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APPLICATION OF BIG DATA TO IMPROVE THE EFFICIENCY OF PUBLIC ADMINISTRATION IN UKRANE

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In the modern world, the ability to utilize Big Data allows for the implementation of better standards of efficiency, transparency, and quality of citizen services. The adoption of management decisions in the public and social spheres based on the analysis of Big Data not only facilitates cost optimization and service quality improvement but also paves the way for a significant increase in the transparency of government activities, enhances public administration efficiency, and serves as a foundation for the introduction of innovations.

This article explores the potential and obstacles of using Big Data in decision-making in public administration in Ukraine. It identifies the key role of Big Data analysis in informed decision-making, improving the efficiency of management processes, enhancing the quality of citizen services, and ensuring the transparency of government activities. The main aspects of the study include analyzing the current state of Big Data usage in the public sector, identifying key challenges and opportunities, and formulating recommendations for the effective implementation of these technologies.

The article highlights the diversity of Big Data sources, including government registries, e-governance, social networks, and others, which serve as the basis for analysis and informed management decisions. The benefits of applying Big Data analysis, such as cost optimization, service quality improvement, and increased transparency in government activities, are examined.

The article also addresses the key challenges faced by Ukraine in the implementation, storage, and transfer of Big Data, such as financial support for creating the necessary infrastructure, personal data protection, inadequate regulatory framework, and personnel issues. It is proven that ensuring cybersecurity and complying with legal norms regarding personal data protection are critical aspects of Big Data utilization. Several recommendations are proposed, including investments in personnel potential and technological development, standardization of data formats, improvement of legal regulations, infrastructure enhancement, collaboration with international partners for exchanging best practices, and the formation and engagement of qualified personnel.

The article conducts a strategic analysis using the "5V" model to increase accuracy and value in working with Big Data in public administration. The main indicators of the model are defined as volume, velocity, variety, veracity, and value. It is established that the successful implementation of Big Data analysis is possible only if systemic obstacles are removed and a favourable environment for their development is created.

The article emphasizes the necessity of actively implementing Big Data analysis in Ukraine's public administration as a strategic direction for achieving digital transformation, and it provides a basic framework for further research and practical applications in this field.

Key words: *innovations, public management and administration, efficiency of public management, Big Data, digital transformation.*

Скібіна Т. І. Застосування великих масивів даних (Big Data) для підвищення ефективності державного управління в Україні

У сучасному світі можливість використання великих масивів даних (Big Data) дозволяють реалізувати кращі стандарти ефективності, транспарентності та якості обслуговування громадян. Впровадження управлінських рішень в державній та суспільних сферах заснованих на аналізі великих масивів даних не лише сприяють оптимізації витрат та покращенню якості послуг, але й відкривають шлях до значного збільшення рівня прозорості у діяльності державних установ, підвищення рівня ефективності публічного управління, є основою для впровадження інновацій.

У статті досліджено потенціал та перешкоди використання великих масивів даних при прийнятті рішень в публічному управлінні України. Визначена ключова роль аналізу великих масивів даних в обґрунтованому прийнятті рішень, покращенні ефективності управлінських процесів, підвищенні якості обслуговування громадян та забезпеченні прозорості діяльності державних установ. Основними аспектами дослідження є аналіз поточного стану використання великих масивів даних у публічному секторі, ідентифікація ключових викликів та можливостей, а також формулювання рекомендацій щодо ефективного впровадження цих технологій.

Стаття висвітлює різноманітність джерел великих масивів даних, включаючи державні реєстри, електронне урядування, соціальні мережі та інші, що є основою для аналізу та прийняття обґрунтованих управлінських рішень.

Досліджено переваги застосування аналізу великих масивів даних, такі як оптимізація витрат, покращення якості послуг та збільшення рівня прозорості у діяльності державних установ. Стаття також розглядає ключові виклики, з якими стикається Україна при впровадженні аналізу, зберігання, передачі великих масивів даних, такі як фінансова підтримка для створення необхідної інфраструктури, захист персональних даних, недостатня нормативна база та кадрові проблеми. Доведено, що забезпечення кібербезпеки та дотримання правових норм щодо захисту особистих даних є критичними аспектами для використання великих масивів даних.

Запропоновано ряд рекомендацій, включаючи інвестиції у кадровий потенціал та технологічний розвиток, стандартизацію форматів даних, вдосконаленням правового регулювання, покращення інфраструктури, співпрацю з міжнародними партнерами для обміну кращими практиками, формування та залучення кваліфікованих кадрів.

У статті проведено стратегічний аналіз з використанням моделі "5V" для підвищення точності та цінності у роботі із великими масивами даних у державному управлінні. Основними показниками моделі визначено: обсяг, швидкість, різноманітність, правдивість, значення.

Встановлено, що успішне впровадження урахування аналізу великих масивів даних можливе лише за умови усунення системних перешкод і створення сприятливого середовища для їхнього розвитку.

