The Use of Data Analytics in Public Administration for Corruption Prevention During Hybrid Warfare

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Abstract

The relevance of the selected theme is stipulated by the destructive effect of corruption on the social structure of society and the weakening of the rule of law. Corruption schemes as an instrument of geopolitics are used as a part of the foreign policy arsenal of authoritarian states such as Russia. Under such circumstances, data analytics provides researchers and public society with a large volume of analytical instruments, enabling comprehensive monitoring of governments. Such monitoring enhances the efficiency of corruption prevention in public administration. The article aims to determine the data analytics method for corruption prevention in public administration during hybrid warfare. Using the methods of content analysis, historical, abstract-logical methods, we found how data analytics can contribute to effective corruption prevention in public administration. Perspective and appropriate methods of data analytics used for corruption prevention in public administration were found. Based on the results of the conducted study, recommendations for improvement of the use of data analytics in public administration for corruption prevention during hybrid warfare were offered. The perspective of further studies includes research on introducing data analytics in the everyday work of particular state institutions.

Keywords: data analytics, hybrid war, public administration, corruption, corruption prevention.

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Introduction

War and corruption have accompanied humankind in an integral symbiosis with civilisation development for centuries. Corruption as a negative phenomenon in public service was first mentioned in archives of ancient Babylon of the 24th century B.C. (Voloshenko, 2022). Doctor of Political Sciences and Expert in International Relations Popescu (2015) believes that bribing defenders or poisoning wells were the methods of mediaeval hybrid tactics.

Nowadays, corruption is a serious obstacle to sustainable development. The price of corruption is higher than simple resources' diversion from their legal designation. Corruption ruins the social structure of society, which weakens the rule of law, undermines trust in government, deteriorates the quality of public life and creates a favourable environment for the prosperity of organised crime, terrorism and violent extremism. Dynamic and profound changes in different spheres of social life require systemic and persistent improvement of government organisational structures and forms of activity (Mykytyuk et al., 2021), including the purpose of this negative phenomena prevention.

The relevance of corruption prevention has increased as it acquired a new geopolitical role. Corrupted actions such as bribery and embezzlement of public funds have been traditionally considered as means of personal enrichment of separate individuals and networks. At the same time, according to a study conducted by Transparency International (2019), corruption may be a method of achieving foreign political objectives and potentially becoming an instrument of hybrid warfare.

Hybrid warfare uses all possible weaknesses of the state to impose will and attack the least protected aspects of social development. This idea belongs to Knud Bartels, former Chairman of the NATO Military Committee (Tyukhtenko, 2018). Using non-violent tactics in hybrid warfare aims to destroy the opponent's disorganising administration system, causing economic losses, demoralising society, etc.

The threat of corruption and financial flows related to it does not relate to the reduction of the state's ability to mobilise resources for sustainable development exclusively. Corruption contributes to the weakening of state institutions, undermines the principle of the rule of law and intervenes in the functioning of the system of criminal justice. Such corruption becomes an effective weapon in hybrid warfare, as it is expressed through the export of corruption influence and contributes to corruption erosion of society (Bachelet, 2022).

Corruption schemes as an instrument of geopolitics have already been used as a part of the foreign policy arsenal of authoritarian states such as Russia. They are grounded in the dependence in a strategic sphere, such as energy export or

investments in infrastructure. These dependencies, based on actual necessity and united with non-transparent administration and economic mechanisms, can finance criminal cross-border schemes (Transparency International, 2019).

Corruption as a foreign policy tool can be developed everywhere where non-transparent companies, government contracting structures, and bribery exist, along with the lack of control and loopholes in key rules.

The Parliamentary Assembly of the Council of Europe has undergone a corruption attack with intention schemes - its ethics observer could not stop it at the beginning. The European Parliament, being unable to fully consider the foreign activity and foreign income of the members of the European Parliament, is also under threat (Transparency International, 2019).

