risk is greater competition“ – Telecommunications

5.6. Digital skills

One of the most common barriers to the adoption of digital technologies in business is the lack of digital skills in the labor market (Probst et al., 2018). When it comes to the results of this study, 50.7% of respondents in the sample state that their employees possess basic digital skills (they know how to use email, web search, social networks, etc.). 17.5% believe that their employees have above-average digital skills (they know how to use digital solutions for data exchange, accounting, digital marketing, sales and shopping, etc.). However, only 17.1% of companies have IT professionals in their companies. It is interesting to note that 1.4% of respondents feel that they do not need any digital skills for business.

The general conclusion is that apart from the skills of using e-mail, Internet browsers and social networks, most employees still have below-average IT skills.

„ My employees are indeed skilled, but when it comes to computers, I would sit down and cry" – Production and trade

„D*igitalization of companies is not a problem... but education is. It's not a problem in finances either, a man will take out a loan, so he will buy equipment. The problem is in computer literacy. We need to go back to our roots and educate people on how to use that equipment and how to implement it. Only in this way can we move forward* " – Production and trade

This is one of the reasons for the low degree of digitalization, given that many companies need a change in organizational culture and even leadership before a more serious transformation. In one of the interviews, one of the managers, addressing the digital skills of the workers, said: „*I will quote the saying that culture eats strategy for breakfast. It's difficult if we don't have a proper culture, if we don't offer new ideas, and if we don't constantly change. We strive to communicate with our employees in a different way*".

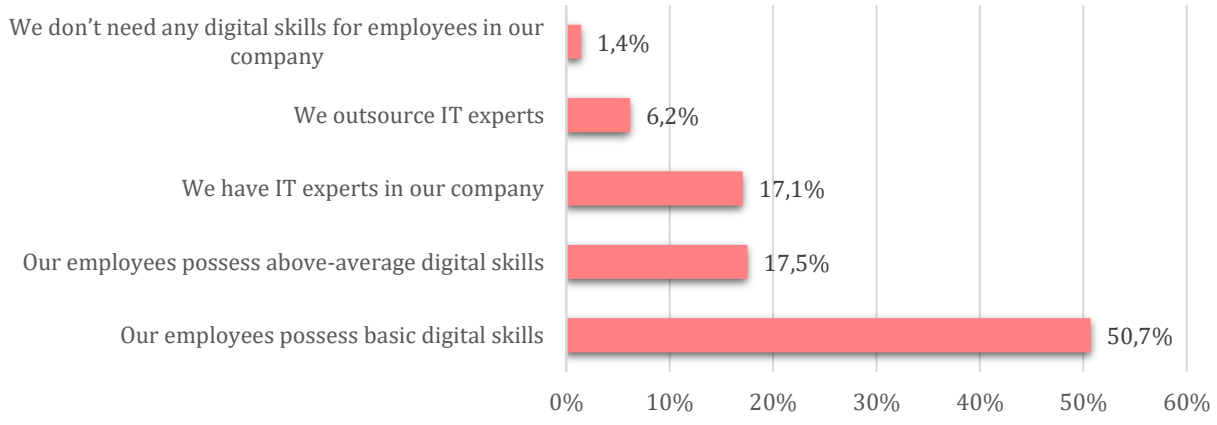


Figure 63. Frequencies of answers to the question: Do your employees possess adequate digital skills?

In addition, research shows that there is a difference in employees 'digital skills with respect to age:

„ *Younger people who work are more capable than older ones. Younger people know more about it* (digital technologies)" – Micro company, financial and insurance activities

„ *If my work colleague is a 59-year-old man, nothing more can be expected of him* (in terms of improving digital skills)" – Trade

5.7. COVID-19 and digital transformation

Digital transformation is a topic and one of the strategic goals of all major companies around the world. The COVID-19 pandemic accelerated or launched IT-driven telecommuting initiatives almost overnight, as well as creating new customer experiences and new sales channels. Although technology has long been treated as a useful tool for interacting with customers and as a way to introduce process automation, spreading the new coronavirus and avoiding face-to-face meetings has forced companies to look for creative digital solutions to continue to operate remotely. Over the course of only a few short months, the pandemic has radically altered how firms throughout the world and in many industries conduct business. Adapting was easier for organizations that were already on the way to digital transformation.

Company managers are now more aware of the strategic importance of technology as a crucial component of business and not merely as a source of cost-effectiveness due to the pandemic. Companies have been forced to respond to the migration of consumers to the online world by innovating their business to communicate with customers through digital channels. Internet traffic peaked when people started learning, working, collaborating, and shopping from home.

Acceleration of digitalization is evident in all sectors, with varying intensity. Finance, pharmacy, professional services and trade are the sectors in which the change in the way of doing business was most visible. The adoption of digital technologies meant investing in them.

If we were to summarize the effects of the pandemic on digital transformation, it would be necessary to point out a few things:

- The increase in awareness of the importance of technology for business - companies have been compelled to adopt certain technologies without the usual comprehensive planning and implementation process and to adapt to change much faster. Furthermore, prior to the pandemic, technology was viewed as a means to automate activities and eliminate unnecessary expenses. Many managers now recognize that technology is a tool that facilitates innovation and progress.
- Analysis of organisational digital capabilities - the impetus for digital transformation has resulted in many organizations starting to go through the process of analyzing their technological capabilities and investments.

- Increasing the use of automation to improve the user experience - companies have made a huge effort towards automation, which has increased their ability to create new experience for customers.
- Increased investment in cybersecurity solutions - with a higher level of digitalization, companies have improved the level of security of their systems.

It is interesting to note that the survey showed that in B&H 23.7 percent of companies felt that they were under pressure to digitize certain operations, which resulted in an increased degree of digital transformation, but also investments.

