

# DIGITISATION OF LEGAL ALGORITHMS TO PREVENT PUBLIC PROCUREMENT CORRUPTION

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**Abstract.** *The subject* of the article is the digitisation of legal algorithms as a means of preventing corruption in public procurement. The research methodology employed a range of methods including formal and dialectical logic, systemic, statistical, comparative law, hermeneutic and axiological analysis. The purpose of the article is to reveal the digitisation of legal algorithms as a means of preventing corruption in public procurement. The subject of the article is the digitisation of legal algorithms as a means of preventing corruption in public procurement. The research methodology employed a range of methods including formal and dialectical logic, systemic, statistical, comparative law, hermeneutic and axiological analysis. *The purpose* of the article is to reveal the digitisation of legal algorithms as a means of preventing corruption in public procurement. The absence of confidence in public authorities' effective utilisation of budgetary funds engenders inherent justifications for entrepreneurs, their employees, and other members of the public to conceal resources from irresponsible or negligent public officials, particularly in the context of cryptocurrency assets. It was found that the issue of corruption in public procurement is part of the wider problem of satisfying the improper motives of public officials. The legal patterns indicate that in countries with high levels of internal corruption, digital and/or paper formalised legal algorithms and practices emphasise the efficiency of fiscal policy rather than the efficiency of public procurement. This explains the inertia and neglect in strengthening existing mechanisms or creating new ones to combat corruption in public procurement. *The practical inactivity* in this area is reflected in the number of criminal cases related to the misappropriation of public funds. It was emphasised that the entity responsible for the oversight of the integrity and legality of all public procurement participants, or a complainant, must possess the capacity to gather evidence in such cases. In order to accomplish this, said entity requires full legal access to the necessary data from registries and other relevant sources. At present, this is only feasible within the framework of criminal proceedings and/or judicial processes. It is therefore advisable to make public procurement complaint procedures judicial in nature, allowing the parties to try to gather evidence independently. Given the globalisation of the information space, investment, financial, trade and logistics markets, the threat of financing terrorism, war and other crimes through improper control of virtual assets in cyberspace. It was determined that the legal nature of public procurement complaints is defined by the public interest. *The value and importance* of this type of public interest lie in its connection to finances – resources that have already been accumulated as a result of successive links in prior public interest efforts: labour participation, administration of entrepreneurship and its infrastructure, taxation, and budget fund management. This consolidation of national labour efforts, embodied by public funds, possesses absolute liquidity, rendering it a primary target for misappropriation, including through illicit channels. It is submitted that the employment of contemporary digital instruments is the only means through which to ensure compliance, by neutralising any dishonest motives for misappropriating public funds through procurement processes.

**Keywords:** algorithm, compliance, corruption, cryptocurrency, data, programming, public procurement, registry, tax.

**JEL Classification:** D73, C61

## 1. Introduction

Digital technologies have the capacity to engender substantial governance gains (Sanchez-Graells, 2024, p. 289). Innovation public procurement has been

identified as a pivotal instrument in catalysing the transition of the economy towards a green and digital paradigm (Manta, 2024, p. 1). One of the trends in public procurement is the transition of administrative

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procurement decisions to digital technologies (software, hardware, internet) and the use of advanced technologies such as AI (allows computers and machines to function in an intelligent way as a system that can interpret and correct external data and has the potential to replace human labour for certain tasks), big data to drive decisions, EDI (the electronic transfer and exchange of business documents between organisations using networks and the internet), etc. These include electronic invoicing systems, automated contract renewals, automated data entry (robotics), smart data collection, automated responses to supplier questions, the use of AI in evaluating proposals, and possibly even automated tenders for simple procurement (Grandia, 2023, pp. 139, 141; Matthews, 2022, p. 116). The integration of innovations in public procurement and legal algorithms ensuring integrity takes place in the digital realm of information law, for example, software program to detect collusion and other manifestations of dishonesty among entrepreneurs in public procurement procedures was finalised on December 3, 2024 by the author of this article and two mathematician-scientists H.M. Shylo and A.S. Lebedeva-Dychko. The primary challenge confronting the programme is the development of its code utilising a restricted dataset that is available in open access, predominantly comprising entrepreneurs' registration data. Additional data necessary for the programme's expansion is classified and accessible exclusively to notaries, courts, and entities involved in criminal proceedings or other public-authority activities not related to public procurement. These include justice authorities, internal affairs bodies, the migration service working with demographic registries, including data on marriage registration, births, deaths, civil status acts, parentage, citizenship, signature samples, facial images, and so forth.

The body responsible for ensuring compliance with public procurement legislation must have access to all state registries containing data on participants in procurement funded by the budget and other public funds. In the context of Ukraine, however, the Antimonopoly Committee is not granted such access. The responsibility for the management of grievances pertaining to public procurement lies exclusively with this Committee (Article 6-1 of the Law of Ukraine "On the Antimonopoly Committee of Ukraine" of November 26, 1993, No. 3659-XII and Article 18 of the Law of Ukraine "On Public Procurement" of December 25, 2015, No. 922-VIII). The hypothesis under consideration here is that the provision of the Antimonopoly Committee with access to all data registries associated with public procurement will engender the minimum necessary conditions for the counteraction of abuses in this sphere. It is well known that overpricing of goods (services, works), conflicts of interest (contracts with close or commercially

connected persons) and other distortions in public procurement procedures are the basis for financial losses from public funds. The essence of this problem is the substitution of private interests for the public interest. This is a corrupt violation that is inherent in the nature of all economically underdeveloped nations.

