
An Assessment of the Information Society Development in Slovenia, Croatia, and Poland in relation to the EU Average on the Base of Connectivity and Infrastructure Development

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Abstract:

Purpose: The purpose of the article is to provide an exposition on the progress made in the information society of Slovenia, Croatia, and Poland, with reference to the EU average on the base of connectivity and infrastructure development.

Design/Methodology/Approach: The study employs a combination of deductive, inductive, and comparative analysis methods, drawing upon diverse reports pertaining to the digital society development in Slovenia, Croatia, and Poland. Moreover, the authors incorporate a critical review of pertinent literature to present the current understanding regarding the nature and drivers of digital society development. Synthesis techniques are employed to facilitate a comprehensive evaluation of the state of the Slovenian, Croatian, Polish, and EU digital societies, thereby highlighting primary dilemmas faced in the present context.

Findings: Examined countries have demonstrated efforts to enhance digital connectivity, and to build up the needed infrastructure for the proper development of information society aligning themselves with the broader European Union digital agenda.

Practical Implications: The results of the research as well as recommendations can indicate further improvements within the information society development.

Originality/Value: The analysis undertaken encompasses carefully selected indicators that characterize pivotal aspects of the digital society in the examined three countries from the perspective of connectivity and infrastructure. These indicators include Fast Broadband coverage, Fixed Very High Capacity Network, Mobile broadband take-up and 5G coverage.

Keywords: Digital society, information, country perspective.

JEL codes: O33, O57.

Paper type: Research article.

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1. Introduction

In an era marked by the increasing influence of the Internet on national economies, the utilization of this medium in both social and economic spheres assumes principal significance, directly impacting the level of information society development. Accordingly, this article aims to elucidate the degree of implementation of the information society in three selected EU countries, Slovenia, Croatia, and Poland.

The development of information societies is influenced by numerous factors, with access to information playing a fundamental role. In this context, infrastructure and connectivity assume a crucial role. Hence, the objective of this article is to assess and compare the level of connectivity and infrastructure development in the three aforementioned countries.

By examining these aspects, we aim to gain insights into the state of information access and its associated infrastructure, which are key determinants in shaping the advancement of information societies.

To accomplish this objective, the authors conducted a comparative analysis of chosen indicators that encompass crucial facets of the information society. In addition to direct comparisons of the selected indicators within the three countries under study, a comparison was also made with the EU average.

This comparative approach enables the identification of areas where those three countries align closely with the EU average, areas where they exceed it, and areas where they face significant challenges in catching up to the EU average. Following the identification of areas where the surveyed countries lag behind, the authors propose a series of strategic actions that can expedite the process of bridging these observed gaps and minimizing delays in development. It is important to note that the analysis

2. Literature Review

The information society can be described as a socio-economic paradigm characterized by the pervasive use of information and communication technologies (ICTs) in various aspects of human life, including communication, education, business, governance, and entertainment. It represents a transition from an industrial society to a knowledge-based society, where the acquisition, processing, and dissemination of information play a central role in economic and social activities.

Information society can be explored from various points of view. Manuel Castells (2010) studies the emergence of the network society, emphasizing the role of information networks and the transformation of social structures and relationships in the context of globalization.

Frank Webster (2014) provides an overview and critical analysis of different theoretical perspectives on the information society, examining the impact of technological advancements on social, economic, and cultural dynamics.

Pippa Norris (2001) delves into the concept of the digital divide, which is a critical aspect of the information society. Exploration of the disparities in access to and usage of ICTs, and their implications for civic engagement and socio-economic development worldwide are increasingly important.

Also the private and legislator sector is increasingly interested in the information society topic. The International Telecommunication Union (ITU) regularly publishes reports and studies on various aspects of the information society, including connectivity, digital skills, and digital inclusion.

Also the European Commission conducts evaluations and publishes reports on the development of the digital single market and the information society in Europe. On the other hand United Nations Development Programme (UNDP) publishes reports on the impact of information and communication technologies on development, including aspects of connectivity, digital skills, and digital inclusion.

The Organization for Economic Co-operation and Development (OECD) produces studies and reports on digital economy, digital skills, and digital transformation, offering valuable insights into the evaluation of the information society. Moreover numerous academic journals in the field of information systems, communication studies, and technology studies publish articles related to the evaluation of the information society.

