ORIGINAL SCIENTIFIC PAPER

E-GOVERNMENT AS A KEY FACTOR FOR THE EFFICIENCY OF PUBLIC ADMINISTRATION: EVIDENCE FROM THE VISEGRAD GROUP

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ABSTRACT

The modernization and digitalization of administrative procedures are key elements of e-government development, as they improve the efficiency, accessibility, and transparency of public services. This paper analyzes the development of e-government through public services, information, and communication between governments and private individuals, businesses, and other stakeholders via digital technologies, especially the Internet. The study covers the countries of the Visegrad Group (Czech Republic, Slovakia, Hungary, and Poland). Officially available data from the United Nations (UN e-Government Knowledgebase) served as the basis for the secondary research. The time frame of the study extends from 2010 to 2024. The research results show, firstly, that the observed group of countries is at the bottom of the EU ranking, and secondly, that Poland has improved its level, while the other V4 countries are lagging behind in the development of e-government.

Keywords: *e-Government, public services, ICT, development, Visegrad Group.*

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INTRODUCTION

In order to modernize the public sector and align the private sector with global trends, digital transformation is more important than ever. The digitalization of all areas of society is now a necessary reality that must be addressed at every level, rather than a matter of personal preference. The ongoing process of digital transformation is expected to be significantly accelerated by the introduction of new technologies characterized by rapid and intensive development [1]. Every nation, including the V4 countries, must prioritize the reform of public administration.

The introduction of electronic services and the digital transformation of public administration are key elements of the reform process. Digital transformation involves reorganizing and improving business processes using all available digital tools and technologies [2]. This includes enhancing business processes and providing digital and electronic services within public administration. The development of e-government and the digital society depends on the regulatory framework. In particular, legislation aims to create an environment that encourages greater use of electronic commerce and to strengthen public confidence in the use and exchange of electronic documents [3], [4].

The strategic and coordinated use of information and communication technologies (ICT) in public administration has become increasingly important in recent years. The three basic principles of e-government are democratic participation, quality public services, and efficient administration. The modernization of public administration and governance largely depends on the development of e-government. E-government promotes economic and social development and strengthens the relationship between the state and its citizens by providing more accessible, efficient, and transparent services. However, for e-government to succeed, challenges such as the digital divide, cybersecurity threats, and resistance to change must be addressed.

The provision of public services to citizens through the use of technical means of communication, such as computers and the Internet, is known as e-government. With e-government, citizens can access government services more easily and directly, while the government can provide services more efficiently. In 2001, the United Nations began conducting a study on the level of digitalization in public administration—e-government. The three key components—online services, telecommunications infrastructure, and human capital—are summarized in the e-Government Development Index (EGDI), with results published biennially [5]. This survey is the only global assessment that evaluates the level of e-government development in individual UN member states. It is primarily aimed at policymakers, as well as professionals with expertise in sustainable development, public administration, digital governance, and ICT [6], [7], [8].

LITERATURE REVIEW

In an effort to increase the efficiency of the public sector, many governments around the world are using information and communication technologies (ICT) to overhaul their service delivery systems [9], [10], [11]. Many countries have transformed their public sector administrative models through the targeted and comprehensive use of modern ICT [12]. There is great interest in how the development of ICT, e-government, and the quality of a country's institutions affect economic development [13], [14], [15]. Using ICT and state-of-the-art technological resources, the actual implementation of electronic government necessitates and drives cultural changes in society [16], [17]. Governments around the world have launched several initiatives to reduce the digital divide, maintain public trust, and improve the openness and transparency of government services to achieve sustainable development. One strategic platform for realizing such goals is e-government [18]. E-government refers to the use of digital technology to establish electronic channels that improve the efficiency of public services, boost economic growth, and raise living standards [19], [20]. Based on ICT, e-government represents a paradigm shift in state administration, aiming to make public services more widely and effectively accessible [21].

