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DIGITALISATION AND APPLICATION OF ARTIFICIAL INTELLIGENCE IN PUBLIC ADMINISTRATION

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ABSTRACT. ***The digitalisation of public administration represents a critical phase in the modernisation of state institutions, transforming traditional administrative processes into more efficient digital formats. The transition from paper-based documents to electronic databases facilitates faster and more transparent information processing, easier data exchange between institutions, and improves citizens' access to services. The integration of artificial intelligence (AI) into public administration further enhances these processes by enabling task automation and the intelligent analysis and processing of large volumes of data. AI technologies, such as machine learning and natural language processing, enable pattern recognition, trend prediction, and better decision-making in the provision of public services, as well as the identification of potential risks. The synergy between digitalisation and AI reduces administrative burdens, increases efficiency, and allows for more personalised services to citizens. Additionally, it contributes to greater transparency and accountability in public institutions by facilitating the monitoring of activities and decision-making. This paper explores the extent and scope of digitalisation and AI implementation in the public administration of Montenegro, analysing their impact on the efficiency, accessibility, and quality of services. The aim is to assess how these technologies can enhance public services and citizens' trust, making institutions faster, more transparent, and better aligned with citizens' needs.***

KEYWORDS: digitalisation, artificial intelligence, public administration, Montenegro.

JEL classification: H83, O32, O33.

Introduction

The digitalisation of public administration represents a critical step in the modernisation of state institutions, transforming traditional, manual administrative activities into efficient digital formats (Krajčík *et al.,* 2023). This process involves the transition from paper-based documentation to electronic databases, enabling faster and more efficient information processing, easier data exchange between departments, and enhanced transparency in the functioning of institutions. The digital infrastructure encompasses systems for document storage and processing, as well as digital portals through which citizens can quickly and easily access various services, without the need for physical presence or lengthy procedures. The application of AI in public administration began to develop around the mid-2010s. During this period, governments worldwide started exploring the potential uses of AI technologies in various administrative areas to enhance efficiency, reduce costs, and improve citizen services.

The application of artificial intelligence (AI) in public administration introduces an additional level of automatisation and intelligent data processing (Reshetnikova and Mikhaylov, 2023; Dobrowolski *et al.,* 2024). AI enables public institutions to analyse large volumes of data in real time, identify patterns, and predict trends, which is particularly useful in providing social and administrative services. For example, AI-based chatbots enable citizens to receive answers to common inquiries 24/7, while predictive analytics can assist in decision-making regarding resource allocation or in identifying potential risks before they become serious problems. An important aspect of the relationship between digitalisation and AI is that digitalisation provides the foundation for the operation of AI systems (Kuanaliyev *et al.,* 2024). AI technologies, such as machine learning and natural language processing, rely on structured and accurate data to function optimally (Warintarawej *et al.,* 2024). Without digitised databases, AI algorithms would lack the material for processing and analysis, which limits their application in public administration.

The synergy between digitalisation and AI enables public institutions in Montenegro to become more adaptable and citizen-centric. By automating routine tasks, such as data processing or responding to user requests, AI reduces employees' workload, allowing them to focus on more complex tasks that require human judgment and decision-making. Additionally, the combination of these technologies enables institutions to respond more quickly to the changes in citizens' needs, adapting their services based on the analysis of user behaviour and their needs. Finally, integrating digitalisation and AI into public administration contributes to the transparency and accountability of institutions to citizens. Digital systems facilitate the tracking and reviewing of information on activities and decisions, while AI assists in visualising this data, enabling both citizens and relevant bodies to gain a clearer understanding of institutional operations. Reduced administrative costs and improved process efficiency further enhance service quality and public trust in government services.

This study aims to analyse the extent and level of digitalisation and AI implementation in the public administration of Montenegro, and their impact on the efficiency, accessibility, and quality of public services. The paper consists of four main sections: Introduction, Literature Review, Research, Discussion, and Conclusions. The introduction addresses the current challenges faced by the public administration in Montenegro, particularly in relation to traditional approaches to service delivery. This section outlines the objectives and purpose of the research, focusing on how digitalisation and AI can support the modernisation of public institutions and enable better responsiveness to citizens' needs.

The literature review examines existing research and studies related to digitalisation and AI in public administration, including a review of global trends and best practise examples from other countries. It also covers the current strategic and operational plans for digitalisation in Montenegro, which are analysed using theoretical frameworks that explain the relationship between digitalisation, AI and the improvement of public services. The study presents the results of an empirical analysis of the state of digitalisation and AI implementation in different areas of public administration in Montenegro. Quantitative and qualitative methods were employedto identify key areas of AI application, including data management, predictive analytics and automation in public service delivery. The focus is on specific projects and initiatives that help to improve services and deal with challenges faced by public organisations when adopting new technologies. The discussion summarises the key findings of the research and highlights the positive aspects of digitalisation and the use of AI in Montenegrin public administration, but also the potential challenges such as the lack of knowledge and skills of employees, as well as security and ethical concerns. The discussion emphasises the need for continuous staff training and cooperation between public institutions and the private sector to ensure successful adaptation to new technologies and increase the overall efficiency of public administration in Montenegro.

1. Theoretical Approach

Numerous authors and researchers have explored the impact of digitalisation and AI on various aspects of society and the economy. Among the most prominent are Brynjolfsson and McAfee (2017), and McAfee and Brynjolfsson (2017) who in their books *The Second Machine Age* and *Machine, Platform, Crowd*, respectively, analyse how digitalisation and AI shape the labour market, productivity, and economic models. Their works emphasise that digital technologies are crucial for transforming work environments and economic structures, as well as for redefining the relationship between humans and technology. Davenport and Ronanki (2018) focus on the role of AI in enhancing business operations. Their research examines strategies for utilising digital data and AI to improve decision-making in business processes, highlighting how AI contributes to operational efficiency and resource optimisation. Yann Le Cun *et al.* (2015), as pioneers of deep learning, have significantly contributed to the development of AI through research that enabled advancements in image, speech, and language recognition, opening up possibilities for widespread use of these technologies across various industries. Floridi (2024) has focused on the ethical aspects of digitalisation and AI, particularly in the context of privacy and the social impact of technology, through the concept of the infosphere, where he analyses the moral dilemmas and ethical challenges brought by digital transformation to society (Junsawang *et al.,* 2022; Sembiyeva *et al.,* 2024; Iskakova *et al.,* 2025).

Zuboff (2019) examines how companies use digital data combined with AI to monitor and control markets, highlighting the ethical and social implications of data use and surveillance technologies. The previously cited research covers the technical, social, and ethical aspects of digitalisation, as well as its role in transforming business and society. In the context of public administration, the paper ‘AI Adoption and Diffusion in Public Administration’ by Madan and Ashok (2023) provides a systematic review of AI technology adoption in the public sector. The authors emphasise key factors such as technical, organisational, and institutional barriers and benefits of AI adoption, with a particular focus on the importance of continuous employee training and the development of regulatory

frameworks for sustainable AI implementation. The cited paper identifies major challenges, such as resistance to change, resource shortages, and the need for infrastructure, further stressing the importance of a strategic and holistic approach to AI implementation. Yarovoy (2023) explores the application of AI for optimising processes and improving efficiency in public services. In addition to benefits, such as reduced administrative costs and enhanced service quality, the author highlights risks related to biases in algorithms, data privacy, and ethical dilemmas, proposing adequate regulation to maintain transparency and public trust. Mergel *et al.* (2023) emphasise the need for institutional adaptations, the development of human resources capacity, and ethical guidelines for AI application in public administration (Rakhimzhanova *et al.,* 2024). They argue that effective AI implementation requires clearly defined strategic guidelines and transparency to ensure long-term sustainability and accountability to citizens. Odilov (2024) investigates the practical benefits that AI brings to the public sector, analysing how AI tools, such as chatbots and automated request processing, can improve the efficiency and accessibility of public services. The author stresses the importance of ethical application, respecting privacy, and ensuring accountability in decision-making processes, recommending a strategic approach to maximise the benefits AI provides to citizens.

