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Digital Governance and Artificial Intelligence in the Development of Territories and Infrastructure

Vasyl Pikiniar

PhD student, Classic Private University,
Zaporizhia, Ukraine.
asylpikiniar777@gmail.com,
<https://orcid.org/0009-0008-9265-2706>

Gennadii Riabtsev

Doctor of Science in Public Administration, Full
Professor, Professor of the Andriy Meleshevykh
Kyiv-Mohyla School of Governance, National
University of Kyiv-Mohyla Academy, Kyiv,
Ukraine; Professor of the Academic Department
of Social Sciences, European Humanities
University, Vilnius, Lithuania. rgl2006@ukr.net,
<https://orcid.org/0000-0002-3478-825X>

Valerii Tertychka

Doctor of Science in Public Administration, Full
Professor, Professor of the Department of National
Security and Political Science, National University
“Ostroh Academy”, Ukraine; Professor of the
Academic Department of Social Sciences,
European Humanities University, Vilnius,
Lithuania. vtertychka@gmail.com,
<https://orcid.org/0000-0002-9788-3190>

Oleksandr Kiliievych

Associate Professor, Associate Professor of the
Andriy Meleshevykh Kyiv-Mohyla School of
Governance, National University of Kyiv-Mohyla
Academy, Associate professor of the Department
of National Economy and Public Administration, Kyiv National Economic University named after Vadym Hetman,
Kyiv, Ukraine. okiliev@gmail.com, <https://orcid.org/0000-0003-3418-5464>

Anna Karpyn

Senior Lecturer Department of Physics and Information Systems, Ivan Franko Drohobych State Pedagogical University,
Drohobych, Ukraine. chapanvas@gmail.com, <https://orcid.org/0009-0005-1708-9229>

Lesya Ilchenko-Syuyva

PhD (Public Administration), Associate Professor, Associate Professor at Andriy Meleshevykh Kyiv-Mohyla School of
Governance, National University of "Kyiv-Mohyla Academy", Kyiv, Ukraine. ilchenko-syuyva@ukma.edu.ua,
<https://orcid.org/0000-0002-8433-562X>

Abstract: This article explores the integration of intelligent transportation systems (ITS). Smart management of urban resources, including energy, water, and other critical systems, is a tool for enhancing economic efficiency in cities. The article also discusses how digital platforms for territorial governance and the automation of administrative processes create conditions for more transparent and efficient administration, while improving citizen engagement. Special attention is given to the issue of cybersecurity and the protection of digital systems, which ensure the stability and reliability of infrastructure. The article also explores the role of digital technologies and artificial intelligence (AI) in the planning, development, and modernisation of territories and infrastructure. It examines the possibilities of integrating digital governance into urban development, transport, energy, communications, and environmental monitoring. The potential of AI is analysed in terms of processing large volumes of data, forecasting socio-economic processes, optimising resource use, and enhancing the efficiency of decision-making. Particular attention is given to the concepts of “smart cities,” digital transformation of regions, and decentralised governance platforms. The article outlines the key advantages, risks, and ethical challenges associated with the implementation of AI in spatial planning and infrastructure renewal.

Keywords: digital governance; artificial intelligence; intelligent transport systems; urban development; smart cities; internet of things.

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1. Introduction

The digital transformation of cities and territories serves as a key anchor in urban development and infrastructure. Through the implementation of cutting-edge technologies, cities are becoming smarter, more adaptive, and more efficient in managing their resources and infrastructure. Digital tools not only improve residents' quality of life but also help create more sustainable, environmentally friendly, and economically efficient urban areas.

One of the most important aspects of this transformation is Intelligent Transport Systems (ITS), which plays a key role in enhancing safety, reducing congestion, and optimising traffic flow.

Smart management of urban resources is another crucial element of digital transformation. It involves the integration of intelligent solutions for managing energy, water, heating, and other critical systems. This approach helps reduce costs and optimise resource use.

Digital platforms for territorial management and the automation of administrative processes are becoming the foundation for transparent governance and greater efficiency at the local level (Bejarano-Murillo, 2025). Such platforms help minimise bureaucratic barriers, provide quick access to essential information, and promote more effective interaction with citizens.