Under these conditions, the relevance of the use of data analytics in public administration for corruption prevention is increasing. The rapid spread of open data and advanced quantitative methods for anti-corruption analysis is widely perceived as a turning point. Such a point provides researchers and public society with various analytical instruments, enabling comprehensive government monitoring (Harrison et al., 2012; Lima & Delen, 2020; Park & Kim, 2020). Still, the use of data analytics is limited and has numerous pitfalls to be considered and requires a response with an appropriate methodology and realistic expectations concerning the information such data can provide for corruption prevention.

Tasks and objectives

The article aims to determine the methods of the use of data analytics for corruption prevention in public administration during hybrid warfare.

The research questions are:
- how can data analytics contribute to effective corruption prevention in public administration?
- what are the most prospective and appropriate methods of the use of data analytics for corruption prevention in public administration?

Methods

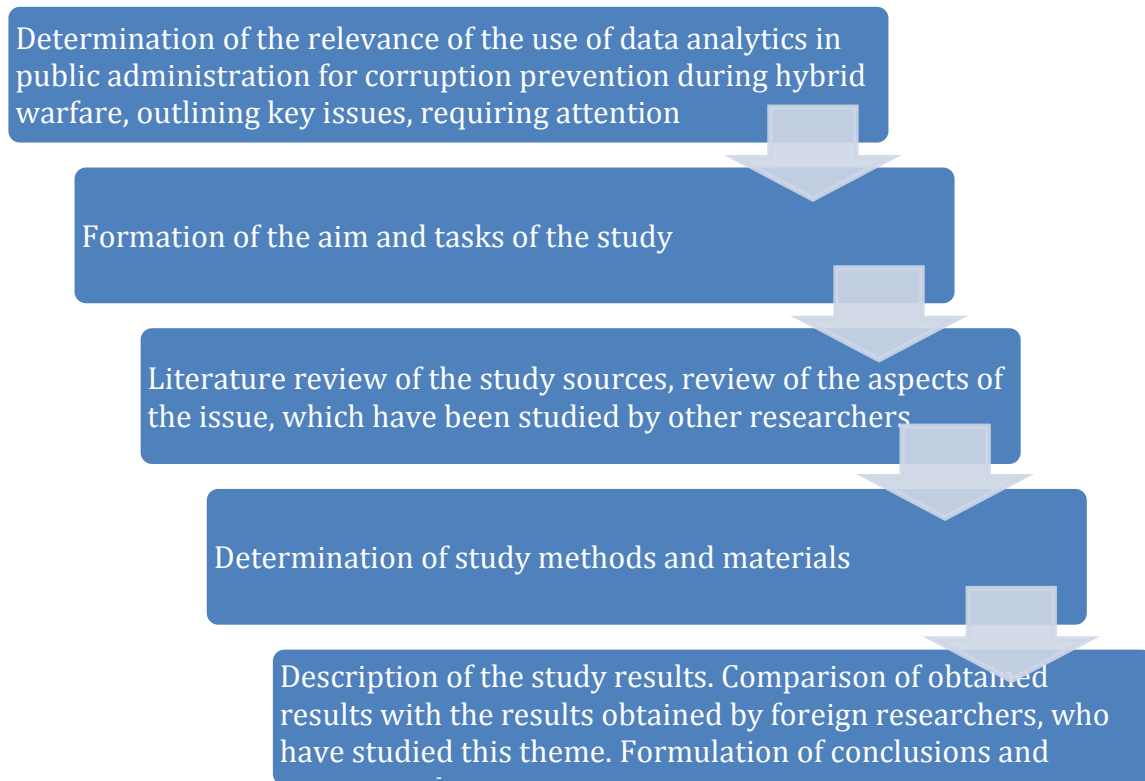Study procedure. The procedure of the study can be depicted with the following scheme (Figure 1):

Determination of the relevance of the use of data analytics in public administration for corruption prevention during hybrid warfare, outlining key issues, requiring attention

Formation of the aim and tasks of the study

Literature review of the study sources, review of the aspects of the issue, which have been studied by other researchers