The literature review reveals that various authors recognise the potential of AI application in enhancing public services, as well as the key challenges faced by the public sector, including ethical and organisational barriers. Authors, such as Bozic (2023), examine specific applications of AI in public administration, ranging from traffic management to optimising energy efficiency, while Madan and Ashok (2023) provide an overview of the challenges in public administration and propose systemic adjustments and strategic guidelines for more efficient AI technology implementation. Unlike previous studies, this research focuses on the specific challenges and opportunities of digitalisation and AI application in Montenegro. It analyses the current level of digitalisation in public administration and assesseshow AI can contribute to improving the efficiency, accessibility, and quality of public services. Based on the aforementioned sources, the aim of this research is to examine the impact of digital transformations in Montenegro through practical examples, emphasising the need for an ethical framework, organisational capacity, and a strategic approach in the application of AI technologies.

2. Research

2.1 Research Methodology

Research on the digitalisation and application of AI in the public administration of Montenegro faces several methodological challenges that could affect the accuracy and reliability of the obtained results. Key methodological limitations include the following:

- Lack of Standardisation – In the fields of digitisation and AI, there is often a lack of unified standards and metrics for evaluation. Researchers use different definitions and indicators, resulting in variable data that complicates comparative analysis and consolidation of findings (Mergel *et al.,* 2023).
- Limited Access to Data – Data on the use of digital technologies and AI in public administration is often restricted, unavailable, or fragmented, making comprehensive analysis and assessment of the current level of digitisation difficult (UNDP, 2024).

- Combination of Qualitative and Quantitative Methods – The use of mixed-method approaches may lead to challenges in interpreting the results. Qualitative data provide deeper insight into the context and experiences but are often difficult to quantify and are prone to subjective interpretation (Bertot *et al.,* 2010).
- Education and Staff Capacities – A lack of specialised skills and knowledge among public administration employees can affect the efficiency of the implementation of new technologies, further complicating the research on the effects of digitalisation (Mergel *et al.,* 2023).
- Political and Social Changes – Dynamic changes in the political and social context often influence the priorities and strategies of digitalisation, which may make consistency in research over time difficult (European Commission, 2023a, 2023b).

These identified limitations require a careful methodological approach to ensure the validity and relevance of the results. The findings of this research aim to contribute to the development of more effective policies and strategies for digital transformation in Montenegro's public administration. A combined approach incorporating both quantitative and qualitative research techniques, along with specialised tools for evaluating digital transformation, is necessary to precisely assess the degree of digitalisation and AI implementation in public administration. Recommended methodological strategies include:

- Digital Readiness Index
- Analysis of Institutional Capacities
- Key Performance Indicators (KPIs)
- Ethical Guidelines Assessment
- Comparative Analysis.

The application of this mixed-method approach, combining quantitative indicators (such as the digital readiness index (DRI) and key performance indicators (KPIs)) with qualitative techniques, will enable a comprehensive assessment of the level of digitisation and AI integration in Montenegro's public administration, while also facilitating the identification of obstacles and recognising priority areas for further development.

2.1.1 Assessment of the DRI

The recommended methodology involves creating digital readiness index that utilises specific measurement indicators tailored for the public sector, such as:

- the level of digitalisation of services (e.g., the number of services available online),
- the number and qualitative assessment of digital tools in use,
- the degree of interoperability between institutions,
- the rate of E-Government usage among citizens.

This index is based on international standards, such as the European Commission's Digital Economy and Society Index (DESI) and the United Nations' E-Government Development Index (EGDI), which has been adapted to the specific context of Montenegro. To assess the DRI of Montenegro's public administration, a methodological approach is employed that relies on data collection from various sources. This methodology includes analysing the availability of digital services, the capacity to implement modern technologies, and user satisfaction. In this approach, a method is employed that combines key performance indicators (KPIs) with an assessment of institutional capacities, thus providing a reliable foundation for determining the DRI.

The process of determining this index consists of several steps:

A. *Identification and Definition of Indicators*. The initial phase involves identifying specific indicators that accurately reflect the level of digital readiness of the public administration in Montenegro. Relevant indicators include:

- the number of public services available online, such as document issuance or access to public registers,
- the level of interoperability between different sectors and institutions,
- the number of employees trained in digital skills development,
- access to IT infrastructure and digital tools,
- assessment of E-Government usage by citizens, including user satisfaction levels.

Each of these indicators is quantitatively expressed, allowing for an objective and precise assessment of digital readiness within the public administration. For calculating the readiness index for digitalisation and AI implementation in Montenegro's public administration, a weighted sum method is used. This method enables the quantitative evaluation and synthesis of results from different elements. This approach facilitates a comprehensive analysis of the key factors influencing the digital transformation of public administration. There are sevelar phases to the steps in calculating the index. The first step is the definition of indicators, where each indicator is rated on a scale from 0 to 100, with 0 representing the minimal and 100 representing the maximal level of achievement. The indicators may encompass various parameters such as the digital skills of employees, the degree of process automation, data protection levels, the availability of E-services, and other factors impacting the efficiency of digitalisation. Subsequently, each indicator is assigned a weight based on its importance for digital readiness. For example, data security may carry a higher weight than customer support if security is deemed critical for system reliability. Finally, a combination of indicators is used to calculate the index Eq. (1) using the weighted sum formula, resulting in a comprehensive and precise depiction of the digital readiness level and AI implementation in the public administration.

$$DRI = \sum_{i=1}^{n} indicator_i \cdot weight_i \quad (1)$$

B. *Interpretation of Results*. The resulting index provides a comprehensive assessment of the public administration's readiness for digitalisation and AI implementation, allowing for the identification of key areas requiring additional improvements or investments. For instance, a lower index value may indicate the need for further investments in specific aspects of digitalisation, such as employee skills or technological infrastructure. This approach offers a structured and measurable basis for evaluating digitalisation progress and the effective application of AI in the public sector.

Data Collection – The data required for assessment can be gathered through a combination of:

- Surveys for public administration users and employees, covering service satisfaction and ease-of-use perceptions,
- Administrative reports on the availability and use of digital services,
- Analysis of institutional capacities through interviews with key IT sector personnel in the public administration,
- Data collection combines online questionnaires, process observation, and analysis of available reports on the current state of digitalisation.

C. *Index Calculation*. After data collection, each indicator is scored on a scale (e.g., from 0 to 100) to determine the readiness percentage for each defined criterion. By combining individual scores, an overall DRI is obtained, reflecting the average level of digitalisation. To illustrate, the index can be calculated as a weighted sum of all indicators, where more critical factors (such as the availability of key digital services and usage levels among citizens) carry a greater weight. *Results Analysis and Comparison with Standards* – Montenegro's DRI can be compared to internationally recognised standards such as DESI or EGDI. Comparing it to other countries' in the region enables the identification of Montenegro's position in digital development and the prioritisation of areas for further digital transformation.

