

AI for Integrity: Using Data Filtration to Detect Malpractices in Public Procurement

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Received:
10/09/2025
Revised:
25/10/2025
Accepted:
17/11/2025
Published:
23/11/2025

ABSTRACT

This article examines the evolution of public procurement frameworks and the increasing role of digital technologies—particularly artificial intelligence—in enhancing transparency, efficiency, and integrity in government purchasing. Beginning with foundational international standards, the study synthesises the core principles of the UNCITRAL Model Law on Public Procurement (2011), the World Bank’s Procurement Regulations (2020), the WTO Agreement on Government Procurement (2012), Transparency International’s Procurement Guidelines, OECD recommendations, and the Procurement G6 initiatives. These global benchmarks collectively emphasise fairness, competition, accountability, and technologically enabled oversight. Building on this normative foundation, the article undertakes a comparative analysis of advanced procurement ecosystems in the United States, the European Union, and South Korea’s KONEPS, highlighting their diverse regulatory architectures, enforcement mechanisms, and digital procurement capacities. The second part of the article focuses on data-driven integrity measures within public procurement, with specific reference to India’s Government e-Marketplace (GeM). It maps the processes of data collection, database strengthening, and identification of red flags indicative of collusion, bid rigging, and other malpractices. The article concludes by arguing that the integration of AI-based data filtration techniques can significantly augment existing procurement platforms by enabling predictive detection of anomalies, thereby strengthening governance and public trust.

Keywords: Public Procurement, Artificial Intelligence, GeM, Transparency Standards, Comparative Procurement Models



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INTRODUCTION

The article focuses on normative behaviours and practises required in the system to assist the arrest of malpractices in procurement. In the initial part of the article, the researcher studies different suggestions and models given by multilateral bodies on procurement. The multilateral bodies are selected on the basis of their area expertise on procurement. This includes the UNCITRAL Model Law on Public Procurement, 2011; the World Bank’s Procurement Framework, 2015; the OECD on Public Procurement and the Transparency International’s Public Procurement Guide. An attempt is made to highlight the importance given to procurement in the international arena and the standards ought to be followed in order to protect the integrity of procurement. This section is followed by comparative studies where the procurement process of the United States of America is studied. The procurement process followed by South Korea and the United Kingdom is also studied to understand, in particular, the use of data analysis to find and identify malpractices in procurement. Here focus is given on KONEPS, BRIAS and data screens. Further, the article moves on to study

the digital platform used in India, GeM (Government E Marketing). This part of the article also tries to understand the significance of data collection and its enormity, data analysis and data management. Next part of the article attempts to identify the various patterns of misconduct that can be understood through data analysis. This part also studies the various red flags that can be extracted from the procurement behaviour of parties indulged in misconduct. The concluding part of the article says how data gathered through GeM shall be filtered using artificial intelligence to identify doubtful manners of misconduct. In this part, the article studies on how to develop algorithms that can assist to recognise and raise red flags whenever suspicious patterns of misconduct are found in the procurement process.

1.1 NORMATIVE MODELS ON PUBLIC PROCUREMENT

Having realised the importance of a sustainable public procurement, there have been deliberations round the world and across the streams to streamline the process of procurement. Multilateral institutions and the

academia debated and focused to give suggestions that would form a normative procurement model. These discussions and experience sharing resulted in multiple documents like UNCITRAL Model Law on Public Procurement, 2011, World Bank's Procurement Regulations, 2020, WTO Agreement on Government Procurement, 2012 and the like. The following part shall analyse such various normative models as proposed by different organisations.

1.1.1 UNCITRAL Model Law on Public Procurement, 2011

1.1.1.1 Introduction to the Model Law, 2011

The United Nations General Assembly on 17th December 1966, vide resolution 2205 (XXI), established the United Nations Commission on International Trade Law with an objective of unification of trade law across the various jurisdictions. This in turn was in furtherance of effective economic practices and proper and transparent spending of money in business transactions, including that of public procurements. In 1986, the UNCITRAL decided to bring some model regulations given the importance of public procurement in the trade and commerce sector.³ The United Nations in its resolution 49/54 dated 9th December 1994

recommended the use of the United Nations Commission on International Trade Law Model Law on Procurement of Goods, Construction and Services. In the 66th Session of the United Nations General Assembly, resolution was passed for the Model Procurement Law on Public Procurement in 2011, after acknowledging the significant role played by the 1994 model law, "which has become an important international benchmark in procurement law reform, sets out procedures aimed at achieving competition, transparency, fairness, economy and efficiency in the procurement process."⁶ The 1994 law was regarded as "one of the most successful of UNCITRAL's instruments, . . . and has been used in numerous states worldwide as the basis for legal reform".⁷ The need for the new model law was felt since, new issues and practises in public procurement have arisen⁸ since the inception of the 1994 model.

The Model Law on Public Procurement aims to function as a guide that stipulates principles and procedures by which not only high value for money can be achieved but also the abuse of public procurement can be curtailed. The Model Law "promotes objectivity, fairness, participation and competition and integrity towards these goals."⁹ It is comprehensive to the extent that it covers all kinds of procurement, viz., standard procurement, emergency procurement, high value complex projects and low value simple procurements. The keystones which can be found in all the suggestions are transparency, objectivity and competition. The Law also is cautious to bring in harmony with other international conventions,¹⁰ viz., "WTO Agreement on Government Procurement, the European Union Directives (on procurement and remedies), the UN Convention Against Corruption, the Procurement Guidelines and Consultant Guidelines of the World

Bank and the equivalent documents of other IFIs."¹¹

1.1.1.2 Model Law - An analysis

The Model Law of 2011 contains 69 Articles divided in 9 Chapters. It has a comprehensive coverage giving the general principles of procurement, types of procurement and digital procurement and complaint redressal system. The following are the different principles that can be extracted for the protection of integrity of the procurement.

- The preamble expresses six principles that the Model Law aims to achieve, such as efficiency, economy, internationalisation, promoting competition, fair and equitable treatment, public confidence and transparency. Every procurement process should have these principles as their cornerstone to bring in a better system.

- Furthering these principles the law says in Article 5 that all the legal framework, the judicial decisions and administrative norms regarding the procurement should be published and given prompt access to the public. Similarly, Article 6 says wide publicity to be given regarding forthcoming procurement so as to maximise the competition. Article 7 says that communications in the procurement process shall be put on record. The law proposes "record of contents" which mandates that the contents of all communications shall be put on record. This further enhances transparency and competition in the process.

- The law is very comprehensive in cases where the tender should be having maximum participation, whereby competition is increased and thus maximum value for money. Article 8 is clear, where it follows not only the non-discrimination policy but also mandates to record reasons for clauses in a tender that limits participation. Furthermore, these recorded reasons are to be communicated to any party upon request. Transparency, in every decision, is the key to competitive procurement, without compromising the quality of the supplied goods. This is further visible in Article 9.2(a) where the law emphasises on the need to have professional, financial, technical and environmental competence of the suppliers, with managerial capacity for the performance of the contract.

- Abundant caution needs to be exercised to scrutinise that only genuine suppliers are participating who have the highest ethical and professional standards. This is visible in Article 9 where the law emphasises on need for suppliers meeting the ethical and other standards, legal capacity to enter into the contract, bankruptcy and insolvency laws are complied, taxes and social security obligations are fulfilled and most importantly no criminal conviction.

- The model law mentions that any supplier who has a competitive unfair edge or advantage shall be excluded from the procurement proceedings. Similarly, the suppliers who have induced the authorities with any form of gratuity so as to influence the decision making process in procurement shall be excluded. The model law is silent to the effect of identifying what might form anti-competitive agreements. Law has just brushed

through (Article 21) the competition and corruption factor, by not expanding more on the subject.

- **Prima facie**, it seems that the law is not vocal enough about the anti-competitive agreements and bid rigging patterns, however the reading of the law in totality gives another message. The design of the model law is as such intended to reduce anti- competitive activity. The law goes very deeply, exhaustively and comprehensively into every aspect of procurement, viz., starting from the notification/publishing of tender to the award of tender and quality management. In every aspect utmost care is given so that the best bidder gets the contract. The law goes deep in every aspect including that of tender designing, terms and conditions restricting competition, estimate preparation, evaluation, language of documents, pre-qualification submissions etc.

The model law lays down a comprehensive framework that details minute procurement procedures. This is particularly important because, by doing so every possible way where the competition can be limited is understood and plugged.

1.1.2 World Bank's Procurement Regulations, 2020

1.1.2.1 Introducing WB Procurement Regulations

The World Bank has established specific guidelines and procedures for procurement in those projects where the investment is financed by the World Bank, so as to ensure transparency, fairness, and efficiency. To ensure that the funds are being used effectively and in a transparent manner, the World Bank has from time to time issued instructions in the form of various regulations and frameworks. The World Bank's Procurement Regulations, 2020 has its core guiding principles as "value for money, economy, integrity, fit for purpose, efficiency, transparency and fairness."¹² The regulation is divided into 8 sections with numerous sub- sections detailing what ought to be a good procurement process.

The Regulations had many components such as **a) procurement planning** which involves need based finalising of goods, works, or services required for the project and in which phase of the project they will be required; **b) Procurement Methods**: The World Bank identifies different procurement methods depending on the nature and complexity of the project, such as international competitive bidding, national competitive bidding, or direct contracting. The regulations detail the type of bidding as per the circumstances; **c) Procurement Documents**: These include bidding documents, request for proposals and terms of reference that provide detailed information about the project requirements, evaluation criteria, and contractual terms; **d) Bidding and Evaluation**: The participating bidders submit proposals in response to the procurement documents. Evaluation committees review the bids based on predetermined criteria to select the most qualified and cost-effective bidder. The regulations set standards here for the evaluation based on the principles of Value for Money (VfM); **e) Contract Award and Implementation**: Once a bidder is selected, a contract

is awarded, and the procurement process transitions into the implementation phase. The regulations stipulate standards to monitor the implementation of contracts to ensure compliance with project objectives, quality standards, and procurement regulations; and **f) Monitoring and Evaluation**: The World Bank conducts regular monitoring and evaluation of procurement processes to assess efficiency, effectiveness, and compliance with its policies and procedures.

1.1.2.2 Major Takeaways from the Regulations

- Prior and post review clause in Section 3.5: Section - III of the Regulations speaks of governance. 3.5 empowers the World Bank to do a review of the procurement process.

This includes cross verifying whether the procurement is done in accordance with legal provision or not. This is equivalent to a pre audit where the bank is empowered to check the standards followed in procurement.

- Independent Procurement Audit 3.9: A third party inspection where the procurement is audited for procedural irregularity and legal provisions is mandated under section

3.9. The borrower is bound to share all relevant information and provide necessary access as demanded by the audit team.

- Conflict of Interest Clause - 3.15: This is one clause where interested parties are barred from being a part of the procurement process. This clause specifically bars any firm or person who is directly or indirectly part of the procurement process. This also includes family members or professionally close business entities.