Determination of study methods and materials

Description of the study results. Comparison of obtained results with the results obtained by foreign researchers, who have studied this theme. Formulation of conclusions and

Figure 1. Study scheme

During January-February 2024, the author conducted a content analysis of the study sources and aspects of the issue, which other researchers have studied. For this, the author has analysed scientific articles written by European and Ukrainian authors, more than 80% of which were published in 2018-2023. Special attention was focused on publications dedicated to the methods of data analytics used for corruption prevention in public administration. A review of several works studying the types of data that can be used in anti-corruption activity was conducted. Data volume, quality, depth, and accessibility were found to have serious limitations for data analysis. Some of the newest approaches to measuring corruption in public administration, which open new ways to corruption revealing and prevention as well as evaluation of anti-corruption measures were analysed. Several significant examples of implementing anti-corruption measures based on data were analysed. These specific examples demonstrate different influences that attempting to work with data analytics for corruption prevention in public administration can have, depending on contextual mechanisms of accountability and administrative possibilities.

Methods

The study uses several methods, such as content-analysis and historical and abstract-logical methods. In particular, a historical method was used to study the development of the corruption factor as an element of hybrid warfare in chronological sequence. The content-analysis method was used for the literature review of the study sources and a review of the aspects of the issue that researchers have studied. Abstract-logical method was used to form theoretical generalisation and conclusions of the study.

Sampling

To conduct this study, content analysis of literature sources of the study was used, which involved analysis of scientific articles written by European and Ukrainian authors, more than 80% of which were published in 2018-2023. The main focus was given to scientific periodicals of EU states of recent years, which were dedicated to corruption phenomena, corruption prevention and counteraction, and the use of data analytics.

Literature review

The studied scientific literature has different definitions of corruption phenomena, which are focused on different aspects of damage caused by institutional and social dimensions of corruption (Grundler & Potrafke, 2019; Akkoyunlu & Ramella, 2020) or procedure aspects of corruption mechanisms (Knack, 2007). Defining corruption before analysis is the key stage. When referring to counteracting corruption, its sources should be defined, and counteraction measures oriented to its primary causes should be determined. In the first case, corruption may be considered the problem — principal-agent, considering that selected politicians like principals can control and bring bureaucrats to responsibility for their actions. Within this context, bureaucrats act on their principals' behalf, providing public goods. The issue of principal-agent arises since principals and agents have different interests, and due to information asymmetry, principals cannot be sure that agents act in their interests.

Conversely, corruption can be defined as an issue of collective actions. This approach considers political elites and the public, where large and diversified communities face difficulties in effective control over well-organised groups of political officials. The issue of collective actions arises as citizens should organise to monitor their collective interests in the control over the government. At the same time, they often fail as the personal interests of some individuals prevail over collective objectives. Within this context, corruption develops when those with

power use their private enrichment position to prejudice the general society (Marquette & Peiffer, 2018).

One of the key challenges of the development and key factor in corruption prevention is the establishment of strong institutions. Higher authorities of financial control are of special importance, as they play a key role in ensuring effective financial management and, thus, accountable and transparent administration.

Independence is an important characteristic of controlling authorities and can define their efficiency in counteracting corruption. To achieve such efficiency, they should be completely independent of national governments, despite attempts to restrict their independence.

Researchers Gustavson and Sundstrom (2018) indicate a variety of authorities and specific nature of audit obligations of the controlling authorities in different states, as well as note differences in structure, professionalism, amount, and independence of resources and transparency. External state audits are compulsory to ensure public sector accountability (Cordery & Hay, 2019).

Controlling authorities can contribute to corruption prevention through detection and deterrence based on their organisation, structure, political culture and corruption perception. Their communication policy is significant for increasing the level of information transparency and their efficiency. Effective communication with interested parties, ensured by increasing information transparency, is important for public and private organisations (Hategan, 2021; Semenikhin et al., 2023).