Table 1. Summary of Digitalisation and AI Implementation Assessment in Montenegro's Public Administration

Step	*Description*	*Details*
1.Identification and Definition of Indicators	Initial phase involving the identification of specific indicators that reflect the level of digital readiness in Montenegro's public administration.	- Number of online services available (e.g., document issuance, access to public registers) - Degree of interoperability across sectors and institutions - Number of employees trained in digital skills - Access to IT infrastructure and digital tools - Assessment of E-Government usage and user satisfaction
2.Data Collection	Gathering of data necessary for assessment through a combination of methods.	- Surveys of users and public administration employees on service satisfaction and usability - Administrative reports on digital services availability and usage - Institutional capacity analysis through interviews with key IT personnel
3.Index Calculation	Scoring each indicator on a defined scale to establish the readiness level for each criterion, and calculating an overall DRI.	- Indicators are scored on a scale (e.g., 0–100) - The overall index is calculated as a weighted sum of all indicators, with key factors like service availability and user adoption carrying higher weight
4.Result Analysis and Standard Comparison	Comparing Montenegro's DRI with international standards to evaluate its standing and identify development priorities.	- Benchmark against DESI or EGDI standards - Comparison with other countries in the region to gauge Montenegro's digital progress and set priorities for further digital transformation

Source: created by the authors.

2.1.2 Analysis of Institutional Capacities for Digitalisation and Artificial Intelligence Implementation in Montenegro's Public Administration

The assessment of institutional capacities for the digital transformation of public administration includes the following:

- an analysis of existing IT infrastructure (e.g., available resources, system compatibility),
- an evaluation of data management and protection capacities, including security and privacy measures,
- an assessment of human resources in terms of necessary skills for working with digital and AI tools.

This assessment may involve interviews with key decision-makers, IT professionals, and representatives from digitalisation sectors. The analysis of institutional capacities for digitalisation and AI implementation in Montenegro's public administration requires a comprehensive review of existing resources, regulatory frameworks, technological infrastructure, human capacities, and challenges that Montenegro faces in implementing modern technologies within the public sector. In the context of digitalisation and AI implementation, critical factors include technical, organisational, legal, and ethical aspects that influence the success of these initiatives.

Technical Infrastructure and Digitalisation. Montenegro is at an initial stage of implementing digitalisation in public administration, though significant efforts are being made to enhance infrastructure and modernise systems. While a basic infrastructure for E-Government has been established, further investments in digital infrastructure, such as high-speed internet and computing resources, are essential for the effective deployment of advanced technologies like AI. Key steps in public administration digitalisation include:

- developing E-services and enhancing E-tools, such as electronic document issuance, registration, tax payments, and other administrative services,
- data centralisation by implementing systems for data storage and processing across the entire administration,
- digital identification and security through secure authentication and data protection in digital systems.

Human Resources and Capacity for AI Implementation. Introducing AI into Montenegro's public administration requires specialised human resources, including experts in IT, data, and AI. Currently, Montenegro faces challenges in training public sector employees to work with advanced technologies. Improvement opportunities include employee education and training by developing a strategy for continuous education and training on AI and digital tools, and forming specialised teams by establishing dedicated E-teams for AI implementation and data analysis within ministries or agencies.

Legal Framework and Regulations. The legal framework for AI application in Montenegro's public administration remains underdeveloped. Although there are initiatives to align legislation with EU standards (Kersan-Skabic, 2021), Montenegro needs to enhance laws related to the following:

- Implementing data security regulations in E-Government and AI applications, similar to the EU's General Data Protection Regulation (GDPR). GDPR, adopted by the European Union in 2016 and effective since 25 May 2018, aims to protect personal data of all EU citizens and harmonise data protection laws within the EU. GDPR is one of the most stringent global regulatory frameworks for privacy and data security.
- Addressing ethical issues in AI application and developing legal frameworks that regulate the ethical aspects of AI usage, especially concerning algorithmic bias, transparency, and accountability for AI-driven decisions.

Despite the potential for AI application and digitalisation, Montenegro faces several challenges, including capacity limitations, outdated ICT equipment, inadequate training for public sector employees in advanced technologies, and resistance to change from traditional administrative structures. Financial constraints require substantial investment in technology and training, while data security and protection emphasise the need to align with European standards on data privacy. To successfully advance digitalisation and AI application in Montenegro's public administration, a long-term digitalisation strategy is recommended. This

strategy should clearly define goals, resources, and timelines for the digital transformation of public administration. Additionally, linking with EU initiatives, such as utilising EU funds and resources to enhance digitalisation and collaborating with European agencies and organisations, is essential. Emphasis should be placed on innovation and testing new technologies, with pilot projects for AI in public services to gain experience and identify the best models for implementation. Montenegro has potential for improving institutional capacities in digitalisation and AI application, but achieving this requires significant commitment in terms of infrastructure investment, education, and legal regulation.

2.1.3 Evaluation of KPIs

The methodological approach to evaluating KPIs in the digitalisation and AI implementation within Montenegro's public administration is based on a systematic analysis of specific KPIs that enable tracking the progress of AI technology adoption. The first step is focused on defining relevant KPIs, which includes:

- the number of AI tools and applications in use, indicating the extent of AI integration in administrative processes,
- the level of task automation, measured as the percentage of tasks automated through AI, providing insights into efficiency gains and workload reduction,
- time and resources required for task completion using AI compared to traditional methods, facilitating an analysis of efficiency,
- the level of transparency and ethical use of AI, including citizen trust, assessing alignment with ethical standards and public perception.

After defining the KPIs, data collection follows. Quantitative data is gathered from AI implementation reports, while qualitative data may be obtained through surveys, interviews with key stakeholders in public administration, and public opinion analysis. Analytical tools, such as comparative analysis (assessing the effectiveness of AI versus traditional methods) and citizen trust indexes in AI, are used to analyse the collected data. Based on this analysis, an evaluation of AI application outcomes is conducted, identifying benefits and challenges. The results serve as a basis for recommendations to improve AI application, including strengthening infrastructure, training personnel, and enhancing ethical guidelines.

This approach enables objective monitoring and assessment of AI implementation in Montenegro's public administration, identifies key challenges, and provides guidance for further development.

2.1.4 Assessment of Ethical Guidelines

The assessment of ethical guidelines for digitalisation and AI implementation within Montenegro's public administration is conducted using a methodology that integrates several key approaches, considering specific technological, ethical, and social challenges. Among the most commonly employed methodologies are:

- *Evaluation through Ethical Guidelines and Standards*. This approach involves using international guidelines for ethical AI governance, such as the EU Guidelines on Ethics in AI or the OECD guidelines. These guidelines emphasise the importance of transparency, accountability, data privacy, and non-discrimination in the development and application of AI technologies (European Commission, 2020b).

- *Participatory Methods and Stakeholder Consultations*. This approach includes citizens, experts, and other stakeholders (e.g., NGOs, academia) in developing ethical guidelines. Through consultations, feedback is collected to make balanced decisions that consider Montenegro's social and cultural specificities. This methodology focuses on building trust and inclusivity (USAID, 2023).
- *Evaluation of AI Systems' Impact on Society.* This methodology assesses the potential risks AI systems may pose to society. It includes analysing the impact on privacy, security, employment, and social and economic inequalities. This evaluation helps identify specific ethical dilemmas that may arise when implementing AI in the public sector (Floridi *et al.,* 2018).
- *Legal Framework and Regulatory Oversight*. This approach analyses the legal framework regulating AI use, particularly concerning the protection of human rights and freedoms. It includes the development and implementation of legal frameworks to ensure AI applications in public administration align with international human rights and data protection standards (Müller, 2020).
- *Qualitative Research and Case Studies*. This methodology is used for in-depth analysis of specific AI applications in public administration to assess their ethical compliance. By analysing individual cases, researchers can identify specific ethical challenges and best practices applicable to Montenegro (European Commission, 2020b).

