Vol. 08, No. 1 (2026) 77-84, doi: 10.24874/PES08.01.009

Proceedings on Engineering Sciences

www.pesjournal.net

MANAGEMENT INFORMATION SYSTEMS BASED ON BIG DATA TO MANAGE QUALITY 5.0: SUSTAINABLE INNOVATIONS IN MANAGERIAL DECISION-MAKING

Aglaya D. Busalova
Ulyana V. Ashmarina
Anastasia A. Sozinova[1]
Narine H. Yengibaryan
Elena V. Ganebnykh

Received 02.07.2025.
Revised 24.10.2025.
Accepted 05.11.2025.

Keywords:

Management information systems, Big data, Quality 5.0 management, Sustainable innovations, Managerial decision-making, R&D, Sustainable development, Internet of Things, Intellectual technologies

A B S T R A C T

The application of intellectual technology in big data analysis is highly relevant in the context of Quality 4.0 management and the era of Quality 5.0 management. This is due to the technological capabilities and potential of this technology. Its integration into management information systems provides them with the qualities of social, environmental, and economic sustainability. Achievement of the Sustainable Development Goals by economic subjects and main infrastructures becomes more effective in the context of modifying and creating innovative management information systems, which contribute to real-time management decisions. In the course of this research, we revealed that smart management information systems, equipped with the intellectual technology of big data analysis and the corresponding intellectual technologies, are used in the sphere of processing of data of monitoring of the state and transformations of the studied objects. Big data analysis of the monitoring of certain processes allows for creating, in real-time, options for decision management. Here the speed and amount of data are the main advantages of this intellectual technology.

The goal of this article was to identify the types of sustainable innovations integrated into management information systems based on big data for managerial decision-making in the context of the management of Quality 5.0.

© 2026 Published by Faculty of Engineering

1. INTRODUCTION

Management information systems are information systems used in the processes of managerial decision-making and the procedures in the sphere of information processing. Management information systems passed various stages of evolution. They were used before the appearance of computers, the Internet, and artificial intelligence. In the period of formation of the concept of management of Quality 4.0, these systems were concerned mainly with effective management of information, required for managerial decision-making in

[1] Corresponding author: Anastasia A. Sozinova
Email: aa_sozinova@vyatsu.ru

different spheres of life activities and economic sectors. In this period, the IT sector started creating AI-based innovations, which fostered quick digitalization and replacement of human labour. In the conditions of dissemination of the concept of Quality 4.0 management and implementation of management information systems at the global level, high-tech companies began to emerge. They functioned in different sectors, and some regions and countries were able to ensure a high level of digitalization and intellectualization of the functioning of services and infrastructures. The main purpose of using management information systems in the age of Quality 4.0 management was the technological results of data processing, which allowed for managerial decision-making in each sphere of activities. A small number of AI technologies were used in managerial decision-making during the management of Quality 4.0. They include big data analysis, which is required for processing, systematization, and assessment of information based on the set algorithm.

The age of Quality 5.0 management introduced new AI technologies, which contributed to an increase in the informativeness of management information systems from the position of management decision generation. Big data analysis is still relevant, similar to the age of Quality 4.0 management. Sustainable development and its key goals in ecology, quality of human development, and balance and responsibility of the economy became preconditions for the creation of sustainable innovations, which facilitate the most optimal management decisions oriented towards socio-centrism and ecologization (Maljugić et al., 2024). Sustainable innovations that are connected with unique qualities of management information systems based on big data analysis are widely applied and have a large effect on the achievement of the Sustainable Development Goals.

The goal of this research was to identify the types of sustainable innovations integrated into management information systems based on big data analysis to ensure managerial decision-making in the aspect of Quality 5.0 management. For this, we try to present types of sustainable innovations of the considered category and analyse the indicators of sustainable innovations' influence on the effectiveness of managerial decision-making in the context of Quality 5.0 management.