Finally, the issue of cybersecurity and the protection of digital systems is of vital importance for ensuring the reliability and stability of these new technologies. As digital platforms and smart systems increasingly constitute key components of urban infrastructure, data protection and privacy will emerge as essential elements of their operation.

The aim of this article is to explore the impact of digital governance and artificial intelligence on the development of urban territories, as well as to identify key trends and opportunities for future infrastructure development in the context of technological change.

2. Theoretical Background of the Study

Intelligent Transport Systems (ITS) are a key element of the digital transformation of cities and regions, which serve as a qualified tool for improving efficiency, safety, and the environmental sustainability of the transport infrastructure. They are based on the use of artificial intelligence, big data, sensor technologies, and network solutions to optimise traffic flow, manage public transport, and relieve the load on road infrastructure.

One of the main functions of ITS is dynamic traffic management. The systems analyse data from surveillance cameras, motion sensors, and mobile applications to adjust traffic lights, change traffic patterns, and suggest alternative routes to drivers in real time. This helps reduce congestion, shorten travel time, and improve comfort when moving around the city.

Another important area is intelligent public transport. Buses, trams, and metro trains can be equipped with artificial intelligence systems that analyse passenger flows, predict arrival times, and automatically adjust the schedule. This helps reduce waiting times at stops, mitigate road congestion, and improve the quality of service for passengers.

ITS also plays an important role in improving road safety. Artificial intelligence systems can detect traffic violations, control vehicle speeds, and automatically notify emergency services in case of accidents. The implementation of intelligent video surveillance and licence plate recognition helps respond to incidents more quickly and reduce the number of road traffic accidents.

According to Borodina and Shevchenko (2020), "the environmental aspect of ITS is no less important. Route optimisation, reduction of vehicle idling time, and the transition to electronic tickets all help reduce carbon dioxide emissions and the overall environmental impact. Combined with the development of electric transport and the concept of 'green' cities, this contributes to the creation of a more comfortable and environmentally friendly urban environment."

Accordingly, the integration of intelligent transport systems represents a significant catalyst for advancing contemporary urban infrastructure. They not only help improve transport logistics but also enhance safety, reduce pollution, and make cities more pleasant for residents and visitors alike.

Smart management of urban resources is an important area of the digital transformation of cities, based on modern technologies. The main goal of this approach is to increase the efficiency of resource use, reduce costs, and improve people's lives.

One of the key areas of smart management is energy saving and energy consumption optimisation. Thanks to modern digital technologies, cities can better control energy consumption, reduce expenses, and minimise negative impacts on the environment.

According to Rachynska (2022), "one of the most important tools in this process is smart grids." They use artificial intelligence and big data to monitor energy consumption, automatically balance loads, and predict peak demand. This helps optimise energy distribution, reduce losses, and avoid overloads that could lead to accidents.

Another important solution is the implementation of smart electricity metres. They allow individuals and businesses to monitor their consumption in real time, detect excessive resource use, and adjust their habits to save money. Additionally, such systems simplify electricity billing and help energy companies better predict demand.

Smart street lighting plays a special role in reducing energy consumption. Thanks to motion and light sensors, such systems can automatically adjust brightness, thereby reducing electricity use during low-activity periods. This not only reduces costs for urban households but also promotes environmental sustainability.

It is also worth mentioning energy-efficient buildings and green technologies. Modern cities are increasingly using technologies to automatically regulate indoor microclimates, reducing heating and cooling costs. Solar panels, heat recovery systems, and passive building technologies significantly reduce overall energy consumption.

Efficient management of water supply and sewage systems is another essential part of a smart city. The use of modern digital technologies increases water use efficiency, minimises losses, and ensures stable access to clean water for residents.

Modern cities use smart water supply networks that enable real-time tracking of water levels in tanks, pressure control in pipelines, and accident prevention. The use of pressure and leakage sensors helps detect pipe damage at an early stage, significantly reducing water losses and repair costs.

