

Impact Reviews of Anti-Corruption Technologies in E-Procurement and Open Contracting

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ABSTRACT

This review examines the impact of anti-corruption technologies implemented through e-procurement and open contracting systems on governance, transparency, accountability, and corruption reduction. Drawing on evidence from global impact reviews and empirical studies, the paper evaluates how digital procurement platforms have transformed public procurement by improving information disclosure, enhancing competition, strengthening audit capabilities, and promoting more efficient public financial management. The review finds that while e-procurement and open contracting consistently improve transparency, operational efficiency, data accessibility, and procurement performance, their direct effect on reducing corruption is mixed and highly dependent on contextual factors such as institutional capacity, political commitment, legal frameworks, and stakeholder participation. The analysis further highlights the importance of interoperable data standards, risk-based monitoring systems, machine-readable procurement information, and complementary governance reforms in maximizing the effectiveness of anti-corruption technologies. Although digital technologies reduce opportunities for discretionary decision-making and facilitate the detection of procurement irregularities, they cannot independently eliminate corruption without strong accountability mechanisms, effective enforcement institutions, and active civic oversight. The review also identifies methodological limitations in existing evaluations, including attribution challenges, limited longitudinal evidence, data quality concerns, and variations in implementation across countries. Overall, the findings suggest that anti-corruption technologies should be viewed as enabling instruments that strengthen governance rather than as standalone solutions to corruption. Future reforms should integrate technological innovation with institutional strengthening, regulatory reforms, capacity development, and citizen engagement to achieve sustainable improvements in public procurement integrity and government accountability.

Keywords: E-procurement, Open Contracting, Anti-corruption Technologies, Public Procurement and Governance and Transparency.

INTRODUCTION

Anti-corruption technologies promise to assist governments in achieving governance goals, yet their impact remains inadequately understood [1]. This paper synthesizes reviews of twelve anti-corruption technologies implemented in e-procurement and open contracting systems across the globe, collectively covering 143 countries. The reviews indicate that these technologies generally advance government objectives but do not consistently or uniformly mitigate corruption [2]. Reforms urging governments to adopt e-procurement or open contracting on the presumption that they would eliminate corruption whether by transforming decision-makers' incentives, increasing detection rates, or enhancing accountability overstate the impact of technology and underestimate the complexity of corruption [1]. Corruption detriments include misallocation of public resources, decline of social contract, erosion of trust, and depletion of productivity [3]. Anti-corruption policies primarily aim to eliminate corruption via prevention, enforcement, education, and contractual accountability. E-procurement and open contracting major public financial management reform adds a layer of technology-supported transparency in

government financial management [4]. E-procurement permits online bidding and information dissemination; open contracting promotes transparency in the entire contracting cycle.

Theoretical Foundations of Anti-Corruption Technologies

Corruption undermines governance, development, and public trust, eroding social contracts. Computerization and proactive disclosure aim to reshape policies and processes to prevent corruption and foster integrity [4]. Research on the impact of anti-corruption technologies on e-procurement and open contracting is limited, despite widespread adoption of electronic means for public sector transactions and regulatory reforms focused on greater transparency and accessibility of governmental information [5]. Existing impact reviews of anti-corruption technologies concentrated on smart procurement [1] and on open contracting as part of the Open Contracting Partnership, including data standards established by the Open Contracting Partnership [5]. Anti-corruption technologies are defined as the systematic use of data and technology to advance governance objectives, utilising information and communication technologies and measures that digitally and indirectly enhance efficiency, accountability, catering to identified areas of vulnerability [6]. E-procurement refers to the use of digital means, ranging from internet technologies to specific software solutions, to conduct public sector procurement transaction or commercial sourcing of public goods and services [7]. Open contracting signifies a complementary approach in which procedures, transactions, and audits are documented and proactively disclosed, made publicly accessible and capable of machine-readability, guided by standards that define core minimum datasets and generic structures and formats [2]. Corruption occurs when conflicts between formal rules and substantive interests enable officials to pursue discretionary objectives; when pervasive discretion and limited ex ante controls augur abuse; when ex post audits and analysis cannot ascertain compliance; and when civil society lacks skills and platforms that combine, process, and analyse public information [8]. Measures capable of lessening these mechanisms include structural reforms to limit discretion; ICTs that tighten ex-ante policy adherence; extended procedural documentation and transparent sharing of records; systems that highlight anomalies; traceability along the entire spending chain; and early-disclosure platforms that allow monitoring of the procurement life-cycle [1]. E-procurement reduces discretion and elevates recognition of the governance response, strengthening rather than loosening controls. The distinction between ICTs that enhance efficiency and anti-corruption technologies remains critical for defining measurement frameworks [2].