Given the considerable investment made to create processes that enable transparency in a large part of national operations [22], e-government processes have become a key area of development [23]. The creation of electronic services that consumers can access online is the main goal of e-government development in most countries [24]. As state governments work to digitize their services, and given that public administration is a key factor influencing sustainable development, it is necessary to gain a deeper

understanding of how the digital revolution affects ESG [25]. Innovations in global e-government are making municipal initiatives more efficient and better organized in delivering services and improving public outcomes [26], [27], [28]. The irreversible process of digitalization in the public sector affects both the organizational structure of public institutions and the communication channels between individuals and institutions [29], [30], [31]. According to Dias [32], formal e-government plans and strategies and the ability to implement them can make a difference and enable nations to achieve better-than-expected results. A comparative study of e-government adoption practices in different countries provides an opportunity to identify the advantages and disadvantages of current information technologies and to discover strategies for maximizing and improving the efficiency of public administration [33]. The results of Mensah [34] showed that the perceived value of e-government services was significantly influenced by both the performance and capacity of the government.

The most widely used metric for assessing the growth of e-governance is the EGDI, created by the United Nations [35]. The impact of the EGDI on the Worldwide Governance Indicators (WGI) in the EU Member States was examined by Yuliantini & Nurmandi [36]. The results show that the six WGI indicators are not significantly affected by the introduction of e-government based on EGDI data in the EU Member States. Sukarno & Nurmandi [37] found that the EGDI had the greatest influence on the WGI indicators for government effectiveness and regulatory quality, with a value over 0.53. According to the EGDI analysis for South Asian countries conducted by Younus et al. [38], the development of e-government should focus on providing better quality services to citizens. Paul & Adams [39] use cross-sectional data from 2012–2020 to examine how e-government development indices influence the Corruption Perceptions Index. The results show that corruption perceptions increase when the OSI increases, that the TII and corruption perceptions are statistically significant but not negatively related, and that the HCI decreases corruption perceptions. Against the backdrop of the global crisis and economic downturn, Lněnička [40] examines and compares the development of EGDI in the EU Member States from 2008 to 2014. The results show that the crisis in the Eurozone and the global recession affected the development of e-government during the years examined. A well-developed e-government infrastructure, reflected in a higher EGDI score, has a positive impact on anti-corruption initiatives and governance practices in various African countries [41].

To promote economic growth, innovation, and competitiveness within the European Union, the countries of the Visegrád Group have intensively developed their digital systems [42]. According to Dziembala's [43] analysis of the concept of sustainable competitiveness of regions, Visegrád Group regions with high GDP per capita do not always occupy top positions in terms of sustainable competitiveness. Ermasova et al. [44] analyzed how governance reforms affected public administration outcomes in the Czech Republic, Hungary, and Slovakia.

Advances in ICT in Poland are impacting the expectations citizens have regarding state administration [45]. During the COVID-19 pandemic in 2020, the highest number of users accessed e-government services [46]. Given the relatively low level of e-government technologies in Poland compared to other European countries, it is reasonable to look for explanations for this situation. Among the various variables influencing the further development of e-government technologies, trust appears to play an important role [47].

Citizen participation in modern public administration in the Czech Republic is examined by Linhartova [48]. With the introduction of e-government, citizens are better informed and able to participate in decision-making, which increasingly makes them co-producers of public goods and services. Kopáčková [49] addresses the problem that led to the creation of the "202020" initiatives, which aimed to bring the Czech Republic into the top 20 nations according to the United Nations' e-government development index by 2020.

With the aim of enabling every potential user to make better use of services, e-government involves the use of ICT by public administration institutions to deliver services. The results show that the acceptance of e-government services in Slovakia is significantly influenced by perceived benefits, the amount of information available about e-government, perceived service quality, perceived security, and trust in e-government [50]. One of the key competencies is digital competence [51]. The lack of digitalization in Slovakia, along with deficits in citizens' digital skills and communication with institutions, was especially evident during COVID-19. One of the most important components of e-government is digital skills that enable users to interact with public administration via e-government services [52], [53]. According to Pisár et al. [54], Slovakia has outperformed the Czech Republic in terms of digitizing key government services. Both countries have room for improvement in some areas and have committed in their strategy documents to further developing them.