The bottom line is that transformation associated with the emergence of the information society fundamentally changes the rules of the civilization functioning in all (or at least in many) aspects. As a consequence, "certain branches of industry are falling, old models of life are disappearing and new ones appear on their place immediately" (Kaku, 2000).

3. Research Methodology

Given the intricate nature of the information society, identifying appropriate evaluation approaches can be challenging. Evaluation efforts in this domain encompass a wide range of areas and directions, each examining distinct facets of its development and impact. Key areas and directions of evaluation include: Connectivity and Infrastructure; Digital Skills and Literacy; Digital Inclusion and

Accessibility; Usage and Adoption; Socio-economic Impact; Policy and Governance; E-government and Digital Services; Emerging Technologies.

These areas and directions provide a comprehensive framework for evaluating the multifaceted nature of the information society and guiding policy decisions and interventions to foster its development and address potential challenges. Owing to the central theme of the article and the constraints imposed by the page limitations, our attention was primarily directed towards a specific domain, namely connectivity and infrastructure.

4. Connectivity and Infrastructure Role

Connectivity and infrastructure play a pivotal role in the information society, shaping its development and determining the extent to which individuals, businesses, and communities can effectively participate in the digital age. The importance of connectivity and infrastructure lies in their ability to enable access to information, facilitate communication, and foster socio-economic opportunities.

López-Catalán *et al.* (2019) emphasizes the critical role of broadband connectivity in promoting digital inclusion. The authors highlight how adequate access to broadband services is crucial for individuals to engage in digital activities, access online resources, and participate in the information society effectively. Robinson *et al.* (2015) focuses on exploring digital inequalities and their societal implications. It underscores the significance of broadband connectivity as a foundation for reducing digital disparities, promoting equal access to information, and addressing social and economic inequalities within the information society.

Van Dijk (2006) discusses the digital divide and highlights the crucial role of connectivity in bridging this divide. The author emphasizes the importance of infrastructure development, including affordable and reliable internet connectivity, to ensure equitable participation in the information society.

All these sources highlight the scientific importance of connectivity and infrastructure in the information society. They underscore how adequate broadband connectivity and robust infrastructure are fundamental in reducing digital inequalities, facilitating digital inclusion, and fostering socio-economic development.

5. Characteristics of the Studied Countries

In order to conduct a comprehensive comparison of connectivity and infrastructure levels among the countries under study, it is pertinent to provide a concise overview of the respective national economies. Fundamental indicators of economic development, such as the Gross Domestic Product (GDP) and GDP per capita, play a significant role in assessing the economic landscape.

Additionally, key demographic factors including population size and land area provide contextual information for comparative analysis. Table 1 presents the data for the year 2022 pertaining to these crucial dimensions in Slovenia, Croatia, and Poland, facilitating a comprehensive understanding of the countries under examination.

Table 1. *Main characteristics of Slovenia, Croatia and Poland by GDP, GDP per capita, number of inhabitants and area size of each country at the end of 2022*

Country	GDP (in millions of dollars)	GDP per capita (in international dollars)	Inhabitants	Area size (in km ²)
Slovenia	62167	29502	2,116,972	20273
Croatia	70487	18250	3,871,833	56594
Poland	688301	18280	37,738,000*	312685

Note: * Data from February 2023.

Source: Own compilation on the base of International Monetary Fund, 2023; Wikipedia 2023; *countryeconomy.com*, 2023.

It is evident that the Gross Domestic Product (GDP) of both ex-Yugoslavian countries examined is approximately one-tenth of that of Poland. However, when considering the population size, the GDP per capita is highest in Slovenia and lowest in Croatia, with Poland occupying a position similar to Croatia.

Nevertheless, these figures are relatively comparable, unlike the size of the countries under study, where Poland significantly surpasses the others. In discussing the commonalities among the studied countries, it is worth noting that they all have a shared socialist past and have become members of the European Union (EU).

However, Slovenia and Poland joined the EU nearly a decade earlier than Croatia did, specifically in 2004 and 2013, respectively. This brief comparison provides a foundation for the proper evaluation and comparison of the development of information societies in each country.

6. Assessment of Information Society Development Status in Slovenia, Croatia and Poland

Infrastructure and broadband coverage are fundamental indicators of a country's readiness to embrace the information age. A robust and well-developed infrastructure, coupled with extensive broadband coverage, enables the effective dissemination and utilization of digital technologies and services. It is imperative to examine these factors to comprehend the information society's progress in each country.

