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DIGITAL TRANSFORMATION: THE KEY TO SMART CITIES AND MODERN REGIONAL DEVELOPMENT

ABSTRACT

The process of organizational change through the use of digital technologies and business models to improve economic performance and respond to changing consumer behavior is inevitable for modern organizations. Digital transformation is a comprehensive process of integrating modern digital technologies into economic, social and administrative systems, in order to achieve more effective, adaptive and sustainable forms of management, production and service. It is not limited to the simple implementation of technologies but implies a deep rethinking and reorganization of business models, public policies and social interactions. The significance of digital transformation for the economy is multidimensional. At the macroeconomic level, it accelerates economic growth by increasing productivity, encourages innovation and creates new markets and forms of employment. At the same time, digitalization contributes to greater transparency, flexibility and efficiency in the management of public resources, which in turn improves the investment climate and competitiveness at the regional and national levels. At the macroeconomic level, digital transformation allows enterprises to optimize their processes, personalize the services offered and respond more adequately to the needs of consumers in the conditions of a globalizing and high-tech economy. In addition, it creates prerequisites for digital inclusion and social innovation, which are essential for fair and sustainable economic progress. The aim of this study is to determine to what extent the demand for digital services is developing in Bulgarian regional development and what are the factors that limit this process. The determinants of demand are examined as a function of the interests and attitudes of users of digital services in the public sector.

KEY WORDS: digital services, artificial intelligence in municipalities, regional digitalization

JEL: H7, R53, R58

INTRODUCTION

Digital transformation plays a central role in creating smart cities and stimulating modern regional development. In recent years, information technologies have expanded their application in all areas of governance, economy and people's lives. Thanks to them, the world is moving rapidly from economy 3.0 to economy 4.0 and is expected to enter 5.0. The main feature that distinguishes economy 5.0 from previous ones is intelligent development. Through the integration of innovative technologies such as artificial intelligence, big data and blockchain technology, cities and regions can become more effectively connected and sustainable. Smart cities also use digital solutions to optimize transport systems, manage energy, monitor the environment and improve the quality of life of citizens. At the same time, regional development is accelerated through intelligent infrastructure, digital services and e-government platforms that facilitate communication between business, administration and citizens. Digitalization not only improves the efficiency of urban and regional systems, but also creates new opportunities

for economic growth, sustainable development and social inclusion. Despite all these opportunities, we can say that there are some difficulties in the introduction of digitalization. They are related to the higher initial costs of implementation, especially in smaller municipalities. Training people is also a serious challenge.

Of course, in order to achieve a high degree of connectivity and economic efficiency in the economy, it is necessary to universally implement new information technologies in all areas of the social and economic life of the countries. For this purpose, it is important to create a digital space in municipalities and between them. At the same time, with the advent of information technologies, interest in territorial and regional issues is growing, which partly explains the revival of interest in regional science and regional economics. This requires modeling regional development as a function of territorial and innovation (information) policies. In Bulgaria, statistics show a high degree of access to the Internet. However, digital connectivity and smart development in municipalities are still at a low level.

The transition to green energy and sustainable urban planning, driven by EU policies and local community perceptions, has positioned the concept of the "green city" as a key topic in both academic and practical discourse. This study provides an in-depth analysis of the current understanding of green cities, while identifying cities structurally prepared for this digital transition.

In recent years, several economic models of cities have been developed around this hypothesis, including at the European Union level. They differ above all in the specific characteristics of each region, but also in terms of culture, level of development, political decisions or pre-existing urban planning. Although all these economic models of cities share common principles such as the desire to have a variety of services when acquiring housing, a detailed analysis reveals that they differ significantly (Pozoukidou & Chatziyiannaki, 2021). After analyzing the existing specialized literature, a relationship can be observed between the perception of quality of life and the level of green spaces in the city. Giannico et al. (2021) conducted an in-depth study using a sample of 51 European cities, in which they showed that, from the perspective of citizens, urban governance of the city and green spaces contribute to the general well-being of their residents, reduce the effects of climate change and have a significant positive contribution to the overall health. This shows that the concept of a green city will be increasingly popular as a model for the development of European cities (Coisnon et al., 2024). Based on this type of study and model of digitalization development, we can say that external factors play a key role in the development of internal factors.