- One Bid Disqualification clause 3.19: A single firm will be barred from submitting more than one proposal. In case of more than one proposal, the firm shall be disqualified.

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- Grievance redressal system - 3.26: It is stipulated that any procurement-related complaints submitted to the borrower shall be addressed promptly, fairly and timely. Timeliness regarding submission as well as resolution of complaint is of utmost importance in order to avoid undue delay and disruption of the project that encompasses the procurement concerned. To achieve this, complaints are required to be recorded by the borrower in the concerned tracking and monitoring system.

- Project procurement strategy - 4.1: For every project financed under IPF (Investment Project Financing), Project Procurement Strategy for Development (PPSD) is to be developed by the borrower. This is to see how procurement will be of benefit to the project and deliver the best value for money by following a risk-based approach. The PPCSD normally covers a minimum 18 months of the project implementation. The PPCSD prepared by the borrower is reviewed by the Bank and approved by it before completing loan negotiations.

- Procurement Plan 4.4 - The procurement plan consists of a brief description of the activities/ contracts, selection methods to be applied, cost estimates, time schedules, review requirements of the World Bank,

procurement documents to be applied and other relevant documents, if any.

- Procurement Tracking tool 5.9- The borrower can use the bank's online procurement planning and tracking tools to record all procurement actions including preparing, updating and clearing its procurement plan and seeking and reviewing the Bank's review.

- Value Engineering 5.13- With a view to provide the necessary functions in a project at optimal cost, value engineering follows a systematic and organised approach. By virtue of value engineering, reduction of time and substitution of materials or methods with less expensive alternatives is achieved. Value engineering shall be applied as specified in the contract documents.

- Standstill period - 5.78- A standstill period of 10 days is prescribed by the World Bank so that the bidders/proposers/consultants get time to examine the notification of intention to award and to assess whether it is appropriate to submit a complaint. It starts from the time of the transmission of the borrower's notification of intention to award.

- Annex 1 - Value for Money (VfM) is a concept that is reflected in the entire procurement regulations. This Annex describes how to achieve value for money in IPF operations. It is applied throughout the planning process, both at the time of approaching the market and contract management to ensure VFM.

- Annex 4 - It stipulates that the procurement process under IPF operations should be free from fraud and corruption. It stipulates maintenance of the highest standard of ethics during the procurement process, selection and contract execution of Bank financed contracts by refraining from fraud and corruption.

1.1.3 WTO Agreement on Government Procurement, 2012

1.1.3.1 Understanding the Agreement

The WTO Agreement on Government Procurement (GPA) is an international agreement that aims to open up government procurement markets among its parties. Amongst other objectives the GPA recognizes the importance of integrity in public procurement. The GPA 2012 represents an update and expansion of the coverage and disciplines of the previous GPA 1994. It includes improvements in areas such as electronic procurement, services procurement, and the participation of developing countries in the Agreement. The 2012 revision of the GPA, covers the procurement of goods, services, and construction works by government entities, such as ministries and state-owned enterprises. The GPA is based on principles such as non-discrimination, transparency, fair and open competition, and procedural fairness. These principles aim to ensure that procurement processes are conducted in a manner that promotes equal treatment of suppliers and enhances market access.

1.1.3.2 Major takeaways from the agreement

- **Designing the tenders so as to avoid legal applicability:** Article II(6) of the agreement mandates that the procurement process shall not be split with the intention of excluding the same from the legal

obligations in the agreement.

- **Principle of Non-discrimination:** Favourable treatment shall not be given to domestic parties as against the international firms. This, although being a clause to protect international trade, also aims to promote competition.

- **Use of IT Solutions:** The agreement mandates usage of digital technology in the procurement process. By using digital platforms, it is mandated that the data leakages should be prevented so as to uphold the integrity of the bidding. This is particularly in reference to the data quoted by the bidders, where maintaining secrecy would make or break the competitiveness of the procurement.

- **Conduct of Procurement clause:** The mandate that the procurement shall be conducted in a transparent and impartial manner, where there are no conflicts of interests and where corrupt practices are prevented.

- **Transparency clause:** The GPA establishes transparency requirements to ensure that procurement opportunities are effectively advertised and information related to procurement processes is made publicly available. This includes publishing procurement notices, specifications, and award information.

1.1.4 Transparency International - Public Procurement Guide 2014

The guide as it is often referred to, offers an insight into the various risks faced by the procurement process thus being susceptible to corruption. The guide outlines certain minimum precautions and some principles which can be followed to minimise unfair practices and to shield the process from corruption. The guide identifies the various unfair practices including bid rigging and collusion between the various parties and between the demand and supply side. The guide mainly pins down the suggestions to four core principles such as integrity, transparency, accountability and professionalism.

1.1.4.1 Major takeaways from the agreement

- **Integrity**, as defined by Transparency International, is "behaviours and actions consistent with a set of moral or ethical principles and standards, embraced by individuals as well as institutions that create a barrier to corruption".¹³ The

agreement stipulates that rule compliance and minimum discretion for decision making is the cornerstone. It further stipulates a code of conduct with commitment to integrity and ethical behaviour and most importantly anonymous and safe mechanisms for whistle-blowers. This code of conduct is mandated both for the demand and supply side where the company/firm shall be permitted to participate in tender only if the code of conduct is implemented by the company and its employees thereby adhering to a strict anti-corruption policy. Rotation of staff, who hold sensitive positions, should be done regularly and no staff shall be involved in all phases of procurement (staff for the planning phase should be separate from the staff of the other phases of procurement).

- **Transparency:** A centralised web information portal

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containing crucial information regarding all phases of procurement such as development of procurement plan, tender opportunities, technical specification, selection criteria, key elements of bid evaluation, the award decision and the justification for it, audit reports and dispute settlement mechanisms shall be made available to the public at large. Sensitive information such as national security or protection of IPR shall be given exceptions.¹⁴ Stakeholder consultation and public comment on need assessment should be called for and use of digital technology for maximising transparency is required.

- **Accountability:** The accountability of the process should be maintained to the effect that any collusion and corrupt practices should attract sanctions. Participation of civil society and the proper audit systems shall be put in place. Appeal process where aggrieved bidders can appeal against the procurement at any phase should be available. Special care needs to be taken so that the appeal process is kept simple and less time consuming.

- **Fairness and Efficiency:** Open competitive bidding should be the norm and any expectations to the same should be limited and clear justifications should be documented and published. Competitive sensitive information should be properly safeguarded, since the same would affect the very foundation of bidding.

- **Professionalism:** Adequate remuneration will attract more professionals in the procurement system and the appointments should be made purely on merit. This holds right for the popular expression, “if you give peanuts you will get monkeys.”

- **Special Risk Factors:** The guide highlights certain high risk factors in procurement, and suggests how adequate care needs to be taken for avoiding such mistakes which might compromise the quality of the procurement. Situations like urgent purchases during the end of fiscal year, emergency purchases during disaster management, inadequate access to information, non-standard bidding documents, locally created product standards, participation of shell companies, participation of companies owned by government officials etc. are red flags in itself that they warrant special attention.¹⁵

- **Checklist Red flags:** The guide details the list of “watch out for” in the various procurement processes such as planning, bidding, bid evaluation, monitoring and evaluation.

- **External monitoring:** Use of e-procurement platforms will assist in reducing malpractices however may not eradicate them. Civil society audit measures, viz., “Social Witness” program of Mexico can be used to closely monitor proper implementation of the tender rules.

- **Sector Specific Action:** Sector specific efforts have been developed in recent years to address issues in the procurement system. These are models developed on the basis of multi stakeholder consultation. The Extractive Industries Transparency Initiative (EITI), Construction Sector Transparency Initiative (CoST) and the Medicines Transparency Alliance (MeTA) are some of them.

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1.1.5 OECD - Fighting Bid rigging in Public

Procurement

In 2016, OECD came out with a report regarding the implementation of the 2012 recommendations the Council had made on Fighting Bid-Rigging in Public Procurement. These recommendations were designed to make such procedures in public procurement so that competition is promoted and the risk of bid rigging is reduced. The Council understood “bid rigging occurs when bidders agree among themselves to eliminate competition in the procurement process thereby raising prices, lowering quality and/or restricting supply.” The Council had identified bid rigging as an evil and to be fought against since 1998.¹⁶ In 2009, the Competition Committee of the council came out with Guidelines for Fighting Bid Rigging in Public Procurement in order to assist the member countries to detect and understand bid-rigging in public procurement so that preventive measures shall be put in place.

The Guidelines specify four main areas of concern, where the members are called to act upon namely a) impact assessment of the procurement laws and practices so as to understand the likelihood of collusion between bidders b) educating public procurement officials regarding the market structure, behaviour and bidding patterns which might suggest collusion c) motivate public procurement officials to follow guidelines and d) developing machinery for monitoring the impact of public procurement laws and regulations on competition.

1.1.5.1 Major takeaways from the agreement

- **Using e-procurement system:** OECD members increasingly use e-procurement systems in almost all stages of procurement starting from publishing procurement plans and announcing tenders to notification of award, e-submission of invoices and ex-post contract management. OECD Recommendation urges public procurement officials to encourage procurement agencies to use electronic bidding systems. This will strengthen the efforts to fight collusion and enhance competition in public tenders as well as make the same accessible to a broader group of bidders and make it less expensive.¹⁷ There are some critical challenges to the use of e-procurement systems faced by potential bidders/suppliers like low knowledge/ ITC skills, low knowledge of the economic opportunities raised by this tool and difficulties to understand or apply the procedure.¹⁸

- **Opening public procurement to smaller suppliers-** This recommendation is also followed in many member countries by adjusting their public procurement policies in order to allow participation of small and medium sized enterprises (SMEs) to bid. Recommendation urges public procurement officials to allow, where possible, smaller firms to participate even if they cannot bid for the entire contract.¹⁹ This mission was taken up by the EU through the EU Public Procurement Directive 2014/24/EU in 2014. It encourages public procurement authorities to divide the contracts into smaller or more lots so as to fit into the capacity of the SMEs.²⁰

- **Educating bidders regarding sanctions** - Though OECD members are keen in increasing the punishment

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for anti-competitive conduct, the Recommendation emphasises that public authorities should communicate to bidder, in advance, regarding the probable sanctions that await them in case they indulge in collusion. In Japan, contractors give in writing to pay damages in case they are found involved in bid rigging. In South Korea, the pre-determined damages for bid rigging is included as a clause in public contracts. Australia and Spain too follow similar practice of informing the bidders in advance regarding the sanctions and including definition of anti-competitive practices in tender documents.²¹

- Authorities to collect all relevant information for proper price discovery- It is important that the public procurement authorities have a thorough understanding of the market scenario before designing the tender. Information regarding relevant market, suppliers, prices and past tenders is vital for the government buyers to come out with more realistic and effective tender specifications by better understanding market capabilities.²²

- Early engagements with potential suppliers- This helps to understand the important procurement issues and should be undertaken before the start of tender process and is considered relevant to the success of a tender. This is also understood to give sufficient time to the businesses to prepare their bid, find partners and bring innovative solutions. As a corollary, these meetings are presupposed to give an opportunity to the bidders to meet each other thereby serving as door openers to further collusion.