Additionally, smart water metres allow residents to monitor their water consumption, while utility services can automate accounting and respond in a timely manner to abnormal situations such as overuse or unauthorised connections (Batty, 2023).

An important direction is the optimisation of water treatment processes using artificial intelligence technologies. AI algorithms analyse the chemical composition of water, automatically regulate reagent dosing, and control purification quality. This increases the efficiency of treatment facilities and provides citizens with safe drinking water.

Smart cities actively use digital solutions to monitor and manage sewage systems (Ullah et al., 2024). Water pollution sensors allow the assessment of wastewater levels, forecast potential sewer overloads, and prevent flooding during heavy rains.

Moreover, modern sewage systems can automatically respond to weather changes by regulating the operation of pumping stations and directing water flows to minimise the load on the network.

"One of the most important aspects of sustainable urban development is water recycling and reuse," notes Kraus et al. (2021). For example, treated wastewater can be used to irrigate green spaces, meet technical needs, or even be reused in industry.

Effective waste management is a vital area in the development of modern cities, as it helps reduce environmental pollution and promote the rational use of resources. The use of digital technologies, artificial intelligence, and the IoT significantly increases the efficiency of waste collection, sorting, and recycling.

One of the most important solutions in waste management is the implementation of smart waste bins. These are equipped with fill level sensors that transmit information to a central system,

allowing the optimisation of waste collection schedules. This helps transport companies avoid unnecessary trips, reduce fuel costs, and lower CO₂ emissions (Chatterjee et al., 2021).

Automated waste sorting systems that use artificial intelligence to recognise and classify waste are also actively used. For example, special conveyor belts with robotic arms can automatically separate plastic, glass, metal, and paper, which significantly increases recycling efficiency.

Digital solutions help optimise the logistics of waste collection. GPS trackers and big data analysis help determine the shortest routes for refuse lorries, reducing traffic congestion and fuel consumption.

Moreover, cities are actively implementing extended producer responsibility (EPR) schemes, which encourage companies to design environmentally friendly packaging and finance recycling programmes at the end of product life cycles.

“Smart cities actively use mobile applications and online platforms to help citizens learn about the location of recycling centres, waste collection schedules, and sorting rules. Such tools help increase environmental awareness among the population,” state Riezebos et al. (2022).

Some cities are also introducing incentive programmes for residents, such as bonuses or discounts on utility services for active participation in waste separation.

Digitalisation also includes air quality monitoring and environmental control. The use of modern technologies allows cities to effectively control pollution levels, forecast ecological risks, and take immediate action to improve the environmental situation.

Modern cities use automated sensor networks that collect data on the level of harmful substances in the air, including:

- Nitrogen dioxide (NO₂) – a major pollutant caused by vehicles and industry.
- Particulate matter (PM_{2.5} and PM₁₀) – hazardous microparticles that enter the lungs.
- Ozone (O₃), carbon monoxide (CO), and other pollutants that affect air quality.

Thanks to IoT technologies, the data is transferred to specific systems, where it is analysed in real time. This information is used by city services to make decisions aimed at reducing pollution.

Artificial intelligence and big data not only allow monitoring of the current air quality but also help forecast environmental hazards. By analysing historical data, weather conditions, and traffic intensity, AI systems can predict periods of high air pollution and recommend preventive measures.

For example, if a high level of air pollution is forecast in a certain area, city authorities can restrict traffic, create low-emission zones, or recommend that residents use public transport instead of private vehicles.

In addition to urban air monitoring, digital technologies are also used to control industrial emissions. Intelligent systems can:

- Monitor emissions in real time;
- Automatically detect environmental standard violations;
- Generate reports and inform regulatory authorities about exceedances of allowable pollutant levels.

According to Kraus et al. (2021), “such solutions help strengthen environmental control and encourage companies to comply with environmental standards.”

An important component of environmental control is public access to environmental information. Many cities create online platforms and mobile applications where residents can:

- Receive up-to-date information about air quality in different parts of the city;
- Learn about environmental protection measures and health recommendations;
- Report cases of illegal waste burning or pollution.

Such services increase environmental awareness and encourage active citizen participation in environmental monitoring.