The risk of corrupt violations in public procurement is a real threat to national security, which becomes critical to the survival of a nation in times of war with an external aggressor. The above highlights the importance of correlating the effectiveness of the resolution of public procurement complaints with the data available to the public authority responsible for this process, contained in automated information and reference systems and registers. Such a body needs powers that go beyond the data provided by the complainant, since the complainant does not have access to state registers containing information on procuring entities and bidders. Accordingly, the testing of the above-mentioned software programme requires the creation of legal possibilities both for its expansion through access to more data from public registers (material legal norms) and for the definition of procedures for the involvement of researchers in the development and testing of the programme in cyberspace (procedural legal norms).

## 2. Analysis of Recent Topical Resources

Public procurement has attracted considerable research interest, particularly in recent years. Numerous scholars have examined various aspects of this complex area, shedding light on critical issues such as corruption, transparency, efficiency and innovation. The main areas of research and contributions are as follows. Researchers such as Bauhr M., Czibik A., Fine Licht J., Fazekas M. have explored the dark side of public procurement, highlighting the role of corruption and the importance of transparency as a deterrent; Lenderink B., Halman J.I.M., Voordijk H. have examined the role of public procurement in promoting innovation. Fazekas M., Sberna S., Vannucci A. have analysed the organisational structures that facilitate corruption. Researchers such as Disdier A.-C., Fontagné L., Tresa E. have examined the economic impact of public procurement policies, particularly in terms of protectionism. Manta O., Mansi E. studied the impact of globalisation on innovative public procurement. Patrucco A.S., Kauppi K., Mauro C., Schotanus F. have studied the use of public procurement to improve public service delivery. Sanchez-Graells A. has focused on the impact of digital technologies on public procurement. Matthews, D. L. and Stanley, L. L. have conducted an examination of logistics and transportation in the public sector. Jance K. has studied the alignment of Albanian procurement legislation with EU standards.

Tälpig C. C. has analysed the efficiency of public procurement systems and their impact on public budgets. Berraida R., El Abbadi L. explored the potential of artificial intelligence in public procurement. Telles P. has studied the potential applications of blockchain technology in this field. Researchers such as A. Baltrunaite (Lithuania), Azleen I., Nasrudin B., Erlane K. G. (Malaysia), P. Nemeč (Czech Republic), Tátrai T., Vörösmarty G., Juhász P. (Hungary), Chang L., Xu M., Guo L., Zhu X., Qin S., Guo X., Yang X. (China), Tabish S.Z.S., Neeraj Jha K. (India) carried out country-specific studies on public procurement practices and challenges. Valuable information from these works has made it possible to establish that the subject matter of this study is currently incompletely disclosed in scientific doctrine and that it is therefore relevant to deepen knowledge of it.

### 3. Qualification of Corruption Offences in Public Procurement Based on Digitised Data

The extant regulations in Ukraine for addressing such losses are ineffective, as evidenced by the persistently high level of embezzlement reported by journalists and/or law enforcement agencies at stages when public funds have already been stolen and the intended purpose of their budget allocation has not been achieved. The resolution of the issue of losses in public procurement funds will be facilitated by the effective consideration of complaints during their course, under specially developed rules for this category of cases. In terms of evidence collection capabilities, these rules must be no less effective than in criminal proceedings.

The bureaucratic nature of public procurement decision-making engenders a permissive environment for potential abuse. Moreover, extant regulatory frameworks are found to be deficient in their capacity to detect fraud in public procurement. To detect fraud in public procurement, it's necessary to analyse all the data related to the process, which requires an AI's tool, through some solutions as (Regression Analysis, Artificial Neural Networks (ANN) and Case Based Reasoning (CBR)), such an algorithm that could extract, transform and load all the data sets related to the contracts, in order to identify the situation of conflicts of interest, companies with the same owners participating in the same tender, concerted and same bidders, companies with the same address (Berraida, 2024, p. 5). The digital approach to working with data on complaints in the field of public procurement is bijective, analogous to the approach used in processing income declarations of public officials, cases of illicit enrichment, and the like. Elements of all these sets in cyberspace are equally represented by parameters of digital data on financial transactions and legal

connections between participants in these transactions. Accordingly, the calculation of distortions of legal requirements for these transactions is ontologically and functionally the same, but partially differs in the types of input data and the scope of output descriptions of the results for each type of corruption offence: 1) bribery in public procurement; 2) illicit enrichment of a contracting authority official (and/or other persons) as a result of receiving a bribe in public procurement; 3) illicit enrichment of an entrepreneur (and/or other persons) as a result of overpricing of goods (services, works) in public procurement; 4) receipt of corrupt income by an official and entrepreneur in public procurement and/or failure to disclose it in the income declaration; 5) laundering of corrupt proceeds in cyberspace using cryptocurrencies and/or other virtual assets obtained in public procurement; 6) inaction of the antimonopoly authority, auditors, criminal justice authorities that facilitated corruption in public procurement, which led to the loss of the opportunity to return corrupt funds and/or illegally legalised corrupt funds. The nature of public procurement also determines the corruption offences that are typical of it. "The division of the subject of a public contract by the contracting authority in order to avoid an open tender procedure, as a result of which the subject of a public contract, its technical and quality characteristics differ from the requirements specified by the contracting authority in the tender documentation, constitutes a violation of the principles of public procurement with budgetary funds in terms of ensuring efficiency and transparency, creating a competitive environment in public procurement, preventing corruption in this area and developing fair competition." (Supreme Court, 2024, pp. 100-101)