„Due to the pandemic, the digitalization process that began in our organization simply had to continue, and even faster than intended. Teleworking, online shopping, and the availability of information to employees in such a new environment have all contributed to the acceleration of business' digital transformation“ – Telecommunications

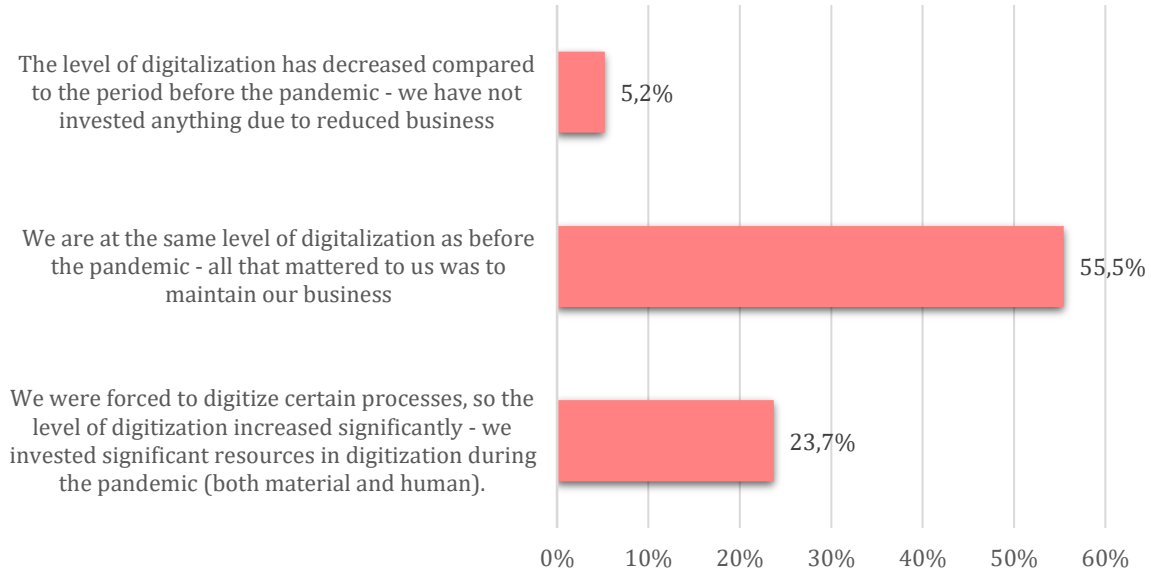


Figure 64. The impact of the pandemic on the level of digital transformation

Companies also had to invest in hardware, especially portable devices, due to remote work:

„ Due to the increased number of employees working from home during the pandemic, we had to procure a larger number of laptops, which at one point were very few on the market due to high demand“ – Public administration

On the other hand, 5.2% of companies reduced their investment in digitalization due to the pandemic, most likely because to lower turnover. Finally, the majority of businesses (55.5 percent) remained at the same level since their priority was only to maintain business, to survive. The comments of the respondents speak in favor of that:

„ *There was a slight decrease in turnover in 2020, so we did not invest anything in the additional level of digitalization*" – Trade and services

„*Due to reduced demand, we had to struggle with survival and job preservation*" – Furniture manufacturing

„*We have not been able to invest in digitization and employ adequate staff in this field*" – Professional services

The debate that is taking place among businesses all around the world is about the future of the many adjustments that have been implemented in response to the outbreak. The question is whether these changes will disappear together in a pandemic. Many of the changes, from working from home to increased interaction with customers through online channels, are likely to prolong their existence in the corporate environment. Companies have already made significant investments; therefore there is no reason why they should not reap the benefits in the post-pandemic period. Given that companies have realized the strength and potential of digital technologies, it is to be expected that they will continue to use them and take advantage of the benefits they offer. However, when it comes to B&H, additional efforts are needed to promote digital transformation, especially among SMEs, and to improve the areas that drive digital transformation.

SMEs can follow three different main paths to a digitized firm: accelerating digitization, digitizing sales functions, and finding digital partners to enter the market. SMEs can opt for one of three digital transformation paths based on their level of digital maturity, learning culture, and history of digital technology use. However, because most industries require direct engagement with clients, digitization of the sales function is required.

In addition to the above, the amount of data managed becomes higher, which means that companies require more resources to support their operations. This would require new management mechanisms and the creation of new specialized jobs. Companies can combine online and offline business to develop synergies between the two business models with the support of digital technologies (Priyono et al., 2020).

PROFILE OF BOSNIA AND HERZEGOVINA

Following the example of the *Digital Transformation Scoreboard 2018*, this chapter presents a profile of B&H that provides a description of specific conditions that enable digital transformation, outcomes, benefits, areas for improvement, as well as a brief comparison with other European countries.

Conclusions were made by the method of triangulation based on primary and secondary data presented in the previous chapters.

6. PROFILE OF BOSNIA AND HERZEGOVINA

The figure below presents the methodological approach to presenting the B&H profile.

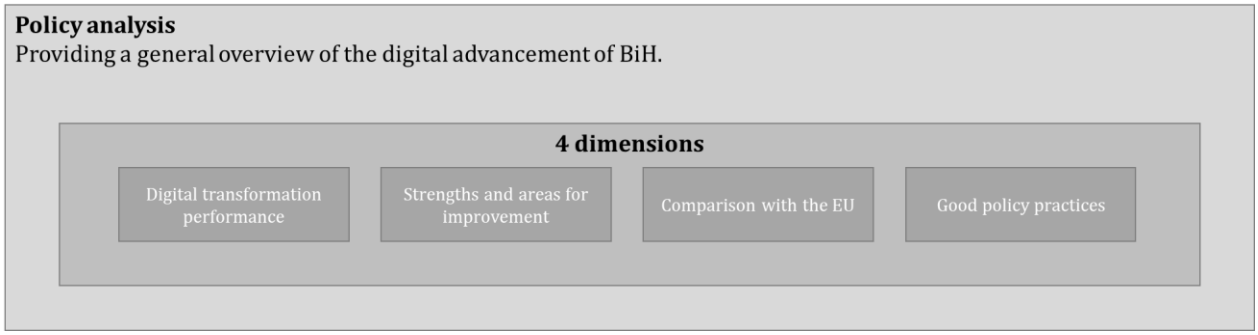


Figure 65. Methodological approach to presenting the country profile

Source: Probst et al. (2018)