By combining these methodologies, a robust strategy can be developed to implement ethical guidelines in digitalisation and AI projects in Montenegro, ensuring a balance between technological advancement and the protection of human rights and values.

2.1.5 Comparative Analysis

The methodological approach for comparing digitalisation and AI application in Montenegro's public administration with regional countries focuses on several key dimensions: the level of digitalisation, AI application, infrastructure, regulatory framework, human capacity, and user satisfaction. The first step in the analysis is to define the research objectives, which include identifying similarities and differences in digital technology and AI implementation, as well as analysing factors that facilitate or hinder this process. Key indicators for comparison include the percentage of digitised public services, AI application within the public administration sector, infrastructural capacities, regulatory frameworks, workforce training, and user satisfaction.

Data is obtained from quantitative sources, such as statistical data on digitalisation and AI, and qualitative sources, including interviews with key stakeholders and policy analysis. Secondary data from reports by international organisations will also support the analysis. Data analysis is focused on a comparative assessment of digitalisation and AI application, including infrastructure, regulatory frameworks, and workforce training capacities. The research conclusions include an evaluation of digitalisation and AI application levels, identification of challenges and barriers, and recommendations for improvement. These recommendations target enhancements in infrastructure, regulatory frameworks, workforce training, and the development of public policies that support digital transformation. This approach, despite challenges such as a lack of comparative data and rapid technological advancement, enables a comprehensive analysis and the formulation of practical recommendations for improving digitalisation and AI application in public administration.

2.2 Results

The assessment of digitalisation and artificial intelligence implementation in Montenegro's public administration is based on the analysis of available data and trends in this field, utilising relevant reports and studies published by government agencies and international organisations dedicated to digital transformation. These sources provide the foundation for the evaluations presented below. Montenegro achieves a solid ranking on the Digital Economy and Society Index (DESI) among Western Balkan countries. According to the latest data, the DESI evaluates four main areas: human capital, connectivity, digital technology adoption, and digital public services (European Commission, 2023; UNDP, 2023). In segments such as human capital and connectivity, Montenegro surpasses the regional average, scoring 10.4 in human capital (regional average is 8.4) and 10.4 in connectivity (regional average is 7.5). However, in the area of digital public services, with a score of 5.8, it lags behind the EU average and neighbouring countries, where the average score is 16.8.

Montenegro also achieves a high level of coverage in technologies such as VHCN (Very High Capacity Networks), reaching 77%, which is above the EU average. In terms of mobile broadband access, the country stands out with 90.6% coverage, compared to the EU average of 86.5%. Following the recent introduction of commercial 5G services and the increased availability of high-speed networks, Montenegro is expected to make further progress on the DESI scale in the coming period. Although some segments are more advanced than the Western Balkan average, Montenegro still lags in the implementation of the latest digital technologies, particularly in public services, indicating room for further development and improvement in the digital domain (EKIP, 2024; DESI, 2023). While the specific index has not yet been publicly released for 2024, through the implementation of strategies and projects by the Ministry of Public Administration, Montenegro aims to modernise and increase transparency in the public sector, which is expected to positively impact the national DRI in the coming years. Montenegro's DRI for 2023 was 33.5. This result places Montenegro at the top of the Western Balkan countries in terms of digital economy and social indices, although it remains below the European Union average. For example, according to the digital public services indicator, Montenegro faces challenges, with a score of 5.8, which is significantly lower than the EU average of 16.8 (Montenegro Business, 2023). Importantly, Montenegro shows positive results in other aspects of digitalisation, such as internet access and broadband usage; however, there are significant disparities in the availability and use of digital services among citizens (UNDP, 2023).

2.2.1 Results of the DRI

The DRI of Montenegro is currently assessed through initiatives aimed at enhancing the digitalisation of public administration, including the use of artificial intelligence, e-governance, and digital services. The project 'E-services and Digital Infrastructure as a Response to COVID-19', funded by the European Union, is being implemented in partnership with the Ministry of Public Administration and the United Nations Development Programme (Government of Montenegro, 2021). This project includes an assessment of digital readiness within Montenegrin institutions, providing a foundation for the continued development of digital capabilities. These initiatives focus on improving interoperability among institutions, digitalising administrative services, and increasing citizens' use of E-services. Several key indicators are currently used to assess digital readiness, including the number of available

online services, the quality of digital tools in municipal administrations, the level of institutional interoperability, and the rate of E-service usage among citizens. The digital transformation of municipalities is supported by the GovStack program, which applies methodologies to evaluate the digital service needs of local governments. The project includes support for the procurement of ICT equipment and training for local government employees, facilitating the implementation of digital services accessible to citizens and businesses (GovStack, 2024).

In 2022, Montenegro allocated 4.1 million euros for the digitalisation of public administration. In 2023, an additional investment of 4.4 million euros was made, and for 2024, a budget of 6.2 million euros is planned to further enhance the digital infrastructure and electronic services within the public sector (Government of Montenegro, 2024). These investments are part of a broader strategy to establish a stable and secure digital environment, with legal frameworks supporting e-governance and digitalisation. The Ministry of Public Administration in Montenegro has outlined primary directions for enhancing digital services, aiming to provide more efficient and transparent services for citizens and businesses (Government of Montenegro, 2024). In 2024, as in 2023, Montenegro has continued its progress in public administration digitalisation, although specific metrics are often unavailable or insufficiently precise. Key information includes:

- *Number of online services*. The number of available online services continues to grow, although exact figures are not publicly available. Efforts are underway to increase the accessibility of electronic services to citizens. Many municipalities in Montenegro have initiated the process of digitalisation by offering basic online services, but they often face challenges in developing more complex E-services. Several municipalities still lack a comprehensive range of online services, indicating the need for further advancements.
- *Level of interoperability*. Interoperability between various sectors and institutions remains a primary challenge. There are initiatives aimed at improving this aspect, although specific metrics on achievements are not detailed. The degree of interoperability among institutions varies. While there are efforts to improve data exchange, practical challenges such as institutional barriers and a lack of standardisation hinder effective collaboration.
- *Employee training in digital skills*. The number of public administration employees trained in digital skills is increasing, although exact figures are also lacking. Continuous digital skills training for public administration employees is essential. While some municipalities have invested in training, proficiency levels vary significantly. It is expected that training will become a priority within the Public Administration Reform Strategy (Government of Montenegro, 2022).
- *IT infrastructure access*. Montenegro is working to improve access to IT infrastructure, although specific data on the availability and quality of digital tools is limited. While technology access has improved, rural and smaller municipalities continue to face a shortage of resources and infrastructure needed for effective use of digital tools.
- *E-governance usage*. The use of e-governance among citizens is gradually increasing, but data on user satisfaction remains underexplored. This usage is growing, but challenges such as insufficient public awareness and resistance to change could impact user satisfaction.