2. LITERATURE REVIEW AND METHODOLOGY

In this research, we used materials and methods that enabled us to perform a comprehensive overview and analysis of sustainable innovations, which are the basis of management information systems based on big data analysis.

The research model is comprised of the following stages:
- Collection and assessment of information about the types of sustainable innovations, including the technology of big data analysis and other intellectual technologies. We used a system approach, connected with the monitoring of information sources (scholarly and analytical works) in the context of the search for innovations with the set characteristics;
- Evaluation of the advantages of these innovations and identification of their impact on the indicators of consumers' activities' effectiveness. For this, we used factor analysis, the coefficients methods, and analytical data of the considered subjects;
- Assessment of the effectiveness of implementing the given sustainable innovations; here, comparative analysis of the results was employed.

We analysed scholarly works that disclose the categorical apparatus and the practical aspect of the considered issues connected with sustainable innovations. One category of studies aims at characterising the types and specifics of management information systems (including ones employing AI technologies or smart management information systems) within certain sectors. Magableh et al. (2024) dwelt on the sectoral directions of using smart management information systems and identified the types of AI technologies used for the achievement of the Sustainable Development Goals by economic and infrastructural subjects (the IoT, blockchain, machine learning, big data analysis, etc). Sergi et al. (2025) dwelt on the assessment of intellectual information systems of management of economic forecasting in territorial entities. Manukyan and Parsyan (2025) presented recommendations for the quality integration of smart management information systems into the banking sector, based on the necessity to reach a balance at the level of ideas on the management of quality and financial indicators. Sadyraliev et al. (2025) performed theoretical and practical analyses of the application of smart information systems that use big data analysis to improve the procedure of managerial decision-making.

Aljehani et al. (2024) evaluated the effect of big data analysis on the use of green innovations and the state of operational effectiveness of telecommunication sector companies. By the example of the activities of telecommunication companies in Bangladesh, the authors demonstrated that the application of management information systems based on big data analysis in the context of the focus on Quality 5.0 management is rather effective and has prospects for growth. According to the authors, the best prospects are seen in further investments in the improvement of this technology integration, which allows creating unique databases on the dynamics of customer demand for further managerial decision-making in market promotion.

Batko and Ślęzak (2022) disclosed the features of applying the technology of big data analysis in the Polish healthcare sector. The scholars noted the growth of the scale of using management information systems by medical establishments based on big data analytics in the system of managerial decision-making in medical

treatment and the system of managerial decision-making in the organisation of the activities of hospitals. Subrahmanya et al. (2022) assessed the level of integration of sciences on big data analytics into the management of healthcare establishments and treatment processes, aimed at the implementation of patients' interests and expectations. The authors systematised approaches, directions, and mechanisms of using big data analysis for managerial decision-making in medicine in the conditions of Quality 5.0 management and proved the necessity for partnership between IT business subjects and healthcare establishments to create effective management information systems based on big data analysis.

Lnenicka et al. (2024) examined the application of big data analysis in smart city management and noted the possibility of transition to big data analytics in smart cities, which entails large economic & organisational, technical, and technological potential, and the need to protect confidentiality and prevent cyber attacks on citizens' data.

Kantor et al. (2023) studied the issues of sustainable project financing. The scholars analysed discussions at the level of society, economy, and government on the necessity for the government's involvement in financial support of transition to sustainable development.

Modern scholarly sources contain a vast array of works in the sphere of theoretical support of sustainable development, the concept of Quality 5.0 management, and the identification of characteristics of management information systems and big data technology. This paper focuses on the typologization of sustainable innovations related to the application of big data analysis, which is a technological basis for management information systems that foster Quality 5.0 management and well-balanced management decisions.

3. RESULTS

Typologization of sustainable innovations, which use big data analysis within management information systems connected with management decision-making, is performed in this paper in the context of sectors of the economy and infrastructures of life activities and the sphere of public governance.

