

A Study on Making Public Procurement Effective, Efficient and Transparent by Incorporating Artificial Intelligence (AI) Techniques in Government e-Marketplace (GeM)

Rahul Mishra¹

¹Scientific/Technical Officer-D, Division of Regulatory Inspection, Atomic Energy Regulatory Board

Publication Date: 2025/09/27

Abstract: Public procurement plays a vital role in ensuring accountability, transparency, and efficiency in government expenditure. The Government e-Marketplace (GeM) has emerged as a digital platform to streamline procurement processes in India by promoting competitive bidding, transparency, and inclusivity. However, challenges such as quality assurance, vendor credibility, process delays, and data management still hinder its full potential. This study explores how Artificial Intelligence (AI) techniques can be integrated into GeM to address these limitations and transform procurement into a more effective, efficient, and transparent system. The paper examines AI applications such as predictive analytics for demand forecasting, natural language processing for automated tender evaluation, machine learning for fraud detection and vendor risk assessment, and chatbots for grievance redressal and buyer–seller support. By analyzing global best practices and identifying potential AI-driven solutions, the study highlights how intelligent automation can enhance decision-making, reduce human bias, ensure compliance, and improve stakeholder trust. The findings suggest that incorporating AI into GeM can significantly strengthen the public procurement ecosystem by improving efficiency, minimizing risks, and ensuring greater transparency in government transactions.

Keywords: Government e-Marketplace (GeM), Artificial Intelligence, Tender, Data Privacy, Automation.

How to Cite: Rahul Mishra (2025) A Study on Making Public Procurement Effective, Efficient and Transparent by Incorporating Artificial Intelligence (AI) Techniques in Government e-Marketplace (GeM). *International Journal of Innovative Science and Research Technology*, 10(9), 1793-1797. <https://doi.org/10.38124/ijisrt/25sep1005>

I. INTRODUCTION

Public procurement is a vital driver of economic growth, especially in developing nations, where it accounts for a substantial share of government expenditure. Globally, in OECD countries, public procurement contributes 25–30% of GDP, while in India it is estimated at 20–30% of GDP. More than a financial activity, procurement is a strategic tool for achieving policy goals such as poverty reduction, job creation, and infrastructure development.

In India, procurement assumes particular importance given the scale of its economy and the demands of a growing population. Ministries such as Defence, Railways, and Telecom allocate nearly half of their budgets toward procurement, highlighting its significance. Yet, the process is often complex due to India's federal framework and multi-tiered governance, which results in inefficiencies, delays, and limited transparency.

To address these challenges, the Government of India launched the Government e-Marketplace (GeM) in 2016 as a

Special Purpose Vehicle (SPV). Conceived as a transformative reform, GeM seeks to infuse efficiency, inclusivity, and transparency into government procurement. Its guiding principles are efficiency (streamlined processes and reduced cycle times), transparency (fair and open access), and inclusivity (enabling participation from large vendors, MSMEs, startups, and individual entrepreneurs).

Since its inception, GeM has significantly reshaped the procurement ecosystem. It has reduced procurement timelines from weeks or months to just a few days, facilitated efficient price discovery, and created a level playing field through mechanisms such as direct purchase, e-bidding, reverse auctions, and customized bids. As of 2025, GeM has processed procurements exceeding ₹8.5 lakh crore, with over 1.5 crore sellers and service providers registered, making it one of the world's largest e-procurement platforms. This transformation aligns with the Government's broader digital governance and "Digital India" vision.

Despite these successes, GeM faces persistent challenges. Quality assurance is a concern, as vendors

sometimes compromise on standards to secure contracts with low bids, leading to risks in sensitive sectors like healthcare and infrastructure. The inclusive registration process, though democratizing, occasionally allows inexperienced or non-serious vendors to participate, causing inefficiencies. The platform is optimized for bulk standardized purchases, making customized procurement less effective despite new tailored bid options. In addition, logistical constraints, delivery delays, and inadequate vendor infrastructure reduce efficiency. Moreover, many SMEs and government officials lack adequate digital skills, leading to errors and delays in using the system effectively.