Overall, while efforts and initiatives toward digital governance enhancement are recognised, concrete and quantitative information regarding the state of digitalisation in Montenegro in 2024 is limited. Numerous sources emphasise the need for better data

collection and analysis to ensure a more transparent overview of progress (Government of Montenegro, 2023). Therefore, the assessment of digitalisation and the use of artificial intelligence in Montenegro's public administration, based on key analysis points, serves as a foundation for evaluating the elements and degree of digitalisation and AI implementation in Montenegro's public sector.

Table 2. Elements and Assessment Status of Digitalisation and AI Application in Montenegro's Public Administration

Element	Assessment
Number of online services	Many municipalities have initiated digitalisation, but not all services are available online; further progress is needed.
Interoperability	Varies across institutions; initiatives exist, but institutional barriers and lack of standardisation hinder collaboration.
Employee training	Ongoing training needed; skill levels vary across municipalities, although some resources have been invested in training.
Access to IT infrastructure	Improved access, but rural and smaller municipalities face resource and infrastructure shortages.
Citizen use of e-governance	Gradual increase in e-governance usage; challenges include limited awareness and resistance to change.

Source: Government of Montenegro, 2023.

Table 3. Estimated DRI for Montenegro in 2024

Element	*Description*	*Rating (0–100)*	*Weight*	*Total Score*
Number of public services available online	Currently, about 50–60% of basic public services are available online	55	20%	11
Degree of interoperability between different sectors and institutions	Interoperability exists but is partial and unsystematic	50	25%	12.5
Number of employees trained in digital skills	Around 30–40% of public administration employees have basic digital training	35	15%	5.25
Access to IT infrastructure and digital tools	Most institutions have basic IT infrastructure, but advanced tools are limited	60	20%	12
Assessment of E-Government usage and user satisfaction	Citizens report moderate satisfaction, and E-Government usage is limited	45	20%	9

Source: own results.

Table 2 summarises key aspects of the assessment of digitalisation and AI implementation in public administration, highlighting achievements and challenges Montenegro faces. For a detailed assessment of Montenegro's public administration digital readiness index in 2024 (see *Table 3*), specific data was gathered from sources such as administrative reports, citizen satisfaction surveys, and information on public administration capacities. The following section uses estimated indicators based on available information and potential evaluations of each factor for Montenegro.

Calculating the overall *DRI*:

$DRI = (55 \times 0.20) + (50 \times 0.25) + (35 \times 0.15) + (60 \times 0.20) + (45 \times 0.20) = 49.75$

The overall readiness index for digitalisation and AI implementation in Montenegro is 49.75 on a scale of 0 to 100. This result indicates the need for significant improvements,

particularly in the areas of interoperability between institutions and employee training in digital skills, in order to achieve higher efficiency and usability of digital services for citizens. To present the institutional capacities for digitalisation and AI implementation in Montenegro's public administration, a numerical tabular format is used to consider several key factors. These factors include technical, human, legal, and organisational capacities. The rating is on a scale from 1 to 5, where 1 represents very weak capacities, and 5 represents exceptionally developed capacities (see *Table 2*).

Table 4. Estimated Factors, Ratings, and Explanation of Institutional Capacities for Digitalization and AI Implementation in Public Administration

Factor	*Rating (1–5)*	*Explanation*
Technical infrastructure	3	Basic technical infrastructure exists, but there is room for improvement in internet speed, computing resources, and digital connectivity across all government sectors.
Development of E-services	3	Some E-services have been developed (such as electronic applications and registrations), but many services still require improvements in terms of simplicity and efficiency.
Data security and digital protection	3	There is basic regulation and infrastructure for data protection, but security remains a challenge, particularly regarding larger data processing systems and privacy.
Human capacity (training and expertise)	2	Further investment is needed in training public servants on new technologies and AI, and the number of experts is still insufficient.
Legal framework for digitalisation and AI	3	There are laws and guidelines for digitalisation and data protection (such as GDPR), but regulations for AI implementation and ethical guidelines are underdeveloped.
Support from government and institutions	4	The government has recognized the importance of digitalisation and AI, and strategic frameworks have been developed, but the implementation of these policies is not always consistent or fast enough.
Use of AI in public services	2	The application of AI in public institutions is still in its early stages, with several pilot projects, but widespread application has not been achieved.
Regulation for ethical AI application	2	Ethical guidelines for AI application (such as algorithm transparency) are not sufficiently developed, and legal frameworks for AI use in the public sector need to be defined.
Capacity for research and innovation	3	There are certain research capacities within academic institutions, but more investment is needed in innovation and the development of advanced technologies.

Source: authors' assessment based on reviewed research, reports, and the strategy of the Ministry of Public Administration of Montenegro.

2.2.2 Results of Technical Infrastructure, Human Resources, and Legal Framework

Based on the presented assessments, it can be concluded that Montenegro has the basic capacities to digitalize and apply AI in public administration, but significant challenges remain in terms of technical infrastructure, human resources, legal framework, and ethical guidelines. Investment in public servant training, improvement of regulations, and expansion of AI use in public services are needed to realize the full potential of digitalisation and AI. Data on the levels of digitalisation in municipalities across Montenegro show inconsistencies in the use of digital tools and services. At the local ggovernment level, digital readiness depends on the resources and capacities of individual municipalities. For example, the capital city of Podgorica is a leader in digital transformation due to its resources, while in many other municipalities, the digitalisation process is still in development. According to available information, the Ministry of Public Administration has recognised the need for supporting digitalisation at the local level and has established a coordinating body to enhance this process through cooperation with municipalities and relevant institutions. These initiatives and the support from the Ministry provide a solid foundation for further monitoring and increasing the digital readiness of municipalities in Montenegro.

Based on the results of the DRI, specific measures for improvement can be proposed, such as:

- increasing the number of digital services available to citizens,
- strengthening digital skills among employees through training,
- enhancing system interoperability between institutions.

The application of this methodology enables a detailed assessment of the state of digitalisation in Montenegro's public administration, with the DRI serving as a benchmark for future evaluations and improvements.

2.2.3 Results of KPI Implementation Evaluation

Based on the available information on AI implementation in public administration in Montenegro, as well as general trends in countries similar to Montenegro, the following are the estimated percentages of goal achievement. This evaluation is based on the current knowledge of digitalisation in public institutions, as well as the experiences of other countries on a similar path.

Table 5 shows the estimated achievement of KPIs for the implementation of AI technology in Montenegro's public administration. The goal of processing efficiency in citizen requests has achieved 40–50% in reducing processing time, while work process automation has reached 35–45%, enabling a higher number of tasks through AI. Citizen satisfaction with services has increased by 50–60%, and the accuracy of AI predictions and recommendations supports decision-making with an accuracy of 40–55%. Administrative costs have been reduced by 25–35%, while the number of new AI applications in the public sector has increased by 30–40%. The transparency and ethical application of AI systems show 60–70% compliance with regulations. Employee resilience and capacity to work with AI have improved through training, achieving 40–50%. AI systems have a 35–45% response rate to complex tasks, and public trust in AI technologies has increased to 50–60%. The realism of adapting institutions and organisational capacities in Montenegro indicates the need for more flexible approaches to AI technology implementation, with concrete examples of how public institutions can achieve practical adjustments, especially with limited resources.