The level of digital transformation in B&H can be assessed as low to moderate. Companies face a variety of challenges in all areas defined as drivers of digital transformation: digital infrastructure, digital skills supply and demand, entrepreneurial culture, investment and access to finance, and e-leadership. Most indicators place Bosnia and Herzegovina below the EU average and at the bottom of the ranking. Given the complexities of governance in Bosnia and Herzegovina, governments at all levels are attempting to identify steps to achieve the country's digital transformation, but the results are barely visible. Projects carried out by internationally active institutions and organizations in this field have a substantial impact on improving the stage of digital transformation.

6.1. Drivers of digital transformation

In terms of digital infrastructure, Bosnia and Herzegovina ranks near the bottom of the table when compared to other European countries. When it comes to talent competitiveness, Bosnia and Herzegovina lags well behind the rest of the region in terms of digital skills supply and demand. B&H is at the bottom of the table, which ranks countries based on the number of ICT experts employed, as well as the percentage of enterprises that have equipped employees with portable devices that enable mobile internet access for business purposes. The assessment of entrepreneurial culture shows that, although entrepreneurship is considered an attractive occupation, still very few people intend to become; or become entrepreneurs. The causes for this can be found in a variety of aspects, ranging from macroeconomic to those associated with the process of establishing businesses, to the business environment itself, and even to people's personality traits. The conclusion regarding investments and access to financing in Bosnia and Herzegovina is that it is relatively simple to obtain a loan (especially compared to other countries in the region). However, when it comes to investing in research and development, the availability of venture capital, and raising money in the stock market, B&H has a worse position than most neighboring countries. It is interesting that the total

income tax rate (share in commercial profit) is much lower than in developed European economies. When it comes to the e-leadership indicator, Bosnia and Herzegovina is at the bottom of the table. According to data on the percentage 10of companies that have trained ICT / IT professionals to develop/upgrade their ICT skills and the percentage of companies that provide their employees with mobile devices for mobile internet connection, Bosnia and Herzegovina is not at the bottom. Bosnia and Herzegovina, on the other hand, is the worst-ranked country in terms of the percentage of enterprises having a workforce with a higher education.

Overall, the assessment of digital infrastructure in B&H is unfavorable in many respects. This is directly reflected in the level of digital transformation.

6.2. Strengths

The vast majority of companies in B&H are equipped with a fixed broadband connection. BH companies can benefit from easy access to loans. Many people consider starting a business a desirable career choice, and promotion and support for entrepreneurship could significantly improve many aspects of the economy. A solid assessment of e-leadership in Estonia is more a consequence of the skills acquired in academic education than on-the-job training provided by companies. The amount of taxes and mandatory contributions that the company pays in the second year of operation, expressed as a share of commercial profit, is quite favorable, so it could be used to attract investments while creating a more stimulating business environment (in terms of starting a business, etc.). An increasing number of companies are turning to e-commerce, which opens up the possibility of expanding the market.

The level of technology adoption and digitalization in B&H is low, which in turn reflects on the country's growth potential. However, the communication and Internet infrastructure is relatively satisfactory, and the ICT sector also tends to grow. In this regard, B&H has the opportunity to take advantage of this, as well as the EU's efforts through the European Union's Digital Agenda for the Western Balkans. This can be used to improve the presented indicators, and consequently, the overall social progress.

6.3. Areas for improvement

B&H continues to face significant shortcomings in most of the areas that drive digital transformation. Commercial loans are available, but venture capital, which is very important for the development of entrepreneurship and SMEs, does not exist in the ecosystem. Furthermore, the country's low performance in terms of talent competitiveness and qualified ICT professionals is evident. In addition, B&H is far below the EU average in the number of companies using the ERP system that enables electronic sharing and processing of information, which is the first step towards the transformation of the business to e-business. The country is poorly positioned on the global competitiveness index as well as on the global talent competitiveness index.

Poor results in the field of digital transformation are a consequence of insufficient use of digital technologies for business purposes. Despite high usage of DSL and broadband communications, the country's average Internet bandwidth has significant room for improvement.

All of the above leads to the conclusion that B&H has room for improvement in each of the analyzed areas that compose the list of drivers of digital transformation. This will create a basis for the improvement of the adoption of digital technologies and digitalization of business and result in a more favorable position of B&H when it comes to the integration of digital technologies, but also in the evolution of the IT start-up environment.

It is necessary to carry out the necessary improvement activities in the SME sector since there is no institutional framework at the state level to support the development of these enterprises. Consequently, there is a lack of financial instruments to promote innovation within small and medium-sized enterprises. Although the FB&H Government provides some financial support, the measures are mostly ineffective and do not meet the real needs of SMEs (ITU, 2018). In addition, funding is divided between several levels of government and there is a lack of coherence and monitoring of implementation as well as achieved effects between different government initiatives. It is important to note that usage of available from EU funds at the low level. This is probably a consequence of the lack of qualified staff.

Low performance in the field of digital skills supply and demand has resulted in the low innovation performance of the country. The ITU (2018) in this report states that young entrepreneurs too often give up their initial venture and re-enter the regular workforce in large companies instead of treating their initial failure as a platform for learning, personal development and improving the next venture. This speaks to the lack of entrepreneurial culture and the already ingrained fact that young people want to stay in their comfort zones, striving for a job in the public sector as the best option. In other words, risk aversion is high, and it is necessary to promote an entrepreneurial culture on several levels.