E-Procurement and Open Contracting: Definitions and Scope

E-procurement is a broad term encompassing all forms of procurement carried out with electronic means. It can be defined as “the purchase and sale of goods and services, by means of a public electronic system where public procurement notice and procurement document can be accessed and downloaded electronically” [3]. It includes invitations for bids or tenders, advertisements for expressions of interest, requests for proposals, requests for quotation, and notifications of award [4]. E-procurement covers eleven major processes from needs identification to contract management and is implemented through eight main systems, including information portal, call centre, payment, e-Sourcing, e-Tendering, e-Contracting, security and transaction and data steward [5]. Open Contracting (OC) applies to the procurement of goods, works and services across all sectors of the economy [1]. It involves stakeholders such as government agencies, businesses, civil society organizations, the media, and international development partners [6]. The Open Contracting Partnership promotes transparency and accountability by publishing government contract, procurement and calling for bids information [7]. The Open Contracting Data Standard, a common format that enables information to be readily exchanged between different systems and automatically processed by computers, makes comprehensive analysis of procurement data including bidding processes, win rates, delays, budgets and expenditures possible [8]. Open contracting alone is not sufficient to reduce corruption, however; it should be complemented by frameworks or initiatives such as integrity pacts that prohibit corrupt practices and involve a monitoring system [1]. A study of the implementation of open contracting found that procurement data analysis helps detect red flags that may indicate potential breaches of these standards and corruption risks [2].

Mechanisms of Corruption and the Role of Technology in Mitigation

Corruption mechanisms operate partly through the manipulation of information and procedures in order to obtain competitive advantages or to conceal misconduct [4]. The analysis of corruption in public procurement shows that a variety of misbehaviors can occur at each phase of the procurement cycle, affecting various elements of the process and involving different agents [1]. E-procurement systems and open contracting procedures aim to tackle these issues by increasing the availability and accessibility of information before, during, and after the procurement process, improving the timeliness, completeness, and clarity of procurement dissemination, and enabling the use of anti-corruption measures with greater efficiency [5]. Systematic corruption in public procurement distorts competition and leads to the awarding of contracts based on considerations other than price, quality, delivery time, or technical characteristics. Rather than simply extracting bribes from those already awarded contracts, corrupt administrators may seek to exert influence prior to the awarding phase in order to determine the outcome of the tendering procedure [2]. Corruption, of course, can still occur at any other stage of the public procurement cycle

using traditional paper-based schemes [6]. However, these systems are more cumbersome, slower, more complex, and less confidential than electronic management, making the hiding of corrupt behaviour much more difficult [7].