1. LITERATURE REVIEW

In our study, we examine the larger Black Sea municipalities. In Bulgaria, these are the municipalities of Shabla, Kavarna, Balchik, Aksakovo, Varna, Avren, Dolni Chiflik, Byala, Nessebar, Pomorie, Burgas, Sozopol, Primorsko and Tsarevo. Their total area amounts to 5,737.3 km2, which represents 5.2% of the country's territory. It includes 202 settlements with a population of 726,745 people, or 10.4% of the country's population. The center in the northern part - the city of Varna - is the third most populous center, and the center in the southern part - the city of Burgas - is the fourth most populous city in the country.

The main objective of the study is to analyze the role of digital transformation as a key driver for building smart cities and sustainable regional development. The study aims to identify good practices, innovative technologies and management approaches that contribute to the modernization of the urban environment, improving the quality of life and stimulating economic growth at the regional level. The emphasis is placed on the interaction of the public sector, business and citizens in the process of digital transformation.

Often, an analysis of different groups of users is used as a tool, in terms of the market situation of certain services, as well as to assess their ability to influence or be influenced by the market price. In general, there is a big difference between the production and management approaches applied in large and small municipalities. The size of municipalities and the digital technologies they use are often related to the potential of the municipality to make investments and successfully develop its business. Larger municipalities have easier access to financing and can very quickly implement the digitalization approach, as long as they see a sense or motive for it. For smaller municipalities, digitalization does not create opportunities, but on the contrary, requires additional investments that are too much for them. High initial costs, associated in some cases with a risk of insufficient return on investment, can become a serious challenge in terms of the accessibility of the technological component of digitalization.

In order to have objective data, we will consider only municipalities with a population of over 1,500 people. Thus, they will fall into focus and analysis because they could build innovative systems for digitalization. In this direction, a number of studies can be found related to new trends in technological scale, which apply an adequate approach to studying municipalities. A similar study analyzes the innovative technologies of municipalities in the Black Sea region of Bulgaria (Tsonkov et al., 2024). In this analysis, the authors propose the formation of a criteria framework for assessing the degree of digitalization of municipalities in the Black Sea region of Bulgaria. It is important to note, despite the population, whether they have a regulatory environment and opportunities for the introduction of digitalization and innovation policies. In order to analyze the degree of application of modern information and communication technologies, it is necessary to use a systematic approach, comparative analysis, statistical assessment, geoeconomic analysis, and other scientific approaches to clarify the problem areas in the field of intelligent development of municipalities in the space of the Bulgarian maritime region. Due to the specificity of the relief, we can say that a multidisciplinary method is needed to assess digitalization and innovation for a smart and modern city

2. METHODOLOGY

Digital transformation is a subject of attention among several scientific researchers (Berman & Marshall, 2014; Chaffey, 2015; Stott et al., 2016; Scuotto et al., 2017), as well as managers, consultants from different sectors (Indulska et al., 2012; Li, 2018; Nagel-Martin, 2016; Wade, 2015). The definitions presented below express the essence of the concept of “digital transformation” in two different groups – business and public organizations.