Table 5. **KPI Implementation Evaluation in Montenegro's Public Administration**

KPI	*Measurement*	*Goal*	*Implementation percentage*
1. Efficiency of citizen request processing	Processing time before and after AI implementation	Reduction in processing time	40–50%
2. Automation of work processes	Percentage of automated tasks	Increased number of tasks performed by AI	35–45%
3. Citizen satisfaction level	Citizen feedback through surveys	Increased satisfaction with services	50–60%
4. Accuracy of predictions and recommendations	Accuracy of AI system predictions and recommendations	Higher accuracy for decision support	40–55%
5. Reduction in administrative costs	Cost savings through AI optimisation	Achieving budget savings	25–35%
6. Number of new AI applications	Number of AI applications implemented	Increased number of AI applications in public administration	30–40%
7. Transparency and ethical application	Percentage of AI systems compliant with regulations	Full compliance with ethical and legal standards	60–70%
8. Employee resilience and capacity	Percentage of employees trained to work with AI	Increased number of trained employees	40–50%
9. AI system response to complex tasks	Time taken by AI systems to respond to complex tasks	Improved response to complex requests	35–45%
10. Public trust in AI technologies	Public feedback on AI application	Higher trust in AI technologies	50–60%

Note: The estimates in *Table 5* are based on research and available data and represent orientation figures. For more accurate data, a more detailed study specific to Montenegro is necessary, including an analysis of the current infrastructure, challenges, and plans for AI implementation.

Source: authors' evaluation based on the analysis of the current infrastructure, challenges, and plans for AI implementation in Montenegro's public administration.

2.2.4 Results Related to Ethical Guidelines of Digitalisation and AI Implementation in Montenegro's Public Administration

This research evaluated the feasibility of the proposed solutions for implementing AI in Montenegro's public administration, considering specific challenges such as financial, human, and technical capacities. Additionally, the importance of aligning ethical guidelines with the local context was emphasised, with concrete steps presented for operationalising these guidelines in order to build trust in the application of AI technologies. Based on the current state of digitalisation and the potential for AI implementation in the public administration of Montenegro, a numerical assessment has been made for each key step on a scale from 0 to 100, with additional weighting of the significance of each aspect in the process. The weighting has been applied according to the implementation priorities and the importance of ethical guidelines, which are crucial for the overall process. The data presented in *Table 6* represents the authors' assessment, based on research findings, and is not exact, as specific data for this assessment are unavailable.

The overall ethical readiness index for AI implementation in Montenegro's public administration is 50 on a scale from 0 to 100. This result indicates significant areas for improvement, particularly regarding data privacy, oversight consistency, and the regular updating of regulatory frameworks, which would ensure the responsible and ethical

application of AI technologies in public administration. The results of the analysis of the ethical guidelines (see *Table 6*) for digitalisation and AI implementation in Montenegro's public administration indicate the need for the development of appropriate ethical regulations, which include:

- Developing guidelines tailored to the local context – Guidelines must consider specific technical capacities and resources of Montenegro, as well as the degree of digitalisation, to ensure they are clear and easily applicable in practice;
- Involving citizens and ensuring transparency – Actively involving citizens in the regulatory process through consultations and feedback strengthens trust in AI systems, especially concerning privacy and data protection;
- Focusing on privacy and data security – Adopting clear rules for data collection, storage, and processing to prevent potential misuse and ensure the protection of citizens' privacy;
- Establishing standards for accountability and oversight – Implementing oversight mechanisms to ensure accountability in AI system applications, with clear definitions of who uses data, how it is used, and how they are held accountable to citizens;
- Flexibility of regulations for technological advancements – Given the rapid development of technologies, regulations must be flexible and subject to periodic review to adapt to new challenges;
- Training and education of employees – Training public servants on ethics and responsibility in AI application is crucial for successful regulation implementation and recognising ethical dilemmas in practice;
- Establishing expert bodies for ethical assessment – Creating bodies to assess AI projects' compliance with ethical standards and protect citizens' rights from potential abuses;
- Monitoring and evaluating the effects of regulations – Regular monitoring of AI implementation in public administration allows for a swift response to identified challenges and risks;
- Furthermore, specific monitoring mechanisms are proposed for building citizen trust, including transparency regarding data usage, the establishment of ethical committees and oversight bodies, and public reports on AI system operations. Additionally, citizens' rights to access and correct data, as well as data encryption, ensure further protection and trust.

Table 6. Numerical Representation of Ethical and Technical Steps for AI Implementation in the Public Administration of Montenegro

Key Steps	*Description*	*Rating (0–100)*	*Weight (%)*	*Total Result*
Developing guidelines tailored to the local context	Currently, guidelines are under development, but they still largely rely on international standards, implying the need for further localisation	65	15%	9.75
Inclusion of citizens and transparency	Public consultations exist, but they are not regular, and it is necessary to improve transparency in decision-making stages to ensure greater participation and trust	55	10%	5.5
Focus on data privacy and security	Regulations regarding data privacy in public administration are partial and not fully aligned with best international practices	50	20%	10
Standards for accountability and oversight	Accountability mechanisms for AI systems have been gradually adopted, but oversight has not been consistently applied, requiring improvements in its effectiveness	45	10%	4.5
Flexibility for technological advancement	Regulations are not updated regularly, limiting their ability to adapt to the rapid technological progress in the field of AI	40	10%	4
Education and training of staff	Training related to ethical principles for AI application is sporadic and disproportionate, requiring the introduction of comprehensive and regular educational programs	35	15%	5.25
Establishing expert bodies for ethical evaluation	Expert bodies have been formed, but their functionality in the ethical evaluation of AI projects is still incomplete, requiring further investments in their operability	60	10%	6
Monitoring and evaluating the effects of regulations	A basic framework for monitoring exists, but there is a lack of comprehensive and systematic evaluation of the effects of regulations on the long-term outcomes of AI implementation	50	10%	5

Source: own results.

The proposed mechanisms such as AI 'explainability' requirements and whistleblower protection enable better control and understanding of how AI systems make decisions, contributing to greater transparency and reducing the risk of misuse.

2.2.5 Results of the Comparative Analysis

Slovenia was selected as the reference country for the comparative analysis of digitalisation and the application of AI in the public administration of Montenegro. The choice of Slovenia as a model is based on its significant progress in digital transformation, particularly in the public sector, and its relatively high position among EU member states. According to the 2022 DESI Index, Slovenia ranks 11th among EU countries, with a score of 53.4, surpassing the EU average of 52.3. This result reflects a comprehensive national digital strategy supporting the digital transformation of the public sector, especially through the enhancement of E-Government and digital services for the business sector. Slovenia's approach emphasises the importance of digital literacy and digital skills as a foundation for developing a functional digital society (European Commission, 2022, 2023b). On the other hand, Montenegro is in the earlier stages of digital transition, although significant efforts are being made to modernise digital infrastructure and develop E-Government. While Slovenia records a high percentage of businesses (26%) offering ICT training, Montenegro is still

developing broader programs to strengthen digital skills in the public sector and among the population, particularly in the context of advanced technologies and the application of AI.

Regarding basic and advanced digital skills, Slovenia achieves solid results, although it still lags behind the EU average (54% for basic skills and 26% for advanced skills). Montenegro faces similar challenges, but currently shows lower results, indicating the need for further investment in education and digital competencies at all levels of society (European Commission, 2022, 2023b). The application of AI in Montenegro's public administration, similar to Slovenia, focuses on gradually improving service efficiency and accountability to citizens. However, Montenegro faces additional technical and staffing challenges. Therefore, Slovenia's successes can serve as a valuable example for defining strategies and policies that would accelerate the process of digitalisation and AI implementation in Montenegro's public sector, with the goal of achieving greater efficiency and adaptability of public services to citizens' needs. This comparative review indicates potential for development in Montenegro through investment in digital skills and infrastructure, which would further facilitate alignment with EU digitalisation standards and strengthen digital transformation in the public sector. *Table 7* presents a comparative review of key digital readiness indicators for Montenegro, Slovenia, and the EU, based on the 2023 report on the 'Digital Decade' status in the EU.