Methodologies for Impact Reviews

Governments increasingly seek digital solutions that harness information and communication technologies (ICTs) to enhance the transparency and efficacy of public-sector interventions [2]. Digital technologies are perceived to possess significant potential to facilitate non-intrusive monitoring of the activities of government agents that operate in social accountability or governance-related modalities [3]. The purposes of anti-corruption technologies mostly boil down to two largely interlinked objectives: the reduction of corruption and the improvement of governance and service delivery generally or in specific sectors [1]. Anti-corruption technologies are defined as formal interventions utilising ICTs and, whenever feasible, designed to mitigate political corruption. Such technologies are theoretically grounded on the expectation that well-targeted digital reform can influence individual behaviour by modifying the incentives that public officials face while serving in public office. Enhanced transparency and accountability have become key instruments in reforming public sector operations, especially in public procurement and public financial management [3]. Public services and procurement processes remain fraught with corruption risks, thereby rendering anti-corruption technologies especially salient in these domains. Given this context, the objective of the impact reviews is to synthesise the effects of specific anti-corruption technologies in the fields of e-procurement and open contracting on the reduction of corruption and the improvement of governance more generally [4]. The scope also embraces an assessment of the related evidence base, notably its robustness and coverage, and highlights outstanding gaps or limitations. There is increasing global recognition of the substantial development impact of public procurement on public service delivery, economic growth, social equity, and environmental sustainability [5]. Open contracting is also considered highly relevant in its own right, outside the framework of corruption. E-procurement refers specifically to the digitalisation of public procurement processes on a standalone basis that is not necessarily associated with the release of disaggregated data or open contracting [6]. In conjunction with broader discussions about ICTs and anti-corruption generally, the assumption that specific anti-corruption technologies may contribute to the achievement of overall objectives is becoming more widespread [7].

Evaluation Frameworks and Indicators

Anti-corruption technologies in digital platforms, such as e-procurement and open contracting, aim to enhance governance by reducing incentives and opportunities for corrupt behavior [3]. They were more common in advanced economies with high governance standards [4]. Digital technologies offer significant potential to address corruption in developing countries, where critical development challenges are often exacerbated by corruption and mismanagement. The theory of anti-corruption technologies in digital platforms links governance objectives to the digital reform agenda [1]. A broad spectrum of anti-corruption technologies, in diverse domains, can fall under this category. It is thus important to diagnose the specific corruption mechanisms targeted by the technology and establish the causal chain through which platform use affects these mechanisms [5]. E-procurement refers to the use of digital technologies to conduct public procurement processes. The focus is in two main directions. One strand of reforms extends access to the entire procurement cycle, from the publication of notices to the adjudication of contracts [6]. The second strand idealizes a scenario of total electronic connectivity, in which the procurement platform receives and emits all relevant information in machine-readable format to and from a multitude of connected information systems. Open contracting encompasses a set of data standards and practices aimed at improving disclosure and increasing opportunities for analysis [7]. The underlying logic is that if more information about the procurement process becomes available, this will create additional incentives for probing the data and undertaking analysis, which, in turn, will motivate relevant actors to respond to the findings of such analysis [8]. Impact reviews represent one of the most rigorous methods to assess the effectiveness of government programs and interventions, in particular when establishing a causal link between a policy initiative and an observed change is critical. When evaluating an initiative such as the deployment of anti-corruption technologies in digital platforms, review objectives should target the routes through which the technology is expected to exert an effect on corruption [1]. Desirable findings would inform policy decisions regarding the merits of reinforcing or abandoning the initiative. In such cases the need to justify the continued application of the technology often arises, irrespective of effect size [2]. Evaluation has thus focused on establishing the activity of the anti-corruption technology, documenting the changes wrought in procurement processes as a result of its establishment, and measuring the overall level of corruption in the ecosystem subsequent to these changes [3].

Data Sources and Methodological Challenges

Evaluating the effects of anti-corruption technologies in e-procurement and open contracting poses two significant challenges [4]. The first challenge stems from establishing credible causal links between anti-corruption technologies and governance outcomes. Such overlay may be difficult since the adoption of these technologies tends to merge within broader e-government agendas, and corruption may vary for reasons unrelated to specific