The integration of Artificial Intelligence (AI) into GeM offers promising solutions to these issues. Predictive analytics and AI-driven quality checks can identify unreliable vendors and flag substandard products before purchase. Machine learning can analyze supplier histories to recommend credible vendors and reduce the participation of non-serious bidders. Natural Language Processing (NLP) can enhance customized procurement by matching buyer requirements with suitable offerings. AI-powered logistics tools can anticipate and mitigate delivery delays, while adaptive AI training modules can upskill vendors and officials, enabling smoother operations.

By embedding AI into GeM, India can move closer to creating a procurement system that is more effective, efficient, and transparent. Such an approach would not only enhance accountability and trust but also ensure that public resources are utilized optimally to support inclusive economic growth.

II. GOVERNMENT E-TENDERING PROCESS THROUGH GEM

The tendering process is the cornerstone of public procurement in government organizations. It ensures transparency, fairness, competition, and accountability in the allocation of public funds. The Government e-Marketplace (GeM) portal, launched in 2016, represents a significant shift from conventional tendering to a digitally integrated procurement ecosystem. It provides an end-to-end online solution for the procurement of goods and services by government departments, ensuring transparency, efficiency, and competitiveness. Unlike traditional tendering, where multiple offline processes are involved, GeM consolidates all stages—right from requirement identification to award of contract—on a single platform. GeM operates on two main modes:

➤ Direct Purchase/Buy:

For low-value purchases (below a certain threshold, e.g., ₹25,000 for goods, ₹1 Lakh for services), officials can directly compare and buy from listed products without a formal tender.

➤ L1 Purchase:

The Direct Purchase with L1 is for mid value transactions and allows direct procurement from the L1 seller after comparing all available sellers on the platform that meet

the requisite quality, specification and delivery period as specified by the buyer. The comparison must be made between goods/services of at least three different manufacturers/OEMs and three different sellers.

➤ Bid/RA (Reverse Auction):

For high-value purchases, a formal tender process is initiated.

Flowchart of the said tendering process is given in Fig.1.

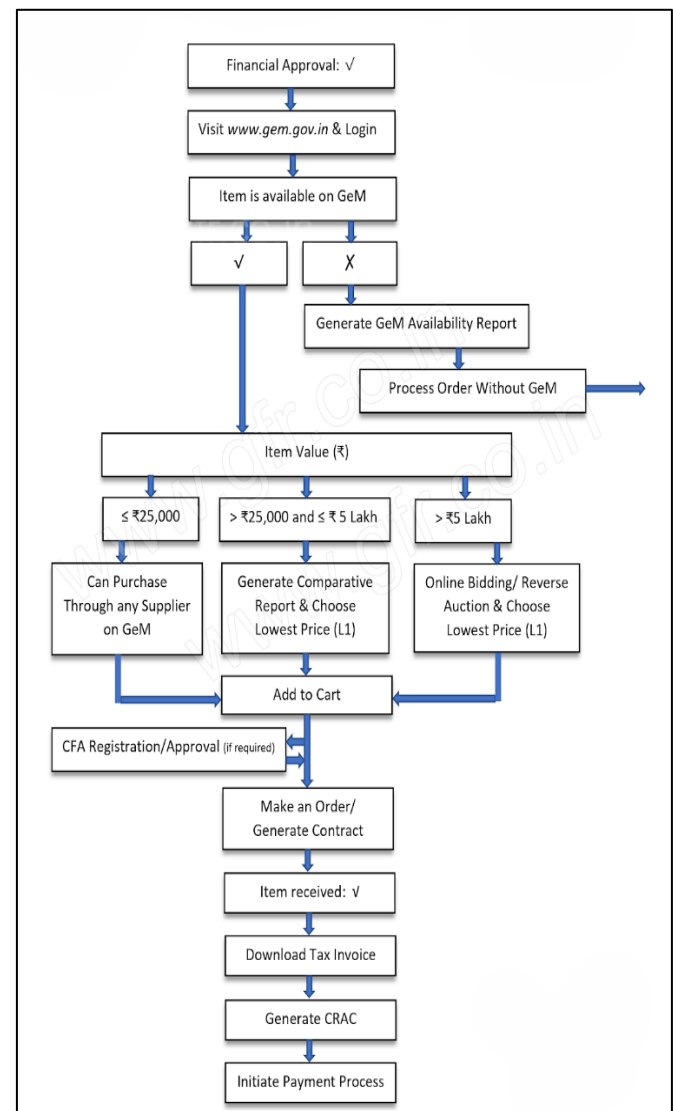


Fig 1 GeM Tendering Process Flowchart

III. ARTIFICIAL INTELLIGENCE TECHNIQUES

➤ Machine Learning (ML)