У статті підкреслено необхідність активного впровадження аналізу великих масивів даних у державне управління України як стратегічного напрямку для досягнення цифрової трансформації, а також надає базовий фреймворк для подальших досліджень та практичних застосувань в цій області.

Ключові слова: *інновації, публічне управління та адміністрування, ефективність публічного менеджменту, великі масиви даних, цифрова трансформація.*

Introduction. In the era of rapid development of information technologies, the role of Big Data in enhancing public administration is becoming increasingly important. Big Data represents vast amounts of structured and unstructured information generated from various sources such as government databases, social networks, electronic devices, transactional systems, and more. The utilization of Big Data in the public sector can contribute to enhancing the efficiency of managerial processes, improving the quality of services offered to citizens, and ensuring transparency and accountability of governmental institutions.

The relevance of this research is driven by the necessity to implement modern information technologies in the public administration of Ukraine to enhance its effectiveness and transparency. Despite the significant potential of utilizing Big Data, its implementation in Ukraine is still at an early stage, requiring thorough study and analysis.

Formulation of the purpose and main objectives of the article. The aim of the article is to determine the role and opportunities of using Big Data for improving public administration in Ukraine, analyzing the current state and issues, and developing recommendations for the effective implementation of these technologies in the public sector. The research aims to identify ways and opportunities for utilizing Big Data to enhance public administration in Ukraine, with the goal of ensuring efficient and transparent functioning of governmental institutions, improving the quality of services provided to citizens, and strengthening society's trust in the state apparatus.

Analysis of recent research and publications. A significant number of modern domestic and foreign scientific works [1-8] are dedicated to the topic of utilizing Big Data.

Karl Rethemeyer R., Kimberley I. [1] explore the potential of using Big Data in public administration, providing examples of successful cases and identifying key challenges and opportunities. Author Janssen M. [2] examines innovations in the public sector through the use of Big Data, offering recommendations for strategic planning and implementation. Scientific research by Fan J., Han F., Liu H. [3] focuses on identifying problems and challenges encountered in using Big Data analytics in public administration. The work suggests ways to overcome these challenges, complemented by studies by J. Attard, F. Orlandi, S. Scerri [4], which examine specific cases of utilizing Big Data in the public sector with evaluations of results and application effectiveness.

These scientific works reflect various approaches to utilizing Big Data in public administration, assessing the impact and advantages of such technologies. However, the application of Big Data in each country's public sector varies. The public sector of Ukraine, in particular, faces key challenges in using Big Data and requires a strategy for the successful implementation of this effective tool to enhance public management efficiency.

Presentation of the main material. Utilizing Big Data in public administration offers several advantages, including:

- enhanced efficiency: Big Data analysis helps identify inefficiencies and optimize processes, leading to cost reductions and improved productivity;
- improved decision-making quality: Through Big Data analysis, government entities can make more informed and precise decisions;
- transparency and accountability: Publishing and analyzing open data contribute to increasing the transparency of government activities and enhancing accountability to citizens;
- innovation and new services: Big Data can serve as a foundation for developing new services and innovative approaches in public administration.

Big Data is a term used to describe massive datasets that are too large, complex, or fast-moving to be processed by traditional data management methods and tools. Big Data encompass both structured and unstructured data from various sources such as social networks, Internet of Things (IoT) sensors, transactional systems, email, mobile applications, and more.

Big Data are characterized by the "3V" model, which includes the attributes of volume, velocity, and variety. To enhance the value and accuracy in describing Big Data, the model can be further supplemented with additional characteristics such as veracity and value. The formed "5V" model is presented in the table below.

Utilizing Big Data in public administration can contribute to enhancing the efficiency and transparency of managerial processes, improving the quality of service delivery, and fostering greater trust from citizens towards government institutions. Therefore, studying and applying the theoretical foundations of Big Data is an important step towards the digital transformation of the public sector in Ukraine.

Based on the characteristics of the proposed model (Table 1), a strategic analysis will be conducted to assess the current state and determine the prospects of applying Big Data in public management. Such analysis involves evaluating various aspects of data (Table 2) and providing recommendations for further steps to achieve the strategic goals of the organization or management sector.

Table 1

Model Characteristics of Big Data

№	Indicator	Description
1	Volume	The amount of data generated and stored is growing significantly, reaching terabytes, petabytes, and even exabytes.
2	Velocity	The speed of data generation and processing is a critical aspect, especially for real-time, data may arrive at a high frequency and require operational processing.
3	Variety	Big data can include different types of information such as text, images, video, audio, and structured data stored in databases.
4	Veracity *	Data quality and degree of reliability, big data may contain inaccuracies or be incomplete, requiring additional efforts to clean and validate them.
5	Value *	The potential of data to create added value, big data only becomes useful when it can be transformed into information that can be analyzed and used for decision making.