anti-corruption technologies [2]. Confounding factors might exert simultaneous influences and distract attention from the effects of anti-corruption technologies proper. Statistical inference might be further complicated by the art of contemporary data analytics, opaque algorithmic manipulations, and the increasing occurrence of masked signification approaches [1]. The second challenge arises from data availability. Even when causal links can be credibly traced, suitable datasets may not exist for all the relevant anti-corruption technologies [4]. The procurement sector is no exception. Administrative records, government-procurement data, audit documents, and media information make up the general set of possible data sources [5]. Even when adequate data do become available, however, they may not suffice to answer all the posed questions. Such constraints call for adaptability and, occasionally, trade-offs in determining an appropriate scope for the analysis [6]. Administrative records, government-procurement datasets, compliance-audit reports, and media monitoring provide an extensive set of possible data sources to inform the quantitative evaluation of the most widely implemented anti-corruption technologies [7]. Transparency and disclosure online, competitive tendering including electronic bids and reverse auctions contracting in small value, and a range of associated measures document how much, how widely, and how well procurement data are being disclosed [8]. Anomaly detection monitoring, traceability and access control audits, and post-contract leak analysis supply information about efforts to prevent misuse [2]. Risk management, control procedures, and, where applicable, the consequent detection of violations indicate the extent to which authorities may be able to reinforce audit capabilities. Surveys of authorities or specialist companies complement these outputs with broader policy perspectives [1].

Empirical Evidence on E-Procurement Effectiveness

E-procurement and open contracting are two digital technologies that have been promoted as effective tools to reduce corruption in public contracting [1]. E-procurement encompasses the use of information and communication technologies in the procurement processes employed by public sector organizations, while open contracting denotes a set of principles and practices that aim to make data related to public contracting freely available to the public. The two are often used together and are complementary [2]. Corruption mechanisms that technology is believed to mitigate include, among others, collusion, coercion, and fraud [3]. E-procurement may reduce opportunities for corruption by increasing the number of potential suppliers, simplifying the bidding process, impartially evaluating proposals, enabling electronic payment, and disclosing procurement requirements through widely accessible channels [4]. Open contracting, in turn, is said to increase competition, reduce overpricing, and facilitate post hoc audits by making information such as bidder participation, awarded contracts, and modifications more easily available to citizens, media, and oversight bodies [3].

Transparency and Disclosure Outcomes

E-procurement and open contracting are both observed to promote greater transparency in the handling of public funds and reduce opportunities for corruption [1]. A 2019 evaluation of expenditures by Namibia's Ministry of Education recorded a 17% increase in procurement-related information published within 30 days, coupled with higher information quality and accessibility, following the adoption of an open contracting approach [2]. Transparency also features prominently in Ukraine's ProZorro system, where a commitment to nationwide open contracting data standards which support timely publication of procurement information continues to sustain donor engagement and support [1]. Several evaluations across multiple jurisdictions document improvements in timeliness, completeness, and accessibility of procurement data, indicating that implementation of open contracting data standards positively affects transparency where a low baseline prevails and adoption of transparency-enabling technologies constitutes a necessary precursor to open data [4].

Competition, Prices, and Efficiency Effects

Anti-corruption technologies in e-procurement and open contracting refine competition settings and disseminate information to bidders [1]. Opportunities for manipulation persist, but e-procurement grants oversight mechanisms additional elasticity by linking transactional data to monitoring efforts [5]. Competitive bidding extends beyond the formal commencement of procurement. Reduction in bid prices represents a primary objective of procurement reform to enhance the correlation between formal cost estimates and tendered prices, allowing for a clearer assessment of efficiency gains through data evaluation [6]. Evidence on competition, prices, and efficiency supplements the core indicators of preliminary e-procurement assessments. Completeness, granularity, and accuracy of procurement data further substantiate evidence-driven policies [7]. A tracking system for tentatively completed bids analyses the gap between orders and competitive suppliers additional to selected bidders [8]. Monitoring the share of above-threshold value procurements displays an inverse correlation with competition levels; non-competitive procurements additionally signify lower efficiency across various regional instances. Open-contracting datasets combine methods and provision information to augment understanding of governance regulation [1].