On a more general level several sources have highlighted the significance of infrastructure and broadband coverage in fostering the growth of information

societies. For instance, a study conducted by ECDPM (European Centre for Development Policy Management) emphasizes the role of infrastructure development in promoting digital inclusion and economic growth in developing regions (Kouladoum, 2023).

Moreover, the International Telecommunication Union (ITU) has underscored the importance of broadband connectivity in achieving the United Nations' Sustainable Development Goals (ITU, 2020).

On a more specific level a study by Karababa and Sever (2018) examines the relationship between historical context and information society development in the Balkans. The authors argue that the region's socialist past has influenced its technological progress and digital transformation. It should be easy to convert that context also for Poland, which was under the socialistic regimes for over 4 decades.

Furthermore, policy frameworks play a vital role in shaping the information society. A study by Heldt (2017) analyzes the impact of national policies on digital inclusion in European countries. The research emphasizes the importance of comprehensive strategies and supportive regulatory frameworks to foster the growth of information societies. Economic conditions also contribute to the development of information societies.

A study by World Bank (2020) investigates the relationship between economic development and internet penetration rates. The findings highlight the positive correlation between economic growth and internet access, underscoring the need for sustainable economic policies to bridge the digital divide.

By examining the infrastructure and broadband coverage in the studied countries and considering relevant literature, we can lay the groundwork for a comprehensive comparison and assessment of their respective information societies. This analysis will provide insights into the progress, challenges, and potential areas for improvement in each country's journey towards an inclusive and advanced information society.

As it was highlighted infrastructure is a basic condition for creating information society in each country. To assess the information society in the examined countries, it is crucial to compare the development of their infrastructure and broadband internet coverage. This analysis will provide insights into the accessibility and availability of digital services.

At the end of 2021 it is evident that there are notable disparities in broadband and NGA broadband coverage among the studied Balkan countries, as compared to the EU average. Slovenia and Croatia demonstrate relatively higher coverage rates, indicating a more developed broadband infrastructure. On the other hand, Poland lags behind, suggesting a need for further investments and initiatives to enhance

broadband accessibility. In terms of VHCN coverage in the examined countries, there are notable variations.

Slovenia emerges as the leading country in this regard, with a level of development that closely resembles that of Poland, as both nations are nearly on par with the EU average. Conversely, Croatia lags behind in VHCN coverage. However, when considering the previous years and trends, it becomes evident that all of the countries are gradually expanding the gap to the European average in terms of development pace in this specific area. This suggests an overall negative trajectory in VHCN coverage across the examined countries, albeit with variations in the current levels of development.

According to the mobile broadband take-up rates in 2019 and 2021 for Slovenia, Croatia, Poland, and the EU as a whole we notice that Slovenia had a mobile broadband take-up rate of 75.0%, indicating that 75.0% of the population in Slovenia had access to and utilized mobile broadband services. Similarly, Croatia and Poland had mobile broadband take-up rates of 70.0% and 73.0%, respectively.

Comparatively, the EU had a slightly higher take-up rate of 80.0% in 2019. Moving to 2021, there is a noticeable increase in mobile broadband take-up rates across all the countries. Slovenia witnessed a rise to 85.0%, indicating an increase in the number of individuals accessing and using mobile broadband services. Similarly, Croatia and Poland experienced an increase to 81.0% and 84.0%, respectively, demonstrating an upward trend in mobile broadband adoption.

The EU as a whole recorded a higher take-up rate of 87.0% in 2021, indicating a widespread adoption of mobile broadband services across member countries.

Overall, the data showcases a positive trend in mobile broadband take-up, with increasing rates observed in both individual countries and the EU as a collective entity. Upon examining the 5G coverage, the data reveals a less favorable situation for the examined countries in comparison to the EU average, which stands at approximately half of the deployment level.

Specifically, Slovenia, Croatia, and Poland exhibit lower percentages of 5G coverage, with rates of 37% for Slovenia and 34% for both Croatia and Poland, in contrast to the EU average of 66%. These figures highlight a significant disparity between the examined countries and the overall European average, suggesting a substantial gap in the deployment of 5G networks.