The success of e-government in a citizen-centered approach begins when citizens start using e-government services, solutions, and systems. The findings of Aranyossy [55] suggest that the Hungarian government can influence effort expectancy, internet trust, facilitating conditions, user experience, and habits to further improve the use of e-government services. Aranyossy [56] claims that increasing internet trust and improving infrastructure in Hungary, along with a convincing value proposition emphasizing time savings and ease of use, can help increase the acceptance of e-government services. Although electronic administration is considered extremely important by most Hungarians, its actual usage rate remains relatively low [57].

RESEARCH METHODOLOGY

There are many different research approaches to promoting e-government, varying in terms of their objectives, characteristics, and scope. Some aim to measure how ICT or e-government affects a nation's economic growth, while others examine residents' satisfaction and how it impacts their daily lives. The ranking of countries based on the results of these surveys is relative and can be interpreted in different ways. The main aim of this paper is to analyze the development of e-government in the countries of the Visegrad Group (Czech Republic, Slovakia, Hungary, and Poland). The methodology was based on desk research using secondary data from the UN database (UN e-Government Knowledgebase), and the analysis covers the period from 2010 to 2024. The United Nations *e-Government Survey* is conducted every two years. In this paper, the analysis focuses on the e-Government Development Index (EGDI).

The EGDI is a benchmarking and development tool that helps countries identify their strengths and weaknesses, learn from each other, and develop e-government policies and strategies. Mathematically [58], the EGDI is the weighted average of the normalized scores of the three most important e-government dimensions: (a) Online Service Index (OSI), (b) Telecommunication Infrastructure Index (TII), and (c) Human Capital Index (HCI).

$$EGDI = 1/3\ (OSI_{\ normalized} + TII_{\ normalized} + HCI_{\ normalized}) \quad (1)$$

As these are composite measures, each of these indices can be extracted and analyzed separately.

The Online Service Index (OSI) assesses the willingness and ability of a government to communicate electronically with its citizens and provide services. It evaluates the four stages of online accessibility of national authorities. The first stage, known as emerging information services, assesses whether the government's website provides links to other government departments and agencies, as well as easily navigable material for the general public. The second stage, enhanced information services, assesses whether a government website facilitates one-way or two-way communication between citizens and government agencies in a straightforward manner. The third level, transaction services, evaluates the level of interaction between citizens and the national administration, including the ability to manage government policies and solicit citizen input.

The Telecommunication Infrastructure Index (TII) quantifies the existing state of the infrastructure required for citizens to participate in e-government. The TII measures the estimated number of individuals per 100 inhabitants who use the Internet, have a primary fixed line, are mobile subscribers, have fixed Internet subscriptions, and access fixed broadband services. While the OSI examines the digital presence and service capabilities of governments, the TII assesses the capacity of national communication infrastructure to enable citizens to participate in all forms of e-government.

The Human Capital Index (HCI) measures citizens' ability to use e-government services. It is derived from the total gross enrollment rates for primary, secondary, and tertiary education, along with the adult literacy rate.

RESEARCH RESULTS

The e-Government Development Index (EGDI) reflects the level of e-government development in each United Nations member state. Countries are categorized into four mathematically defined levels within the EGDI range from 0 to 1: very high (0.75–1.00), high (0.50–0.7499), medium (0.25–0.4999), and low (0.00–0.2499). The EGDI tracks the progress of public administration across 193 countries globally. According to the 2024 index, the top five countries are Denmark (0.9847), Estonia (0.9727),