The top ten potential procurement risks: conflict of interest among evaluation team members, strong inertia in the composition of the evaluation team, multiple points of contact, indications of preferred suppliers, number of bids, links between bidders that undermine competition, exceptionally large bids, significant changes in project scope or costs after award, a contact person not employed by the bidder, and a shortened time span for the bidding process (Ilias, 2023 p. 191). Whilst the integrity of public service is prioritised in the majority of countries worldwide, the effectiveness of the respective regulations will be contingent on the rigidity with which they are implemented and enforced (Tabish, 2012, p. 34). Evidence of corruption offences is at best established by administrative and/or criminal justice authorities too late to protect public funds from being misappropriated as a result of violations in public procurement and the consequent loss of public interest, delay in the achievement of socially important goals, and more. As a rule, complainants in public

procurement cases, assuming the integrity of their complaint and the absence of dishonest motives to procedurally obstruct public procurement, have indirect evidence of corruption on the part of the contracting authority and/or the bidder. These may encompass data pertaining to property acquired by the contracting official (or their close associates) beyond the limits of their declared income. The clandestine accumulation of illicit wealth is facilitated by the use of cryptocurrencies and other virtual assets in the laundering of criminal funds in cyberspace. This is achieved through the purchase of property via networks such as "InTheBox", "Genesis Market", "2Easy", "Russian Market", "OMG!OMG!" and other dark web marketplaces.

It is imperative that all such data is analysed by the program for "Corruption Risks in Public Procurement" during the consideration of complaints about violations of tender procedures. Furthermore, if grounds exist (e.g., reasonable suspicions regarding the integrity of a participant, high tender prices, etc.), the program should also analyse data at the stage of tender proposal submission by participants. In the case of Ukraine, it is crucial to establish procedures for access to all these types of evidence through amendments to the Code of Administrative Procedure and/or the Criminal Procedure Code, laws on public procurement, national security (in the area of protection against losses in public procurement), and the adoption of new laws on procedures for the use of digital content, digital tools for these procedures, and evidence-gathering procedures in anti-corruption tender procedures, among others. This relationship highlights the national security objective of neutralising threats to the country's economic and political interests. For example, the US Department of Justice seized Hydra Market, the world's largest and most stable darknet marketplace. In 2021, Hydra accounted for an estimated 80% of all cryptocurrency transactions related to the darknet market, with approximately 5.2 billion USD in cryptocurrencies received on the marketplace since 2015. The seizure of the Hydra servers and cryptocurrency wallets containing 25 million USD worth of bitcoin was carried out in Germany on April 5, 2022 by the German Federal Criminal Police (Bundeskriminalamt) in coordination with US law enforcement agencies (Justice Department Investigation Leads to Shutdown of Largest Online Darknet Marketplace, 2022).

The set of tools for managing public budgets consists of a wide range of legal, political, organisational, digital and other types of tools. The choice of effective tools to ensure compliance with legal requirements depends on the social context of the country, its legal traditions, the legal awareness of the population, etc. For example, in August 2009, E. Worth (French Minister of the Budget) published a list of

3,000 people who had hidden accounts in the Swiss bank HSBC. The policy has had a chilling effect on taxpayers: 75,468 taxpaying households declared foreign accounts in their 2009 tax returns, up from 29,612 two years earlier (Crouzel, 2011). In terms of developing an effective system to prevent corruption in public procurement, Albania has laid a good foundation by significantly improving transparency through its comprehensive e-procurement and e-appeals system (Jance, 2024, p. 97). Economic development and cultural background affect the number of bids received for a typical public procurement contract. Eastern and Central and Eastern European countries have a shorter history of public procurement and a weaker procurement culture (Tátrai, 2023, p. 254). Italian legislation provides that the national government may dissolve any local government when there are direct or indirect links between local elected politicians and criminal organisations, or when there is undue pressure that affects or endangers the normal functioning of the local administration (Fazekas, 2021, p. 1146). Eliminating political favouritism saves Lithuanian taxpayers around 180 million EUR per year, compared to 5-6 million EUR per year spent on financing political parties. The ban on corporate donations is proving to be an effective means of eliminating political favouritism in public procurement (Baltrunaite, 2020, p. 579).

The predicted effect of digital tools on law enforcement can be attributed to the transparency of data concerning subjects and conditions of public procurement. Ex ante transparency is measured by the proportion of missing information in calls for tenders, while ex post transparency is related to contract award. However, transparency requirements may be less efficient in preventing pre-bidding collusion between firms than corrupt practices between agencies and firms (Bauhr, 2019, pp. 503, 500). Digital corruption risk management (CRM) in public procurement is a specific set of procedures and requirements to detect, assess and mitigate corruption offences at each stage (management and control) using algorithms in digital programmes. These programmes process data on contracting authorities, "organised crime proxies in public procurement" (Fazekas, 2021, p. 1156), as well as procurement participants, their close associates and related parties, ensuring the absence of conflicts of interest or criminal collusion. The concept of conflict of interest covers at least any situation in which employees of the contracting authority or of a procurement service provider acting on behalf of the contracting authority who are involved in the conduct of the procurement procedure or who may influence the outcome of that procedure have, directly or indirectly, a financial, economic or other personal interest which might be perceived as compromising their impartiality and



independence in the context of the procurement procedure (EU 2014/24 Art. 24). In addition to directive, preventive, and detective controls, it is important to regularly conduct formal risk assessments (monitoring) and analyse them based on the likelihood and impacts of each type of risk (Ilias, 2023, p. 192).