First off, it is necessary to identify the features of management information systems that are used for managerial decision-making. These systems are one of the types of management information systems which exist together with the following information systems: Executive Support System, Knowledge Work System, Office Automation System, Transaction Processing System, etc. Management information systems used for managerial decision-making usually collect, process, and provide the data of various categories to ensure managerial decision-making in different spheres. Big data, integrated into these systems, allows working with large amounts of information coming from various sources (processing, systematisation, and analysis of information). The key advantages of this intellectual technology are as follows:

- Speed. Most scholarly sources do not point to the quantitative indicators of measuring the speed of this technology in working with information within management information systems. However, it is stated that speed is the key advantage of big data analysis. Given the authority and image of Google LLC, we shall consider that information is processed in real time within this technology (Google LLC, 2025). Accordingly, implementation of this technology is preferable to the use of human labour or regular digital technologies of data analysis that do not involve AI;
- Scale of data. Information that can be processed allows covering all possible data coming into the management information systems;
- Data formats, used for this technology, are diverse, which differs management information systems based on big data from certain traditional systems that use only a limited range of formats.

Table 1 contains the typologization of sustainable innovations used by subjects of the economy.

Table 1. Sustainable innovations based on big data analysis used in management information systems in the context of management decision-making for Quality 5.0 management

	Sustainable innovations based on big data analysis in management information systems	Application in sectors of the economy	Description
1	Tool for monitoring the state of the object based on digital sensors and big data analysis, integrated with management information systems	Retail	Allows monitoring data on the company's resources (products, equipment, products' compliance with the norms of the trading company), price tags, and prices in real-time at the point of sale. Possibility to collect data on the state of security (monitoring of customers and personnel's behaviour). Directions of managerial decision-making: pricing policy and management of resources and measures in the sphere of security

2	Tool for input, receipt, and processing of electronic health records of patients for making decisions on the optimal therapeutic model (diagnostics, forecasting of treatment) based on big data analysis, integrated with management information systems, which includes protocols of selection of procedures and medication	Healthcare Sector	1. Contributes to acceleration of medical services and diagnostics. 2. Allows processing of patient data received from the electronic health record in real-time, using the technology of big data analysis. 3. Allows for systematisation of data presented in management information systems on the options of protocols for selection of procedures and medication (which saves patient and doctor's time). This contributes to the speed of treatment, which, in some cases, is required for patients with certain health issues. A decision on the choice of a treatment model is made by the doctor based on the models that are created using management information systems with the application of big data analysis. 4. Management of patient's treatment with the use of this tool is demonstrated in real-time. Visualisation is conducted based on the results of examinations, X-rays, and other procedures; the corresponding information is put in the patient's electronic health records.
3	Tool for monitoring the quality and location of cargo based on digital sensors and big data analysis, integrated with management information systems	Cargo transportation sector	1. The transported cargo is equipped with a digital sensor. 2. During transportation, the cargo owner and transportation company can have access to its location and the location of the vehicle in real time. The data about location are routed in the management information system. 3. Visual images and other user indicators of the cargo quality are determined with the help of the digital sensor. 4. Based on the precise data on the location of vehicles and traffic problems, a managerial decision on the change of the route could be made. Big data analysis with the use of the set algorithm within the management information system creates alternative options for the route. 5. Big data analysis allows modelling delivery time (given delays and changes in routes).
4	The tool for monitoring of urban environment based on digital sensors and big data analysis, integrated with management information systems	Sector of municipal management and sector of security management	1. Management information systems with connected Internet of Things (digital sensors that perform monitoring of objects of urban environment management) and big data analysis. 2. Monitoring of the functioning of the objects of urban environment management in real-time and transfer the information about this to the management information systems. 3. Analysis of big data, obtained with the help of the Internet of Things, data processing, and offer of response options to possible failures. 4. Managerial decision-making based on the presented response options. The use of the Internet of Things and big data analysis in municipalities is possible in case of coordination with the city community since their application is aimed at improving the quality of life (a social component of sustainable development). The application of this sustainable innovation in the security management sector must also take into account the need for human rights protection and the protection of confidential data.
5	Tool for monitoring the processes of Quality 5.0 management based on digital sensors and big data analysis, integrated with management information systems	Industrial production and agriculture	1. The use of management information systems with the Internet of Things (digital sensors for monitoring production and agricultural objects) and big data analysis. 2. Monitoring of the state of production lines and agricultural production in real-time and transfer of information about this in the management information systems. 3. Analysis of big data obtained with the use of the Internet of Things, data processing, and offer of response options to possible failures and threats to the quality of production and personnel safety. 4. Managerial decision-making based on the presented response options.