The implementation of Big Data in public administration in Ukraine faces several significant obstacles. One of the key challenges is the insufficient financial support for creating infrastructure for processing and storing large volumes of data. High requirements for protecting personal data and confidential information necessitate effective cybersecurity measures and compliance with relevant legal norms. The lack of standardization and regulatory framework in the field remains a serious impediment to the effective implementation of innovations in public administration. The legal framework regarding the collection, processing, storage, and protection of Big Data in Ukraine is also imperfect, lacking considerations for citizen interests, confidentiality, and security. Furthermore, there is a challenge in terms of staffing as Ukraine lacks qualified professionals in data analysis and software development.

The current state of applying Big Data in public administration in Ukraine is characterized by a significant increase in data volumes from various sources such as government registries, e-governance, and social networks. Data processing speed remains a critical aspect, particularly for real-time applications, yet the existing infrastructure requires further development to meet global standards. The variety of data includes text, images, video, and structured data, but integrating these data in a unified manner is a complex task. Data veracity is another issue, as Big Data can be incomplete or inaccurate, requiring additional efforts for cleansing and validation. Despite these challenges, the potential of Big Data for creating added value is already partially realized in areas like e-governance, anti-corruption tools, healthcare, and education.

At present, the application of Big Data in public administration in Ukraine is in an active development stage, although significant improvements are needed to unlock its full potential. For the further development of Big Data utilization in public management, it is important to invest in education and training of data analytics professionals, expand intersectoral cooperation, and apply advanced international practices.

Conclusions. Utilizing Big Data in public administration is a promising tool for enhancing the efficiency and transparency of managerial processes. Big Data provide the opportunity to analyze large volumes of information and make informed decisions based on data. Despite the potential that Big Data application offers, Ukraine faces

Table 2

The current state and strategic prospects of using Big Data in the sphere of public administration of Ukraine in accordance with the model «5V» (supplemented by the author with references [5, 7, 8])

№	Indicator	Description	Current state	Strategic perspectives
1	Volume	In Ukraine, the amount of data generated and stored is growing significantly. This data comes from a variety of sources, including government registries, statistical services, e-government systems, social networks, mobile applications and IoT sensors. The storage of large volumes of data is an important aspect for ensuring effective public administration, and Ukraine has already taken the first steps in this direction, for example, the creation of a single state open data portal.	Significant growth of data volumes from various sources (state registers, e-government, social networks).	Further growth in data volumes is expected with the development of digital services.
2	Velocity	The speed of data generation and processing is a critical aspect, especially for real time. In Ukraine, there are initiatives aimed at implementing systems for fast data processing in real time, for example, in the field of providing administrative services and responding to emergency situations. However, the overall level of data processing speed does not yet correspond to the best global practices, and requires further development of infrastructure and technologies.	Implementation of real-time data processing systems is insufficient.	The need for the development of infrastructure and technologies for fast data processing.
3	Variety	Big data in Ukraine includes various types of information such as text, images, video, audio, and structured data stored in databases. Examples of diverse data include surveillance footage, statistical data, social media data, geospatial data, and more. Despite the existence	Data includes text, images, video and structured data, but their	Data standards and formats should be unified to simplify analysis.
		of various data sources, their integration and analysis remain difficult tasks due to insufficient unification of data standards and formats.	integration is complex.	
4	Veracity	The quality of data and the degree of their reliability remain challenges for Ukraine. Big data can contain inaccuracies or be incomplete, requiring additional efforts to clean and validate it. In Ukraine, work is being carried out to improve the quality of data, including the creation of centralized registers and the use of modern technologies for information validation. However, many government agencies still face problems with the reliability and completeness of data.	Data validity and completeness issues due to insufficient validation.	The need to create centralized registers and use technologies for data cleaning.
5	Value	The potential of data to create added value in Ukraine is just beginning to unfold. Big data becomes useful when it can be turned into information that can be analyzed and used for decision making. Several successful projects based on big data analysis have already been implemented in Ukraine, for example, e-government systems, anti-corruption tools, as well as projects in the field of health care and education. However, much effort is still needed to fully unlock the potential of big data.	Big data is used for e-government, anti-corruption projects, healthcare and education.	Further disclosure of the potential of data for decision-making and improving the efficiency of public administration.

significant challenges such as insufficient financial support for data processing infrastructure, cybersecurity issues, and an unstable legal environment.

Developing and implementing data standardization strategies, enhancing workforce skills, and fostering intersectoral cooperation can contribute to the successful adoption of Big Data in public administration. While Big Data already demonstrates its potential in areas like e-governance, anti-corruption efforts, healthcare, and education, additional efforts are needed to address technical and organizational aspects to achieve maximum impact.

Therefore, implementing Big Data in Ukrainian public administration requires a comprehensive approach and systematic planning to achieve maximum socio-economic benefits for society.

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