- Using screens to detect cartel- Competition authorities of many jurisdictions use screens to detect cartels. Detection of bid rigging being an important aspect of public procurement, many jurisdictions use screens in their attempt to find out bid rigging. Screens analyse the structure of the market/industry to understand the likelihood of collusion and also to examine the behaviour of bidders and tender outcomes. In the 2013 OECD Roundtables, the use of screens to detect cartels was debated upon and the success of the same in detecting a number of cartel cases was made out. Korean Fair Trade Commission has developed an electronic screening system called Bid Rigging Indicator Analysis System (BRIAS) which has aided the competition authorities in bringing out many cases of bid rigging in public procurement.

- Using professional expertise to detect bid rigging- Given the rampant bid rigging practices prevalent in almost every economy, detection of bid rigging is the need of the hour. Competition authorities across the globe are fervently searching for tools to detect the same. Many of them, especially several South American countries like Columbia, Chile and Peru have sought the help of economic experts within the competition departments itself to develop screens as well as computer programmes to detect bid rigging.²³

- Convergence of competition and public procurement authorities- Though bid rigging and

similar anti-competitive practices and imposing consequent sanctions fall squarely within the jurisdiction of competition authorities, it should be appreciated that public procurement authorities who involve in procurement activities get to know a prima facie understanding of these bid rigging practices. They interact with the bidders directly and observe the behaviour of bidders that are not recorded in the documents submitted by the bidders and those which are outside the direct reach of the competition authorities. Hence, it is ideal that both procurement authority and competition authority work in tandem in an effort to bust bid rigging. For effective convergence of both the authorities, effective communication is inevitable. There shall be a proper and established communication channel between the authorities and in order to make the best convergence possible.

- Checklist for designing procurement- For proper design of tender, some points need to be adhered to like being informed about the market namely products/services available. The tender process should be so designed as to ensure optimum participation of all potential participants. Defining the requirements clearly to avoid predictability is an important step in designing the tender. Tender terms should be so drafted as to avoid bias. It should be clear and comprehensive without being discriminatory. The tender should be so designed as to effectively reduce communication among bidders. While transparency is an inevitable factor in the entire process of bidding it should always be balanced and caution should be taken that it does not facilitate collusion by disseminating information beyond what is legally required. The criteria to evaluate the tender should be chosen carefully as the same determines the intensity and effectiveness of competition in the tender process. This exercise should be carefully undertaken so that it does not result in unnecessary deterrence of credible bidders including SMEs. Finally, the staff should be adequately trained as they are the primary interface with suppliers. They should be able to understand the risks of bid rigging and be able to identify any red flags at the first instance itself. Hence, timely training of staff assumes importance.

- Checklist for detecting bid rigging
This includes looking for warning signs and patterns at the time of submitting bids. For example, one supplier becoming the lowest bidder always, regular suppliers failing to submit bids, companies taking turns to win the bid and the like. The bid documents that are submitted too should be checked for warning signs like identical mistakes, same handwriting in documents submitted by different suppliers, quoting of identical prices by competitors etc. Bid-prices should also be checked for warning signs as it can help 'uncover collusion'. It is also important to look for suspicious statements that may lead to the finding that companies may have reached an 'agreement or coordinated their prices or selling practices.' It is equally important to look for suspicious behaviour like meetings or events where suppliers get an opportunity to interact and exchange their plan of action. It further enumerates certain steps

that need to be taken by procurement officials in case they find any instance of bid rigging.

1.1.6 Procurement G6

Also known as the Multilateral Meeting on Government Procurement, the Procurement G6 is an informal group of 6 national central purchasing bodies, including Canada, Chile, Italy, South Korea, the United Kingdom and the United States. The initiative has a history of holding meetings from time to time to address various challenges involved in procurement like e-procurement, and inclusion of SMEs. and minimising the risk of corruption among others.

1.2 COMPARATIVE STUDIES OF PUBLIC PROCUREMENT

In this part of the paper, the researcher tries to understand the process followed in those jurisdictions where the procurement process is understood to be more streamlined when it comes to anti-competitive practices.

1.2.1 Procurement in the United States of America

The US economy is one of the largest and most dynamic in the world, driven by a diverse range of industries including technology, finance, manufacturing, and agriculture. It operates on a mixed-market model, blending elements of capitalism with government intervention to ensure fairness and stability. With a GDP exceeding \$25 trillion, the US economy is characterised by high levels of consumption, investment, and innovation, supported by a robust infrastructure and skilled workforce. Overall, the resilience and adaptability of the US economy continue to shape global economic trends and influence international markets.

The procurement laws in the U.S are different for the federal, state and local governments. The main governing aspects of procurement of supplies and services for the federal government can be found in Federal Acquisition Regulation. Various methods and types of public procurement are followed in the US, including competitive bidding, requests for proposals (RFPs), requests for qualifications (RFQs), and sole-source procurement. Various factors determine the manner/method chosen for procurement such as the nature of the goods or services being procured, the estimated value of the contract, and the specific requirements of the project etc.

The two main agencies in the US safeguarding the competition are the Antitrust Division of the Department of Justice (DOJ) and the Federal Trade Commission. The enforcement of competition is monitored by means of investigation and prosecution by the Antitrust Division. Its primary responsibility is to enforce antitrust laws, which are designed to promote fair competition and protect consumers from anticompetitive behaviour in the marketplace. The Federal Trade Commission is an independent agency of the government that primarily promotes consumer protection and aims to eliminate and prevent anticompetitive behaviour.

It is now pertinent to understand some of the good practices in the United States that are useful in arresting

anti-competitive practices in procurement.

1.2.1.1 Interdepartmental coordination and cooperation

Anti-Competitive Practices in procurement is investigated and prosecuted by the Antitrust Division of the US Department of Justice. Bid rigging is a serious offence in the U.S which is criminally prosecuted. The Antitrust division has a multi-agency cooperation such as the US Attorney, the Criminal Division (DOJ), FBI etc., where evidence for bid rigging is collected. This is particularly of importance because the other investigating agencies during the course of their own parallel investigation might find evidence of bid rigging etc., which otherwise the Antitrust Division might not have found. "The FBI assists the Antitrust Division through its International Corruption Unit (ICU), which, in addition to antitrust offenses, investigates allegations of corruption of U.S. public officials and fraud against the U.S. Government (among others). The FBI found conceptual and analytical synergy in grouping these activities since investigations in any one of these areas has the potential to lead to operational intelligence in another, and its robust liaison relationships with foreign law enforcement and regulatory officials often aid the investigations."²⁴ Thus the inter-agency coordination is an excellent initiative which has helped to increase the evidence in prosecution, leading to conviction. In *US v. Shelton*,²⁵ the Antitrust Division had conducted a bid rigging joint investigation along with the US Attorney's Office, FEMA, FBI, IRS and the Department of the Interior which concluded in a successful conviction with the longest sentence ever imposed under the Sherman Act.

Interdepartmental coordination in Indian CA, 2002 Section 21 and Section 21A of the Competition Act, 2002 speak about interdepartmental coordination in India. Section 21 is about reference given to the Competition Commission by any other statutory authority. Such a situation arises when the statutory authority is apprised ²⁴ Statement of William J. Baer, Ass't Att'y Gen'l, Antitrust Division, and Ronald T. Hosko, Ass't Dir., Criminal Investigative Div., FBI, before the Subcommittee on Antitrust, Competition Policy and Consumer Rights, Committee on the Judiciary, United States Senate (Nov. 14, 2013), available at <http://www.justice.gov/atr/public/testimony/301680.pdf>. that any order it is likely to pass would be contrary to the provisions of the Act. In such a case the CCI is mandated to give an opinion on the same within sixty days.

Under Section 21 21A, the CCI can make reference to any statutory authority if any decision taken or likely to be taken by the former, is or would be, contrary to any provisions of the Act because the implementation of that provision is entrusted to that statutory authority. The statutory authority is required to give opinion on the same within sixty days.

Both under Section 21 and Section 21A, the CCI as well as the statutory authority respectively is not bound by the opinion received by it. The reference mentioned here is a kind of coordination but not the typical

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interdepartmental coordination helpful in proving anti-competitive practice. In the US, coordination comes handy mainly during investigation which contributes evidence and results in increased convictions. Whereas, in India, there is no substantial contribution as regards evidence collection as a result of the reference under Section 21 and Section 21A. Hence, it may be concluded that the Competition Act, 2002, does not envisage the kind of interdepartmental coordination as seen in the US.

1.2.1.2 National Procurement Fraud Task Force

The task force was created in 2006 to address the fraudulent behaviour in procurement. It has around 58 agencies (both prosecution and investigation) and is chaired by the Department of Justice, Criminal Division. The task force has been a tool to “increase the coordination and strengthen partnership”²⁶ between the agencies in addressing the issue of effective procurement. The task force has representation from various agencies such as the Department of Justice, the Federal Bureau of Investigation (FBI), the Internal Revenue Service (IRS), the Department of Defense (DoD), the General Services Administration (GSA), and other relevant entities. Other than investigating and prosecuting cases of fraudulent procurement, it trains the procurement agencies regarding the frauds and increases awareness in the system. The National Procurement Fraud Task Force plays a very significant role in safeguarding the integrity of the government procurement process and protecting taxpayer money so that maximum efficiency is achieved.

1.2.1.3 Outreach and Training programs and Recovery Initiative

Public Procurement officials are trained by the Division attorneys who have vast experience in prosecution of bid rigging cases. Their expertise helps the officials to change the procurement terms and conditions so as to make the process more competition friendly. In the year 2009, the Antitrust Division came up with the “Recovery Initiative”. This initiative was to prepare the officials to recognise and report any activity where there is an unlawful appropriation of public funds. The Recovery Initiative was introduced in the American Recovery and Reinvestment Act, 2009 which was a multi-billion US \$ economic stimulus program. Around 25 thousand officials were trained in different federal agencies regarding antitrust awareness and collusion detection.