In scientific literature, data analysis is noted to be a critical element of corruption prevention, which enables the detection of tight relations between audits in the public sector and events of corruption and fraud (Filatova et al., 2023). The issue of data analysis efficiency in corruption prevention has been actively studied recently. Many of these studies are focused on reviewing and developing strategies for enhancing transparency and better implementing data analytics in different ministries, agencies, and subjects of public society (Machova & Lnenicka, 2017). However, other authors pay attention to mechanisms built into the structure of political institutions and governmental relations, which create limitations for using data analytics in corruption prevention (Soudijn & Been, 2020).

Using data analytics with modern technologies to ensure corruption counteraction and prevention is considered an effective mechanism of corruption counteraction in the works of other researchers (Rudik, 2019). Corruption risks can be either minimised or completely neutralised under the condition of the implementation of modern information technologies (Kostyuk, 2019).

The authors of another study concluded that analysis of the collected data provides a state with the tool for bringing state buyers to responsibility (Bauhr et al., 2020). Data analytics enables the detection of potentially risky buyers in public

procurement, as well as unreliable suppliers and territories with increased corruption risks. Furthermore, it is easier for state authorities to receive feedback and information from the public on state duties' performance by the officials. For example, law-enforcement authorities authorised to investigate corruption and apply sanctions can act based on investigations in mass media of information provided by public society (Lagunes, 2021).

In such a way, understanding the mechanisms of data analytics enables the development of effective anti-corruption measures in public administration, eliminating informational asymmetry between governments and the public. Within this context, data analysis is the key instrument for fighting corruption (Kobis et al., 2022). At the same time, data analytics, with the help of modern technologies to counteract and prevent corruption, remains an under-researched topic. The ways in which data analytics can be used to prevent corruption in public administration and the ways in which it can be implemented in the work of public institutions are not sufficiently explored. This study supplements the literature analysed above, offering a balanced evaluation of the possibilities and challenges of using data analytics for corruption prevention in public administration.

Results

The study outlined the following mechanism of influence, using data analytics to contribute to effective corruption prevention in public administration the most (Figure 2). Mechanisms of influence indicated in Figure 2 may be presented differently. In this case, there is a difference between the public and government (thus, elected officials and bureaucrats). Each of the presented groups ('government' and 'public society') can be viewed in a variety of ways. For example, in government politicians and bureaucrats are on different levels, as well as those accountable to their electorate and those assigned by other subjects. Similarly, the public can be more or less engaged in a 'government' group depending on their roles, whether they belong to public society, journalists, business groups or groups of interest.

Considering informational flows among the subjects, data analytics can help reduce corruption in two ways: through top-down or bottom-up transparency. Hence, top-down transparency means that the government's activities become more open to the public. Bottom-up transparency can solve the issue of information asymmetry similarly but in the opposite direction. It is easier for state authorities to receive feedback and information from the public on state duties' performance by their officials. For example, law enforcement authorities, authorised to investigate corruption and apply sanctions, can act based on investigations in mass media of information provided by public society (Lagunes, 2021).
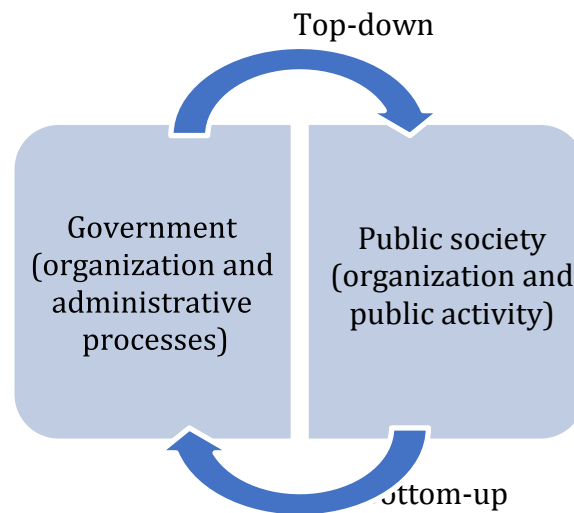
Figure 2. Mechanism of influence using which data analytics can contribute to effective corruption prevention in public administration the most.