Source: Compiled by the authors based on Batko and Ślęzak (2022), Honrubia (2025), Lnenicka et al. (2024), Magableh et al. (2024), and Subrahmanya et al. (2022).

The effectiveness of using a sustainable innovation connected with the monitoring of the state of objects based on digital sensors and big data, integrated into the management information systems, was analysed by the example of Walmart Inc. (USA). Walmart Inc. is a multinational company that functions in the retail sphere. Its retail networks consist of grocery stores, department stores, and supermarkets in the USA and other countries. Since 2019, the company has been using sustainable innovation – an innovative solution for managing product quality in sales points based on the set of technologies of the Internet of Things (based on digital sensors) and big data analysis (Honrubia, 2025).

The principle of this innovation's functions is as follows:
- Boxes with products on shelves and other equipment have digital sensors with a 180-degree view;
- The sensors perform video recording of products in real-time, and the information is transferred to the management information system;
- Big data analysis ensures receipt of information and its processing and assessment with determination of the results on the quality of products and their compliance with the company standards and indicators of product safety;
- Based on the information obtained, a decision on the price change is made (including discounts), the need for withdrawal from sale, or order of a certain amount of a similar product from suppliers.

The indicators of sustainability of this innovation are as follows:
- Social effect. The company satisfies consumer demand for products with an optimal price/quality ratio. The practice of discounts for products that lose their market appearance but are safe for consumption ensures the affordability of food products for the most disadvantaged groups;
- Environmental effect. Due to timely reaction to the change in the indicators of product quality, the company reduces the amount of spoiled products, which contributes to the decrease in waste and the necessity for recycling.
- Economic effect. The application of this sustainable innovation allows the company to support the positive dynamics of revenues. The company's revenue grew during the COVID-19 pandemic and in the post-pandemic period. The positive dynamics during the COVID-19 period were observed with a limited number of companies and sectors, which was caused by uncertainty and risks of managerial decision-making (Sahakyan and Antamoshkina, 2022). The dynamics of revenue of Walmart Inc. were as follows (Walmart Inc., 2025):

2019 - $514.4 billion;
2020 – $524 billion (an increase of 1.9 % compared to 2019);
2021 – $559.2 billion (an increase of 6.7 % compared to 2020);
2022 – $572.8 billion (an increase of 2.4 % compared to 2021);
2023 – $611.3 billion (an increase of 6.7 % compared to 2022);
2024 – $648.1 billion (an increase of 6 % compared to 2023).

To prove the effectiveness of this sustainable innovation, let us find the dynamics of the coefficient of turnover of inventory. This element includes goods, final products, and raw materials in the structure of the company's balance. In the case of Walmart Inc., this is just goods. Traditionally, the coefficient of turnover of current assets is calculated as a ratio of revenue to the average annual value of current assets. The coefficient of turnover of inventory is calculated as a ratio of revenue to the average annual value of inventory. The coefficient's growth is a sign of the effectiveness of management decisions in inventory management. In the case of Walmart Inc., the indicator equaled 116, and in 2024 – 12.

Let us consider the effectiveness of using the information systems of decision management based on big data analysis by the example of the leader in the UK healthcare system – Guy's and St Thomas' NHS Foundation Trust.