Inadequate tertiary education and IT staffing results in poor e-leadership performance.

6.4. Comparison with European countries

As already mentioned, the basic drivers of digital transformation are:

- Digital infrastructure (4 indicators)

  B&H's position regarding the number of companies using DSL or other forms of fixed broadband connection is in line with the European average. However, B&H is much worse positioned when it comes to internet bandwidth. When it comes to integrating business processes using ERP systems, B&H is quite low on the table, just ahead of Bulgaria, Romania, Turkey and Hungary. Only Hungary is behind B&H if we speak about the number of

companies that use CRM to analyze customer data. In conclusion, B&H's digital infrastructure lags behind the infrastructure of most European countries. According to official data, the situation is comparable to Bulgaria, Romania, while Hungary is probably in a worse position. According to the UN (2020), B&H belongs to the economies in transition in the category of higher and middle income, while Bulgaria and Romania belong to the developed economies in the category of higher and middle income, and Hungary in the category of developed countries with high income.

- Supply and demand of digital skills (4 indicators)

  According to the innovation results, B&H is at the very bottom of the table, behind Bulgaria, Romania, Hungary, and even neighboring countries. Also, in B&H it is much harder to find people with the skills needed to fill a job than in most European countries. Only Hungary and Romania are positioned behind B&H. It is interesting that B&H's companies generally do not have difficulties in filling the ICT experts' jobs, unlike many developed EU countries that are worse positioned (Belgium, the Netherlands, Finland, etc.). However, if the interpretation of this result includes the fact that a far smaller percentage of B&H companies employ IT professionals, if at all, then it is clear that the data on the difficulties in finding experts does not indicate the situation on the labor market. B&H is positioned below the European average when it comes to the number of employees who received a portable device that enables mobile internet connection for business use, just ahead of Cyprus and Bulgaria. In conclusion, B&H is far behind all countries in the region when it comes to talent competitiveness, which is a very devastating figure. In addition, B&H is at the bottom of the table, which ranks countries according to the percentage of employment of ICT experts, as well as the percentage of companies that have provided employees with portable devices that enable mobile internet connection for business use. All this results in a low level of innovation and indirectly on overall social progress.

- Entrepreneurial culture (3 indicators)

  The overall entrepreneurial activity, as well as the entrepreneurial intentions in B&H are far behind most European countries. Only the situation regarding the perception of the occupation of an entrepreneur is more positive. However, although entrepreneurship is considered an attractive occupation, very few people intend to become or become entrepreneurs. The reasons for this can be found in many factors, starting from macroeconomic, those related to the process of founding companies, to the business environment itself, but also the personal characteristics of people. It can also be the result of a complex administrative environment that makes it difficult to open a new company and even more difficult to close it if the venture fails.

- Investments and access to finance (6 indicators)

Investments in research and development, as well as direct investments in the IT sector are indicators according to which B&H is positioned behind most European countries. On the other hand, the total income tax rate expressed as a share of commercial profit positions B&H above many developed countries (B&H companies are less burdened by this tax), and it is easier to get a loan than in many countries. However, the availability of venture capital, as well as access to the stock market, again puts B&H to the very bottom of the list, which ultimately determines access to finance as less favorable for business compared to most European countries.

- e-leadership (3 indicators)

  Bulgaria, Romania, Greece, Lithuania, Northern Macedonia and Turkey are countries that are worse positioned in B&H in terms of the number of companies that have trained IT professionals to develop/upgrade their IT skills. However, it is last on the list when the number of companies with a higher education workforce is taken into account. Finally, Bosnia and Herzegovina is close to the EU average in terms of the number of companies that provide their employees with mobile devices for mobile internet connection. Bulgaria, Romania, Cyprus, Greece, Slovakia and Italy are behind B&H when it comes to this indicator. In other words, companies in B&H lack highly educated staff but also trained IT staff.

Overall, B&H is in a far worse position than most European countries in terms of drivers of digital transformation. It can be comparable only with Bulgaria, Romania and Hungary, and in some parameters with Greece and Cyprus.

A few more comparative analyzes of B&H that can be important in interpreting the state of the level of digital transformation, but also the drivers of DT are presented in the text below.

According to the **World Bank Profile of Bosnia and Herzegovina**[6], the political system in B&H is very complex, reflecting constitutional provisions developed to end ethnic conflicts, as well as subsequent changes to the system introduced under the leadership of the international community through the Office of the High Representative. A key economic challenge of B&H is the imbalance of its economic model: public policies and incentives are directed towards the public, not the private sector, consumption rather than investment and imports instead of exports. Bosnia and Herzegovina needs to develop a business environment that will attract private investment for SMEs and the growth of large companies. It is also very important to work on facilitating original performance and improving productivity, as well as creating the necessary jobs in the private sector. In order to ensure sustainability and future growth, it is necessary to address the imbalance in the economic model.

[6] Profile of B&H – World Bank. Available at: https://www.worldbank.org/en/country/bosniaandherzegovina/overview#1 [access: 23.08.2021.]

The business environment in Bosnia and Herzegovina is quite unstable. According to the **Report of the World Bank**[7] (World Bank Group, 2020), the figure below presents the ranking of B&H according to topics relevant to the business. Thus, for example, when it comes to starting a new business or starting a company, the registration procedure consists of 5 steps. Compared to the surrounding countries, Bosnia and Herzegovina ranks 184th out of 190 countries. Montenegro ranks 101st, Croatia 114th. Furthermore, in terms of tax payments, B&H ranks 141st out of 190 countries. Croatia is on the 49th, and Montenegro is in the 75th position. Also, B&H is in the 70th position out of 190 countries when it comes to cross-border trade, while Montenegro is in the 41st.