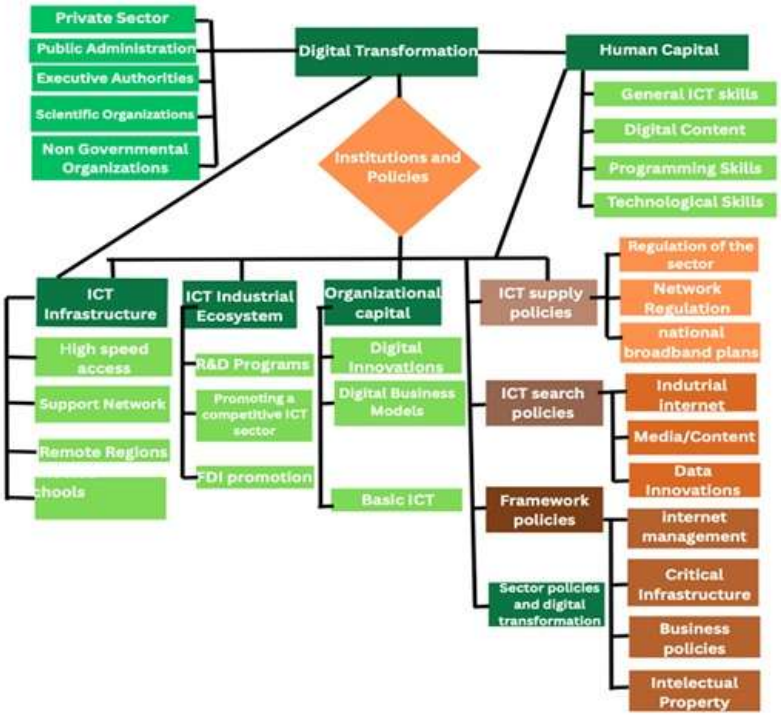
“Digital transformation refers to strategic, customer-centric business transformation that requires cross-sectoral/horizontal organizational change, as well as the implementation of digital technologies – digital transformation of business and business strategies. Digital transformation is not about something being digital or about digital products or services. It is a combination of transformative digital technologies, tools, processes and most importantly people (culture and mindset) that truly transform the way business is done today.” (Ministry of e-Government, 2022). Technology is of course an important part, but digital transformation is not limited to that. It is usually tied to innovation, as it is “not a reaction to today’s business environment, but rather a proactive approach to anticipate the next big opportunity” (Ministry of e-Government, 2022).

The development of information and communication technologies is the driver of digital transformation in the public sector. It is associated with initiatives such as launching online services or modernizing software. Therefore, the term is more likely to be “digitalization” than “digital business transformation” (Ministry of e-Government, 2022).

Digital transformation is a process characterized by the widespread implementation and combination of digital technologies in all spheres of public and economic life (Council of Ministers of the Republic of Bulgaria, 2020b).

Figure 1 presents a diagram of digital transformation with the main participants in it and the existing interconnections between them.

Figure 1. Diagram of digital transformation – Main actors and interrelationships (Council of Ministers of the Republic of Bulgaria, 2020b).

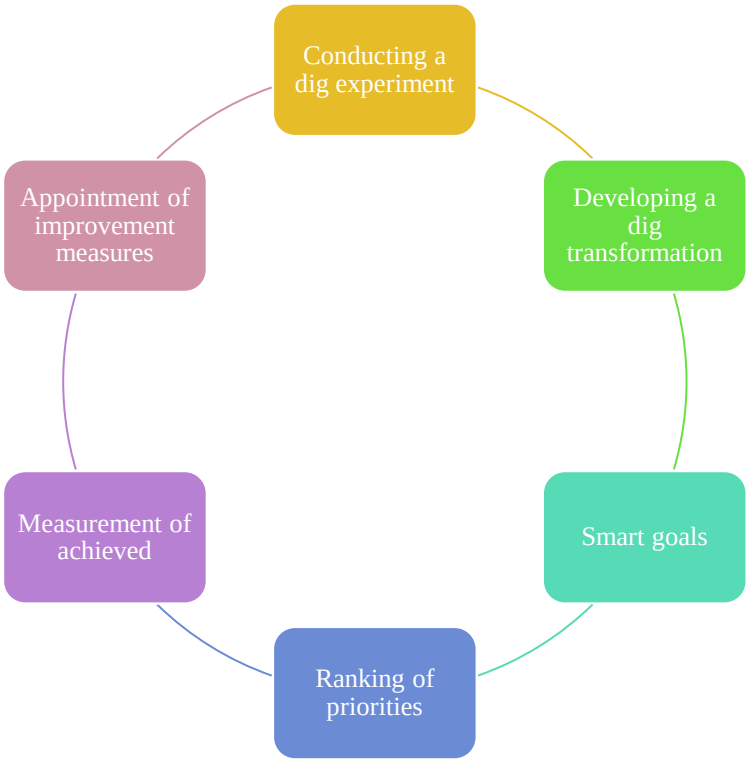


Source: Miroslava Boneva (2024), Factors for digital and business transformation.