This network of organisations in the sphere of healthcare (four hospitals in London and one hospital in Harefield) belongs to the category of educational and research since it deals with the practical training of medical personnel (dentists, nurses, and physicians). It provides medical treatment for UK citizens and foreign patients. Since 2020, this network of medical organisations has been using a sustainable innovation – an individual digital template for options for individual diagnostics and treatment of patients (Guy's and St Thomas' NHS Foundation Trust, 2025e). The scheme of this innovation's functioning is as follows:
- Transfer of the information about the patient from the electronic health record to the database of the management information system;
- Analysis of big data on the state of patients' health and its correspondence to standard indicators;
- Transfer of data on the medical indicators of the patients (anonymously) in the course of the process of diagnostics and treatment to academic partners, with whom there are contractual relations on interaction in the editing templates of the main procedures. This process is conducted through the management information system;
- Receipt of data on the options of editing the templates of the main procedures of diagnostics and treatment for each case from the academic partners;
- Management decisions by the doctor on the selection of the template of the procedure of diagnostics and/or treatment;
- Carrying out of medical procedures.

The uniqueness of this sustainable innovation lies in the constant improvement of the main procedures of diagnostics and treatment of patients, based on protocols that take into account individual features and reactions of the human body.

Let us assess the influence of implementing and using the management information system for diagnostics and treatment based on the above sustainable innovation. It is necessary to establish the medical organisation's activities in 2020-2024. The following was established (Guy's and St Thomas' NHS Foundation Trust, 2025a; Guy's and St Thomas' NHS Foundation Trust, 2025b; Guy's and St Thomas' NHS Foundation Trust, 2025c; Guy's and St Thomas' NHS Foundation Trust, 2025d):

- The period of 2020-2021: number of contacts with patients – 2.4 million; personnel – 22,700; revenue – 2.4 billion pounds;
- The period of 2021-2022: number of contacts with patients – 2.5 million; growth of personnel by 1.3 %. These two components reflect the effectiveness of the management of sustainable development's social component. Over 2021-2022, the company demonstrated economic effectiveness (growth of revenue up to 2.6 billion);
- The period of 2022-2023. In this period, an increase in the number of contacts with patients was 4 %, and an increase in revenue was 7.7 %;

The period of 2023-2024. This period featured the growth of the use of the considered sustainable innovation. As for the social component of sustainable development, there were the following transformations: the number of contacts with patients grew by 7.7 % in 2023-2024 compared to 2022-2023; the number of employees grew by 3.9 % compared to 2020-2021; revenue increased by 3.5 %, up to 2.9 billion pounds.

4. DISCUSSION

Sustainable innovations, created based on intellectual technology of big data analysis and other adjacent intellectual technologies which take into account the concept of Quality 5.0 management, are used in management information systems for managerial decision-making in various sectors of the economy and infrastructures.

In the case of the creation of sustainable innovations (in partnership with the academic community), which are characterised by high resilience (life cycle is higher compared to innovations with a traditional life cycle, which are oriented towards market trends but do not involve a focus on large uniqueness of solutions), small business can also conduct high-tech innovative activities. This will allow raising competitive positions in a certain market. Achievement of high effectiveness of innovations in this direction depends on the application of long-term sustainable investments and the creation of successful partnerships with R&D representatives.

An important direction for further research is the possibility of the integration of various smart management information systems to achieve a synergetic effect within certain tasks. For example, the possibility of integrating intellectual management information systems with the forecasting of the economic state of regions and countries (Sergi et al., 2025) and smart information systems of management of ecology and social sectors of territorial entities. The importance of this integration is also noted by Kazambayeva et al. (2023), who substantiated the compilation of the forecasts of socioeconomic and environmental development of subsidised regions in real time with the use of the entire range of data.

The creation of new types of smart management information systems largely depends on the level of expectations and demand in this direction from interested parties. The business sector, infrastructural subjects, and local authorities need to achieve the Sustainable Development Goals. Thus, it would be prudent for local authorities to attract new segments of stakeholders to the creation of sustainable innovative solutions based on big data analysis, which would contribute to the execution of various commitments in social, environmental, and economic spheres. The financial and large industrial sectors could join efforts to achieve results in the sector of green financing of smart start-ups (Zhang et al., 2025). Also, an obvious advantage here is support for the high level of effectiveness and competitiveness of the local IT sector, which would ensure the development and implementation of innovations together with R&D representatives.