In such a way, understanding the data analytics mechanisms enables the development of effective anti-corruption measures, eliminating information asymmetry between governments and the public. Within this context, data analytics is a key instrument for corruption prevention in public administration.

First, instruments of e-governance and collected data can contribute to the standardisation and automation of administrative processes and government work, reducing the sphere of authority of officials and limiting direct contact with the public. This can complicate the possibility of corruption and restrict conspiracies among corrupt officials.

Secondly, data analytics can support collective social actions, providing information through different platforms such as guard portals. This opens opportunities for large-scale mobilisation against corruption, which can lead to the creation of organised anti-corruption movements. It is worth noting that although data analytics can achieve certain progress in fighting major corruption, it is limited and less effective in counteraction to minor corruption cases. The following factors should be present to ensure the efficiency of the above-mentioned mechanisms of influence (Figure 3).
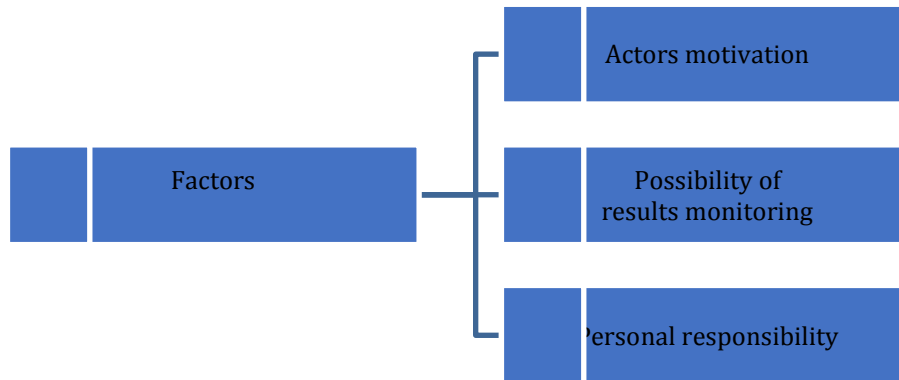
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┌─────────────────────┐
│   Actors motivation  │
└─────────────────────┘

┌───────────┐    ┌─────────────────────┐
│  Factors  │────│    Possibility of    │
└───────────┘    │  results monitoring  │
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┌─────────────────────┐
│ Personal responsibility │
└─────────────────────┘
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Figure 3. Efficiency factors of mechanisms of influence using which data analytics can contribute to effective corruption prevention in public administration the most.

1. Actors' motivation. Those using open data should be motivated to control the actions of governmental authorities. Depending on the influence of government decisions on their everyday life, their motivation level can vary, and they can make more or less effort and spend different time monitoring government actions. For example, parents of public school students will probably be interested in control of the quality of school meals and equipment. However, the quality of complex defence procurements will not influence the everyday life of the public a lot (at least in peacetime), which reduces their motivation to monitor. Data analytics can significantly influence such motivation.

2. Possibility of results monitoring. The possibility of results monitoring is compulsory for effective control over the government's activity. This is especially important for projects with a high value and large influence, like highway construction or the development of state IT infrastructure. Still, the wide range of state investment projects demonstrates negative consequences only with time. For example, a road with a non-stable base can normally operate only for a few years but is later ruined and not subject to repairs.

Data analytics can find insights in corruption relations and also in the stage of early detection of ineffective results. For example, legislation on procurements often provides long-lasting terms of announcements but allows exceptions for reducing these terms. Data analysis enables finding consistent patterns that correspond to exceptional rules on behalf of suppliers. These details may be used to develop individual risk indicators, which allow individuals, even without profound legal knowledge, to detect risky tenders.

3. Personal responsibility. Effective corruption prevention and counteraction became possible only when particular politicians and bureaucrats,

who bear responsibility and/or illegally benefit from corruption actions can be identified. Establishing responsibility for corruption, interested parties can take measures based on this information. For example, the electorate can vote on behalf of the discharge of corrupted politicians, and companies can move to less corrupted regions with better administration.