Table 7. Comparative Overview of Digital Infrastructure, Skills, Business, Public Services, and Legislation in Montenegro, Slovenia, and the EU (2023)

Indicator	*Montenegro*	*Slovenia*	*EU Average (2023)*
Digital Infrastructure	5G coverage in major cities, limited rural coverage	High optical internet coverage, 5G network in major areas	55% rural coverage with advanced networks, goal by 2030: 100% gigabit and 5G coverage
Digital Skills	Basic digital skills among younger and medium-educated individuals	Most of the population possesses basic digital skills	Goal: 80% with basic digital skills by 2030, currently 59% with basic skills
Digitalisation of Business	Limited adoption of technologies such as cloud computing	High level of digitalisation among small and medium enterprises	Goal: 66% of businesses with cloud technology and 20% with AI by 2030
Digitalisation of Public Services	Some services available online, further modernisation needed	Comprehensive E-Government system, electronic health card available	Goal: 100% digital services and e-identification by 2030

Note: Due to the unavailability of precise data, estimated data for Montenegro are presented in *Table 8* based on the authors' research.

Source: European Commission, 2023a

In terms of digital infrastructure and the application of advanced digital technologies, Montenegro lags behind Slovenia and the EU average. Slovenia achieves notable results, especially in the field of E-Government and business process digitalisation. On the other hand, the EU sets ambitious targets for 2030, which include universal gigabit networks, an increase in ICT experts, and comprehensive digitalisation of public services. Achieving these goals requires significant financial investments and the improvement of digital competencies throughout Europe (see *Table 7*). These changes are crucial for strengthening the EU's digital sovereignty and competitiveness, as well as for reducing the digital development gaps between EU member states and candidate countries in the process of digital transition. The

comparative analysis of the key digital readiness indicators for Montenegro, Slovenia, and the EU average for 2022 and 2023 is presented through data covering the same indicators, which allows insight into the progress and challenges on the path to achieving digital maturity.

Table 8. Comparative Overview of KDI for Montenegro (Estimated), Slovenia, and the EU in 2022 and 2023

Indicator	*Montenegro 2022*	*Montenegro 2023*	*Slovenia 2022*	*Slovenia 2023*	*EU Average 2022*	*EU Average 2023*
Internet usage (% of population)	76%	78%	88%	88%	88%	89%
Basic digital skills (% of population)	30%	35%	50%	50%	52%	54%
Advanced digital skills (% of population)	10%	12%	20%	20%	24%	26%
Basic digital content creation skills	40%	42%	66%	66%	65%	66%
Enterprises providing ICT training (% of enterprises)	15%	17%	26%	29%	21%	22%
ICT specialists (% of employed, ages 15–74)	2.2%	2.5%	4.8%	4.5%	4.4%	4.6%
ICT graduates (% of all graduates)	1.5%	1.8%	4.1%	4.5%	4.0%	4.2%

Source: for Slovenia and EU: European Commission, 2023a

The analysis of *Table 8* indicates that Montenegro lags behind Slovenia and the EU average in almost all aspects of digitisation, particularly regarding basic and advanced digital skills. Slovenia achieves significantly higher results, which can be attributed to the continuous development of digital competencies among citizens, as well as systematic ICT training. On the other hand, the EU shows steady growth in the areas of digital skills and ICT sector workforce training, reflecting the overall goal of achieving high digital competence across the entire European Union. Although the data show progress in Montenegro compared to the previous year, this progress has still not reached the EU average levels. These results imply the need for further investment in digital infrastructure, as well as the improvement of education and training programs for digital skills. The current estimates for Montenegro are based on available data on current efforts in the digitalisation of public services. While Montenegro has not yet reached the level of digital development of Slovenia and the EU average, significant steps are recognised toward improving digital services, particularly in the areas of mobile optimisation and the introduction of eehealth (see *Table 9*).

Table 9. Comparative Overview of KPI in Montenegro, Slovenia, and the EU for 2023

Indicator	*Montenegro 2023 (estimate)*	*Slovenia 2023*	*EU Average 2023*
E-Government users (% of internet users)	65–70%	81%	74%
Digital public services for citizens (score from 0 to 100)	55–60	71	77
Digital public services for businesses (score from 0 to 100)	70–75	83	84
Pre-filled forms (score from 0 to 100)	60–65	72	68
Transparency in delivery, design, and personal data (score from 0 to 100)	55–60	64	65
Customer support (score from 0 to 100)	65–70	82	84
Mobile device compatibility (score from 0 to 100)	80–85	94	93
Access to electronic health data (score from 0 to 100)	65–70	80	72

Source: European Commission, 2023a

The estimates for Montenegro in *Table 9* are based on current efforts toward digitalisation in Montenegro, which, while showing progress, still lags behind the EU and Slovenia, particularly in terms of digital public services and transparency. The implementation of these mechanisms requires coordination among institutions, investment in skilled resources, and the development of standardised procedures to ensure continuous data protection and public trust in AI applications in Montenegro's public administration.

Table 10. Overview of the Level of Digitalisation and AI Application in Montenegro's Public Administration

Area	Digitalisation level	AI application	Implementation Level (%)	Weight (%)	Overall Result
1. Traffic management	Early phase of traffic monitoring system implementation	AI analyses traffic patterns, reduces congestion, and improves vehicle flow	30	15%	4.5
2. Energy efficiency	Software solutions for monitoring energy consumption	AI optimises energy consumption and identifies patterns for reducing use	25	10%	2.5
3. Waste management	Basic digital platforms for waste tracking	AI optimises waste collection routes and waste management processes	20	10%	2
4. Communication automation	E-Government platforms and query responses	AI chatbots for automated responses and request processing	40	10%	4
5. Fraud detection	Digitalised services for reporting and validation	AI detects fraud patterns in service applications	15	5%	0.75
6. Public safety	Limited digitalisation and analytics in safety	AI analyses criminal patterns, helps predict high-risk locations	25	10%	2.5
7. Urban planning	Basic digital planning tools	AI analyses demographic and economic data for sustainable development	20	5%	1

Table 10 *(continuation).* Overview of the Level of Digitalisation and AI Application in Montenegro's Public Administration

8. Transport	Public transport tracking systems	AI optimises public transport routes, autonomous vehicles in experimental phase	30	5%	1.5
9. Healthcare	Digitalised e-health records and patient tracking	AI personalises treatments and tracks patients remotely	35	10%	3.5
10. Education	Digital platform for teaching and data collection	AI analyses student performance and adapts teaching methods, development of strategies for personalisation	30	5%	1.5
11. Environmental sustainability	Basic digital platforms for tracking environmental factors	AI enables monitoring ecological conditions and managing natural resources	25	5%	1.25

Source: authors' estimates based on reviewed research, reports, and the Ministry of Public Administration's strategy of Montenegro.

The overall estimated index of the level of digitalisation and AI application in Montenegro is 23.5. The total index for the level of digitalization and AI application in Montenegro's public administration is 23.5 on a scale from 0 to 100. This result indicates that digitalisation and AI application in Montenegro's public administration are still in the early stages across most sectors. Additionally, many sectors have plans for further development and improvement of AI technology application, but there is significant room to increase implementation to achieve greater efficiency and better services for citizens.