Misuse Prevention and Audit Capabilities

Adopting anti-corruption technologies in procurement is likely to affect systems of accountability, bribing incentives, and opportunities for information misuse [6]. Public contracts can constitute large sums; systems

without adequate safeguards permit unauthorized alteration of government documents and budgets, or tampering with bidding documentation [7]. Technology is intended to limit unapproved manipulation of both data and processes. Instead of paper-based interactions, public procurement shifted to digital modalities in which only registered officials and suppliers can access a joint public cloud storage system [8]. All changes are timestamped and traceable to the originator. Procedures routinely undergo comparisons or audits of temporal efficacy, seeking to identify irregularities in both process and final amounts [1]. Machine-learning techniques detect deviations from typical behaviour; post-execution auditing highlights procurement anomalies addressed during preparatory phases. Observed sample applications of Contract Monitoring tend to provide documentation overkill [2]. Investigations remain hindered by resource scarcities, as many systems' implementation of open-contracting standards arrived without central support or training material. Little progress toward recording contracts and payments in a single database has been made; only bilateral links between datasets exist [3]. Instead of migrating to high-level system links and central information exchange, open contracting evolved in parallel as an independent domain [4].

Open Contracting Data Standards and Interoperability

Open contracting promotes transparency and accountability by making government contract information publicly accessible; it enables better value for money, increased competition, and reduced fraud [1]. Its implementation is facilitated by the Open Contracting Data Standard, which encourages the disclosure of data at all procurement phases, thereby allowing the analysis of buying patterns and bids even those submitted unsuccessfully [2]. Nonetheless, open contracting alone is insufficient for countering corruption and must be complemented by additional measures, such as integrity pacts agreements between governments and bidders not to engage in corrupt practices, increasingly monitored by civil society [3]. Analyzing procurement data with algorithms that assess corruption risks serves to detect "red flags" that signal potential breaches [4]. Interoperability extends the concept of open contracting of systems. Open Contracting Data Standards set out a series of Core Datasets, covering the entire procurement cycle. These standards can be implemented in machine-readable formats and published on either government or third-party platforms [5]. They stress the importance of linking datasets across systems, especially between public procurement and contracting, and advocate the establishment of a common identifier in procurement documents to enable such connections [6].

Standards Adoption and Data Quality Indicators

More formal evaluation frameworks, characterizing the mechanisms through which the interventions are expected to affect the identified corruption problems, will allow for more targeted assessments [4]. A minimal set of indicators based on the open contracting data standards is proposed to support such assessments. Measurement frameworks for standards adoption also benefit from open contracting best practice documents that supply detailed implementation indicators to complement those based on core datasets [7]. Beyond basic indicators, the following dimensions of data quality can be distinguished: completeness and coverage; granularity; accuracy and consistency; accessibility and machine readability; and timeliness and currency [8]. Addressing multiple dimensions better reflects both compliance and capability, as well as processes that can translate availability into use [7]. After establishing an appropriate measurement strategy, the next step is to identify and secure the corresponding data sources, administrative records, procurement datasets, audit reports, media outputs, survey results, and so forth. With respect to open contracting, the core datasets identify a minimal data specification shared across major data systems, while additional data standards and implementation indicators further clarify expectations to guide measurement and encourage cross-system data linking [8]. A preliminary evaluation of open contracting implementation gathered evidence on whether the core datasets are being made publicly available in accordance with the standards. Tracking adherence to the standards and aligning datasets across diverse systems thus becomes highly relevant [6]. Attribution challenges arise because anti-corruption technologies are frequently introduced alongside other reforms, and corruption trends also shift independently of the reform under study. Such confounding influences complicate the identification of causal effects and strengthen the case for complementary methods such as statistical matching techniques [7]. Many reviews of anti-corruption technologies contend with similar limitations, although open contracting may be easier to isolate than other e-government tools. Attempts to associate changes in corruption indicators with technology deployment retrospectively sometimes fall short of demonstrating whether and how the technology itself contributed to the observed outcome, yet such associations may still prove definitive in the absence of alternatives [8]. With regard to e-procurement and open contracting, multiple bidding, price reductions, and number of suppliers provide plausible proxies; yet whether the interventions actually alter competition pre or post-implementation remains uncertain. Hence there is value in determining precisely which changes appear associated with the rollout of e-procurement or open contracting and exploring a wider range of proxy indicators to expand the confirmatory evidence [1].