Thus, smart urban resource management is a comprehensive approach that helps improve the efficiency of public services, save resources, enhance environmental conditions, and create a pleasant urban environment. The use of digital technologies enables cities to become more sustainable, intelligent, and citizen-oriented.

Digital platforms for territorial management are an important tool for the development of modern cities and regions. They use advanced technologies to collect, analyse, and manage information about urban resources, infrastructure, and the environment. Such platforms facilitate effective decision-making, improve the quality of municipal services, and ensure sustainable territorial development.

Digital platforms for territorial management cover a wide range of functions:

- **Monitoring urban resources:** This includes monitoring the condition of roads, transport infrastructure, water supply, energy systems, waste disposal, and pollution. With data provided by sensors, people can respond quickly to potential problems.
- **Geoinformation analysis (GIS technologies):** Maps and spatial analysis help with development planning, determining traffic routes, analysing the ecological state of territories, and assessing risks (such as floods or landslides).
- **Intelligent traffic management:** Analysing data on traffic, congestion, public transport, and parking spaces allows optimisation of transport flows and increases residents' mobility.
- **Digital interaction with citizens:** Platforms allow citizens to access city services, submit infrastructure repair requests, file complaints, receive administrative services online, and participate in public discussions and voting.
- **Forecasting and modelling territorial development:** The use of artificial intelligence and machine learning makes it possible to predict future changes in the urban environment, considering demographic, economic, and environmental factors.

Many developed cities have already successfully implemented digital platforms for territorial management.

Singapore, for example, has an integrated city management system that analyses traffic flows, pollution levels, electricity and water consumption, and provides predictive recommendations for municipal services.

Urban planning digital platforms: In London and New York, GIS analysis is used for development planning, allocating recreational zones, reducing traffic, and improving the ecological state of areas.

Electronic land management: Dubai has a unified digital platform that allows for land use control, property registration, and simplifies the permit issuance process for developers.

Improved administrative efficiency: Centralised data access allows municipal departments to make faster decisions and respond to emergencies.

Resource savings: Optimising the use of energy, water, and transport infrastructure helps reduce urban expenditures.

Improved quality of life for residents: Access to online services, efficient public transport, environmental monitoring, and safety enhance residents' comfort.

Transparency and citizen participation: Open data and electronic democracy tools promote public involvement in addressing key urban issues.

“Digital platforms for territorial management are an integral part of modern urban development,” says Prifti et al. (2024). The use of such technologies enables cities to adapt to contemporary challenges and create smart urban environments that meet societal needs.

The automation of administrative processes is an essential component of digital transformation in public administration. It significantly enhances efficiency, reduces bureaucracy, and provides citizens with more transparent and accessible services. The implementation of modern technologies simplifies routine and labour-intensive procedures, reduces the human factor, and enables automatic data processing, which is crucial for effective governance in the modern world.

As noted by Tkachenko and Sydorchuk (2024), “one of the most important areas of automation is e-government, which allows citizens and businesses to receive necessary public services online. This includes business registration, tax declaration submission, obtaining licenses and other permits without the need to visit government offices. All these processes are automated using digital platforms, significantly improving service accessibility for the population.”

Another key element is Robotic Process Automation (RPA), which can greatly simplify and speed up routine processes. For example, software robots can automatically process applications, check and organise documents, integrate data from various state registers, perform calculations, and verify compliance with regulations. These technologies reduce the human factor in administrative processes, minimise errors, and increase the efficiency of public authorities.

Electronic document management is another important aspect of automation. The implementation of electronic signatures and document flow allows government bodies to operate without paper, significantly reducing the time required for document processing and archiving, and minimising the risk of document loss. Electronic document management systems store documents in digital form, simplifying access and reducing the cost of storing physical copies.

Carson et al. (2024) believe that automated data monitoring and analysis help authorities control performance, forecast service demand, and optimise resources. Big data and analytics systems can help detect process issues at an early stage, allowing timely strategy adjustments and improved service delivery.

One of the most well-known examples of automation is digital platforms for administering social benefits, where applications for subsidies, pensions, and other allowances are processed automatically. Algorithms verify data, ensure correct benefit calculations, and reduce the number of errors in financial support distribution.