3. Discussion

Implementation of AI in Montenegro's public administration requires a strategic approach that takes into account specific institutional and organisational capacities, as well as the current stage of digitalisation and AI technology adoption. Although progress in digitalisation and AI application in public administration is evident, significant challenges remain that must be addressed to ensure the effective implementation and sustainability of these technologies. Based on an assessment of the current situation and analysis of existing data and experiences from other countries, several key factors influencing the success of AI implementation in Montenegro can be identified. The first key factor relates to capacity building and staff training. Continuous investment in training public institution employees on the fundamentals of AI technologies, ethical guidelines, data management, and the application of appropriate regulations is necessary. While the assessment of Montenegro's current level of digitalisation shows that the country is in the phase of accelerated development of digital services (40–50%), this is still far from the desired state. Given the limited resources and the need for skilled personnel, training public servants in AI technologies and ethics must be a priority. This process includes not only initial training but also continuous education to ensure employees can properly use AI solutions in their daily work. The second factor concerns the implementation of flexible approaches and pilot projects. Given the high level of uncertainty in the application of AI technologies, it is recommended to start with smaller, specific projects that allow for testing AI solutions in smaller sectors, such as transportation and healthcare, where AI is already being applied. This approach allows institutions to gain experience and build public trust without significant initial investments, with the current level of AI

application estimated at 20–30%. This percentage reflects the initial phase of implementation in Montenegro, with plans for further expansion in the coming years, particularly in the areas of service automation and fraud prevention. The third important factor is the development of appropriate ethical regulations, which must be flexible and tailored to local conditions. While global ethical frameworks exist, their application in Montenegro must consider the specificities of the social, economic, and legal environment. Local ethical guidelines need to be developed to facilitate the implementation of AI technologies in a way that is both acceptable and effective within the Montenegrin context. These regulations must be accessible and realistic to avoid challenges arising from the implementation of strict global rules that may not be applicable in the domestic environment.

Furthermore, it is essential to ensure appropriate technical infrastructure and implement monitoring mechanisms. Transparent data collection and processing will enable better tracking of AI technology implementation and build public trust in public administration processes. While laws supporting digitalisation exist, the application of AI technologies requires ongoing adaptation of the legislative framework to ensure data privacy protection and institutional accountability in the application of new technologies. One example of best practices in the application of digitalisation and AI in public administration in the region can be seen in Serbia through the project 'Robot Sofia'.' This project leverages AI to enhance communication between citizens and institutions, allowing citizens to ask questions and quickly receive answers about various public services via a chatbot platform. 'Sofia' is integrated with multiple government portals and provides automated responses to a wide range of inquiries, from administrative processes to guidance on using digital services (IRT3000, 2019). Additionally, Croatia employs AI technologies in the 'eCitizens' project, which enables citizens to access a variety of public services through a unified digital platform. Public administration can analyse service usage patterns, better understand citizen needs, and improve decision-making processes by using predictive analytics tools.

These regional examples highlight the potential of AI and digitalisation in delivering services more efficiently, reducing administrative burdens, and enhancing user experience (Government of Croatia). The assessment of the level of digitalisation and AI application in Montenegro also includes challenges related to infrastructure, internet coverage, internet connection speed, and system interoperability between institutions. While investments have been made in digital infrastructure, there are significant areas that require additional investment to ensure uniform digitalisation, particularly in less developed regions. There is also a need for further investment in training public administration employees to enhance skills in digital technologies and ethical guidelines. Based on these assessments, further investment in stable digital infrastructure and the organisation of training for public administration employees is recommended to accelerate adaptation to new technologies. Additionally, cooperation with international organisations, as well as the use of European funds, which can provide significant support for the faster implementation of advanced technologies in public administration, is essential. Finally, the real level of digitalisation in Montenegro's public administration can be estimated at 40–50%, while AI application currently stands at 20–30%. Growth is expected in the coming years, with continued investment in infrastructure, education, and legislative framework adjustments. The development of these factors represents a key step towards the successful implementation of AI technologies in Montenegro's public administration.

Conclusions

This paper makes several key contributions to enhancing digitalisation and AI implementation in Montenegro's public administration. First, an in-depth analysis of the current state of the public sector identifies major challenges in AI technology implementation, including technical, organisational, personnel, and regulatory barriers, forming the foundation for developing a strategy for further digitalisation progress. The second significant contribution of the paper lies in formulating concrete guidelines and recommendations for the effective application of AI systems, encompassing the need for staff training, resource optimisation, and the introduction of data protection standards to preserve user privacy. The third important conclusion focuses on creating an ethical framework for AI use in public administration, which is crucial for establishing public trust and minimising the risk of misuse, with an emphasis on transparency and accountability in decision-making processes. Additionally, the paper evaluates the effects of AI application on the efficiency and quality of services in public administration, highlighting potential benefits as well as risks that require careful management. Finally, a model is proposed for oversight and feedback between institutions and citizens, aiming to increase transparency and public trust in AI systems while ensuring their accountability and adaptability to citizens' needs. With these conclusions, the paper contributes to laying the groundwork for responsible and effective digitalisation and AI implementation in Montenegro's public administration, thereby fostering the modernisation of the public sector, improving service quality, and enhancing the efficiency of administrative processes.

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SKAITMENINIMAS IR DIRBTINIO INTELEKTO TAIKYMAS VIEŠAJAME SEKTORIUJE

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SANTRAUKA

Šiame straipsnyje nagrinėjamas skaitmeninimo ir dirbtinio intelekto diegimo mastas Juodkalnijos viešojo administravimo sektoriuje, analizuojamas jų poveikis veiksmingumui, prieinamumui ir paslaugų kokybei. Tyrimo tikslas – įvertinti, kaip šios technologijos gali prisidėti prie viešųjų paslaugų gerinimo ir gyventojų pasitikėjimo institucijomis stiprinimo, padarant paslaugas greitesnes, skaidresnes ir labiau atitinkančias visuomenės poreikius.

Viešosios administracijos skaitmeninimas yra itin svarbus valstybinių institucijų modernizavimo etapas, transformuojantis tradicinius administravimo procesus į veiksmingesnius skaitmeninius formatus. Perėjimas nuo popierinių dokumentų prie elektroninių duomenų bazių padeda greičiau ir skaidriau apdoroti informaciją, palengvina duomenų apsikeitimą tarp institucijų ir pagerina gyventojų prieigą prie paslaugų. DI integravimas į viešąjį administravimą dar labiau pagerina šiuos procesus – taip atsiranda galimybė automatizuoti užduotis ir išmaniai analizuoti bei apdoroti didelius duomenų kiekius. DI technologijos, tokios kaip mašininis mokymasis ir natūralios kalbos apdorojimas, leidžia atpažinti dėsningumus, prognozuoti tendencijas, priimti geresnius sprendimus teikiant viešąsias paslaugas bei nustatyti galimą riziką. Skaitmeninimo ir DI sinergija sumažina administracinę naštą, didina veiksmingumą ir leidžia teikti labiau personalizuotas paslaugas gyventojams. Be to, tai didina skaidrumą ir atskaitomybę viešosiose institucijose, palengvina veiklos ir sprendimų priėmimo stebėseną.

REIKŠMINIAI ŽODŽIAI: skaitmeninimas; dirbtinis intelektas; viešasis administravimas; Juodkalnija.