Information Privacy and Governance Considerations

For most public authorities, open data and transparency are increasingly being recognized as the most effective and simplest means of leveraging the opportunities that Big Data offer. In relation to procurement, it is generally accepted that open data and transparency are of the utmost importance [1]. All stakeholders can monitor the procurement data and influence the law and its implementation to ensure effective and timely open disclosure of procurement information [2]. By taking advantage of modern technologies, public procurement laws can be monitored more effectively, providing citizens better access to information on procurement activities and improving the corruption-resistance of the system [3]. The advancement of information and communication technology (ICT) provides enormous opportunities for the improvement of public sector procurement. Given the enormous amount of government funding and resources incurred on public procurement, the potential gains by increasing efficiency and effectiveness are phenomenal [4]. Furthermore, with the advancement of Big Data, Artificial Intelligence (AI) and Block-Chain technology, many sectors of the economy are transforming. Public procurement is also entering into the cloud with huge benefits as elaborated here. Access to procurement data can engender tremendous hope for citizens across many regions [5]. All effective procurement systems can help promote Small and Medium-sized Enterprises (SME) access to public procurement. Public officers can support decision making and estimate when and how procurement is likely to happen; they can prepare an estimate supplier list; they can monitor the access of various companies along the different segments of the procurement process; they can also assess the effectiveness of the procurement systems [6]. Through access to the data from any public procurement software, the citizen can discover abnormal data at judiciary level or inquire new or well-connected companies awarded with huge amount contracts at the end of long procurement process [7]. In accessing G2G procurement data, Civil Society Organization (CSO) can use the data to improve efficiency at the public office level [7]. Reviewing the procurement indicators from different offices through the procurement system can help measure the offices' performance with regard to the effective procurement system [1].

Contextual Determinants of Success

The implementation of anti-corruption technologies does not automatically guarantee success. A coherent understanding of the context in which they operate is vital for predicting outcomes [9]. An extensive review of the relevant literature reveals that, broadly, there are two common interpretations of context: institutional capacity and political economy factors [1]. Technological initiatives for open contracting and e-procurement closely engage with both these interpretations. Capacity encompasses the availability of human resources, institutional knowledge, systems, and infrastructure, and the extent to which these are utilized. Political economy looks at factors like the distribution of power among different stakeholder groups, the degree of political competition, and the quality of democratic institutions [4]. Capacity is critical for the proper design, implementation, and maintenance of an open contracting or e-procurement initiative, and for the provision of necessary complementary services like capacity development and system integration. Without sufficient capacity, negative effects like wasted resources and poor-quality services are more likely [5]. Political economy factors influence the design, scope, and sustainability of open contracting and e-procurement initiatives more than technical issues [6]. Illicit deviations from the rules or processes of a procurement procedure often hold few consequences in low-capacity political systems, and technology is less likely to effectively mitigate corruption in such contexts [7].

Institutional Capacity and Political Economy Factors

E-procurement aims to achieve efficiency and transparency in public procurement processes by integrating technology and the internet into every stage of the procurement process [4]. The e-procurement system is expected to help improve the effectiveness of the procurement process and thus curtail the menace of corruption prevalent in public procurement in Nigeria [5]. The expected benefits have informed the decision of the government and public agencies in Nigeria to adopt the e-procurement system [3]. Governments at all levels procure goods and services from various sources, including contractors and vendors. The procurement process is an important part of good governance in any country [6]. Procurement improves the standard of living of the populace, enhances economic productivity, promotes good governance, fosters the development of small and medium enterprises, and facilitates the achievement of specific government priorities [7]. Many countries have adopted the e-procurement system to facilitate general or procurement administration [8].

Complementary Reforms and Stakeholder Engagement

There exists a large body of knowledge on the necessity of complementing the introduction of anti-corruption technologies with further reforms and the engagement of diverse stakeholders. These concepts are examined separately, but they are deeply interconnected [3]. The designs of digital systems and of anti-corruption policies should be guided by an understanding of the role of governance in enhancing citizen welfare through the realization of democratic ends and the provision of public goods [4]. Reforms that remain within the existing governance framework such as those that follow the traditional approach to open data that continues to treat information as separate from elements of accountability and corruption are unlikely to have much impact.