The guided buying process uses machine learning algorithms to detect patterns within vast datasets and to predict or make decisions.

By analyzing historical data, ML algorithms can identify patterns and relationships that might not be apparent to the human brain. This enables procurement leaders to

make data-driven decisions, optimize supplier selection, and forecast demand more accurately.

For example, an ML model can analyze past purchasing data, supplier performance metrics, and market trends to predict future demand, helping organizations optimize inventory levels and avoid stockouts.

➤ *Natural Language Processing (NLP)*

Natural language processing algorithms are designed to interpret, generate, and transform human language. They can understand and analyze written or spoken language, enabling procurement professionals to extract valuable insights from textual data.

NLP algorithms can automatically categorize and extract relevant information from supplier contracts, requests for proposals, or customer feedback that includes social media. They also facilitate communication with chatbots or virtual assistants, allowing users to interact with procurement systems in a conversational manner.

For instance, NLP can be used to extract key terms and conditions from contracts, enabling faster and more accurate contract review and analysis.

A generative AI (gen AI) tool for natural language processing, ChatGPT, is being embedded in third-party software integrations. Besides using ChatGPT for procurement, you'll also find ChatGPT accounting, ChatGPT for finance, and many other uses.

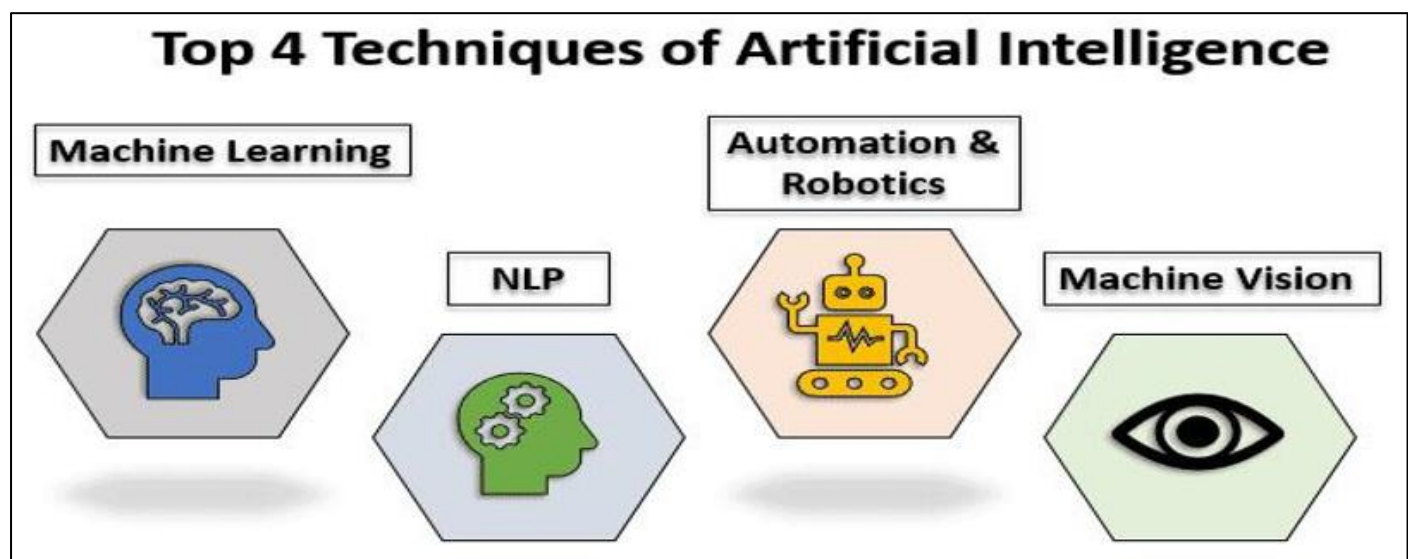


Fig 2 Top 4 Techniques of Artificial Intelligence

➤ *Robotic Process Automation (RPA)*

In robotic process automation (RPA), an algorithm that mimics human actions is used to automate repetitive and rule-based tasks. While RPA is not technically considered a form of AI, it offers significant benefits in terms of process efficiency and productivity.