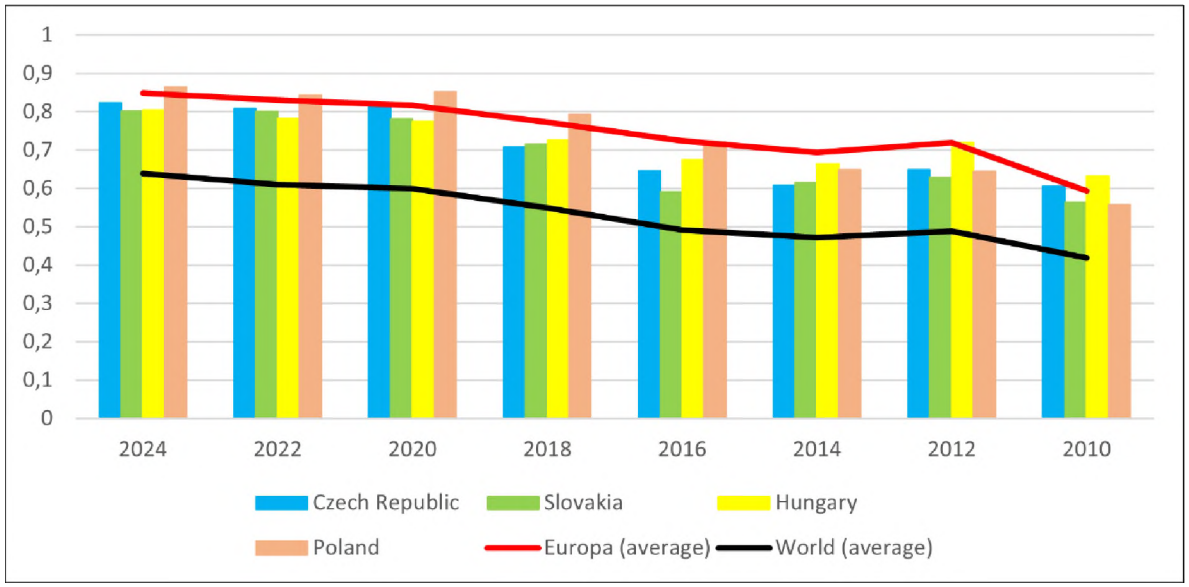
Singapore (0.9691), the Republic of Korea (0.9679), and New Zealand (0.9671). In 2022, Denmark (0.9717) also held the top position, followed by Finland (0.9533), the Republic of Korea (0.9529), New Zealand (0.9432), and Iceland (0.9410). The Visegrad Group countries, however, are not among the top performers, as illustrated in Table 1.

Table 1. V4 countries - EGDI ranking

		Czech Republic	Slovakia	Hungary	Poland	Europe (average)	World (average)
2024	EGDI	0.8239	0.8021	0.8043	0.8648	0,8493	0,6382
	Rank	54	60	59	37	-	-
2022	EGDI	0.8088	0.8008	0.7827	0.8437	0,8308	0,6102
	Rank	45	47	51	34	-	-
2020	EGDI	0.8135	0.7817	0.7745	0.8531	0,8170	0,5988
	Rank	39	48	52	24	-	-
2018	EGDI	0.7084	0.7155	0.7265	0.7926	0,7727	0,5491
	Rank	54	49	45	33	-	-
2016	EGDI	0.6454	0.5915	0.6746	0.7211	0,7241	0,4922
	Rank	50	67	46	36	-	-
2014	EGDI	0.6070	0.6148	0.6637	0.6482	0,6936	0,4712
	Rank	53	51	39	42	-	-
2012	EGDI	0.6491	0.6292	0.7201	0.6441	0,7188	0,4882
	Rank	46	53	31	47	-	-
2010	EGDI	0.6060	0.5639	0.6315	0.5582	0,5937	0,4178
	Rank	33	43	27	45	-	-

Source: UN E-Government Knowledgebase, 2024.

Among all European Union countries monitored, Denmark had the highest EGDI index value in 2024 (0.9847). However, the V4 countries—Czech Republic (22nd place), Hungary (25th), and Slovakia (26th)—are among the last six EU countries with the lowest index values. This clearly indicates that the V4 countries are lagging behind the rest of Europe in terms of e-government development. With an EGDI of 0.8648 in 2024, Poland ranks 17th among EU member states and is therefore slightly better positioned than the Czech Republic, Hungary, and Slovakia, but still significantly below the leading EU countries. The development of e-government does not appear more favorable in the other years observed (2010 to 2022). However, it is worth mentioning that Poland ranked 26th in terms of e-government development in 2010. In comparison, certain progress can be observed, even though Poland still falls far short of keeping pace with the most developed EU member states in the field of e-government services.