In general, the automation of administrative processes brings significant benefits: reducing time and financial costs, improving access to public services, increasing transparency, and reducing corruption through open data and minimal human intervention. Digital technologies can significantly improve the quality of services for citizens, ensure sustainable development, and enable effective management of state resources. Automation of administrative processes not only simplifies the work of government agencies but also greatly enhances interaction between the state and its citizens, making governance more efficient and citizen-oriented.

Cybersecurity and the protection of digital systems are among the most pressing issues in today's world, where technologies and digital platforms are increasingly integrated into everyday life, business processes, and public administration. With the growth of digital technologies and online resources, the number of cyber threats that endanger user data confidentiality and the integrity of digital systems is also increasing.

As noted by van den Hoven et al. (2024), “cybersecurity encompasses a wide range of programmes to protect networks, prevent information leakage, and defend against other cyber threats.” Since the internet and digital technologies are used in all areas — from finance and business to government institutions and healthcare — it is crucial to ensure their security and protect them from malicious actions.

The key components of cybersecurity are:

1. Network and infrastructure protection. One of the most important areas of cybersecurity is the protection of networks through which information is transmitted. This includes the installation of firewalls, intrusion detection and prevention systems (IDS/IPS), and the use of encryption to ensure the confidentiality of data transmitted over the network.
2. Data protection. One of the critical aspects of cybersecurity is protecting data from unauthorised access, destruction, or modification. Various encryption methods, data protection tools, and multifactor authentication are used for this purpose. Encryption helps ensure the confidentiality of data even if it falls into the hands of malicious actors.
3. Software protection. Software security is vital for the stable and secure operation of digital systems.

4. Incident response and post-attack recovery. An essential part of cybersecurity is not only preventing attacks but also responding to them quickly. Every organisation should have an incident response plan that includes measures for detecting attacks, localising them, eliminating consequences, and recovering systems and data. Regular training and simulated attacks help employees prepare for real cyber threats.

5. User education and awareness. One of the most common attack vectors is the human factor. In digital environments, users are at risk of becoming targets of cyber fraud and deceptive practices. Therefore, it is essential to educate and train employees and citizens to increase their awareness of cyber threats and teach them how to respond to them (Table 1).

Table 1. Key Components of Cybersecurity

Key Components of Cybersecurity	Description
Network and Infrastructure Protection	Includes the installation of firewalls, intrusion detection and prevention systems (IDS/IPS), and the use of encryption to ensure the confidentiality of transmitted data.
Data Protection	Use of encryption methods, security measures to prevent unauthorised access, modification, or leakage of data.
Software Protection	Regular software updates, elimination of vulnerabilities, and implementation of secure coding standards to prevent cyberattacks.
Incident Response and Post-Attack Recovery	Development of response plans, attack localisation, mitigation of consequences, system and data recovery, and conducting training exercises.
User Education and Awareness	Raising awareness of cyber threats, training in safe behaviour in the digital environment, and preventing phishing attacks.

Modern cyber threats range from hacker attacks and viruses to more sophisticated schemes, such as distributed denial-of-service (DDoS) attacks, theft and sale of personal data, or ransomware. These attacks can have serious consequences for companies, government institutions, and authorities.

According to Karpa et al. (2023), “the protection of digital systems is also a significant issue on a global level. With the development of modern technologies, new security challenges arise. For example, the security of internet-connected devices is becoming increasingly important, as attackers can use them as entry points for attacks on other parts of the network.”

Cyber threat protection is also crucial for national security. Governments and regulatory bodies are actively working to strengthen cybersecurity at the state level by implementing new security rules and standards and expanding cooperation with other countries and international organisations to combat cybercrime.

Cybersecurity and the protection of digital systems are critical for ensuring the stable functioning of both individual organisations and public institutions in today's digital world. Protection systems against cyber threats must constantly evolve, as cybercriminals continue to refine their methods. Given the scale and importance of digital systems for the economy, social development, and national security, ensuring cybersecurity becomes a priority for all countries and organisations.