In procurement, RPA allows for automated invoice processing, purchase order generation, and supplier onboarding. By mimicking human behavior, RPA reduces errors and processing time, resulting in streamlined operations.

An example of RPA in procurement could be an automated system that retrieves supplier information from emails and updates the supplier database accordingly.

➤ *Computer Vision*

Computer Vision equips machines with the ability to interpret visual information from the world. This technique has revolutionized industries like healthcare, automotive, and robotics, enabling tasks such as facial recognition, object detection, and autonomous driving. The extent to which it

can discriminate between objects is an essential component of machine vision.

Sensitivity in computer vision is an AI application's ability to pick out small details in visual information. A low-sensitivity system may not pick up subtle clues in images or fail to work well in low lighting. However, high sensitivity might be able to look at an image's fine details and pick up on information other systems might miss.

IV. ARTIFICIAL INTELLIGENCE IN ENHANCING PUBLIC PROCUREMENT (GEM)

Artificial intelligence in procurement refers to the use of advanced technologies and algorithms that enable machines to perform tasks traditionally carried out by humans, but with enhanced efficiency, speed, and accuracy.

In a nutshell, procurement is a complex process involving managing vast amounts of data, navigating dynamic market conditions, mitigating risks, and optimizing supplier relationships. The sheer volume of data and the need to analyze it efficiently make AI a valuable tool for procurement teams.

The Government e-Marketplace (GeM) portal is India's flagship digital platform for government procurement. It has streamlined the tendering process by integrating requirement identification, bid submission, evaluation, and contract award into a single digital interface. While GeM has improved efficiency, integration of Artificial Intelligence (AI) can further enhance transparency, reduce delays, detect fraud, and optimize decision-making. This section presents a structured explanation of the GeM tendering process and highlights AI-enabled improvements at each stage.

➤ *Preparation of Estimates and BoQ:*

Engineers/technical staff prepare cost estimates based on standard schedule of rates (SOR), market survey, and design requirements. Machine Learning (ML) models estimate costs using real-time market price databases. An AI tool analyzes real-time and historical data: prices for identical items, geographic price variations, demand cycles, inflation trends, and supplier competition. It suggests a data-driven, highly accurate benchmark price range instantly, eliminating guesswork and reducing the risk of inflated estimates or underestimation.

➤ *Preparation of BoQ and Specs:*

BoQ is a structured document listing item-wise quantities of work, description, and unit of measurement. Natural Language Processing (NLP) can extract work items from design documents and auto-generate draft BoQ. It cross-references with past successful tenders and recommends pre-vetted, standard technical specifications and a pre-filled BoQ template. It flags anomalies or missing items in BoQ.

➤ *Tender Document Drafting and Approval:*

AI systems generate tender documents using pre-approved templates and clauses. It cross-verifies tender clauses against govt. procurement rules to avoid lapses. AI models detect ambiguous wording or clauses prone to disputes. Before submission for approval, the AI checks the draft tender for common errors, inconsistencies, or non-standard clauses (using NLP) and flags them. It can also predict approval timelines based on the authority's past behavior.

The AI analyzes supplier participation patterns for similar tenders. If it predicts low participation (e.g., only 2-3 bidders for a large tender), it can recommend modifying clauses (e.g., extending timelines, simplifying eligibility) to attract more bidders and ensure healthy competition.