In this regard, entrepreneurs, all members of management, and chief accountants of participating organisations are required to submit declarations of income and integrity prior to participation in public procurement. As posited by Tabish (2012, p. 33), leadership constitutes the pivotal element in the realm of anticorruption performance. The tone at the top establishes the cultural environment and organisational values for risk management and internal control (Ilias, 2023, p. 191). In addition, automated information-retrieval, reference, and management systems, in conjunction with registers, function as sources of input data for these programs. The data encompasses residential addresses, civil status acts, land cadastre, registries of buildings and structures, vehicles, and property rights to real estate, among others.

Algorithms for processing data from the accounts of procurement participants (or their close associates) on Facebook, Instagram, TikTok, Weibo, Tencent, Douyin, Xiaohongshu, and other social networks have been developed for the innovative anti-corruption analysis of public procurement. Other information about such participants includes 1) expenditure on advertising their goods (services, works) and their content; 2) feedback from national and international partners regarding co-operation and the integrity of such partners; 3) parts of the biographies of the company's directors and chief accountant (excluding data on family members), in particular regarding their education, professional career and social recognition.

The security of public procurement is enhanced at the stage of submission of tenders by the inclusion of advertising data about the goods. Legislative standards for advertising require the accuracy of data about the advertised object. In addition, the results of the study of the bidder's history, customer reviews and other advertising data serve as a strong argument for a balanced evaluation of their bid and their ability to fulfil contractual obligations. Armed with this data, an honest bidder gains evidence against a corrupt public procurement organiser, and vice versa. The task of processing bidders' advertising data is made easier by the trends towards digitalisation and the mediation of AI. According to a report by GroupM, global advertising spending will grow by 7.8% in 2024 to 989.8 billion USD. GroupM expects the global advertising industry to exceed 1 trillion USD in revenue next year, a year earlier than previously forecast. Digital is expected to account for 70.6% of the total advertising market in 2024 (699 billion USD). In the preceding year, the five largest digital companies

(namely, Google, Meta, ByteDance, Amazon and Alibaba) accounted for 77.7% of the digital market. The surge in artificial intelligence products, services and enabling hardware has likely contributed to an increase in business investment (Benjamin, 2024; Makarenkov, 2024, p. 218).

As public procurement evolves towards a performance-orientation, characterised by increased collaboration between stakeholders, the importance of new capabilities in organisations is growing. Consequently, dyadic capabilities are becoming more relevant for practitioners seeking to develop sustainability or innovation objectives, as well as essential organisational capabilities. Private supplier managers, for example, must be able to define value and benefit in the pre-procurement phase, and these benefits must be aligned with societal needs. Transparency is a prerequisite for building trust in business relationships, which is a valuable asset if flexibility is sought during the contract period (Loijas, 2024, p. 139). The determination of rankings for public procurement authorities and tender participants assumes particular significance. These rankings are based on a range of data, including the number and volume of integrity contracts executed without inflated prices, as well as those concluded as a result of winning public procurement competitions. The compilation of such rankings is conducted on an annual basis by a digital program administered by the authority responsible for ensuring compliance with public procurement legislation. Rankings for contracting authorities and participants in public procurement help to assess the real risk of corruption in this area. The higher the risk level, the more frequently and thoroughly anti-corruption safeguards are applied by public authorities and open civil society.

Strategic public procurement can be defined as the deliberate use of procurement resources and processes to achieve both public management and policy-driven objectives (Patrucco, 2024, p. 15). The financial scale and strategic significance for national interests of industries such as mining, energy, machinery, aviation, shipbuilding, automotive, aerospace, and other capital-intensive, including innovative, sectors of the economy necessitate additional data analysis for public procurement processes relevant to these sectors. It is evident that, given its status as a considerable component of capital investment for mining enterprises, equipment procurement exerts a direct influence on company productivity and economic returns (Chang, 2024, p. 1).

By leveraging the collective purchasing power of the public sector, procurement can ensure that the public sector functions as a "responsible buyer", ensuring that the adopted digital technologies align with public interest objectives such as trustworthiness, responsibility, explainability, transparency, safety,

and high levels of robustness, interoperability, and cybersecurity (Sanchez-Graells, 2024, p. 289). In order to ensure the efficacy of procurement data for goods in strategic industries, it is essential to eliminate corruption obstacles posed by individuals wielding significant economic and/or political influence. In accordance with this objective, the anti-corruption component of their procurement procedures must encompass data from at least the register of oligarchs, the transparency register, as well as other national and international information and communication systems that ensure the collection, accumulation, protection, accounting, presentation, processing, and provision of information. The analysis of this information is pivotal in ensuring the optimal protection of the public interest. In the context of knowledge-intensive sectors of the economy, this aligns with national interests. The permanence, recurrence,

and scale of these challenges inevitably trigger other economic threats to national security, which are further compounded by political and external military threats. Consequently, these deprivations collectively erode the nation's capacity to counter both external aggressors and large-scale internal criminal activities.