The importance of digital transformation is associated with the broad impact that changes in the behavior of economic entities have. According to the sixth area of impact "Digital Economy", presented in the strategic document "Digital Transformation of Bulgaria for the period 2020-2030" (Council of Ministers of the Republic of Bulgaria, 2020b), digital transformation itself has enormous potential for economic growth both at the regional and national levels. Bulgaria should build on its strengths in advanced digital technologies and its stable presence in traditional sectors to take advantage of the opportunities offered by technologies such as 5G networks, the Internet of Things, big data, robotics, AI, blockchain, 3D printing, etc. This is expected to allow Bulgarian organizations to take a share of the emerging markets of the products and services of the future. Industry and its interaction with services occupies a large share and plays an important role in the development of the Bulgarian economy. This interaction is important to be supported by facilitating investment in new technologies and accepting the changes that have occurred as a result of increasing digitalization and the transition to a low-carbon and circular economy. According to Slavova (2016) and the authors cited, the transformation of consumer experiences when using the organization's goods and services is expressed in the in-depth study of market segments and their behavior in the marketing space, consumer behavior and loyalty, interactive communications with customers in the sales process and the digitalization of the largest possible number of touchpoints between the organization and customers. An algorithm for implementing digital business transformation has been proposed to improve administrative services. It aims

to transform processes and adapt to modern conditions caused by the dynamics of technological development, related to the regulatory framework, as well as the growing dynamics of consumer demand.

Figure 2. Algorithm for digital transformation in the organization



Source: Boneva, 2018

Figure.2 shows the digital transformation model. The logical sequence of key aspects when implementing digital transformation resembles the Deming cycle (Nedyalkov et al., 2018), as transformation is not a one-time act, but a process that serves to adapt the organization to the changing external environment and continuous improvements are needed.

The stages through which the digital transformation in the organization should go have a strict sequence:

1) Conduct a digital audit – this is the initial stage, as a diagnosis of the condition is necessary to proceed to other actions.

2) Developing a digital transformation strategy - based on the current state, a strategic framework for desired business development is outlined.

3) Setting SMART goals – in accordance with the strategic framework, goals are set that are specific, measurable, achievable, relevant, have practical significance and are time-bound.

4) Prioritization – arranging goals by degree of importance and allocating tasks for implementation.

5) Measurement of the achieved results - after completing the tasks, their implementation is checked and evaluated, compared with the indicators of the respective goal in order to assess the degree of its implementation.

6) Appointment of improvement measures - depending on the achieved results and the discrepancies with the set goals, as well with the changes that have occurred in the external

environment in the meantime, proposals for improvements are created, and a new transformation cycle begins.

In connection with the application of an adequate and relevant framework for studying this process, the research of Tsonkov and Petrov can be mentioned. The authors develop an analysis for assessing sustainable and smart cities (Tsonkov & Petrov, 2024). Their research and analysis represent a serious attempt to analyze the process of implementing new technologies and digital tools, including 5G technologies (Tsonkov & Petrov, 2024). According to the authors, the digital development of municipalities is directly related to the implementation of a new generation of mobile and Internet communications and technologies. Thinking in this direction, GIS technology offers a wide range of opportunities for developing a model for analyzing and assessing the digital transformation of Bulgarian municipalities. A similar experience, based on the GIS system, is the study of Tsonkov and Kostev (Tsonkov & Kostev, 2023). The authors examine the smart development of municipalities in Northeastern Bulgaria, using analysis of geospatial data and statistical models. On the other hand, Berberova-Valcheva attempts to examine the level of development and provision of electronic services in municipalities in Bulgaria, thus revealing the degree of digital transformation of Bulgarian cities (Berberova-Valcheva, 2024).