5. CONCLUSION

As a result of this research, it should be noted that the R&D sector, subjects of various other sectors of the economy and infrastructures, and the IT sector demonstrate good results in adapting technological progress to the needs and demands of modern society. This is proof of the effectiveness of the transition to the concept of Quality 5.0 management based on sustainable sectoral and infrastructural innovations, presented within smart management information systems that use the intellectual technology of big data.

Promotion of advantages of using sustainable innovations is the key task of the R&D sector, IT sector, local, regional, and national authorities, and international organisations. They could be promoted under the guidance of government and international organisations together with the offer of stimulation and support of business subjects and infrastructural support in the completion of projects in the sphere of Quality 5.0 management. Small and medium companies, which strive towards an increase in their competitive position in sectoral and infrastructural markets can initiate a smart digital transition to be further supported by the government, funds, and international organisations.

The development of new types of smart management information systems must take into account the indicator of their long life cycle, which can be achieved in the case of effective partnerships between customers and representatives of academic communities. There is also a

need for substantial intellectual potential of customers and partners.

References:

Aljehani, S. B., Abdo, K. W., Nurul Alam, M., & Aloufi, E. M. (2024). Big Data Analytics and Organizational Performance: Mediating Roles of Green Innovation and Knowledge Management in Telecommunications. *Sustainability*, *16*(18), 7887. https://doi.org/10.3390/su16187887

Batko, K., & Ślęzak, A. (2022). The use of Big Data Analytics in healthcare. *Journal of big data*, *9*(1), 3. https://doi.org/10.1186/s40537-021-00553-4

Google LLC (2025). What is Big Data? Retrieved from https://cloud.google.com/learn/what-is-big-data

Guy's and St Thomas' NHS Foundation Trust (2025a). Annual Report summary 2020/21. Retrieved from https://www.guysandstthomas.nhs.uk/about-us/publications/annual-reports-and-accounts/annual-report-summary-202021

Guy's and St Thomas' NHS Foundation Trust (2025b). Annual Report summary 2021/22. Retrieved from https://www.guysandstthomas.nhs.uk/annual-report-summary-202122

Guy's and St Thomas' NHS Foundation Trust (2025c). Annual Report summary 2022/23. Retrieved from https://www.guysandstthomas.nhs.uk/annual-report-summary202223

Guy's and St Thomas' NHS Foundation Trust (2025d). Annual Report summary 2023/24. Retrieved from https://www.guysandstthomas.nhs.uk/about-us/publications/annual-reports-and-accounts/annual-report-summary-202324

Guy's and St Thomas' NHS Foundation Trust (2025e). Data analytics and commercial data sharing. Retrieved from https://www.guysandstthomas.nhs.uk/citi/commercial-innovation-services/consultancy-and-analytics/data-analytics-and-commercial-data

Honrubia, M. (2025). Walmart Innovation: Big Data, Iot & Automatic Learning. Retrieved from https://www.ennomotive.com/walmart-innovation/

Kantor, O. G., Rudneva, Y. R., Dunov, D. Y., Ergasheva, S. T., & Leybert, B.M. (2023). Green Finance: Analysis of Prospects of the Russian Market. Food Security in the Economy of the Future: Transition from Digital Agriculture to Agriculture 4.0 Based on Deep Learning, 45-56. doi: 10.1007/978-3-031-23511-5_6

Kazambayeva, A. M., Begeyeva, M. K., Nursapina, K. U., & Rakhmetova, R. (2023). Systematic Approach to Sustainable Development in Agricultural and Food Systems – Example of Republic of Sakha (Yakutia) and the Arctic Zone. *Problemy Ekorozwoju*, *18*(1), 226–234. https://doi.org/10.35784/pe.2023.1.24