1.2.1.4 Algorithmic Pricing and Collusion Identification.

In an extremely competitive market, the firms have now started using digital interventions to determine the offer price in tenders. This is per se not anticompetitive since the firm uses dynamic data to conclude as to a best offer price so as to win the tender. The anti-competitive factor comes into play when the firms start using the same software for price discovery of other players and to eliminate these players. The algorithms are used to find the behaviour of other players and a set of firms collude to offer a price by which the other players are excluded

from the competition. The FTC keeps a keen watch over any such technological advancements that hampers competition. In a note submitted to OECD by the US, it explained the above issue as “if competing firms each entered into separate agreements with a single firm (for instance a platform) to use a particular pricing algorithm, and the evidence showed they did so with the common understanding that all of the other competitors would use the identical algorithm, that evidence could be used to prove an agreement among the competitors that violates U.S. antitrust law.”²⁷

1.2.1.5 Data Screens in Procurement

Government procurement agencies deploy software to analyse bid data to understand the signs of bid rigging. Advanced data analytics techniques are increasingly used to identify suspicious behaviour in procurement data. Suspicious patterns, such as consistent winning bids by the same suppliers or unusually high prices, will act as a red flag which will trigger further investigation. By studying large datasets of bidding activity, authorities can detect anomalies and potential instances of collusion more efficiently. Some techniques/tools used are **a) Data Analysis Software:** Specialised software that can identify suspicious patterns such as bid rotation, complementary bidding, or consistent overpricing by certain suppliers; **b) Predictive Analytics:** Advanced analytics techniques, including machine learning and predictive modelling, are used to identify anomalies and forecast potential instances of bid rigging. Even before a bid is placed the market study data will predict an estimated pricing and behaviour of bidders. This prediction data is used to pinpoint deviations from predicted/ expected bidding behaviour and flag contracts that may warrant further investigation; **c) Data Mining Tools:** Huge quantum of datasets pertaining to procurement transactions are studied and analysed to uncover hidden patterns and relationships. By examining historical bid data and comparing it to current bidding activity, these tools can identify deviations that are indicative of bid rigging; **d) Link Analysis Software:** Link analysis tool studies interdependence or connections/relations (professional and personal) between bidders, subcontractors, and contracting officials involved in procurement processes. By mapping out these relationships, investigators can identify collusion networks and pinpoint individuals or entities suspected of engaging in bid rigging; **e) Fraud Detection Systems:** Some procurement agencies utilise fraud detection systems that automatically flag transactions or bids exhibiting characteristics associated with bid rigging or collusion. In this, basically patterns which are in the forms of red flags are given to the software. The process is screened for these red flags; **f) Database Management Systems:** Robust database management systems are essential for storing, organising, and querying procurement data efficiently. These systems enable investigators to retrieve and analyse relevant information quickly, facilitating the detection of bid-rigging patterns; and **g) Custom-Built Solutions:** In some cases, government agencies develop custom-built software or applications tailored to their specific needs for bid-rigging detection. These solutions

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may incorporate proprietary algorithms or algorithms adapted from academic research to identify collusion signals effectively.

1.2.1.6 Procurement Collusion Strike Force (PCSF)

In 2019, the Department of Justice formed the strike force²⁸ to coordinate between all levels of government against the antitrust practices in public procurement. “The PCSF is organized as an interagency partnership, consisting of federal prosecutors across the U.S. and national law enforcement partners tasked with detecting and preventing fraud, waste, and abuse. The PCSF has two objectives: (1) deterrence through outreach and training, and (2) more effective detection, investigation, and prosecution of these crimes.”²⁹ The main objective of the Force is to build analytical tools that will help to find anti-competitive patterns and collusion in procurement. This data analysis and red flags in procurement has enhanced the detection of bid rigging in procurement.³⁰

1.2.1.7 PSCF Tip centre

“The PCSF Tip Center receives and reviews complaints, concerns, and tips regarding individuals and/or organisations potentially engaged in antitrust crimes such as price fixing, bid rigging, and related schemes— affecting government procurement, grant, and program funding.”³¹ In a competitive market, there will be a lot of clandestine information that flows. The significance of understanding the same and being updated is very crucial for the watchdog authorities to have an effective control over the market players. Many times the information comes from disgruntled men within the firms that operate in the market. These tips play another role in the market. The firms understand that anytime the information of illegal practices might reach the authorities, which further keeps them in check.

1.2.1.8 Data Analytics Project 2020 (Data Aggregation)

In the US different levels of government (Federal, State and Local) use different platforms and law for the purpose of procurement. This decentralised system makes it difficult for PSCF to apply the cutting edge technological algorithms into the data since the procurement data is fragmented and owned by different levels of authority. To address this issue the PSCF in 2020 came up with the solution of data aggregation. A massive Data Analytics Project was introduced which aggregated procurement data in different levels of government. An integrated e-procurement system³² will also help the data aggregation. “The goal of the project is not to build a universal data analytics program, but instead to build analytics tools that increase detection of anti-competitive collusion across all levels of government. The PCSF’s role in the data analytics project is to act as a subject-matter expert, advising governmental agencies on how to use procurement data in building their own tools.”³³

1.2.1.9 Corporate Antitrust Compliance Program

“Antitrust compliance programs promote vigorous

competition in a free market economy by creating a culture of good corporate citizenship within a company that seeks to prevent antitrust violations. Although an antitrust compliance program may not prevent every violation, an effective compliance program should be able to detect and address potential antitrust violations.”

³⁴ This is the introduction statement of the US Department of Justice’s report on Evaluation of Corporate Compliance Programs in Criminal AntiTrust Investigations, published in July 2019. Such compliance programs from high value firms and companies would make the procurement market more sensitive and educated towards healthier competition.

1.2.1.10 Competition in Contracting Act, 1984 (CICA)

The Act mandates the use of open competitive bidding in the process of public procurement. This had further helped the system to incorporate the necessary procedural changes to

accommodate stringent competition in the bidding system.³⁵ “CICA is designed to ensure

officials contract in a way that achieves two key goals of the Federal Government: (1) to spend tax dollars in the most efficient way and (2) to support the economy”³⁶ The private person audit/grievance provision (right to file a protest in case of suspicion in the procurement process) in the Act has helped the system to be more competitive. “CICA also allows private parties to monitor the practices of procurement officials by giving them a right to file a protest if they suspect deviations from a competitive bidding and award process”³⁷ This helps to keep the procedure under check.

Aforementioned initiatives in the US antitrust regimes seem to be effective and fruitful interventions to keep antitrust activities in public procurement at bay. However, these interventions cannot be said to be exhaustive given the changing dynamics in antitrust practices. It is important that the authorities are aware of the latest interventions, mainly technological, used by the bidders to resort to antitrust activities in public procurement so as to come up with corresponding defiant techniques.

1.2.2 Procurement in South Korea

South Korea’s economic history is a remarkable tale of transformation from a war-torn agrarian society to one of the world’s leading industrialised nations³⁸ in just a few decades. South Korea’s economy is renowned for its dynamism and export-driven nature, often likened to the ‘Asian Tigers.’ With a strong emphasis on industrialization, the nation excels in sectors such as electronics, automobiles, shipbuilding and technology. Notably, multinational giants like Samsung, Hyundai, and LG contribute significantly to its global economic footprint. Embracing innovation and technological prowess fuels South Korea’s economic expansion and competitiveness worldwide. Despite occasional hurdles like geopolitical tensions and demographic changes, South Korea perseveres, sustaining impressive economic growth and asserting its pivotal role in the

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global economy. With a value of more than 200 Billion USD in the procurement market, the South Korean system has a lot of lessons to offer. The said procurement system has won numerous awards such as 39 United Nations Public Service Award, Global IT Excellence Award, and the e-Asia Award.

Korea's basic laws related to public procurement includes the following Acts,⁴⁰ viz.,

- a) Act on Contracts in Which the State is a Party
- b) Act on Contracts in Which a Local Government is a Party
- c) Act on the Government Procurement Program
- d) Act on Facilitation of Purchase of Small and Medium Enterprise-manufactured Products and Support for Development of Their Markets
- e) Defense Acquisition Program Act

These Acts combinedly ensure transparency, fairness, efficiency and integrity in the procurement process for government agencies and public entities with the governing principles being equal treatment of bidders, competition, transparency, non-discrimination and integrity. It further stipulates contract management by having provisions for monitoring the performance of contract, dispute settlement, and monitoring strict compliance mechanisms with respect to contractual obligations.

The Korea Fair Trade Commission (KFTC) is a central administrative organisation which is a ministerial level body functioning under the authority of the Prime Minister. The KFTC has the dual functions of formulation and administration of competition policies. It also functions as a quasi-judicial authority that deliberates, decides, and handles antitrust cases. It is composed of a committee, the decision-making body, a secretariat and a working body. "The secretariat is directly involved in drafting and promoting competition policies, investigating antitrust issues, presenting them to the committee, and handling them according to the committee's decision. The KFTC is committed to four main mandates: promoting competition, strengthening consumers' rights, creating a competitive environment for SMEs and restraining concentration of economic power. To that end, the KFTC enforces 12 laws including the Monopoly Regulation and Fair Trade Act (MRFTA)."⁴¹ The Monopoly Regulation and Fair Trade Act (MRFTA) is the main legislation that governs cartels in Korea. The Criminal Act and the Framework Act on the Construction Industry also have provisions regarding cartels. "Article 315 of the Criminal Act prohibits any tampering with the fairness of auctions or tenders through fraudulent, coercive, or other deceptive methods. Similarly, Article 95 of the Framework Act on the Construction Industry penalises individuals who collude with other bidders to submit prearranged bid prices, thereby unjustly benefiting or disrupting fair pricing mechanisms."⁴²

It is now pertinent to understand some of the good practices in South Korea that are useful in arresting anti-competitive practices in procurement.

1.2.2.1 Centralised Procurement System

Unlike the US, Korea has a more centralised procurement system. All levels of government are mandated by law to procure through a centralised system if the procurement cost threshold crosses a limit. This is made through the Public Procurement Service of Korea (PPS), which acts as a centralised agency that is involved in the procurement business. The agency does the business of procurement for central government agencies and for the local governments and public enterprises, in such areas where the cost is above the prescribed limits. Thus the quantum of procurement done by the PPS amounts to around 30% of the total procurement of the entire country including the defence procurement.⁴³ The "...centralised procurement has been proven to be more beneficial in Korea. This is because Korea has been able to make public procurement more transparent and efficient by establishing an E- Procurement System, mainly led by PPS, and allowing various procuring entities to use it."⁴⁴ The major takeaway is that every country should make efforts to understand what kind of procurement (centralised or decentralised) procurement will benefit the economy of the nation. Once that clarity is achieved both the legal regime and the procurement platforms should be changed to mandate the procurement structure accordingly. South Korean law mandated centralised procurement as well as technically made KONEPS compatible for the same.