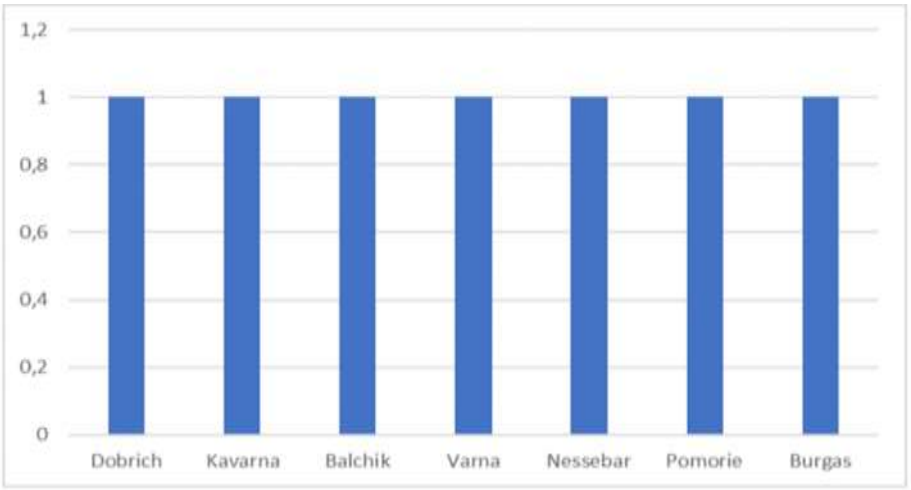
RESULTS

Analyzing both citizens 'perceptions of urban green spaces and the European Commission's goal of achieving climate neutrality by 2050, it is clear that there is a clear shift towards green urban development. A smart city is a technologically advanced urban area that uses various types of electronic methods, voice activation methods, and sensors to collect specific data. The information obtained from this data is used to effectively manage assets, resources and services. In return, this data is used to improve operations in the city.

This study analyzes the applied innovation policies. In Bulgarian conditions, the concept of a smart city is vague, since activities related to the combination of information and communication technologies are carried out spontaneously and rarely proportionally to the existing information and physical environment. In Bulgarian conditions, new software and technological solutions are required, but the process is not sustainable, and management decisions do not have the necessary rationality. This requires the use of limited resources, improvement of the infrastructure, and the working and living environment as a condition for the introduction of intelligent systems in cities. In this sense, we can assume that a smart city uses a framework of information and communication technologies to create, implement and promote development practices to address urban challenges and create a unified technologically enabled and sustainable infrastructure [3]. This definition gives us sufficient reason to assume that a smart city is a set of territory in which there is a system of hardware, software (modern information and communication technologies), connected in a network through which modern problems of urban management are solved. The basis of smart cities is connectivity, a reliable information environment that allows for optimal decisions related to life in the urban system. Therefore, smart development combines modern information and communication technologies with decision-making system management that improves the environment, economic processes and the use of limited resources. We can conclude that smart management solutions combine connected information and communication technologies with the database and information flows to optimize management processes. In this regard, we can give an example of gamification. This is a simulation model in various fields through which we can predict when and where certain events will occur in order to take the necessary measures to prevent damage. According to the study by Tsonkov, Petrov, Berberova (2024), effective management of smart cities depends on strategic policies and innovations in regional development

Figure 3 shows a graph with selected Bulgarian cities that have undertaken strategies for innovative policies in their regional development.

Figure 3. Adopted strategies, intelligent content development as part of the document.



Source: systematization of the authors

Looking at the graph, we can summarize, and we can categorically state that in the indicated cities, strategies and policies have been adopted to develop intelligent innovative approaches to digitalization for a higher level of security of citizen service processes. "Digital transformation can refer to everything from IT modernization (e.g. cloud computing), to digital optimization, to the invention of new digital business models. The term is widely used in organizations by municipalities and customers.

According to Goodman (Goodman, 2016), every ten minutes we create as much information as in the first ten thousand generations of humanity. The cost of storing this data is also falling exponentially. This huge growth in the global information infrastructure is often called the “big data revolution”. Through big data, several complex tasks are now finding their solution. For example, in the field of medicine, when all patient data is catalogued in electronic medical records, doctors will be able to monitor which treatment is most effective, notice deadly side effects of drugs and even predict the development of a disease before symptoms appear. As a result of big data processing, profit growth is observed in all industries and, according to the organizers of the World Economic Forum, data is “the new oil” (Goodman, 2016).

This is why the transformation of data from ongoing processes into value and added value for the organization is crucial.