Graph 1. E-Government Development Index (EGDI)
Source: UN E-Government Knowledgebase, 2024.

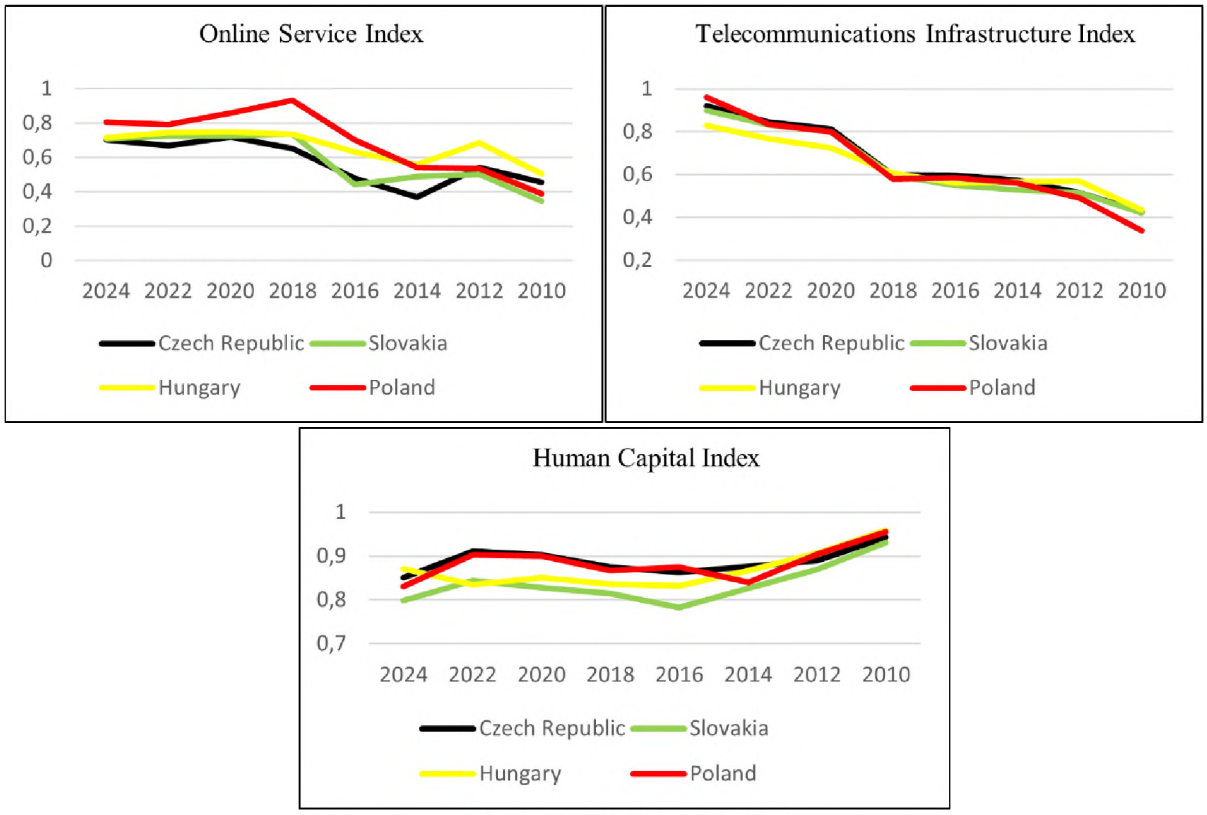
Graph 1 presents the EGDI scores of the V4 countries for the period 2010–2024, in comparison with the average for European countries and the global average. Compared to all other countries (193 in total), the V4 countries ranked between 24th and 67th place, which clearly indicates that ideal conditions have not yet been established to support a more comprehensive development of public administration. When analyzing the e-Government Development Index for the V4 countries, it is noticeable that Poland was the best-ranked country from 2016 to 2024, with an index ranging from 0.7211 to 0.8648.