1.2.2.2 Korea On-Line Procurement System (KONEPS)

KONEPS is the e-procurement system that can electronically process the entire process of procurement, ranging from tender notice to awarding, contracting, inspection and payment. "KONEPS is a comprehensive online system that performs the overall management of government procurement business, including bidding, contract-signing, and payment regarding commodities, services and construction as needed by the central and local governments and public institutions."⁴⁵ A comprehensive digital procurement system is the stepping stone to an efficient and transparent process. KONEPS has been a model for the whole procurement world covering the end to end process of the procurement. All stages of the procurement can be found mentioned as a part of the KONEPS, making this participatory and procedurally inclusive. OECD recognizes the KONEPS due to the following character of it, viz.,⁴⁶

- KONEPS is very comprehensive and it covers the entire phases/system of the procurement cycle.
- It is regularly updated to expand its functionality.⁴⁷
- The scope and coverage of KONEPS is on a better scale.
- Data exchange between different digital platforms. (around 160 digital platforms are integrated for the data exchange).
- Integration with surety companies to cross verify the bonds
- Integration with credit rating agencies to verify the past performance data

- Integration with commercial banks for e-payment and loan facilitation.
- Efficiency and value for money. A study conducted by the Hanyang University shows the integration and digitalisation of the process have resulted in saving at least 8 billion USD in annual transactions. 48

1.2.2.3 Legal Restriction on Contract Types

The Contracts in Which the State is a Party Act, defines four types of public procurement bids, viz., open-competition bidding, limited-competition bidding, selective-competition bidding and direct contracting. The statutory mandate clearly says that the open-competition bidding is the general method, and any deviations are allowed only when distinctly defined legal parameters are met. This per se decreased the discretionary power of the authorities to opt for non-competitive bidding process in procurements.

1.2.2.4 Types of Award systems

There are different processes followed to award the procurement contract. This is kept dynamic and situation based which is mainly dependent on which type of firm wins the bid.

The various such methods are **a) Qualification Assessment Awarding System:**⁴⁹ The

awarding system is used when the bidder quotes offer prices that are lesser than the estimated cost. The estimate is prepared by the bidding authorities as a reference point, and if the winning bidder has quoted less than the estimated cost, then the question arises regarding the quality of tender performance. As a natural corollary, the capacity of the winner to perform the contract also needs to be assessed. "The contract performance capabilities assessment comprehensively assesses the bidder's performance records, technical capabilities, financial conditions, faithfulness in past contract performance, appropriateness of materials and manpower procurement prices, subcontractor management plan and subcontracted worker labor condition implementation plan, contract and order compliance level and quality level and bidding price."⁵⁰ This is done so as to assure that the contract performance is not compromised. This also becomes a learning lesson for price discovery so as to make corrective measures while preparing the estimates; **b) Comprehensive Assessment Awarding System:**⁵¹ In this system all participating bidders are comprehensively ranked on the basis of three criteria, viz., bidding price, capacity to deliver the contract and social responsibility performance. The contract is awarded to that bidder who has the highest score. "This system was introduced in order to reform the awarding system focused on lower prices, but it has also been criticized in that bidding price is still a critical part of awarding criteria;"^{52c)} **Contracting by Competitive Dialogue:**⁵³ Traditionally the procurement is confined to those products that are off-the-shelf items hence the system is not fine-tuned for procuring innovative and technologically advanced products. This lack of fine tuning resulted in technically advanced systems not getting adequately reflected in the procurement process.

In order to overcome this issue so that technically advanced products and services can be covered under procurement, this method of contracting by competitive dialogue was introduced, where in "...when goods or services contract requiring expertise and technology, it is difficult to determine technical requirements or details of the final contract subject matter in advance, the head of or contracting officials of a central government agency may adjust and confirm such details of the subject matter and contract performance plan through competitive and technical dialogues with competitors regarding details of the subject matter and then receive and assess their proposals and make a contract with the person who is recognized to be most advantageous to the state."⁵⁴

Korean Public Procurement Law

1.2.2.6 Multiple Award Schedule

The Multiple Award Schedule (MAS) is defined as "a system which makes contracts with multiple suppliers whose products are equal or similar in terms of quality, performance and efficiency, after eligibility testing of delivery performance and financial conditions, thereby enabling public institutions to select goods or services they want from KONEPS and meet various demands from public institutions."⁵⁵ The process of MAS has different end users, i.e., buyers and the multiple suppliers of the similar product. By this method the various end users have the option of buying from a range of sellers. This further encourages more sellers to participate in the procurement thus increasing the competition in the quality of product and the terms of contract performance.

1.2.2.7 Increased role of Competition Agencies

Public procurement and the involvement of the competition agencies in the same is at a very high level in South Korea as compared to what the Indian system is. In the Korean system, the monitoring of the bid rigging is in itself a function of the KFTC. It is legally mandated that all procuring agencies submit all bid related information⁵⁶ in BRIAS for scrutiny by the KFTC. Within 30 days of awarding a bid contract, the procurement agencies are mandated to submit 10 point information to the BRIAS for analysis of KFTC.⁵⁷ Through this system, there is a pro-active role by the Commission to detect bid rigging. The KFTC can even call for any other information it deems fit for the analysis of bid rigging collusion acts.⁵⁸ Hence, in all sense the KFTC acts as a watchdog to each and every procurement done by 350 + government agencies of Korea. On the contrary, in the Indian System, one must note that there is very little power/role for the CCI to interfere in the procurement process. There is no proactive inquiry done by the CCI. The audit process if ever it identifies some errors it raises objections to the same but no anti bid rigging process is initiated at the level of CCI.

1.2.2.8 Bid-Rigging Indicator Analysis System (BRIAS)

South Korea's construction company coalition is a landmark incident in the procurement regime. The

circumstances that led to the same was that four different construction companies conspired to bid in a manner that every company would be awarded designated sections of large construction projects. With such shadowy agreements and schemes the companies were able to secure around 30% of the construction works in S Korea.⁵⁹ It was in the month of September of 2006 the government launched BRIAS where quantitative analysis is used which is specially designed to analyse the data so as to find anti-competitive practices. With the digitalisation of procurement, data is available on a massive scale. Algorithms designed to find anomalies in the procurement are fed with this data. With the help of data analyses done by BRIAS, the KFTC was able to convict the offenders and impose a fine of 22.1 Billion Won, to recover the overpayments done due to the clandestine agreements.⁶⁰ It can thus be understood that “the success of BRIAS is inspiring”⁶¹ and has a lot to offer to the procurement economy.

BRIAS is a data analysis system which identifies unethical patterns in data and raises red flags. “The system uses a specially created quantitative analysis to determine the probability that a procurement is tainted by collusive behaviour and therefore in need of further investigation”⁶²

OECD suggestions on digitalisation and use of data analysis opines that “Drawing information directly from the Korean e-procurement system KONEPS, BRIAS looks to data elements including bidding price (as a ratio compared to reference price), the number of participants, and the competition method, and applies a formula that generates a potential bid-rigging score. If above a certain threshold, this then suggests the need to collect more information regarding the contract action. Based on this closer look, an investigation is opened in cases where it is warranted.”⁶³

BRIAS over time has ensured that the hiccups that are in the system are addressed to. The following are some takeaways from the BRIAS experience.

- a) A centralised uniformity in data collection was made for the purpose of avoiding multiple formats of data, which had resulted in further complexities. There are many multiple procurement agencies which had their own platforms and thus uniformity of data was not found, which stands addressed now. Takeaway is that data collection in a uniform method is crucial.
- b) BRIAS has identified a threshold below which the scrutiny is not taken up. This was done to focus on the high value procurement since the smaller procurement data was humongous enough to confuse and distract the system from identifying the malpractices. In order to avoid such blind spots in the monitoring activity of BRIAS caused by huge data, contracts listed in KONEPS with value of more than 0.5 Billion KRW are taken up for algorithmic filtration.
- c) The screening parameters in the algorithm are tailor made to identify the bid rigging practices. The Korean Commission did a study of bid rigging cases in the past years and handpicked most relevant information which form cardinal indicators for the bid rigging. With such a

measure the system continuously studies the core data elements corresponding to bid rigging. These data patterns are therefore updated on a real time basis thus addressing the new patterns of bid rigging, which otherwise would have gone undetected.

1.2.3 European Union Directives on Procurement

The European Union (EU) traces its origins to the aftermath of World War II, born out of a desire for peace and economic cooperation. The Treaty of Paris in 1951 established the European Coal and Steel Community (ECSC), integrating resources crucial for post-war reconstruction. The Treaty of Rome in 1957 furthered integration, creating the European Economic Community (EEC) to foster economic cooperation among member states. Over the decades, the EU expanded both in size and scope, with more countries joining and policies evolving to include agriculture, trade, and environmental standards. The Single European Act of 1986 aimed to create a single market, eliminating barriers to trade and allowing for the free movement of goods, services, capital, and people. The Maastricht Treaty of 1992 formalised the EU, establishing common foreign and security policies and paving the way for the Euro currency.

The European Union (EU) boasts one of the largest economies globally, characterised by a diverse mix of industries including manufacturing, services, and agriculture. With a combined GDP exceeding \$15 trillion, the EU represents a significant market for global trade and investment. The Euro, adopted by 19 member states, facilitates seamless financial transactions and price stability within the Eurozone. The EU's internal market, based on the free movement of goods, services, capital, and labour, promotes competition and economic growth. Economic policies and regulations are harmonised across member states, fostering a unified approach to trade, investment, and economic development.

1.2.3.1 Public Procurement in the European Union

In the EU, public procurement is given great importance as in any developed country. More than 2,50,000 public authorities in the EU spend around 14% of the GDP for public procurement.⁶⁴ This accounts to almost 2 trillion euros per year. Public authorities remain the key buyers in many sectors like energy, transport, waste management, social protection and the like. It is found that improving public procurement efficiency even by 1% could save almost 20 billion euros per year.⁶⁵

The EU law has come up with minimum harmonised public procurement rules with an intention to create a level playing field for businesses across Europe.⁶⁶ Public authorities as well as public utility operators are governed by these rules while purchasing goods, works and services.⁶⁷ The EU states have to adopt them into their national legislation which guide tenders above a certain limit in order to allow competition.⁶⁸ Tenders whose value are below this limit will be guided by national laws. These national laws, however, respect the general principles of the EU law.

The European Parliament and the Council of the European Union through a directive has legislated on public procurement.⁶⁹ At the outset itself the Directive makes it very clear that award of public contracts by or on behalf of member states should be in compliance with the TFEU principles. It describes public procurement as having a key role in the Europe 2020 strategy. It is considered an important market based instrument in achieving smart, sustainable and inclusive growth while ensuring the most efficient use of public funds.

The Directive is very clear regarding the transparency aspect as well. The principles of transparency, non-discrimination and equal treatment are enumerated in the Directive stipulating that they should be complied with while awarding contracts.⁷⁰ It obligates the contracting authorities to ensure transparency so as to provide all tenderers with a reasonable opportunity to be informed of the criteria and arrangements that guide the award of contracts. It further goes on to specify that the relative weightage to the criteria should be made known to the tenderer in advance and any retraction from the same should be justified by the public authorities.⁷¹

The above enlisted principles namely transparency, non-discrimination, and equal treatment aimed at attaining the most efficient use of public funds are very important in a public procurement process as the absence of them will render the very purpose of it futile. It is also highly essential given the need to protect integrity in the system. Keeping the tenderers informed in advance of the conditions for the award of contract, providing the weightage of each criterion, informing any change in such criteria are very important in maintaining the transparency throughout the tender process. This will address to a great extent favouritism, and restrictive tender terms that often affect the inclusiveness of tenderers in public procurement. This is nothing but ensuring that there is enough competition among the tenderers in a procurement. Healthy competition can ensure there is best value for money.