Transactions still remain susceptible to the very same types of unethical behavior or misconduct that they were prior to e-procurement [5]. Moreover, anti-corruption policies focusing exclusively on augmenting transparency in public procurement without additional attention to improving accountability and the integrity of processes and public officials are likewise unlikely to yield much more than modest, short-lived impacts [6]. Open data alone cannot allow citizens to ascertain whether, at any moment in time, the procurement process actually fulfills its intended purposes [7]. Technologies that have already been implemented can assist in implementing data solutions, but if the broader accountability and governance systems are not considered, such implementations are unlikely to be successful [8]. Hence, there is a need to provide attention not merely to the technologies used but to the very type of governance expected from them [1].

Regional and Sectoral Variances in Impact

Region-specific issues and anti-corruption technologies are pervasive in public procurement [2]. Countries with a highly proliferated anti-corruption technology and e-procurement system experience a limited reduction in corruption levels. In Colombia, public procurement is shared among local, regional, and national levels. E-procurement generates only macrolevel corruption while concerns on re-level and collusion prevail [3]. Indonesia's public procurement embraced e-procurement in 2008 but does not integrate other open-contracting data elements [1]. Despite a transparent, competitive, and conducive environment for business, the level of corruption remains significant. In Peru, even with employed procurement technology corruption persists; fraud, traffic of influence, and collusive arrangements continue [2]. The healthcare sector of pharmaceutical institute in public procurement enjoins greater transparency, accountability, and efficiency induced by the use of anti-corruption measures in technologies yet undesirable practices in terms of price mark-ups and quality arise [3].

Public Sector Procurement Domains with Notable Results

Prominent anti-corruption technologies in public-sector procurement exhibit substantial, documented, and transferable impacts [3]. In many government contexts, procurement represents the highest-risk sector for corruption [3]. Proposals targeting procurement such as e-procurement and open contracting have thus attracted significant attention and investment to mitigate that risk and promote better services and infrastructure at a lower cost [4]. Governments and agencies investing in such proposals have experienced unequivocal, beneficial results across regions, sectors, and levels of governance. These results confirm the rationale for procurement-focussed proposals: they possess the potential to bring about large-scale institutional change that is otherwise difficult to achieve [5].

Lessons from High-Risk and High-Value Procurements

High-risk and high-value procurements are engineered to provide targeted assistance through diagnostic tools and mitigation measures to tackle specific sources of risk that hinder success in other settings [6]. Certain characteristics can render public-sector procurement more susceptible to fraud, waste, and abuse [4]. Contextual risk drivers include a lack of design capacity, limited competition, concentrated market power, and a reliance on single-source contracts [5]. Rigorous analytical approaches and innovative procurement processes have been successfully applied to address such challenges outside the public sector and can also be adapted for broader application in the public sector [1].

Methodological Limitations and Risk of Bias

Experience with anti-corruption technologies in e-procurement and open contracting is limited, and methodological constraints pose challenges for fully and accurately interpreting findings [7]. The types of analysis employed so far include simple pre- and post-intervention comparisons, cross-sectional correlations between the implementation of the technologies and misallocation indicators, and principal component-based aggregations of procurement data exhaustiveness, compliance, or accessibility [8]. The risk of bias is present, owing to non-random assignment processes that influence which entities adopt anti-corruption technologies, variation across actors or sectors in the degree of implementation, differences in the type of digital reform undertaken, constraints on available data that prevent a comprehensive exploration of causal factors, and dependencies between multiple anticorruption technologies applied or between technology and supporting measures [1]. Where case studies report steps taken toward the operationalization of selected technologies, the distinction between activity and outcome is often blurred [2].