Figure 66. Ranking of B&H according to topics relevant to business (1-190)

Source: World Bank Group (2020)

According to the **Network Readiness Index for 2020**[8] (Portulans Institute, 2020), Bosnia and Herzegovina ranks at 87th position. When it comes to neighboring countries, Croatia is on the 43rd, while Serbia is in the 52nd position. The Network Readiness Index is a report that ranks a total of 134 world economies based on their performance in 60 variables. Recognizing the prevalence of digital technologies in today's networked world, the index is based on four basic dimensions: technology, people, management, and performance. This holistic approach means that this index covers issues ranging from future technologies such as artificial intelligence and the Internet of Things to the role of the digital economy in achieving sustainable development goals.

[7] Report „Doing Business 2020. Available at: https://www.doingbusiness.org/en/data/exploreeconomies/bosnia-and-herzegovina [access: 23.08.2021]
[8] Report „Network Readiness Index 2020". Available at: https://networkreadinessindex.org/wp-content/uploads/2020/11/NRI-2020-V8_28-11-2020.pdf [access: 23.08.2021]

Furthermore, the **Global Connectivity Index** is a report that ranks 79 countries on the S-curve chart and maps the transformation to the digital economy. According to ICT investments, ICT maturity and digital performance related to the economy, the S-curve maps countries into three clusters (groups): Beginners (starters), Those who are in the adoption phase (Adopters) and Leaders (frontrunners). Since 2019, the CGI research methodology has been expanded to help policymakers understand the growing impact of artificial intelligence on the global economy. When it comes to the Global Connectivity Index for 2020[9] (Huawei, 2020), Bosnia and Herzegovina is not among the 79 leading countries. When it comes to neighboring countries, Croatia is in the 38th position, while Serbia is in the 51st position.

In addition to the above global reports, when it comes to the **Global Cybersecurity Index 2018**[10] (ITU, 2019), Bosnia and Herzegovina ranks: 118th out of 175 countries worldwide in terms of cyber security and 43rd out of 46 countries at the European level on cyber security. The Global Cyber Security Index (GCI) is a complex index that combines 25 indicators to measure the monitoring and comparison of countries' cyber security commitment levels against the five pillars of the Global Cyber Security Agenda (GCA). These pillars form the five GCI subindexes. The main objectives of the GCI are to measure:

- types, levels and evolution over time of cybersecurity commitment in countries and in relation to other countries;
- progress in the cyber security commitment of all countries from a global perspective;
- progress in the commitment to cybersecurity from a regional perspective;
- Cybersecurity breakdown (i.e., the difference between countries in terms of their degree of involvement in cybersecurity initiatives).

The goal of the GCI is to help countries identify areas for improvement in cybersecurity, as well as motivate them to take action to improve their current state, thus helping to raise the overall level of cybersecurity worldwide. Through the information gathered, the GCI seeks to show the practices of others so that countries can implement selected aspects adjusted to their national environment, with the added benefit of helping to harmonize practices and foster a global culture of cybersecurity.

6.5. Good practices

The EU Digital Agenda for the Western Balkans is one of the most significant efforts in the field of digital transformation. This agenda aims to support the region's transition to a digital economy and bring the benefits of digital transformation, such as faster economic growth, more jobs and better services. The Information Society Development Policy in Bosnia and Herzegovina 2017-2021 also represents a significant policy framework. This policy is aligned with the eEurope 2020 Strategy and

[9] Report „Global Connectivity Index 2020“. Available at: https://www.huawei.com/minisite/gci/en/index.html [access: 23.08.2021.]
[10] Report „Global Cybersecurity Index 2018“. Available at: https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI.01-2018-PDF-E.pdf [access: 23.08.2021.]

the Digital Agenda 2020. It is important to note that some of the most important good practices are related to projects of international organizations, especially GIZ and UNDP.

CONCLUSION

This chapter presents the basic conclusions of the study through two perspectives. First, the overall level of digital transformation of companies in B&H was assessed and discussed. Secondly, on the basis of all results and conclusions, the companies were profiled on the basis of the level of digital transformation. Three basic profiles were presented and assessment of the structure of the B&H market according to the identified profiles was performed.

7. CONCLUSION

7.1. The level of digital transformation of companies in B&H

B&H, as a developing country, has a lot of room for technological progress and digitalization. The technological progress of companies in B&H varies significantly, ranging from the fact that some companies almost do not use digital technologies to those that are at a higher level of digital transformation. When asked to rate the level of digitalization of business on a scale from 1 to 10, where 1 is the lowest and 10 the highest, the **average score obtained is 6.4**. On the other hand, the average grade of the level of digitalization in relation to the main competitors is 5.6. It should be emphasized, however, that self-evaluation depends on the level of knowledge of the company's managers, those who know more and have digitally transformed the business cautiously give themselves average grades, while those who don't have knowledge or idea of what can be covered by digital business transformation give themselves high grades without adequate factual background. In this regard, it is necessary to perform a qualitative assessment of individual segments of digitalization and application of IT in business, as presented in the text above.

It is evident that there are differences in the level of digital transformation depends on the sector in which companies operate. Companies engaged in production as the basic drivers of digital transformation represent business needs for solving problems in production. These problems can often be quantified and monitored numerically before and after the implementation of information technology. Examples of such problems are:

- machine downtime,
- waiting and idling of the workforce during the production process,
- time required to find parts and materials and consumption of raw materials,
- loss of raw materials through scrap and
- percentage of rejected final products through the quality control process.

Similarly, organizations that have a large number of employees engaged in the trade or have business processes that include vehicles for delivery and distribution of products have implemented solutions for recording working hours of employees, productivity and GPS tracking of fleet and fuel consumption.

The size of the company also determines to some extent the level of digital transformation. However, it is interesting that medium-sized companies (from 50 to 249 employees) have a higher rate of technology adoption. The reason for this could potentially lie in the fact that a number of large companies have inherited practices from the previous system and still have the problem of a high degree of bureaucracy within their business operations.