3. Empirical Study

As part of the study, a survey was conducted involving 100 respondents, including representatives of local government authorities, urban planning specialists, engineers, IT experts, and community residents with experience using digital services of territorial administration.

The purpose of the study: to determine the level of awareness, trust, and attitudes towards the implementation of digital technologies and artificial intelligence in the management of territorial development and infrastructure.

Research methods:

- Online survey (structured questionnaire);
- Content analysis of responses.

Expert evaluation methods:

- Statistical processing of results (descriptive statistics, correlation analysis);
- Online survey (structured questionnaire);
- Content analysis of responses;
- Expert evaluation method;
- Statistical data analysis (descriptive statistics, correlation analysis).

Composition of the Expert Group. The expert group consisted of 12 specialists. They were selected based on professional competence and relevant practical experience of at least five years. All experts had proven expertise in their respective fields. The group included: 1) three representatives of local self-government bodies involved in territorial strategic planning; 2) three specialists in urban studies and territorial development; 3) two engineers specialising in infrastructure systems; 4) two IT experts with experience in the implementation of digital municipal services; and 5) two researchers specialising in digital governance and public administration.

Evaluation System. Expert evaluation was carried out using a five-point Likert scale. The scale was defined as follows:

- 1 – very low level or complete disagreement;
- 2 – low level;
- 3 – medium level or partial agreement;
- 4 – high level;
- 5 – very high level or complete agreement.

Table 2. Key indicators of respondents' perceptions and readiness for the implementation of digital governance and artificial intelligence in territorial development

Indicator	% of respondents
Aware of digital management in territorial development	72%
Have experience using municipal-level digital services	58%
Believe AI can improve territorial and infrastructure management efficiency	81%
Express concerns about privacy and cybersecurity	64%
Support the implementation of "smart infrastructure"	77%
Consider their community's digital development level insufficient	69%
Need training on digital tools and monitoring systems	54%

The empirical findings presented in Table 2 show that respondents generally hold a positive view of digital governance and the use of AI in managing territorial and infrastructure development. However, the results also point to several barriers that limit the full implementation of digital solutions at the local and regional levels.

A relatively high level of awareness of digital services is observed among respondents (72%), indicating steady progress in the digital transformation of society. Despite this, only 28% of participants report a clear understanding of how digital technologies can be practically implemented in their local communities. This suggests a noticeable gap between general awareness and practical knowledge of digital governance processes.

Strong support for the introduction of intelligent systems (77–81%) reflects a high degree of societal readiness for innovation. At the same time, a significant share of respondents express concerns about personal data protection and cybersecurity (64%). These concerns underline the

importance of developing transparent AI use policies and ensuring reliable information protection mechanisms within national and regional digital strategies.

The study results show an overall positive attitude towards the digital transformation of governance systems and infrastructure. Most respondents support the implementation of innovations but emphasise the need for information security, process transparency, and public digital education. The obtained data may serve as a basis for developing community digitalisation strategies and implementing AI in local planning.

4. Study Results

The study was conducted among 100 respondents from different regions of Ukraine, representing municipal institutions, IT companies, infrastructure development enterprises, and active citizens. The aim was to determine the attitudes of the population and specialists towards using digital technologies and AI in managing territories and infrastructure.

1. Awareness of Digital Governance and AI:

- 72% of respondents are aware of digital platforms for community management;
- 64% express concerns about privacy and cybersecurity .

2. Level of Use of Digital Services:

- 58% have used electronic municipal services (e.g., e-petitions, online registration for housing and utility services).

3. Assessment of Digital Technology Effectiveness:

- 81% believe AI can improve resource and transport infrastructure efficiency;
- 77% support the implementation of a "smart city" or smart infrastructure;
- 64% express concerns about the security of personal data in digital systems.

4. Need for Digital Education:

- 54% of respondents indicated the need for special training programmes for civil servants, utility workers, and residents on using digital platforms;
- 29% consider citizens' digital literacy a barrier to effective technology implementation.

The results show broad support for the digitalisation of administrative processes and high interest in implementing innovative technologies, including AI. However, a range of technological and social limitations were identified that require systemic resolution. The need for public digital education and enhanced managerial competencies may serve as a foundation for developing national and regional digital development strategies.