#### 4. Relevant Grounds for Digitising Legal Algorithms for Preventing Corruption in Public Procurement

An important area in public procurement is the further development of the electronic procurement system, introduction of new tools and digitalisation of processes to increase transparency, reduce the risk of discrimination and reduce operating costs (Strategy for Reforming the Public Procurement System for 2024-2026 and the Operational Plan for

Table 1

#### Illustration of Ukrainian legal formalisation for demographic, family, property and other data registers

No.	Laws titles and details	Data register type
1.	The Law of Ukraine "On State Registration of Legal Entities, Individual Entrepreneurs and Public Organisations", dated May 15, 2003, No. 755-IV	Entrepreneurial interests
2.	The Law of Ukraine "On State Registration of Real Rights to Real Estate and Their Encumbrances", dated July 1, 2004, No. 1952-IV	Real estate
3.	The Law of Ukraine "On the State Registration of Civil Status Acts", dated July 1, 2010, No. 2398-VI	Familial ties
4.	The Law of Ukraine "On Access to Public Information", dated January 13, 2011, No. 2939-VI	Procedures ensuring the right of access to information held by public information managers and of public interest
5.	The Law of Ukraine "On the Unified State Demographic Register and Documents Confirming Ukrainian Citizenship, Identity or Special Status", dated 20.11.2012 No 5492-VI	Residence and other demographic data
6.	The Law of Ukraine "On the Prevention of Corruption", dated October 14, 2014, No. 1700-VII	The content of income declarations of public officials and any corruption offenses committed by them
7.	The Law of Ukraine "On Public Procurement", dated December 25, 2015, No. 922-VIII	History of procurement procedure appeals; received tender proposals
8.	The Law of Ukraine "On Stimulating the Development of the Digital Economy in Ukraine", dated July 15, 2021, No. 1667-IX, "Diia City"	Companies engaged in computer programming, software publishing, IT education, data processing, web portals, research and experimental development in the field of natural and technical sciences related to ICT, services related to the circulation of virtual assets and/or cybersecurity, as well as compliance with decent wages and net profit
9.	The Law of Ukraine "On Prevention of Threats to National Security Related to Excessive Influence of Persons with Significant Economic and Political Weight in Public Life (Oligarchs)", dated 23.09.2021 No. 1780-IX	Significant economic and political weight of individuals in public life
10.	The Law of Ukraine "On Lobbying", dated February 23, 2024, No. 3606-IX, and the Resolution of the Cabinet of Ministers of Ukraine "On the Transparency Register" approved on October 15, 2024, No. 1175	Lobbying subjects and their reporting (transparency register)
General legal basis for data exchange of public registers		
11.	The Law of Ukraine "On Public Electronic Registers", dated 18.11.2021, No. 1907-IX; the Law of Ukraine "On Peculiarities of Provision of Public (Electronic Public) Services", dated 15.07.2021, No. 1689-IX; the Resolutions of the Cabinet of Ministers of Ukraine "On the Trembita System of Electronic Interaction of State Electronic Information Resources", and "Certain Issues of Organising Electronic Interaction of State Electronic Information Resources" approved on 08.09.2016, No. 606	Rules for exchange between some basic public data registries

Its Implementation in 2024–2025, approved by the Cabinet of Ministers of Ukraine on February 2, 2024, No. 76-p). The public procurement system provides for the creation of additional opportunities and practices for small and medium-sized enterprises (Strategy for Recovery, Sustainable Development, and Digital Transformation of Small and Medium Enterprises until 2027, approved by the Cabinet of Ministers of Ukraine on August 30, 2024, No. 821-p). To effectively support job creation, help small and medium-sized businesses, protect the environment and promote research and innovation, public procurement procedures need to be well designed (Tálpig, 2024, p. 451).

In accordance with strategic plans, the digital formalisation of algorithms is intended to eliminate corruption in public procurement, thereby enabling compliance with quality standards for all goods (works, services) funded by public funds. This will also demonstrate the absence of any management non-compliance with any requirements that Ukraine needs, taking into account its integration progress towards the EU market, where only products that fulfil requirements providing a high level of protection of public interests, such as health and safety, protection of consumers, protection of the environment and public security and any other public interest (Regulation (EU) 2019/1020). Looking at the current practical issues arising from Directive 2014/24/EU, there are two areas where existing technical solutions are lacking. These are the registration of contracts (amendments) and the ESPD/e-certis information exchange system, and the award notices and amendments that are manually sent to the Official Journal of the EU (Telles, 2022, p. 187).

The study identifies corruption as a significant impediment to the realisation of efficiency, sustainability, and budgetary objectives (Tálpig, 2024, p. 460). The elimination of corruption from public procurement is facilitated by the procedure of consultations of the contracting authority with potential suppliers and other market participants. The objective of the competitive dialogue approach is to align the multifaceted requirements of contracting authorities with the potential solutions offered by suppliers. The procedure is especially useful in large, complex projects, where contracting authorities often experience difficulty in defining the means of satisfying their needs or in assessing what potential suppliers are offering in terms of technical, financial, or legal solutions (Lenderink, 2022, p. 663). Openness to competition is subject to multiple thresholds depending on the nature of the good or service and on the authority purchasing it (Disdier, 2021, p. 3073). For instance, Ukraine references this consultative institution, yet it does not delineate the criteria for the compulsory implementation of this procedure.