Business internationalization is also a significant indicator of the focus on the adoption of digital technologies in business. Organizations that have entered the European and international markets

with their products have a greater degree of maturity of business processes, harmonization with international business standards, which consequently requires a digital transformation that allows digital recording of business events, easy proof of business facts during internal and external audits. With these organizations, it is evident that digital transformation is incorporated not only through Enterprise Resource Planning (ERP) software solutions, but also through the use of Document Management System (DMS), Customer Relationship Management (CRM) systems and even Supply Chain Management (SCM) systems operating in the public or private cloud, addressing all security elements such as encrypted communication between remote locations, use of firewalls and antivirus software solutions. A greater degree of digital transformation has been observed in SMEs operating in several geographically distributed locations, in the territory of B&H, or in several countries.

A greater degree of digital transformation, as well as joint-venture **investments** organized between domestic and foreign investors, leads to the standardization of processes that are already established in digitally transformed parent companies.

Unfortunately, very few companies have a formally defined digital transformation strategy. Organizations without formal digital transformation strategies depend on the quality of individuals who are in positions of IT managers who have their informal plans. Following their potential departure, such informal plans would also disappear. It is important to note that an organization that has a formal digital transformation strategy usually implements information technology in all areas of business and even implemented solutions such as 3D printers, artificial intelligence and big data analytics, as well as a prediction system for forecasting revenue in the coming business periods. It is clear that digital transformation does not only apply to new technologies but also implies and requires changes in organizational culture, ways of thinking, improvement of skills, and even changes in organizational structures.

It is evident that small and micro enterprises focus on survival and digital transformation in these enterprises is considered as a necessary evil and is applied only in necessary processes such as e-mail communication and the use of computers in accounting processes. It is evident that a significant number of companies (especially micro companies) have neither a registered website nor a domain for web presentations.

SMEs are key to inclusive economic development but are extremely neglected due to institutional and market regulations, especially due to limited access to external financing. SMEs play a key role in providing income from different workforce segments, creating new jobs, fostering added value and economic growth (Sommer and Disse, 2020).

The basic idea of digitalization is the efficient and full use of ICT tools, while the main purpose of digitalization is to improve access and improve business. Digitization also enhances the reputation and image of institutions. By digitizing their business processes, SMEs make business transactions more profitable, save time, and have less stress. First of all, the physical sale of goods is time consuming and stressful. Working on an e-commerce platform or through a website can give SMEs

the opportunity to increase sales and access to new customers in both the local and international markets. Also, e-commerce allows for flexibility of time, geographical location and product delivery.

SMEs can use customer insights and data to design new products that meet customer requirements. However, the high cost of introducing software and technology has made it difficult for enterprises to develop such capabilities on their own. But with the arrival of cloud-based solutions, these software packages have become free, while functionality and virtual goods have become billable. However, lack of knowledge of new technologies as well as skepticism discourage businesses from engaging in digital initiatives.

There is also a fear related to data protection and security, i.e., unauthorized access, destruction, alteration or disclosure of information to others without permission, as well as cyber-attacks. In addition, a large number of SMEs face a lack of resources and a poor state of infrastructure for efficient operations. There are inequalities in access to finance, government loans and grants (Fields et al., 2014).

7.2. Company profiling

Based on the presented data analysis, it is possible to identify three categories of companies depending on the level of application of digital technologies in business.

The first group includes companies that we have called "Traditionalists", alluding to their aspiration to do business using established processes and considering digital technologies an unnecessary expense.

TRADITIONAL COMPANY

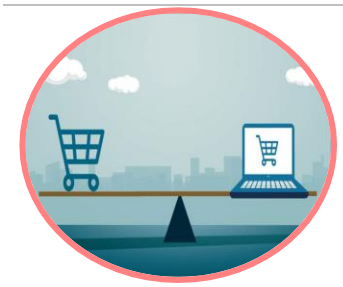
Description

- Digital technologies are used at a minimum.
- There is a strong perception that technologies are not necessary for business.
- The company probably doesn't have strategic plans either, and if it does, IT is not one of the strategic goals.
- It does not have a person in charge of IT (neither internally nor outsourced).
- Often there is not even a website, and if there is, it is purely informative.

Technologies	• The company mainly uses social networks and, to some extent, mobile technologies. • Very often without any protection against cybercrime or implemented only antivirus software. • There are usually no integrated business processes that use ERP systems.
Demography	• Usually a micro or small company. • Most often a private company, domestic capital or a public institution. • It is more often a family business. • The owner is often the director of the company. • More common in service industries and trade. • It mainly operates only in the B&H market.
Tagline	„Why invest in expensive technologies when it is definitely best to work the old-fashioned way “

Table 9. Description of the category "Traditional company"

The second group includes companies that have developed awareness of the importance of digital technologies for business and are on the path to digitalization.



DIGITALLY AWARE COMPANY

Description	• Digital technologies are used in the company in most functional areas. • Digital technologies are considered as a means to achieve more efficient business. • The company probably doesn't have strategic plans either, and if it does, IT is not one of the strategic goals. • Usually, it does not have a person in charge of IT (they hire IT staff according to the indicated need - outsourcing)
Technologies	• It mainly uses social media, mobile technologies and introduces the use of cloud services.

	• It very often applies protection against cybercrime. • More often it has integrated business processes using ERP systems.
Demography	• Usually a micro or small company. • Most often a private company, domestic capital or a public institution. • The function of the owner and director of a company is often segregated. • Equally in most industrial sectors. • Mainly produces for both local and foreign markets.
Tagline	„We must be digitized because digitization increases efficiency and it enables us to follow competitors“

Table 10. Description of the category "Digitally aware company"

Finally, the third group includes companies whose degree of digital transformation is high.