Determination of corruption factors and individuals bearing responsibility is a complex task, which is often complicated due to the complexity of institutional mechanisms. Data analytics can highlight the cause of corruption and identify individuals who should bear responsibility.

While exercising control over corruption levels in public institutions, data analytics is of great importance as it can indicate instruments and structures that bring benefits to agents. Furthermore, data analytics can reduce the cost of control over public authorities, automating certain processes of monitoring legislation observance or accurately defining legislation violations.

Nevertheless, the causes of a particular non-compliance and abuse of power and authority require profound analysis, in particular interviews with interested parties and study of the regulatory acts, where data analysis is less effective. Still, data analytics can contribute to the identification of individuals engaged in corruption offences. For example, commissions for corruption prevention, which act in many states, often control politicians and other officials through property declarations, different registers and information from whistle-blowers. Data analytics and general data openness can make the fight against corruption easier.

It is worth noting that although data analytics enables the public to overcome barriers to collective action, an important precondition for this is sufficient information literacy for a significant part of society. If the public does not have such skills, corrupt officials can remain unpunished even if certain public organisations possess data on corruption offences.

The main issues of the efficiency of data analytics for corruption prevention in public administration may be divided into two groups: related to data and related to measurement. Each factor group can significantly influence the quality and accuracy of analytical results and their practical use.

Referring to the data, analytics limitations can be related to information volume and quality, as well as its accessibility (Figure 4). This means that data used for the analysis may not reflect all transactions and participants due to limited or incomplete databases. Technical data storage and systematisation issues also influence their suitability for corruption-level evaluation. This is especially relevant while comparing different states, as their legislation can define requirements for accountability.
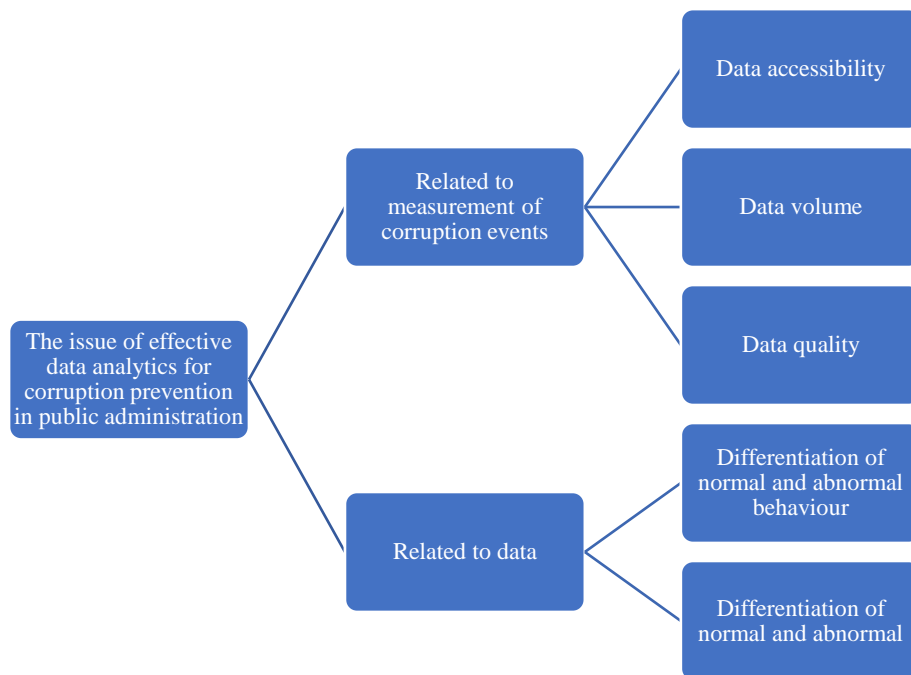
Figure 4. The issues of the efficiency of data analytics for corruption prevention in public administration

Two approaches are available for corruption measurement: based on the data and based on theory. The first case involves using relevant data and methodology to verify theoretical expectations, while the second determines the study question based on the available data. Theoretical studies help to develop an understanding of the issues, filling gaps in knowledge or checking hypotheses. On the other hand, approaches based on data can detect less complex mechanisms and provide valuable information directly from the data, including those that could have been omitted earlier.