Beyond blockchain, organisations are investing in other technologies such as digital training solutions, the Internet of Things and cloud computing. Cloud computing minimises communication issues, enhances collaboration in a secure manner, and helps improve their processes by making data collection and analysis easier (Matthews, 2022, p. 13). It is evident that, in the present moment and for the foreseeable future, a regulatory gap exists which leaves the adoption of digital technologies by the public sector largely unregulated, and thus exposed to the risk of regulatory capture and commercial determination. The existing and growing gap in the public sector's digital skills undermines the ability of public procurement to act as an effective gatekeeper and regulator. A public buyer lacking in digital proficiency is a vulnerable entity, as they are unable to critically evaluate claims pertaining to the proffered digital technologies. Consequently, they are susceptible to the "policy irresistibility" of "tech fixes" for governance issues (Sanchez-Graells, 2024, pp. 288, 289). In the domain of public procurement integrity control, supervisory bodies, such as those in Ukraine, are constrained by outdated legislative norms. These bodies are unable to access a range of national and international registers. The obligation to provide information requested by the Antimonopoly Committee is prescribed by law; however, penalties or other liabilities for failing to provide such information are only stipulated within the laws governing economic competition. At present, there is no financial or other liability for ignoring requests from the Antimonopoly Committee in cases concerning public procurement complaints under Ukrainian law.

Current legislative procedures for challenging illegal actions in public procurement frequently appear to offer a degree of protection for public interests. This phenomenon may be attributed to the presence of intricate corruption schemes that involve cartels among bidding firms, thereby manipulating the competitive process (Fazekas, 2021, p. 1157). It is evident that complainants have virtually no access to the vast range of data required for a systemic analysis that could substantiate the existence of a "corrupt agreement among public decision-makers and entrepreneurs" (Fazekas, 2021, p. 1144), such as conflicts of interest, collusion among participants, bribery of contracting authorities, and similar violations. In the most effective cases, the mobilisation of available data is achieved, with a series of indirect pieces of evidence of corruption practices in public procurement being attached. The Antimonopoly Committee frequently adopts a passive role in such investigations, relying solely on complaint materials and its existing data. Its initiative in such matters is more an exception than a legislative obligation. "In order to analyse data that indicates violations

of public procurement legislation, the following may be used: information that has been published in the electronic procurement system, contained in unified state registers, and in databases that are accessible to the central executive body responsible for implementing state financial control policy." (Article 8(2)(7) – Article 8(2)(10) of the Law of Ukraine "On Public Procurement", dated December 25, 2015, No. 922-VIII) There is no explicit reference to any requirement for the collection of data, evidence, or analogous materials. This approach can be regarded as a legal subversion, as it is evident that the defined procedure is unable to ensure the inclusion of all critical data necessary for the correct resolution of a case.

Evidence suggests that attempts to prevent corruption in public procurement are being evaded, as demonstrated by the absence of a system for information exchange within the existing procedures for handling complaints regarding such procurement violations. Furthermore, there is a lack of an institution with the capacity to eliminate the actual grounds for such violations. Concurrently, such systems are in place for fiscal purposes. For example, in Ukraine, the tax service receives information from notaries and state registrars on the registration of individuals' ownership of real estate (see Procedure for Electronic Interaction of Information Systems of the Ministry of Justice of Ukraine and the State Tax Service of Ukraine Regarding the Confirmation of Data on Individuals During State Registration of Property Rights, approved by Order of the Ministry of Justice of Ukraine and the Ministry of Finance of Ukraine, dated January 31, 2022, No. 280/5/41). Ukraine's existing system of electronic interaction with state electronic information resources, Trembita, should become part of the analytical framework for handling complaints related to public procurement and preventing corruption in such procurement. This can be achieved through appropriate algorithms, etc.

Depending on the specifics of the subject matter for which an anti-corruption algorithm is being developed, expertise in relevant fields (law, programming, etc.) is essential. "Involving independent experts or external procurement professionals in the tendering process could help to avoid risks of corruption and favouring incumbent suppliers. Their judgements are sometimes more easily accepted by other stakeholders, such as citizens or political parties." (Grandia, 2023, p. 102). In public procurement, this includes commodity experts and professionals with practical experience of services and works. Their knowledge of variability, stability, the content of essential conditions, processes and obstacles in operations is the fundamental basis for filling software codes with meaningful content. Appropriate organisational forms for such developments may include co-operation between entrepreneurs

and experts familiar with corruption-prone aspects of public procurement, as well as universities, research institutions and other organisations. For instance, in Ukraine, entrepreneurs listed in the registry of the legal regime "Diia City," with specialisations in business innovation, digital infrastructure development, and skilled professionals, could fulfil this role. An innovative example from Denmark: instead of defining detailed solutions, the city identified problems and invited innovative solutions from the market; innovation labs and pilot projects: the city created living labs and pilot projects to test and evaluate innovative solutions in a real urban environment; this allowed for a more informed procurement process and reduced the risk associated with the introduction of unproven technologies; co-operation with startups and technology companies (Manta, 2024, p. 9).

The Member States of the multilateral convention "On Mutual Administrative Assistance in Tax Matters" (2011) and "Model Tax Convention on Income and on Capital" (1992) (applicable to persons who are residents of one or both of the Contracting States) provide a basis for all forms of information exchange – on request, spontaneous, and automatic (Model Tax Convention on Income and on Capital: Condensed Version 2017, 1992-2017). In particular, since 2009, the OECD, the EU and the Global Forum on Transparency and Exchange of Information for Tax Purposes have made significant progress in enhancing transparency and the exchange of information on request. Since July 15, 2014, the Common Reporting Standard (CRS) has emerged as a set of financial account information to be exchanged, the financial institutions required to report, the different types of accounts and taxpayers covered, as well as common due diligence procedures to be followed by financial institutions. This initiative was developed and endorsed by the OECD Council in response to a request by the G20 and subsequent calls on jurisdictions to obtain this information from their financial institutions and automatically exchange it with other jurisdictions on an annual basis (Standard for Automatic Exchange of Financial Account Information in Tax Matters, 2017, pp. 3, 9). In line with this trend of international fiscal vigilance of public authorities, Ukraine, albeit with a significant delay of 10 years, has implemented the international standard for the automatic exchange of information on financial accounts and reports by country (see Law of Ukraine "On Amending the Tax Code of Ukraine and Other Legislative Acts Regarding the Implementation of the International Standard for Automatic Exchange of Financial Account Information", dated March 20, 2023, No. 2970-IX).