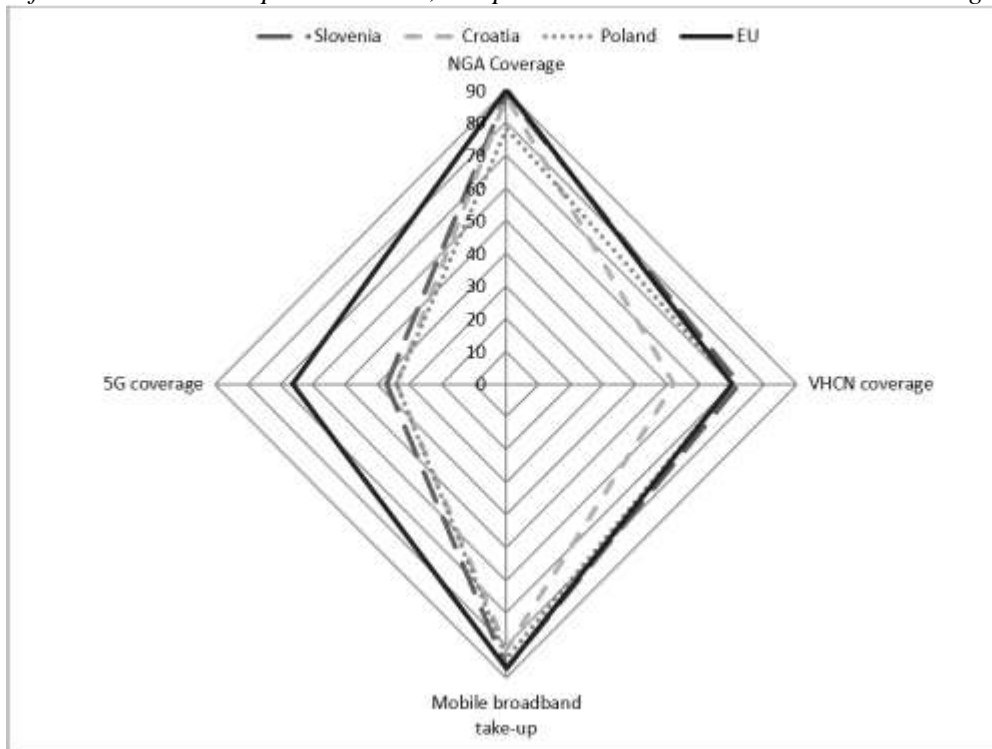
7. Comparison of Connectivity and Infrastructure Development in Slovenia, Croatia and Poland in 2022

Having presented a number of various data in the area of information society development from the connectivity and infrastructure development it could be

noticed that the researched countries have some areas to catch up to in order to reach at least the EU average (not to mention in order to catch up the most advanced digital economies like Finland, Denmark, Netherlands or Sweden).

On the other hand none of the three researched countries had the lowest position in Europe and all are at least a bit in front of such countries like Romania, Bulgaria or Cyprus. Knowing those facts, it is reasonable to compare the overall state of the information society development in Slovenia, Croatia and Poland. Figure 1 shows data on Slovenia's, Croatia's and Poland's performance in the Connectivity and Infrastructure Development in 2022, compared to each other and to the EU average.

Figure 1. Slovenia's, Croatia's and Poland's performance in the Connectivity and Infrastructure Development in 2022, compared to each other and to the EU average.



Source: Own elaboration.

8. Conclusions

The conducted research shows that Slovenia is the leader of the three examined countries. It has made significant progress in connectivity and infrastructure development, even surpassing the European Union average in VHCN coverage. Slovenia's broadband infrastructure generally equals the European Union average, with widespread access to high-speed internet services.

Additionally, the country has been proactive in developing the mobile broadband and to much lesser extent the 5G. Out of the three examined countries it achieved the best results.

Croatia has shown notable advancements in connectivity and infrastructure development, although it still lags behind the European Union average in all researched areas. The country has made substantial investments in mobile broadband take-up and also to some part in 5G. Croatia's broadband infrastructure has seen improvements, but there is room for further development to meet European Union standards. Among the three countries under investigation, the observed outcomes demonstrated the least favorable performance.

Poland has made significant strides in electronic connectivity and infrastructure development, often exceeding the European Union average. The country has made substantial investments in expanding its broadband infrastructure, resulting in widespread access to high-speed internet services across the nation. However there is still room for improvements, especially in the deployment of 5G networks.

Overall, Slovenia and Poland have shown notable progress in electronic connectivity and infrastructure development. On the other hand while Croatia has made strides in this area, there is still room for improvement to bridge the gap. All three countries have demonstrated efforts to enhance digital connectivity, and to build up the needed infrastructure for the proper development of information society aligning themselves with the broader European Union digital agenda.

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