Discussion

The conducted analysis showed that the issue of efficiency of data analysis in corruption prevention has been actively studied by different researchers recently. Jeppesen (2019) studied the contribution of different audit types to counteracting corruption. The author concluded that audit standards should include corruption in their definition of fraud in private and public sectors. Auditors should cooperate and exchange information, while audit methods should be used for corruption detection. The author provides a key role in data analytics, which is also given in our study.

Johnsen (2019) analysed the influence of the audit of the efficiency of higher financial control authorities on public administration in four Scandinavian states (Denmark, Finland, Norway, and Sweden). Statistical regression results showed that efficiency audits positively influenced efficiency, changes, improvement, and, to a certain level, accountability of public administration employees who managed efficiency audits conducted by the auditors. The authors state that one of the most important factors of audit efficiency is data analytics and information results in mass media, which in certain ways correlate with efficiency factors if mechanisms of influence are formulated in our study.

Sharing a similar idea, Yang and Wu (2020) name the differentiation of 'normal' and 'abnormal' behaviour as one of the corruption prevention issues. The extended use of the large data enabled researchers to apply more complex methodological approaches as machine learning methods.

The other study (Poltoratskaia & Fazekas, 2024) described and analysed methods of data analytics for corruption prevention in public procurements. It also discussed the main challenges for effective corruption counteraction based on data in public procurements. The authors formed similar conclusions on the efficiency of data analytics for corruption prevention in public administration, on the example of public procurements. The importance of data analytics in corruption prevention in public administration is also noted in other studies (Branet & Hategan, 2024; Cordery & Hay, 2019).

Generally, many scientists emphasise the necessity of using data analytics in public administration for corruption prevention. Some underline the necessity of counteracting corruption manifestations, considering their use by authoritarian regimes as tools during hybrid warfare (Branet & Hategan, 2024). Some researchers proceed to raise the question of efficiency and methods of data analytics in the prevention of manifestations (Poltoratskaia & Fazekas, 2024). Nevertheless, all of them share the idea of the importance of data analytics, which was formed in this study.

Conclusions

In such a way, using data analytics in public administration provides numerous possibilities for corruption prevention during hybrid warfare. Herewith, the active participation of relevant interested parties is the key factor in effectively using data analytics in public administration for corruption prevention. This may be achieved by using easy-to-use and accessible analytical platforms and open data, as well as a clear understanding of the advantages each party can receive from counteracting corruption.

Simple implementation into the everyday work of public authorities is an inevitable part of the efficient use of data analytics. This can include using verified risk indicators and automation of processes to enhance the efficiency of the work. Still, it is worth noting that data is not a universal method in corruption prevention due to its complexity and the necessity for profound reforms. Still, further development of data analytics use in corruption counteracting is expected in the coming years due to the improvement of open data and quantitative methods. It is important to underline that extended use of data analytics should occur within social and administrative mechanisms of accountability, enhancing their efficiency but not substituting them.

The conclusion formed in this study can be used to improve the applying of data analytics in public administration for corruption prevention during hybrid warfare. The perspective of further studies may be the development of recommendations for data analytics implementation in the everyday work of particular state authorities.

Recommendations

- to ensure actors' motivation with the use of explanatory work concerning advantages each party (government and public society) can receive from counteracting corruption;
- to use easy-to-use and accessible analytical platforms and open data;
- to implement data analytics into the everyday work of public authorities through the use of verified risk indicators and automation of processes to enhance the efficiency of the work;
- to conduct extended use of data analytics should be within social and administrative mechanisms of accountability, enhancing their efficiency, but not substituting them.

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