DIGITALLY ADVANCED COMPANY

Description	• Digital technologies are used in the company in all functional areas, and in most of them, they are very advanced technologies. • Digital technologies are seen as a means to achieve competitiveness and innovation. • The company has strategic plans, and IT is part of the strategic commitment. • Has a person or department in charge of IT.
Technologies	• It uses most of the technologies adequate for the sector in which it operates. • It has a more advanced protection system against cybercrime. • It has integrated business processes using ERP systems.
Demography	• Usually a large or medium company. • Most often a company with a share of foreign capital in the ownership structure.

	• The function of the owner and director of the company is completely separate. • Most often in the finance sector and the manufacturing industry, as well as in the IT sector. • Operates for both local and foreign markets.
Tagline	„ Technology is a tool for enhancing overall corporate performance“

Table 11. Description of the category "Digitally advanced company"

Based on the collected secondary and primary data, the authors of this study made an assessment of the structure of B&H industry when it comes to the three identified company profiles (note: the result is only an assessment).

Figure 67. The estimate of the structure of B&H industry

According to this estimate, 4 percent of enterprises in Bosnia and Herzegovina are digitally advanced (as defined above), while 24 percent are on the path of digitalization. Unfortunately, the majority of the population, up to 72 percent, are charactered as traditional businesses, i.e., businesses that employ digital technology only to a limited extent, most commonly a specific system for monitoring certain activities (rarely ERP), and social networks for communication with customers.

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Appendicies

Appendix 1. Questionnaire

Introduction
Company:
E-mail:
Website:
Year of the establishment of your company:
A number of employees: 1-9 10-49 50-249 250 and more
Annual income in EUR (average over the past 3 years): Up to EUR 2 million 2 to 4 million EUR 4 to 6 million EUR 6 to 8 million EUR 8 to 10 million EUR 10 to 50 million EUR 0ver 50 million EUR
Industry / business sector in which your company operates: 1. Agriculture, forestry and fishing 2. Mining and quarrying 3. Manufacturing industry (production) 4. Production and supply of electricity, gas, steam and air conditioning 5. Water supply, wastewater disposal, waste management, and environmental remediation activities 6. Construction 7. Wholesale and retail trade; repair of motor vehicles and motorcycles 8. Transport and storage 9. Accommodation and food service activities (hotels and restaurants) 10. Information and communication 11. Financial and insurance activities 12. Real estate business 13. Professional, scientific and technical activities 14. Administrative and support service activities 15. Public administration and defence; compulsory social insurance 16. Education 17. Health and social work activities 18. Arts, entertainment and recreation 19. Other service activities
How would you describe your company when it comes to the market in which you operate? An internationally recognized company

We operate in the European market
We operate in the B&H market
We are still in the business development phase
Start-up

Level of business digitalization

How would you rate the level of informatization and digitalization of your company on a scale from 1 to 10, where 1 is the lowest and 10 is the highest?

How would you rate the level of digitalization of your company in relation to your competitors (scale from 1 - we are much worse than competitors, to 10 - we are much better than competitors)?

Does your company have an integrated Enterprise Resource Planning (ERP) software solution?

Yes No

Which of the following digital technologies do you use in your business? Please select all that you use.

1. Social media (e.g., social networks, blogs, forums, etc.)
2. Mobile services (e.g., location-based technology, wearable technologies, etc.)
3. Cloud technologies (e.g., Amazon EC2 - Virtual IT, Google App Engine - hosting application, Google Apps and Microsoft Office Online - SaaS, Apple iCloud - network storage)
4. Internet of Things - e.g., active monitoring and optimization of industrial machines, network product identity and supply chain monitoring (Supply Chain Tracking, etc.)
5. Cybersecurity solutions (e.g., encryption, antivirus protection, etc.)
6. Robotics and automated machinery (e.g., automated assistant or automated machine, etc.)
7. Big data and analytics (e.g., Apache Hadoop, MapReduce, etc.)
8. 3D printing
9. Artificial intelligence (virtual shopping, augmented reality / virtual reality / mixed reality – e.g., AcrossAir, Google Sky Map, PokemonGo, VR glasses)

Which of the following digital technologies do you use in your business? Please select all that you use (some questions are intentionally repeated).

What were the main purposes of your company in adopting some of the digital technologies? List all that apply.

- Enhance data privacy and protection of client data
- Engage with customers
- Understand customers' behaviours and tastes
- Analyse information on your products, services, employees
- Improve the design and production processes
- Improve your marketing and advertising strategies
- Enhance sales
- Deploy new products
- Enhance services
- Be more competitive
- Reskill the workforce

- Other

Please indicate why you have not implemented any digital technologies in your firm:

- We don't need technology for business
- Technologies are too expensive
- Technologies are too complex and complicated
- We have no information or knowledge about the technologies we could use
- We don't have employees with enough skills to use them
- All of these technologies are insecure
- Other

Impacts of digitalisation

How would you evaluate the impact of technology adoption and digitization on your company's annual turnover (last 3 years, excluding pandemic effects)?

- Significantly increased (> + 20%)
- Increased (<20%)
- Remained unchanged
- Decreased (<-20%)
- Significantly decreased (> -20%)

How would you evaluate the impact of technology adoption and digitization on your company's operational costs (last 3 years, excluding pandemic effects)?

- Significantly increased (> + 20%)
- Increased (<20%)
- Remained unchanged
- Decreased (<-20%)
- Significantly decreased (> -20%)

In your opinion, what are the most common advantages of business digitalization?

- Increase in turnover / revenue
- Profit growth
- Cost reduction (savings)
- Creating a better customer experience
- Product and service innovation

Has the adoption of digital technologies resulted in positive business results for your company?

Yes No

If the answer to the previous question is Yes, then the question follows:

What benefits has your company had from the adoption of digital technologies / digitization?

- Enter new markets
- Gain new clients
- Bring new or significantly improved products or services to market
- Shift you current customers towards new products and services
- Improve and / or change its business model

What business functions have been enhanced by the adoption of some of the above digital technologies?