In this context it is worthwhile to understand the applicability of competition law in public procurement in the EU. It would also be relevant to understand how corruption and integrity are perceived and addressed in the EU setting.

1.2.3.2 Application of Competition Law in Public Procurement

The 2014 Directive gives emphasis on the fact that public procurement should be opened for competition.⁷² The Directive also asks contracting authorities to not use innovation partnerships in such a way as to prevent, restrict or distort competition. It also promotes the use of electronic purchasing techniques with a view to increase competition.⁷³ When it comes to technical specifications, the Directive specifies that these specifications should allow public procurement to be open to competition. In this light, the Directive makes it categorical that technical specifications should be drafted in such a manner as to avoid artificial

narrowing down of competition. Requirements favouring one particular economic operator should be avoided as the same will have the effect of narrowing down the competition artificially.⁷⁴ It is provided that in order to select the most economically advantageous tender, it is necessary that tenders take place in conditions of effective competition by following objective criteria for award of contracts by giving due regard to the principles of transparency, non-discrimination and equal treatment.

It is further stipulated that in order to ensure the possibility of free and fair competition, the award criteria chosen by the contracting authority should not confer upon them an unrestricted freedom of choice. The Directive also gives the contracting authority the liberty to exclude economic operators proven to be unreliable on account of violations of competition rules.⁷⁵

The Directive is very clear with respect to ensuring the competition aspects of public procurement. Regarding the design of the procurement, the Directive makes it clear that the design should not be made with the intention of artificially narrowing down the competition. The Directive also clarifies that making the design of the procurement with the intention of unduly favouring or disadvantaging certain economic operators is qualified as artificial narrowing down of competition.⁷⁶

In order to avoid any distortion of competition, Article 24 of the Directive exhorts the member states to ensure that suitable steps are taken by the contracting authority to effectively prevent, identify, and remedy conflicts of interests that arise during procurement. Article 24 is very clear as to what all situations are covered by conflicts of interest. Any financial, economic or other personal interest, of any of the staff members of the contracting authority or of a procurement service provider acting on behalf of the contracting authority, might be considered to compromise the impartiality and independence in the context of the procurement procedure. The staff members should be involved in the conduct of the procurement procedure or capable of influencing the outcome of the procedure directly or indirectly. This shows the clarity of the Directive regarding the protection of the integrity of public procurement.

Even the national courts have taken a proactive role in ensuring that competition stands undisturbed in a public procurement scenario. It is worthwhile to appreciate the reading of the Lithuanian Supreme Court in the Pontem⁷⁷ case. It ruled that it was not forbidden for the mutually related economic operators to take part in the same tender. The Court was, thereby, endorsing the principle of competition embedded in public procurement.⁷⁸ In Maniga⁷⁹ case, the Lithuanian Supreme Court laid down categorically that when an issue arises regarding the fairness of procurement procedure it is the responsibility of the contracting authority to find out if the competition has been

Under Article 32, the Directive further enlists the circumstances during which the contracting authorities are relieved of their responsibility to go for open competition. Those exceptions are enlisted in unequivocal terms. It is also made clear that absence of competition in that situation is not the result of an artificial narrowing down of the parameters of the procurement.

This kind of meticulous drafting is again noticed in Article 41. It reads that in case any candidates or tenderers or an undertaking related to them have participated in the market consultations conducted by the contracting authorities, the contracting authorities need to ensure that their participation will not distort competition in the public procurement.

To ensure this, the Directive proposes some suggestions, the extreme one includes exclusion of such participants from the procedure. All this shows the importance given to public procurement procedure in the EU in order to ensure that it is conducted freely and fairly. The same is reflected in Article 42 which states that technical specifications should not have the effect of creating unjustified obstacles that might affect the opening up of public procurement to competition.

Under Article 55, regarding informing candidates and tenderers of the decision made by the contracting authority on award of contract and other matters, it is specified that if the disclosure of any such information is found to prejudice fair competition between economic operators, then the contracting authority reserves the right to withhold the same. Under Article 57, entering into agreements by economic operators with the aim of distorting competition is considered as a ground to exclude the economic operator from the procurement procedure.

Article 67 mentions that the award criteria should not be so made that it gives unrestricted freedom of choice on the contracting authority. The Directive also makes it important that in order to ensure genuine competition the number of participants invited to participate should be sufficient.⁸⁰

In the light of the above discussion, it may be understood that the EU law on public procurement was drafted so meticulously keeping in mind the aspect of fair and genuine competition at every stage of procurement. The member states have to draft their procurement laws keeping in mind the Directive. It is now important to understand how the law handles integrity issues arising during the process of procurement in the EU. In other words, whether there is any differentiation given to distortion of competition in public procurement based on where they arise from i.e., from the side of the contracting authority (government / demand) or from the side of the tenderers (supply).

1.2.3.2.1 Screens and Interdepartmental coordination

The EU does not practise the use of screens like BRIAS. However, individual nations in Europe do use external help like machine learning to detect bid rigging in public procurement, using machine learned management information systems which filter the procurement process and identify red flags which are anti-competitive in nature. This becomes an investigation platform for the officers to initiate an investigation. Furthermore, machine data which is a behaviour based algorithm can be useful for framing indisputable evidence for conviction. Even if the evidence gathered from the algorithms cannot be a conviction evidence, the same can be a starting point of investigation and ‘such evidence can be used in court to obtain warrants or authorization for a more intrusive investigation, ultimately leading to actionable evidence and convictions.’⁸¹

The UK Competition and Markets Authority (CMA) had set up a specialist DaTA (Data, technology and Analytics) unit in 2019 and an officer was also appointed at the helm.⁸² CMA demands data of limited companies from a newly developed pipeline of DaTA frequently which is of use in the detection of suspected cartel activity, in understanding the market structures viz. concentration and profitability, and understanding ownership structures.⁸³ The DaTA pipeline will effectively replace the work of CMA staff that was prone to manual errors and was time consuming.⁸⁴

A cartel screening tool was introduced by the Swiss competition authority (COMCO) to fight against bid rigging.⁸⁵ Though it applied only two screening tools initially, on identifying that it does not give conclusive evidence in case of partial collusion, another procedure was tailor made to detect partial collusion which proved to be successful.⁸⁶

As seen in the case of the US and South Korea, many jurisdictions in the world give formal roles to competition law authorities in public procurement matters. Denmark is one such jurisdiction where the competition authority is responsible for public procurement.⁸⁷ Even though the competition authority issues guidance and interpretation of the public procurement rules it lacks formal authority to make formal decisions or pass orders on suspension of a contract.⁸⁸

1.2.3.3 Conflict of Interests- Corruption and Fraud- Integrity Issues

1.2.3.3.1 Definition of Conflict of Interests

Conflict of interests takes place when a person entrusted with a public function develops a personal interest in the matter which is detrimental to the very purpose of the function undertaken by the person. It is a “collision or a clash between the private interests of a person performing public function, or another person related to the latter, and the public interests which the above mentioned person has to defend by exercising this public power.”⁸⁹

In the US, the principle of conflict of interest has a

principal-agent dimension. The government is the principal and the contracting authority is the agent. If the contracting authority holds an interest which is different from the interest of the government the principal and agent are said to hold two different interests thereby resulting in the conflict of interests. OECD's definition is also similar and is adopted by the European Commission, and the European Anti-Fraud Office (OLAF). Accordingly, 'a conflict between the public duty and private interests of a public official, in which the public official has private-capacity interests which could improperly influence the performance of their official duties and responsibilities.'⁹⁰

The EU Directive 2014/14 at the outset itself exhorts the contracting authorities to prevent distortions in public procurement, arising from conflict of interests, by all means under national law. It includes identifying, preventing and remedying such conflicts of interests.⁹¹ This conflict of interest is susceptible to corruption in course of time. Some characteristics of conflict of interests have been identified as universal. ⁹² Some of them are as follows: 1) that arises during execution of professional duties; 2) the one exercising professional duty has a personal interest in the situation that is beneficial to him /her/institution concerned; 3) there is power entrusted with such authority; and 4) this personal interest will influence the free and fair execution of the power/duty entrusted with the person concerned.

The European Union courts have categorised conflict of interests into two categories based on the parties who are involved in it. Firstly, there exists vertical or internal conflict of interests. This conflict is between the contracting authority/ demand side and the supplier (tenderer) or even third parties but never between two or more public buyers. That is, in order to qualify as a vertical conflict of interests there needs to be involvement of entities acting at two different levels in a market. A second categorisation that has developed over a period of time is horizontal/external conflict of interests. This includes involvement of tenderers wherein they enter into agreements or indulge into activities like bid-rigging thereby causing distortion of competition. This excludes the involvement of contracting authority. It is called horizontal as it involves the economic operators who are independent market players who are at the same level.

The concept of vertical conflict of interests became apparent when it was taken up by the Lithuanian Supreme Court in the e Vigilo case⁹³ and later on in the Specializuotas case.⁹⁴ Even though the Lithuanian Supreme Court refers to agreements among the tenderers as horizontal conflict of interests, in reality there is no conflict because it concerns the tenderers alone who do not have any conflict of interests.⁹⁵

1.2.3.3.2 Differentiating between Conflict of Interests, Fraud and Corruption

Conflict of interest can be defined as a state of affairs. Willingness is not a necessary attribute of conflict of

interest. Hence, it has an objective nature.⁹⁶ It may not be the result of any act of the person concerned. Conflict of interest may arise even when the person concerned sits idly. In other words, intention is irrelevant while considering the existence of conflict of interest. For example, any tenderer providing information to the contracting authority on market situations may end up being excluded from participating in the tender exclusively on grounds of conflict of interest.⁹⁷

The very existence of conflict of interest cannot predict a breach of public faith unless the person concerned takes it forward and acts in his own interest. If it is taken forward, then it becomes the starting point of corruption. Corruption involves acceptance of bribes, kickbacks, arbitrary award of contracts, manipulation of contracts, undue modifications, undue restrictions to competition and the like.⁹⁸ It should be noted that European law treats both conflict of interest and corruption differently. Under Article 57(2) when corruption becomes an automatic ground for exclusion, conflict of interest qualifies to be one only when it cannot be dealt with by applying less 'intrusive measures'.⁹⁹ It shows the difference in the gravity of the two issues. The difference lies in the very nature of conflict of interest and corruption. Corruption happens resultant to an irregularity or an undue advantage. Therefore, corruption is said to be a 'result crime' whereas conflict of interest arises along with the irregularity and is independent of the result which may or may not arise from such irregularity.