Lnenicka, M., Hervert, P., & Horak, O. (2024). Understanding big data and data protection measures in smart city strategies: An analysis of 28 cities. *Urban Governance*, *4*(4), 255-273. https://doi.org/10.1016/j.ugj.2024.12.008

Maljugić, B., Ćoćkalo, D., Bakator, M., & Stanisavljev, S. (2024). The Role of the Quality Management Process within Society 5.0. *Societies*, *14*(7), 111. https://doi.org/10.3390/soc14070111

Magableh, A. A., Audeh, A. Y., Ghraibeh, L. L., Akour, M., & Albahri, A. S. (2024). Sustainability and Information Systems in the Context of Smart Business: A Systematic Review. *Systems*, *12*(10), 427. https://doi.org/10.3390/systems12100427

Manukyan, H. H., & Parsyan, S. H. (2025). Artificial Intelligence Integration Assessment In Banks Through Financial Reporting: Case Study of Armenia. *Journal of Trends and Challenges in Artificial Intelligence*, *01*(01) (2024), 33-38. doi: 10.61552/JAI.2024.01.004

Sadyraliev, Z., Zhumanbayeva, T. K., Dybina, O. V., Krutilin, A. A. & Amirkhanyan, G. M. (2025). Big data and artificial intelligence in information systems of product quality management. *Proceedings on Engineering Sciences*, *7*(1), 119-128. doi: 10.24874/PES07.01A.003

Sahakyan, M., & Antamoshkina, E. (2021, November). Managerial Decision-Making in the Sphere of Tourism under the Conditions of Risk and Uncertainty. In *International Scientific and Practical Conference Digital and Information Technologies in Economics and Management* (pp. 117-129). Cham: Springer International Publishing. doi: 10.1007/978-3-030-97730-6_11.

Sergi, B. S., Popkova, E. G., Petrenko, E., Ergasheva, S. T., Aslanyan, M., & Mikayelyan, V. (2025). An Innovative Digital Platform for Socioeconomic Forecasting Climate Risks and Financial Management. *Journal of Risk and Financial Management*, *18*(5), 277. https://doi.org/10.3390/jrfm18050277

Subrahmanya, S. V. G., Shetty, D. K., Patil, V., Hameed, B. M. Z., Paul, R., Smriti, K., Naik, N., & Somani, B. K. (2022). The role of data science in healthcare advancements: applications, benefits, and future prospects. *Irish journal of medical science*, *191*(4), 1473–1483. https://doi.org/10.1007/s11845-021-02730-z

Walmart Inc. (2025). Financial Results. Retrieved from https://stock.walmart.com/financial-information/financial-results

Zhang, S., Lyu, W., Ali, A., & Liu, Z. (2025). An empirical study on the development level of artificial intelligence investment through the combination of industry and finance - Based on China's a-share listed companies. *Proceedings on Engineering Sciences, 7*(1) (2025), 69-78. 10.24874/PES07.01.009

Aglaya D. Busalova
Federal State Budgetary Educational Institution of Higher Education "Russian University of Economics named after G.V. Plekhanov", Moscow, Russia
aglayabusalova@gmail.com
ORCID 0000-0002-2987-0646

Ulyana V. Ashmarina
Sebryakovsky branch of the Federal State Budgetary Educational Institution of Higher Education "Volgograd State Technical University", Mikhailovka, Russia
yluana34@rambler.ru
ORCID 0000-0003-4365-5624

Anastasia A. Sozinova
Vyatka State University, Kirov, Russia
aa_sozinova@vyatsu.ru
ORCID 0000-0001-5876-2823

Narine H. Yengibaryan
Armenian State University of Economics, Yerevan, Armenia
n.yengibaryan13333@mail.ru
ORCID 0000-0002-3663-5193

Elena V. Ganebnykh
Vyatka State University, Kirov, Russia
ev_ganebnykh@vyatsu.ru
ORCID 0000-0003-0669-8318