It is evident that states consistently prioritise effective tax administration. However, comparable,



more targeted, consistent, or determined efforts in overseeing the efficiency of public procurement or other expenditures from public funds – formed through collected taxes – are less evident, particularly at the international or regional levels. For instance, even the European Anti-Fraud Office, an organisation known for its authority, sometimes initiates its anti-corruption investigations only after journalists and/or U.S. criminal justice systems have conducted their inquiries. This phenomenon occurs despite the potential for undue influence from U.S. companies on EU officials, and vice versa. For instance, throughout 2023, multiple individuals – including subjects of US and Ukrainian investigations – solicited bribes from Sinclair & Wilde to secure payment of the remaining 14.5 million USD owed to it. Sinclair & Wilde declined these solicitations and reported them to the relevant authorities in the US and Ukraine. A subsequent examination of the uniforms by law enforcement organisations and defence officials revealed that the prices charged by Sinclair & Wilde were BELOW fair market value, particularly when accounting for the costs associated with shipping and logistics (Delnero, 2024).

Key challenges for the future include the need for more systematic collection of information on public procurement policies at the international level and progress in their transparency (Disdier, 2021, p. 3086). The effectiveness of the anti-corruption infrastructure is further weakened when multinational corporations seek to exploit national budgets through public procurement, especially in states or unions where top officials are easily bribed and/or temporarily beyond the control of other branches of government – parliaments, courts or law enforcement agencies. For example, Dalligate and the aggressive lobbying of the tobacco industry (2009-2014): EP's Members complained about "tobacco lobbyists turning up in their offices uninvited; numerous invitations to drinks, dinners and cocktail events; targeted social media and email campaigns coordinated by tobacco companies; indirect lobbying through small retailers, anti-counterfeiting firms and farmers' groups; and allegations of industry-sponsored amendments". At least 161 employees of the tobacco giant Philip Morris International had (undisclosed) lobbying meetings with at least 233 Members of the European Parliament to try to influence the European Parliament's decision on the final version of the Tobacco Products Directive, a new law that tightens the rules for the production, manufacture and sale of tobacco products in the EU (Hörz, 2014). It is well known that the adoption of this Directive, following the neutralisation of the corrupt influence of the tobacco lobby on EU authorities, led to a two-thirds reduction in the number of smokers. Part of the corruption of this lobby was the discrediting of EU Health Commissioner John

Dalli. Although this led to his dismissal, journalists and members of the European Parliament found that John Dalli acted with integrity and was free from corruption. The allegations against him were made possible by procedural violations by the European Anti-Fraud Office.

The genuine desire of countries to combat the misappropriation of public procurement funds is often demonstrated by their implementation of legal decisions and practices already developed by the EU, the United States, Japan, Singapore and other countries with strong legal systems, effective criminal justice systems and robust international co-operation mechanisms. In addition to existing alternative data sources, such as the Opentender platform under the EU co-founded DIGIWHIST project, a forthcoming Public Procurement Data Space (PPDS) project aims to create a digital platform at EU level to integrate procurement data scattered at EU, national and regional levels (Nemec, 2024, p. 2159). Through digital platforms, an important aspect is the access to a wider group of suppliers at the most optimal time, as well as the increasing interconnectedness of countries and thus the exchange of ideas, technologies and best practices. This can be particularly beneficial in sectors where specific expertise is required and where this expertise can be made available to the applicant in virtually no time and with optimised resources from a financial, human and time point of view (Manta, 2024, p. 2). For example, the absence of rules, other than those related to anti-money laundering, for the provision of services related to such unregulated cryptoassets, including the operation of trading platforms for cryptoassets, the exchange of cryptoassets for cash, etc., leaves the owners of these cryptoassets exposed to risks, in particular in areas not covered by consumer protection rules. There are significant risks to market integrity, including in terms of market abuse and financial crime (Regulation (EU) 2023/1114, item 4).

All of these decisions and practices affect the production of material goods (such as labour remuneration and consumer rights), the digital format of financial and other data, and the management and control of public revenues and expenditures. For instance, these are rules on the information on payers and payees accompanying transfers of funds, in any currency, and on the information on originators and beneficiaries accompanying transfers of cryptoassets, for the purposes of preventing, detecting and investigating money laundering and terrorist financing (Regulation (EU) 2023/1113). A fundamental principle is that disputes over tender procurement are to be resolved by the judiciary, where all evidence in a case is to be collected at the preparatory stage of the proceedings. Concurrently, the very existence of effective judicial review designed to

ensure compliance with Union law is the cornerstone of the rule of law. This applies, in particular, to judicial review of the validity of measures, contracts or other documents that result in public expenditure or debt, in particular in the context of public procurement procedures, which may also be subject to judicial review (Regulation (EU, Euratom) 2020/2092). In particular, tenders which do not comply with the procurement documents, which were received late, where there is evidence of collusion or corruption, or which have been found by the contracting authority to be abnormally low, shall be considered as being irregular. In particular, tenders submitted by tenderers lacking the required qualifications, and tenders whose price exceeds the contracting authority's budget as determined and documented prior to the launch of the procurement procedure, shall be considered as unacceptable (EU 2014/24 Art. 26). In order to guarantee transparency, accountability, and integrity, public procurement processes must include such safeguards as professional oversight, accessible procurement data, and rigorous legal compliance. Key practices include the publication of tender notices, bid evaluation criteria, and award decisions, as well as the implementation of robust anti-corruption measures such as conflict-of-interest policies and fraud detection mechanisms. Ensuring fairness and impartiality in the bid evaluation process is supported by transparent grievance mechanisms for suppliers (Patrucco, 2024, p. 5).