It is worthwhile to take note of a small yet substantial difference between corruption and fraud. As already stated, corruption takes place when there is breach of public faith and therefore it can happen only in the demand side of public procurement. Whereas, fraud takes place in a private realm, i.e., within the supply side. It is linked with deception or cheating irrespective of whether it affects the public budget. It includes bid rigging, excessively low tenders, anticompetitive agreements, poor quality of performance and the like.¹⁰⁰ In other words, fraud is concerned with the illegal activities carried out by the economic operators in the process of a public procurement which affects or is likely to affect the outcome of fair competition in procurement.

It can be said that the Directive of 2014, by covering conflict of interests, corruption and fraud in its ambit, encompasses the concept of integrity in wholesome. Though the term is not mentioned specifically the aim is no less than protection of integrity in public procurement. The EU laws including some decisions of CJEU have time and again reiterated many principles that help in protecting the integrity of public procurement.¹⁰¹ They can be summed as follows:

1. The Right to Good Administration- This is explicitly recognised by the EU law¹⁰² and the CJEU.¹⁰³ Though this principle is ultimately the reflection of the principle of integrity, the latter is not expressly recognised by the EU.¹⁰⁴ Under the Charter of

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Fundamental Rights of the EU, (CFREU), every person has the right to have his affairs dealt with by the EU offices impartially and fairly within a reasonable time period. It includes the right to be heard before any individual measures are taken which would affect him adversely.

2. The Principle of Good Governance- The European Court of Human Rights, through its case laws,¹⁰⁵ has asserted time and again that the principle of good governance flows from the European Convention of Human Rights. "It requires that where an issue pertaining to the general interest is at stake, especially when it affects fundamental human rights, including property rights, the public authorities must act promptly and in an appropriate and above all consistent manner."¹⁰⁶ It can be rightly concluded that the law in the EU is clear with regard to the catering of good governance and also to deal with in case shortfalls happen. This again is a facet of integrity and has huge implications when it comes to its protection in public procurement.

3. The Principle of Equal Treatment and Non-Discrimination- The EU Directive on Public Procurement¹⁰⁷ makes it amply clear that the award of public contracts by member states has to comply with principles like equal treatment and non-discrimination among others. The law is unequivocal in stating that the economic operators should be treated equally and without discrimination. Towards protecting this principle the Directive illustrates how not to narrow down competition artificially by designing the procurement with an intention of unduly favouring or with an intention of causing disadvantage to certain economic operators.¹⁰⁸

4. The Principle of Transparency- This principle too is expressly mentioned in the EU Directive on public procurement.¹⁰⁹ However, literal interpretation of the same is not what is desired because it might lead to chaos in the whole public procurement regime. If interpreted literally, transparency might lead to publicity of information resulting in compromising the confidentiality of procurement. The reasons, motivations, and processes that resulted in the award of contract by the contracting authority should be comprehended correctly.¹¹⁰ The transparency of the procedure depends on how rightly it is comprehended. In the process of achieving transparency, in fact, other mentioned principles are also accomplished. It may therefore be summed up that transparency should be appreciated in the context of public procurement in its substantive sense.

The above discussion on EU law including the decisions of national courts, the CJEU and the European Court of Human Rights makes it clear as to how the law and the law enforcing institutions in the EU are loud and clear so as to ensure that the process of public procurement can happen with minimum interventions and distortions.

1.3 DATA FILTRATION AND IDENTIFICATION OF MALPRACTICES

In this part of the article, the focus is on digitalisation.

The use of e-platforms in procurement is studied. This part further analyses the use of digital platforms to collect such data which can be used to analyse and identify certain patterns of malpractices in procurement. The paper then highlights certain patterns that can be indicative of malpractices. Here various situations are explained in detail which warrants further inquiry as to the legality of similar transactions. An attempt to illustrate such patterns is the main focus here. The next part understands the potential of Government e-Marketing which is the digital e-procurement platform of India and how the data can be used for filtering information for identification of bid rigging.

1.3.1 Digital Platforms and Patterns of Malpractices

Digitalisation enhances transparency by making data and processes more accessible and easily monitored. Procurement systems that are automated provide real-time reporting and audits, reducing opportunities for fraud and errors. Digitalisation drives transparency by enabling the easy collection, storage, and sharing of information across platforms. Through digital tools, organisations can offer real-time updates and detailed reporting, making their operations more visible to stakeholders.

When all the data is available in the digital platform, the next step should be to use this data for identification of malpractices. All procurement data shall go through an algorithmic filtration that would screen for certain patterns, the presence of which, may be identified as an indicator of malpractices. Let us now illustrate some patterns that may warrant a red flag in the procurement process.

1.3.1.1 Illustrations that warrant red flags

Some patterns in the bidding process, if looked critically, would raise questions to a reasonable mind. Let us try to identify some of such patterns. These patterns are illustrative so as to suggest how the algorithm should be filtering the procurement data. It is not exclusive and is suggestive on how patterns should be. A study can be conducted to identify such patterns based on the data of such procurements where bid rigging was proven. These illustrations would then form part of the AI screening the entire procurement transactions.

1.3.1.1.1 Red Flags during Participation in Bids

Supplier fingerprint: Each bidding firm's bidding pattern can be studied to make a fingerprint of the firm's typical bidding behaviour. This would include where all the firm participates in bidding, what time of the year the firm usually participates, price discovery of product/service of the firm, raw materials used by the firm, chief competitors of the firm, main players who usually supply the product/service, any particular geographical area where the firm participates for bidding, any types of bids the suppliers had been winning or losing considerably, supplier's participation in subcontracting to other firms, number of times the supplier had withdrawn from a bid; etc., Once the

fingerprint of all the firms are traced, the AI shall screen for patterns to identify anomalies. Some anomalies are illustrated below.

- The same firm is on a regular basis found to be winning or losing the bids.
- Firms, even though they participate in bidding, do not put competitive prices in some areas. For instance, for similar products/services the same firms have different prices for different geographical areas. This might be indicative of geographical allocation of bids.
- Certain suppliers abstain from bidding, even though their products/services are very competitive. This might be indicative of understanding between the winning bidder and the abstaining bidder. Another data that might strengthen the red flag is when the winning bidder's product cost turns out to be higher than the abstaining bidders usual costing. This comparison can be made from the 'price discovery' in the fingerprint data of the abstaining bidder. Higher cost shows might be indicative of higher profit components to be shared with others.
- If it is found that the bidder suddenly withdraws his bid or the bidder submits bids all the time but never wins the tender, such cases might be a red flag indicating illicit understanding between the bidders.
- At times it can be found that the winner of the bid sub contracts the work to bidders who have lost the bid. There might be times when the winning bidder refuses to enter into a tender contract, thus allowing the next bidder to win the contract, following which the work is subcontracted between them.
- If there is a rotation of winning bids (taking turns to win bids) between a close group of bidders that becomes a pattern to which inquiry is warranted.

1.3.1.1.2 Red Flags in Bidding Documents.

Bidding documents on closer studies can reveal some footprints of collusion. A study of the documents that are submitted might have evidence that suggests that the bids were made by the same person or otherwise jointly made. Some of the practises that shall be pondered upon are as below illustrated.

- There might be identical mistakes in the documents submitted by the bidders, the error being both mathematical calculations or in the spelling. It is difficult to understand how two bidders can misspell the same word in the same manner, unless they have colluded and made the documents jointly.
- Another clue which might be an indicator of collusion is the handwriting and stationary, packaging etc., if they are found similar. Also, if the documents come by post and are posted from the same post office, despite the bidders addresses not in the same area, then that too is an indicator.
- The bid costing is also another indicator. If the bidders show similar estimates in the costing of items, that is a red flag. There is a need to compare the same with the price discovery made by the AI using supply chain traceability.
- If the contact address and the fax/numbers etc., are similar that requires an explanation from the bidders.

There might be cases where the bidders even use similar letterheads for the purpose of intent letters.

- There might be situations where the tender is found to be very similar in nature, and the price increments are made by the bidders on a regular basis. That is an indicator.

Also, if the tender documents contain a lot of corrected information, it is an indication of last minute adjustment made to the documents.

1.3.1.1.3 Red Flags in Pricing Patterns

- Once the price discovery is made, the department has a reasonable understanding of the factors affecting the cost of the product/service. Deviations by all the bidders, viz., heavy unexplained identical rise in cost needs a good justification on why it does not amount to collusion.

- Usually the bidders are willing to offer discounts during the negotiations of the tender. If the bidders strongly oppose and say as one against the discounts, then it is a red flag. So the elimination of usual discounts in those markets which have had a history of discounts, need to be taken with caution, as the same might be collusion.

- Same cost, i.e., identical pricing, needs to be checked, especially when the bidders have in the earlier times different price ranges. If a bidder was very consistent with his pricing, then a sudden identical price is a concern too.

- A substantial difference between the winning bidder and the other bidders is another red flag to the extent that the other bidders quoted in purpose higher price to be out of competition.

- Another bid rigging indicator is when the same bidder has quoted in similar bids with substantial difference in price quotes.

- When a new bidder destroys an existing cartel, the cartel bidders will reduce their quotes in comparison to their ordinary prices. Hence, a sudden fall in the prices than the usual quotes might be an indicator for the existence of a cartel.

- Some price components are logically safe to assume that it should be different for different bidders, for example, transportation cost for local bidders and non-local bidders should be different. Despite that if the same is found to be identical, it should raise a red flag.

1.3.2 GeM Data Filtration with AI Algorithms.

There are multiple procurement platforms in India, amongst which Government E- Marketplace, GeM, is the major one. GeM is an online platform launched by the Government of India to facilitate the procurement of goods and services by various government departments and organisations. Launched in August 2016, GeM is maintained and governed by the Government of India. It is to be noted that multiple states and departments have their own other E-procurement platforms too. GeM serves as a unified platform, enhancing procurement efficiency across various government bodies in India.

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GeM aims to bring transparency and efficiency to public procurement, reducing corruption and delays. The platform offers a vast array of products and services, including office supplies, electronics, and services like consulting and transportation. Both buyers and sellers can navigate the platform easily, with features to compare prices and specifications. Government departments can make direct purchases from registered sellers without the need for complex tendering processes for smaller value items. Vendors can register on GeM to list their products and services, enabling them to reach government buyers directly. The platform provides data analytics tools for buyers to analyse procurement trends and make informed decisions. GeM encourages participation from Micro, Small and Medium Enterprises (MSMEs) to promote inclusive growth.

GeM, as a platform, is an opportunity. The data this platform can offer is good enough to understand the whole history of any bidder, buyer and seller. As discussed in the earlier part of this article, where the United States uses data analysis tools, viz., Data Mining, Predictive algorithms, Link Analysis, Fraud Detection etc., the same can be done over the GeM data. In fact, data can be collected tailor specific to the requirement of the needs of the aforementioned tools.