When comparing the development of e-government in the V4 countries with the global average, it can be said that these countries have made progress. However, this comparison is not entirely adequate, as the analysis includes many countries around the world that are at a significantly lower level of development than the V4. The fact that the overall European average is consistently higher than the average for the V4 countries highlights that the development of e-government in these countries is still not at an optimal level. Looking exclusively at EU member states, it is clear that the V4 countries are significantly lagging. This is further supported by the fact that the V4 countries have been behind in e-government development for over 20 years, with no visible indicators that this trend will change in the near future.

As previously noted, the EGDI evaluates how countries utilize ICT to deliver public services effectively. In the following sections, all three components of this index will be discussed from the perspective of the V4 countries. These components determine a country's ranking—higher scores reflect a more advanced level of e-government development.

ICT has proven to be one of the most important factors for the successful development of e-government. Accordingly, the EGDI measures the capacity and readiness of the public sector to use ICT to promote knowledge and information for the benefit of citizens.

Based on the results of a comprehensive survey assessing many aspects of online presence (including all 193 UN member states), key OSI estimates were determined. The five OSI sub-indices cover: the provision of services, the institutional framework supporting e-government development, content provision, portal technology, and e-participation. The normalized values for each of these sub-indices are used to calculate the composite OSI score. On a scale from 0 to 1, the results represent standardized index scores, where 0 indicates the lowest level and 1 the highest level of online service provision.



Graph 2. OSI, TII and HCI
Source: UN E-Government Knowledgebase, 2024.

In recent years, the V4 countries have significantly improved their performance in this segment. Graph 2 shows that at the beginning of the observation period, the OSI value ranged between 0.3 and 0.5 in the V4 countries (middle OSI group). Subsequently, the OSI value increased gradually, with occasional fluctuations—most notably in 2014, when the OSI declined in three of the four observed countries. The fastest OSI growth was recorded in Poland, which demonstrated consistent improvement from 2010 to 2018. Over the past six years, Poland's OSI value reached 0.8 (very high OSI group), representing the highest result among the V4 countries. The other countries (Czech Republic, Slovakia, and Hungary) had OSI values ranging between 0.65 and 0.75 during the same period (high OSI group).

When examining the TII throughout the observation period, this index showed steady growth in all V4 countries, unlike the other two indices (OSI and HCI). In 2010, these countries were in the medium TII group; by 2024, their TII values exceeded 0.8, placing them in the very high TII group. The development of communications infrastructure in the V4 region is well advanced. At the end of 2024, Poland had the highest TII value (0.9603), followed by the Czech Republic (0.9204), Slovakia (0.8985), and Hungary (0.8282). This parameter is expected to remain stable in the coming period.

The HCI value showed a slight decline in the V4 countries over the period analyzed. In 2010, extremely high HCI values were recorded (Hungary – 0.9597, Poland – 0.9552, Czech Republic – 0.9429, and Slovakia – 0.9310), but these gradually decreased. Among the three sub-indices observed, only the HCI recorded a decline. Despite this downward trend, the V4 countries remained within the very high HCI group in 2024.

Although government bodies already make extensive use of ICT, e-government is more than just redesigning organizations, procedures, and behaviors to deliver public services more efficiently. When implemented properly, e-government facilitates communication between citizens, businesses, organizations, and the government, making it easier, faster, and more cost-effective. Efficient electronic government services (e-government) offer numerous advantages, including greater citizen participation in politics, increased transparency, and improved efficiency and savings for both businesses and public authorities. With further e-government development in the V4 countries, there will undoubtedly be a reduction in corruption through increased transparency, improved convenience in accessing services, greater internal efficiency and productivity, and lower overall costs through the use of technology.