## 5. Conclusions

It is evident that public authorities are interested in the organisation of information about citizens and entrepreneurs for tax purposes. This is beneficial for the combatting of both the shadow economy and associated crimes. Nevertheless, it is imperative to ensure integrity in budgetary expenditures to prevent the erosion of the material foundation of a nation. The absence of confidence in public authorities' effective utilisation of budgetary funds engenders inherent justifications for entrepreneurs, their employees, and other members of the public to conceal resources from irresponsible or negligent public officials, particularly in the context of cryptocurrency assets.

The issue of corruption in public procurement is part of the wider problem of satisfying the improper motives of public officials. While bribery in the context of tax administration is limited to officials in the tax authorities, bribery in the context of public expenditure is potentially accessible to all public officials who manage these funds. Moreover, without taxes it is impossible to build up public funds, which are often stolen through kickback schemes or inflated prices for public procurement goods.

Consequently, the objectives of fiscal policy do not contradict the objectives of corrupt officials, but rather create potential opportunities for illicit enrichment. The analysis of legal patterns in countries with high levels of internal corruption suggests that digital and paper formalised legal algorithms and practices place a greater emphasis on the efficiency of fiscal policy as opposed to public procurement efficiency. This has resulted in a reluctance to strengthen existing mechanisms or create new ones with the aim of addressing corruption in public procurement. The inactivity in this area is evident in the number of criminal cases related to the embezzlement of public procurement funds. For years, these cases have not resulted in the implementation of effective anti-corruption policies that are targeted, economically sound, and appropriately justified public budget expenditures, rather than inflated spending.

The entity responsible for the oversight of the integrity and legality of all public procurement participants, or a complainant, must possess the capability to gather evidence in such cases. To this end, the entity in question requires full legal access to the necessary data from registries and other relevant sources. At present, this is only feasible within the framework of criminal proceedings and/or judicial processes. It is therefore advisable to make public procurement complaints procedures judicial in nature, allowing the parties to try to gather evidence independently. In case of refusal, they could apply to the court to obtain such evidence. The Antimonopoly Committee does not have these powers and cannot provide such assistance to complainants, which renders the review of complaints legally insufficient and replaces the rule of law in public procurement with its imitation. One potential approach to address the inefficiencies observed in the efforts to combat corruption and other violations in public procurement is to extend the application of administrative jurisdiction or criminal procedural rules to complaint procedures. The implementation of such frameworks would facilitate the collection of the necessary data for a comprehensive evaluation of the validity or groundlessness of complaints.

In any case, a complaint about violations or dishonesty in public procurement is a statement with evidence of a crime. This goes beyond the concept of a complaint in the administrative sense, where it concerns the private interests of citizens or entrepreneurs. The legal nature of public procurement complaints is defined by the public interest. In particular, the term "public" appears twice in the terminology: in the title of the procurement procedure and in the interest it seeks to protect. The value and importance of this type of public interest lie in its connection to finances. Resources have already been accumulated as a result of successive links in prior

public interest efforts, including labour participation, administration of entrepreneurship and its infrastructure, taxation, and budget fund management. This culmination of national labour efforts, represented by public funds, carries absolute liquidity, making it a prime target for misappropriation, including by illicit means. Accordingly, public funds cannot be adequately protected against misappropriation in public procurement by an administrative complaint procedure or a passive approach to complaints. These procedures do not offer absolute protection. Judicial and/or criminal procedures are the only sufficiently robust measures against the misappropriation of such assets. Only these options, used by developed countries through modern digital tools, can ensure compliance by neutralising dishonest motives for misappropriation of public funds through procurement processes.

The supervisory body should analyse the data in the register for procurement complaints concerning items that exceed a significant threshold for national public funds. In Ukraine, this threshold exceeds 22,000 EUR (over 1 million UAH at the current exchange rate). Ukraine should amend Article 8(2)(7) ("Procedure for Monitoring Public Procurement Procedures") of the Law "On Public

Procurement" dated December 25, 2015, No. 922-VIII, replacing the term "may" with "must" and granting the authority to work with registry data while ensuring compliance with information legislation.

In the context of the globalisation of the information space, investment, financial, trade, and logistics markets, and in view of the threat of financing terrorism, war, and other crimes from improper control over virtual assets in cyberspace, as well as Ukraine's integration into the EU's economic and administrative system, it is crucial to grant the body handling procurement complaints access to information about foreign enterprises participating in Ukraine's procurement processes. This will require agreements with the relevant regulatory bodies in the countries where such bidders are registered, as well as with accounting and other firms that hold or have access to the necessary corporate data. Building on these efforts, data from court decision registers, journalistic reports and other information systems will be integrated into computerised algorithms. These datasets should be processed by decision support systems and related intelligent automated systems, including those driven by artificial intelligence, under the supervision of competition and other public authorities at national and EU level.

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