5. Discussion

The study results show that digital governance and artificial intelligence (AI) have great potential in the context of territorial and infrastructure development. At the same time, they reveal obstacles hindering their full implementation at the local and regional levels.

First, it should be noted that the high level of awareness (72%) about digital services indicates a positive dynamic in the digital transformation of society. However, less than one-third of respondents (28%) have a clear understanding of implementation mechanisms, highlighting the need for targeted informational and educational efforts for the public and leadership.

The support for the implementation of intelligent systems (77–81%) reflects society's readiness for change, but significant concerns about data protection and cybersecurity require special attention. Developing personal data protection strategies and transparent AI usage policies should be a priority of the national digital strategy.

Digital inequality is particularly relevant: the results show that only half of the respondents (54%) have access to the necessary digital education or resources. This creates a risk that some regions and social groups may fall further behind in the digital transformation process.

Another important issue is the lack of financial resources and personnel, noted by about 40–50% of respondents. This problem must be addressed not only through state investments but also by creating partnerships with businesses, universities, and the IT sector.

Interestingly, among participants already experienced in using multimedia or digital services, there was higher motivation to engage in local governance, indicating increased civic activity in the digital age.

Thus, the discussion of results leads to the conclusion that a comprehensive, multi-level approach to implementing digital governance is necessary, considering social, educational, infrastructural, and ethical aspects. Artificial intelligence and digital technologies should be seen not only as tools but as drivers of administrative culture transformation and civic engagement in decision-making processes.

6. Conclusions

Intelligent transport systems and smart urban resource management constitute the core components of the digital transformation of modern cities, a process that is essential for ensuring their sustainable development and competitiveness amid rapidly growing urbanisation. The implementation of advanced technologies allows not only for the optimisation of transport flows but also for improving other crucial aspects of urban life, such as energy consumption, water supply, waste management, and other municipal services.

Thanks to intelligent transport systems, it is possible to reduce congestion levels, improve the accessibility of public transport, decrease CO₂ emissions, and enhance road safety. Traffic forecasting and real-time flow management help shorten travel time, which has a positive impact on the economy and citizens' quality of life.

Moreover, the use of digital platforms for managing urban resources enables administrations to better plan infrastructure development, reduce maintenance and repair costs, and increase process transparency. An important aspect is also the active involvement of citizens in decision-making, which promotes democratic principles and improves trust in local authorities.

These technologies provide not only economic efficiency but also reduce environmental impact, promoting more sustainable use of natural resources and improving residents' quality of life. Technologies implemented within the smart city concept help create an inclusive, safe, and comfortable environment where every citizen has access to convenient and accessible services.

This article has examined the impact of digital governance and artificial intelligence on urban development, identified key trends, and explored opportunities for future infrastructure development in the context of technological change.

The conducted study has confirmed the crucial role of digital technologies and artificial intelligence (AI) in transforming modern approaches to territorial governance and infrastructure development. The integration of intelligent systems into the fields of urban planning, transport, energy, digital communications, and environmental monitoring opens up new opportunities for enhancing the efficiency, transparency, and adaptability of managerial decisions.

Particular relevance is given to the concepts of the “smart city” and the digital transformation of regions, which involve not only technical modernisation but also changes in administrative culture, increased citizen participation in decision-making processes, and the creation of decentralised administrative platforms. Empirical studies confirm society's strong interest in the implementation of digital solutions, while also highlighting the need to overcome challenges such as digital inequality, lack of qualified specialists, limited financial resources, and ethical dilemmas associated with the use of AI.

Artificial intelligence holds significant potential for forecasting socio-economic processes, optimising infrastructure planning, and ensuring the efficient use of resources. However, its application must be based on clear legal, ethical, and socially responsible principles.

In this context, digital governance, in combination with artificial intelligence, is key to the innovative development of regions and the modernisation of infrastructure. Achieving a sustainable

effect requires cross-sectoral cooperation, institutional support, strategic vision, and systematic digital education for both decision-makers and citizens.