RECOMMEDANTIONS

E-government, which uses digital technologies to improve service delivery, speed up procedures, and promote transparency, is crucial for increasing the efficiency of public administration. This is particularly evident in countries that are working hard to digitize government services, such as the Visegrád Group (Poland, Hungary, Czech Republic, and Slovakia). Digital platforms reduce the amount of manual paperwork, accelerate administrative processes, and reduce the likelihood of errors. In addition, e-government projects make government processes more visible, which strengthens public trust. The V4 countries should develop a unified national e-government strategy. It is also very important to create a long-term plan for digital transformation that is aligned with national development goals and the EU's digital agenda. Furthermore, it is essential to ensure coordination between ministries and local governments to avoid duplication and fragmentation.

The main recommendations for improving e-government in the V4 countries as a basis for efficient public administration are: (a) developing e-government platforms that are accessible to all citizens; (b) improving internet connectivity, especially in rural and underserved areas, to ensure equal access to e-services; (c) launching country-wide initiatives to train citizens, government employees, and SMEs in the effective use of e-services; (d) forming partnerships with other countries to share best practices and experiences in e-government development; and (e) automating routine tasks, improving decision-making, and personalizing citizen services with the help of artificial intelligence (AI). Governments can significantly increase the efficiency, transparency, and responsiveness of public administration through e-government projects if they put these proposals into practice. This will not only improve service delivery but also increase public confidence and encourage greater citizen participation.

CONCLUSION

One of the most important drivers of economic growth in the modern world is digital transformation. To realize the full potential of digital transformation and achieve equitable and sustainable economic growth, digital technologies must be harnessed and a culture of digital innovation fostered. According to the European Union, digital transformation is an essential prerequisite for promoting innovation, competitiveness, economic growth, and social progress.

The use of information technology for the delivery of government services, information exchange, communication, and integration of various stand-alone systems is referred to as electronic government or e-governance. With the help of IT, citizens can access government services via e-governance. The aim of e-government is to make interaction between the government and citizens, the government and businesses, and the government agencies themselves simpler, cheaper, and more transparent. The introduction of e-government has a direct impact on the reduction of administrative burdens, greater efficiency, and availability of information, as well as improved quality of work through the automation and optimization of services used by individuals and legal entities. The establishment of the best possible e-government system occupies an important place in the process of European integration and enables better institutionalization through the modernization of institutions and processes.

E-governance is the use of ICT, particularly the Internet, as an instrument for achieving good governance. The goal of electronic administration is to enable citizens to complete as many administrative procedures as possible online in the future, thereby eliminating waiting times and saving time. The idea of e-government has emerged as a beacon of hope for administrative reform in this digital age, where there is a growing demand for efficiency and openness. Technology-enabled e-government is used to manage resources, transmit information, provide government services, and conduct transactions between government agencies, individuals, and businesses in compliance with regulations.

Citizens of V4 countries, especially those with lower levels of education, are less inclined to use e-government services compared to citizens of other EU countries. The success of e-government development in the V4 countries can be hindered by several challenges. Technical faults or poor information quality are among the main reasons preventing citizens from using government websites. Low-income households and residents of rural areas often lack access to e-governance services. If citizens believe that their data is not secure, their confidence in e-government will be diminished. In the V4 countries, inadequate or underdeveloped ICT infrastructure can significantly limit the benefits of e-government services. Some e-government platforms are overly complex and not user-friendly, making them difficult to use for individuals with low digital literacy. The technological stagnation in e-government is also caused by insufficient funding for service improvements, which inevitably affects the users of these services. Therefore, it is crucial for all V4 countries to invest in infrastructure, promote digital literacy, adopt better legislation, and strengthen public security systems in order to address these issues in the coming period.

The limitations of this paper, which could be addressed in future research, are: (a) the study focuses only on the development of e-government in the V4 countries, (b) the analysis covers the period from 2010 to 2022, and (c) the research is based exclusively on officially available UN data. Accordingly, the recommendations for future research include: (a) expanding the analysis to include more countries (e.g., all EU member states or additional countries within a specific region), (b) extending the analysis to cover the full period of EGDI application (since 2001), and (c) applying additional methodologies using secondary and/or primary data to gain new insights and formulate more comprehensive conclusions and recommendations.

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