Policy Implications and Recommendations

Corruption in public procurement remains a critical obstacle to good governance and economic development. Recognising the adverse economic, social, and political consequences of corruption at both national and local levels, governments and international agencies are investing substantial resources to curb corrupt practices in public procurement processes [1]. E-procurement is widely promoted for its potential to increase transparency, efficiency, and competition. Various open contracting initiatives allow the publication and analysis of detailed procurement data pertaining to specific projects and budgets at multiple stages of the contracting cycle [2]. E-procurement is a step along the path towards modernizing public procurement. It refers to the use of information and communications technology (ICT) to provide all steps of the public procurement process from planning

through the award of a contract [3]. Instruments can vary from online announcement of a bidding opportunity to the full electronic tendering process including online submission and evaluation [4]. Various kind of transactions can be processed through electronic means: submission of documents, notices of acceptance, etc. Open contracting, a concept closely related to e-procurement, promotes transparency and accountability by making government contract information publicly available for comprehensive analysis across the entire procurement cycle covering planning, award, and implementation phases [5]. Governments and international development agencies invest significant resources globally to curb the adverse economic, social, and political consequences of corruption at national and local levels [5]. In a 2022 survey of 180 countries, Transparency International ranked corruption in government procurement as the most critical area affecting corruption. The scourge of corruption in public procurement globally is especially acute in developing countries. Improved monitoring and control of public procurement are expected to create a virtuous cycle that counteracts widespread incentives for rent-seeking corruption similar to that described by Rose-Ackerman. Various challenges, however, impede the establishment of such mechanisms [6]. Technologies play a crucial role in the reform of e-procurement and hold promise for curbing corruption. E-procurement refers to the use of information and communications technology (ICT) to facilitate public procurement processes [7]. Open contracting, closely related to e-procurement, promotes transparency and accountability by disclosing government contract information for public examination. These technologies are expected to reduce incentives for corrupt conduct, enhance detection of such activities, and increase the likelihood of sanctions being applied when corrupt behaviour occurs [8]. Public procurement constitutes a high-risk area for corruption. Such activities often represent a large portion of government budgets and involve a myriad of complex and frequently non-transparent processes; procurement of large infrastructures has been identified as a particularly high-risk area [1]. Engaging in corrupt behaviour when conducting contracts with public bodies tends to be perceived as low-risk, while possible exposure to sanctions remains relatively low [8].

CONCLUSION

Anti-corruption technologies have emerged as important instruments for improving transparency, accountability, and efficiency in public procurement systems. The evidence synthesized in this review demonstrates that e-procurement and open contracting have generated measurable improvements in procurement transparency, competition, information accessibility, audit capabilities, and administrative efficiency across many jurisdictions. Digital procurement systems reduce opportunities for discretionary decision-making, facilitate real-time monitoring, strengthen record traceability, and enhance the ability of oversight institutions and civil society to identify procurement irregularities. These improvements contribute significantly to broader public financial management and governance objectives. However, the review also demonstrates that technological innovation alone cannot eliminate corruption. The relationship between digital procurement technologies and corruption reduction remains complex and context-dependent. Countries with stronger institutions, effective legal frameworks, political commitment, adequate technical capacity, and active stakeholder participation are more likely to realize the full governance benefits of e-procurement and open contracting. Conversely, weak institutional environments, limited enforcement capacity, inadequate data quality, and insufficient interoperability between government systems constrain the effectiveness of these technologies and allow corrupt practices to persist despite digital reforms. The findings further emphasize the need to complement technological interventions with broader governance reforms, including stronger accountability mechanisms, integrity frameworks, independent oversight institutions, robust audit systems, transparent procurement regulations, and meaningful citizen participation. Investments in capacity building, standardized procurement data, artificial intelligence-supported risk detection, interoperable digital infrastructure, and continuous monitoring can further enhance the effectiveness of anti-corruption initiatives. Despite methodological challenges including attribution difficulties, heterogeneous implementation models, and limited long-term impact evaluations the available evidence consistently supports the conclusion that e-procurement and open contracting strengthen procurement governance and create conditions that make corruption more difficult to conceal and easier to detect. Future research should prioritize rigorous longitudinal studies, comparative cross-country evaluations, and standardized measurement frameworks to better isolate the causal effects of anti-corruption technologies. Ultimately, sustainable reductions in corruption will depend not only on digital innovation but also on sustained political will, institutional resilience, and comprehensive governance reforms that reinforce transparency, accountability, and public trust.

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