In this regard, it is important to seek answers to questions such as:

Does the organization derive value from its data?

How can data sets be used to make informed decisions?

How can big data be processed through artificial intelligence and offer possible solutions?

How to transform data into suggestions that meet set intentions?

1. Digital transformation in organizations has the potential to answer some of these questions. For this reason, this scientific paper pays special attention to **the digitalization of the integrated management system**.

In this direction, the review of the municipalities along our Black Sea coast shows that the introduction of intelligent systems has made some progress. In practice, it is necessary to carry out a number of structural and organizational activities and strategies at the municipal level, despite the accumulated experience, as evidenced by Table 1, which shows the strategic understanding of the problem by the municipalities. As the author emphasizes in his publication, digital transformation is inextricably linked to the number of implemented projects.

Table 1. Implemented smart projects/initiatives, implemented strategies and platforms in Bulgarian maritime municipalities with 10,000 or more

Cities	Number of implemented or ongoing smart projects / Initiatives	Existing local smart city strategy and policy	Smart City Platform
Dobrich	8	1	0
Kavarna	3	1	0
Balchik	4	1	0
Varna	10	1	1
Nessebar	7	1	1
Pomorie	9	1	0
Burgas	25	1	1

Source: systematization of the authors

The analysis shows that all municipalities have implemented strategies for the development of smart systems, including several projects and initiatives. However, there is some delay in the construction and facilitation of smart city platforms. This shows that municipalities are ready to implement a wide range of electronic and digital technologies. This will lead to a transformation of the living and working environment in the region. Not least because the inclusion of such information and communication technologies requires training and sustainable management of these processes. Analyses of the development of specific smart city strategies in the Black Sea municipalities show that they need to catch up. Only the municipality of Burgas has prepared such a document. At the same time, the municipalities of Nessebar, Varna and Burgas have made their smart city platforms. Municipalities represent a key territorial unit where the interests of citizens, business and public administration intersect. In this sense, the digital transformation of municipalities is not just administrative modernization, but a strategic process that has a direct impact on the quality of life, sustainability and competitiveness of settlements. By introducing electronic services, cloud platforms and automated processes, municipalities can significantly improve the efficiency of public administration. This leads to better access to services, reduced bureaucracy and increased transparency in management. E-government not only improves the relationship between citizens and institutions but also increases trust in local government. Investments in smart infrastructure - intelligent transport systems, energy-efficient street lighting, waste management through sensors and environmental monitoring platforms - contribute to the sustainable development of cities. Municipalities that successfully integrate technologies become incubators for innovation and attractive investment zones. When there are conditions for a

favorable ecosystem, including the Internet, digital hubs, and training for start-ups, municipalities can stimulate the development of the local economy. Digitalization creates prerequisites for new business models, jobs, and economic diversification, especially in less developed areas. Digital transformation allows for new forms of citizen participation in the decision-making process, such as electronic voting, consultations, and open data. This leads to higher engagement, higher cohesion, and the development of a culture of joint responsibility in the local community. Of course, despite all the opportunities, the digital transformation of the municipality also faces some challenge, in terms of the lack of human potential, limited funding, as well as still weak coordination between institutions. This requires focused work to build unified policies at the European level.

CONCLUSION

Digital transformation is no longer a choice, but a necessity for modern society. It is a driving force that unlocks the potential of smart cities and provides the foundation for sustainable and modern regional development. By implementing innovative technologies, smart infrastructure and real-time data, cities and regions can become greener, more connected, and more attractive for people's businesses. Digitalization not only improves the quality of life but also creates new economic opportunities, increases administrative efficiency, and encourages civic participation. In a world where change is constant, digital transformation is the key that unlocks the door to a more innovative, fair, and sustainable future. Only by boldly embracing digital innovation can we build cities and regions that meet the challenges of the future. Technology gives us tools, but vision and trust between people are the true foundation of smart communities. Regional development is not measured only in kilometres of infrastructure, but in speed and connectivity, and quality of life. Digital transformation connects people, economies, and ideas in a common effort for progress and sustainability. The future belongs to those who realize the power of technology today and turn it into an engine of positive change.

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