Therefore, digital technologies form the foundation for building smart cities that meet residents' needs and support the development of a sustainable, technologically innovative, and environmentally friendly urban environment.

References

- Batty, M. (2023). *Digital twins in city planning*. UCL Working Papers Series. Paper 237. Casa. https://www.ucl.ac.uk/bartlett/sites/bartlett/files/casa_working_paper_237.pdf
- Bejarano-Murillo, E. (2025). Digital governance across continents: Cases from diverse national strategies. In J. Saura (Ed.), *Data-driven governance through AI, digital marketing, and the privacy interplay* (pp. 1–30). IGI Global Scientific Publishing. <https://doi.org/10.4018/979-8-3693-6945-6.ch001>
- Borodina, I. V., & Shevchenko, M. O. (2020). *Intelligent transport systems as part of smart cities*. https://fts.khadi.kharkov.ua/fileadmin/F-TRANSPORT/%D0%97%D0%91%D0%86%D0%A0%D0%9D%D0%98%D0%9A_%D0%9C%D0%90%D0%A2%D0%95%D0%A0%D0%86%D0%90%D0%9B%D0%86%D0%92.pdf
- Carson, B., Cox, S., Hlacs, A., & Escobar, M. (2024). *Digital public infrastructure for digital governments*. https://www.oecd.org/content/dam/oecd/en/publications/reports/2024/12/digital-public-infrastructure-for-digital-governments_11fe17d9/ff525dc8-en.pdf
- Chatterjee, S., Rana, N. P., Dwivedi, Y. K., & Kumar Roy, S. (2021). AI applications for marketing in emerging markets. *Journal of Business Research*, 131, 252–265. <https://www.scirp.org/reference/referencespapers?referenceid=3956227>
- Karpa, M. I., Kitsak, T., Domsha, O., Zhuk, O., Akimova, L. M., & Akimov, O. O. (2023). *Artificial intelligence as a tool of public management of socio-economic development: Economic systems, smart infrastructure, digital systems of business analytics and transfers*
- Kraus, K. M., Kraus, N. M., & Pochenchuk, H. M. (2021). Digital infrastructure in the context of virtualization and a new quality of economic relations management. *Efektivna Ekonomika*, (12). <https://elibrary.kubg.edu.ua/id/eprint/37369>
- Prifti, K., Demir, E., Krämer, J., Heine, K., & Stamhuis, E. (2024). Digital governance: Confronting the challenges posed by artificial intelligence. In *Digital governance* (pp. 45–78). Springer. <https://doi.org/10.1007/978-94-6265-639-0>
- Rachynska, H. (2022). Zasady tsyfrovoy ekonomiy v infrastrukturi suchasnoho biznesu [Principles of digital economy in modern business infrastructure]. *Ekonomika ta suspilstvo* [Economy and Society], 44, 1–7. <https://doi.org/10.32782/2524-0072/2022-44-107>
- Riezebos, S., Saxena, R., Gelissen, T., Oliveira, M., Sibal, P., Dreier, V., & Yang, S. Y. H. (2022). *Multistakeholder AI development: 10 building blocks for inclusive policy design*. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000382570>
- Tkachenko, I., & Sydorchuk, O. (2024). *Adapting EU artificial intelligence regulations for electoral processes: A path for Ukraine*. IFES Ukraine. <https://www.ifesukraine.org/wp-content/uploads/2024/09/ifes-artificial-intelligence-eng-5.pdf>
- Ullah, A., Anwar, S. M., Li, J., Nadeem, L., Mahmood, T., Rehman, A., & Saba, T. (2024). Smart cities: The role of Internet of Things and machine learning in realizing a data-centric smart environment. *Complex & Intelligent Systems*, 10, 1607–1637. <https://doi.org/10.1007/s40747-023-01175-4>
- van den Hoven, J., Pozzi, G., Stauch, M., Lishchuk, I., Musiani, F., Domingo-Ferrer, J., Ruggieri, S., Pratesi, F., & Trasarti, R. (2024). *The European approach to artificial intelligence across geo-political models of digital governance*. <https://shs.hal.science/halshs-04696710/document>