In short, the AI shall be used so that the GeM data can be filtered using a self learning AI tool which can identify certain red flags which can further warrant further investigation. The filtration is summarised as below.

- AI shall be a self-learning tool having access to each and every data regarding procurement and market economics.
- AI shall be used to make 'price discovery' in general and also a price discovery of individual bidders, so as to flag deviations.
- AI shall allot bidders a ranking / colour coding using various integrity and performance parameters.
- The algorithm shall make a competition score of the market to find out how competitive a particular market is. In Brazil, Administrative Council for Economic Defense (CADE), makes such predictions using quantitative data with which various indexes and econometric models are used to measure competition level in the market. Similar studies are done by the Korean Fair Trade Commission which comes out with biannual market competition study to understand market concentration.¹¹¹
- AI shall scan the process through preloaded patterns of bid rigging and continuously learn itself regarding new bid rigging patterns from the procurement data.
- Various economic models, as used in various jurisdictions to understand and predict procurement disruptions shall be the part of the algorithm. "The analytical methods for detecting anti-competitive behaviors are often used by worldwide competition authorities in dealing with anticompetitive cases. The enterprises could claim compensation whenever they have been harmed by the existence of a cartel on their operational market. The use of analytical methods based

on statistical data could be a method for observing certain anticompetitive behaviors on the market."¹¹² Over the years, economists have developed many models to understand market behaviour and its distortions. There are many tools to study the standard deviations with which one can derive and understand interventions that distort the market.¹¹³

- Data Mining, Predictive Algorithms, Link Analysis, Fraud Detection., etc., shall be the foundation of the AI algorithm.

1.3.3 Block Chain Technology - Data Integrity and Price discovery

Blockchain technology is a decentralised digital ledger system that securely records transactions across multiple computers. This ensures that the data is immutable and transparent. Each block in the chain contains a list of transactions, a timestamp, and a reference to the previous block, forming a continuous chain.

"Blockchain is a shared immutable ledger that facilitates the process of recording transactions and tracking assets across a business network. Anything of value can be tracked and traded on the Blockchain network. A Blockchain is a distributed database, which is shared over a computer network. Blockchain stores information electronically in a digital format to make transactions secure.

Blockchain is a new technology, which is known as Distributed Ledger Technology (DLT). With the help of Blockchain technology, currency as well as anything can be converted into digital format and stored. Actually it is an exchange process, which works on data blocks. In competitive behavior, used when there is no a priori information about the collusive behaviors. The first step is to divide auctions into two categories (collusive and competitive) with significant differences between them. The data of variables are then studied so as to identify the difference in patterns in both categories. (Caldiero, Christopher, Maureen Taylor, and Lia Ungureanu. 2010. Organizational and media use of technology during fraud crises. *The Handbook of Crisis Communication* 396–409. doi:10.1002/9781444314885. *The Handbook of Crisis Communication*, 396–409). Another model is "Asymmetric Bidding" (Eric Maskin & John Riley, *Asymmetric Auctions*, 67 Rev. Econ. Stud.) Here the theory of competitive bidding is applied against the asymmetric bidders to distinguish between competitive and collusive bidding. Feinstein, Block, and Nold propose and test a model of a cartel that manipulates engineers' estimates of the costs of highway construction jobs by submitting complementary bids relatively close to the winning bidrigging. (Feinstein, Jonathan S.; Block, Michael K.; and Nold, Frederick C. "Asymmetric Information and Collusive Behavior in Auction Markets." *A.E.R.* 75 (June 1985): 441-60.) Zona proposes a test for bid rigging in highway construction auctions based on a switching regression model. (Zona, J. Douglas. "Bid-rigging and the Competitive Bidding Process: Theory and Evidence." Ph.D. dissertation, State Univ. New York Stony Brook,

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1986.) Comanor and Schankerman examine the propensity of bid-rigging schemes to submit identical bids in individual auctions. (Comanor, William S., and Schankerman, Mark A. "Identical Bids and Cartel Behavior." *BellJ. Econ.* 7 (Spring 1976): 281-86.) this, one block is connected to another block. These blocks cannot be hacked. Blockchain technology aims to keep documents digitally secure."114

In short the greatest advantage of blockchain is that data integrity can be maintained and data cannot be corrupted.

The success of an artificial algorithm that would screen data for finding possible bid rigging patterns would entirely depend on the sanctity of data. Hence, it is suggested that GeM users can be linked together thus forming a block in the chain. The use of blockchain would thus add credibility to the data sanctity of GeM, which in turn will increase the credentials of data screening done by the algorithms, thus helping in reducing bid rigging and increasing its probability in being counted as evidence.

1.3.3.1 Supply chain traceability

"Traceability, in supply chain traceability, is the ability to identify, track and trace elements of a product or substance as it moves along the supply chain from raw goods to finished products.¹¹⁵ It is the ability to track and trace the movement of goods and materials throughout the supply chain, from raw materials to its final destination. It involves collecting and analysing data at every stage of the supply chain to ensure that products are made safely, ethically, and sustainably. The primary goal of supply chain traceability is to enhance transparency and accountability, making it easier for companies to manage risk, reduce waste, and ensure that their products are safe for consumers."¹¹⁶ By using supply chain traceability, the products of the suppliers and the sourcing of the products can be understood. This further can be used to make an accurate understanding of the cost involved in input material,¹¹⁷ which can be used to understand the price discovery of the product. This price discovery can be further used to identify discrepancies of offer price in the tender between the different parties. Thus, by using the supply chain traceability, the AI can be taught to filter out and predict the fair price of a product, variations from which can be identified as a red flag and justifications can be sought for. In short, supply chain traceability can be used for identification of the following.

- A fair price of the product can be determined to set a benchmark. Deviations from this benchmark can be a red flag.
- The quality of the offered products.
- The products are as per offered specification standards.
- Price Discovery can be made and individual pricing can be compared for actual costing incurred by the party.
- Deliberate deflation/inflation of pricing can be

identified so as to distinguish colluding.

CONCLUSION

Public procurement has increasingly become the focus of international regulatory harmonisation, reflecting its significance in advancing governance, economic efficiency, and public trust. A number of authoritative instruments—most notably the UNCITRAL Model Law on Public Procurement (2011), the World Bank's Procurement Regulations (2020), the WTO Agreement on Government Procurement (2012), Transparency International's guidance on anti-corruption in procurement, the OECD's recommendations on public procurement, and the collaborative insights of the Procurement G6—collectively constitute an emerging corpus of global best practices. Although varying in scope and institutional context, these frameworks share several conceptual convergences centred on transparency, value for money, competition, integrity, and accountability.

The UNCITRAL Model Law (2011) remains a cornerstone for states seeking to design or reform procurement legislation. It emphasises procedural transparency, competitive tendering as a default rule, and clearly structured procurement methods adapted to diverse market conditions. Importantly, it institutionalises mechanisms for domestic review and remedies, supporting fairness and reducing opportunities for arbitrary decision-making. Its flexible, technology-neutral drafting also facilitates the integration of e-procurement and contemporary digital tools.

Complementing this, the WTO Agreement on Government Procurement (GPA) 2012 advances transparency and non-discrimination at the international level by requiring open competition among suppliers from member states. Its emphasis on publishing procurement opportunities, standardising documentation, and ensuring impartial evaluation procedures contributes to a predictable and rules-based procurement environment. The GPA's commitment to dispute settlement, along with provisions for the progressive expansion of market access, positions it as a key treaty for fostering cross-border participation and global competition.

The World Bank Procurement Regulations (2020) adopt a development-oriented framework that integrates fiduciary assurance with flexibility and innovation. Principles such as value for money, fit-for-purpose procurement strategies, and proportionality underpin its methodology. The inclusion of strategic procurement planning, procurement risk assessment, and emphasis on sustainable and socially responsible procurement signal a shift from purely procedural compliance to performance-based governance.

Parallel to these institutional frameworks, Transparency International provides normative guidance on mitigating corruption risks. Its Public Procurement Guide highlights systemic vulnerabilities—such as

opaque decision-making, conflict of interest, and collusion—and advocates for enhanced disclosure, civil society oversight, and robust integrity controls. These recommendations align closely with the behavioural and ethical dimensions of procurement reform.

Similarly, the OECD advances a holistic governance-centric perspective. Its recommendations promote professionalisation of procurement officials, integration of digital procurement systems, strategic use of data analytics, and responsible supply chain management. Its emphasis on coherence with broader public governance structures underscores procurement's role in achieving public policy goals, including sustainability and innovation.

Finally, the Procurement G6, a collaboration of technologically advanced procurement agencies, contributes practice-driven insights on e-procurement, open contracting, and data standardisation. Their advocacy for interoperable digital platforms and real-time data transparency underscores the increasing centrality of technology to procurement integrity and efficiency.

Collectively, these instruments illustrate the emergence of a global normative architecture in public procurement—one that is transparency-driven, risk-informed, technologically adaptive, and anchored in principles of fairness and accountability. They not only harmonise procurement standards across jurisdictions but also offer a dynamic blueprint for states seeking to modernise procurement systems in an era of digital governance and heightened public scrutiny.

Building on the comparative analysis of procurement models in the United States, the European Union, and South Korea's KONEPS, it becomes evident that mature jurisdictions increasingly converge around principles of transparency, competition, accountability, and technological integration. Each system adopts different institutional designs—ranging from the United States' decentralized federal procurement framework to the EU's highly harmonised directives and South Korea's fully integrated digital procurement environment—but they collectively illustrate the trajectory of modern procurement governance. The lessons drawn from these systems demonstrate that structural reforms, when paired with robust technological infrastructure, substantially reduce transaction costs, improve auditability, and enhance compliance with procurement objectives.

Similarly, the examination of India's Government e-Marketplace (GeM) underscores the transformative potential of digital procurement platforms in emerging economies. GeM's architecture for data consolidation, vendor registration, price comparison, and process automation equips the procurement ecosystem with unprecedented visibility. This digital record-keeping enables systematic identification of irregularities through patterns of pricing, vendor behaviour, bid participation, and contract execution. When these

datasets are filtered with methodological rigour, they reveal red flags indicative of collusion, bid rotation, artificial price inflation, and other forms of procurement malpractice.

The integration of artificial intelligence into this ecosystem presents an even more promising frontier. AI-driven filtration can detect anomalies at a scale and speed unmatched by manual oversight, enabling predictive and preventive interventions. Machine-learning models can map behavioural correlations, classify risk profiles, and continuously refine detection thresholds based on historical and real-time procurement data. As governments increasingly shift toward digital-first procurement, the fusion of established international standards with advanced analytical tools offers a pathway to more transparent, accountable, and ethically resilient procurement systems. Ultimately, the future of procurement governance will depend on the ability of states to institutionalise these technologies within a principled regulatory framework that protects integrity while fostering innovation.

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