- Technical architecture
- Quality assurance
- Project management
- Strategic partner management
- Technology prototyping
- IT Programming
- Business requirements management
- Enterprise architecture
- User experience design
- CRM
- Operational Marketing

How has the digitalization of business affected the number of employees in your company?

- Maintain the number of employees stable
- Increase the number of employees and create vacancies
- Decrease the number of employees

Attitude about digitalization

Do you consider the development of information technologies and the digital economy as a chance for the business of a company like yours? Choose one of the answers.

- The availability of new digital technologies is an opportunity for my company
- Digital technologies have already generated positive results for my company
- The availability of new digital technologies poses an operational risk to my company

What are the opportunities or threats (risks) to which the company is exposed in its business due to the development of the digital economy? Briefly explain.

What is the percentage of annual turnover that you invest in IT and digitalization of business?

- Between 0% and 5%
- Between 5% and 10%
- Between 10% and 15%
- Between 15% and 20%
- Over 20%

What is the percentage of annual turnover that you invest in the training strategies of your employees (especially in the field of digital skills)?

- Between 0% and 5%
- Between 5% and 10%
- Between 10% and 15%
- Between 15% and 20%
- Over 20%

Which of the following answers corresponds to the investment in digitalization processes in your company?

- We have invested our own funds in the integration of digital technologies/digitization
- We have raised funds (from investors) to invest in the integration of digital technologies
- We received money from the state/entity / canton/municipality to invest in the integration of digital technologies

When it comes to improving products/services, what was the primary goal of investing in your company's digital transformation?

- We have invested in the development of new products or services that enable digital technologies
- We have invested in improving production processes through digital technologies

Digitalisation strategy and planning

Is there a business innovation and digitalization strategy in your company?

- We have an integrated innovation and digitalization strategy
- We also have an officer/employee who is in charge of digital transformation and computerization of business
- We have a department/employee that deals with business development and development of new products and services using digital technologies
- We do not have a strategy for innovation and digitalization

Choose the answer that best reflects the state of your digital strategy.

- We have prepared a digitalization strategy at the company level
- We have implemented a digitalization strategy and it is functional in our company
- We have implemented a digitalization strategy as part of our company's corporate strategy - it has changed our business model
- We plan to establish a digitization strategy in the next 3 years
- No, we have no digitization strategy
- Other

Do you plan to continue to introduce digital technologies in your business and invest in computerization?

Yes No

If the answer to the previous question is No, then the question follows:

Why not?

- We don't need technology for business
- Technologies are too expensive
- Technologies are too complex and complicated
- We have no information or knowledge about the technologies we could use
- We don't have employees with enough skills to use them

- All of these technologies are insecure
- Other

Which of the following technologies and services do you plan to start using in your business in the next 3 years?

- Social media (e.g., social networks, blogs, forums, etc.)
- Mobile services (e.g., location-based technology, wearable technologies, etc.)
- Cloud technologies (e.g., Amazon EC2 - Virtual IT, Google App Engine - hosting application, Google Apps and Microsoft Office Online - SaaS, Apple iCloud - network storage)
- Internet of Things - e.g., active monitoring and optimization of industrial machines, network product identity and supply chain monitoring (Supply Chain Tracking, etc.)
- Cybersecurity solutions (e.g., encryption, antivirus protection, etc.)
- Robotics and automated machinery (e.g., automated assistant or automated machine, etc.)
- Big data and analytics (e.g., Apache Hadoop, MapReduce, etc.)
- 3D printing
- Artificial intelligence (virtual shopping, augmented reality / virtual reality / mixed reality – e.g., AcrossAir, Google Sky Map, PokemonGo, VR glasses)

Do you think your company will benefit from improved levels of digitization and digital transformation in the future?

Yes No

If the answer is Yes, the question follows:

What benefits of digitalization do you expect for your business?

- Increased turnover or profit
- New customers
- Improved user experience (service)
- Increased access to new foreign markets
- Improved data collection and analysis
- Increased number of innovations
- Consolidated (systematized) business processes and operations
- Reduced operating costs
- Empowered and skilled workers
- Increased business visibility
- Other

Which of the following tools do you use on the Internet for business purposes?

- Company website
- A blog, a micro-blog like Twitter or Instagram
- Media sharing sites like YouTube, Slide Share
- Information access networks such as Google, Wikipedia
- Social networks such as Facebook, LinkedIn

- We don't use anything
- Other

Do your employees possess adequate digital skills?

- Our employees have basic digital skills (they know how to use e-mail, web search, social networks, etc.)
- Our employees have above-average digital skills (they know how to use digital solutions for data exchange, accounting, digital marketing, sales and shopping, etc.)
- We have IT experts in our company
- We outsource IT experts
- We don’t need any digital skills for employees in our company
- Other

What do you need to promote the digital transformation of your company? Please select the three most important options.

- A handbook with recommendations and practical examples of how digital solutions can improve your business
- Support programs (for staff and management)
- Individual consultations
- Information campaigns
- Leaflets with information on various digital solutions
- Training
- Staff with digital skills
- We don't need anything
- Other

To your knowledge, are there any policies for the digitalisation of industry in B&H? Specify.

Are you aware that there are some other initiatives for the digitalisation of business operations in B&H? Specify.

Are you aware that there is a company that is an example of good practice in digital business transformation? Specify.

In your opinion, what are the main obstacles and barriers to business digitalization that companies in B&H face?

How has the Covid-19 pandemic affected the level of digital business transformation in your company? Explain.

- We were forced to digitize certain processes, so the level of digitization increased significantly - we invested significant resources in digitization during the pandemic (both material and human).
- We are at the same level of digitalization as before the pandemic - all that mattered to us was to maintain our business
- The level of digitalization has decreased compared to the period before the pandemic - we have not invested anything due to reduced business