➤ *Tender Invitation:*

Traditionally, tender is advertised widely (e.g., in newspapers, Government e-Procurement Portal, departmental website). For large procurements, it may also be published internationally. AI identifies qualified suppliers/vendors and sends automated alerts. It checks vendor databases for shell companies, past fraud, or blacklisting and recommends suitable vendors based on historical performance and category expertise.

➤ *Pre-Bid Process:*

Traditionally, clarification (Pre-bid) meeting is held with prospective bidders. Queries regarding scope, specifications, and conditions are addressed. Based on the meeting feedback, amendments/addenda to tender documents may be issued. AI Chatbot can be used to provide 24x7 virtual assistant to prospective bidders instantly in multiple languages. The chatbot can answer hundreds of common queries from bidders in real-time regarding specifications, document submission, and process steps, based on the tender document. It reduces the need for pre-bid meetings and manual clarifications, levelling the playing field for all bidders.

➤ *Automatic Scrutiny:*

Bidders submit their bids in prescribed format before the due date (online/offline). Bid generally comprise of two envelop i.e. Technical Bid and Financial Bid. AI can check submitted documents for completeness, formatting, and mandatory attachments. It can detect duplicate/misleading documents (using image recognition and blockchain-backed verification). Using computer vision and NLP, it can:

- Validate that a GST certificate is authentic and current.
- Check that a product catalogue matches the description.
- Verify that an experience certificate is from a legitimate entity and relevant to the tender.

➤ *Technical Bid Evaluation:*

AI can check bidder compliance with eligibility criteria and past performance. NLP based analysis can be used to read technical proposals and compares with tender specs. The AI pre-evaluates all technical bids. It scores them based on pre-defined criteria (e.g., past performance ratings on GeM, compliance with specs, document authenticity). It presents a ranked shortlist to the committee, highlighting strengths, weaknesses, and potential risks for each bidder. Judicious use of AI reduces evaluation time from days to hours, minimizes human bias, and allows the committee to focus on nuanced judgment rather than administrative checking.

➤ *Financial Bid Analysis:*

AI can compare rates with market benchmarks and flags abnormally low or inflated bids. Before awarding, the AI analyzes the winning bid. If the L1 price is abnormally low (e.g., 30% below the market benchmark or L2), it runs a risk analysis. It checks the bidder's financial stability (from past data) and flags a potential risk of default or non-performance thereby proactively prevents auction failures where a winning bidder cannot deliver, saving time and resources.

➤ *Tender Committee Recommendations & Approval:*

AI can automatically prepare side-by-side comparison tables and provide probability-based recommendations (e.g., L1 vs. lifecycle cost). The AI compiles a comprehensive report for the committee and approving authority. It includes the entire process history, the AI's validation checks, risk scores for bidders, and a clear, auditable justification for recommending the L1 bidder. It makes the approval process faster and more evidence-based, strengthening accountability.

➤ *Award of Work:*

Based on the approval of competent authority, AI can auto-generate Letter of Acceptance (LoA), agreement drafts, and work orders. AI + blockchain enable auto-execution of contracts when conditions are met. AI predicts contractor performance risks based on historical data. AI can generate proactive alert for work commencement, milestone tracking, and delays.

➤ *Performance Monitoring:*

AI monitors the supplier's performance against milestones. It can predict potential delays based on factors like the supplier's historical performance, logistics data, or even external events (e.g., weather). It alerts the project manager proactively to intervene. It can help in shifting management from reactive to proactive, ensuring timely project completion.

V. CONCLUSION

Integration of Artificial Intelligence (AI) in the Government e-Marketplace (GeM) portal can significantly enhance the effectiveness of public procurement. AI tools can bring greater transparency by detecting anomalies, favoritism, and collusion in bidding while maintaining real-time audit trails. Efficiency can be improved through AI-powered chatbots for query resolution, automated contract management, invoice validation, and faster payment processing. Data-driven decision-making is enabled as AI analyzes past procurement trends, predicts price fluctuations, and recommends reliable vendors based on performance history. Fraud and risk can be minimized by using machine learning to flag suspicious vendor activities and cross-verify credentials with government databases. Quality assurance is strengthened through sentiment analysis of feedback and predictive analytics to anticipate product or service issues.

Moreover, AI enhances user experience by offering personalized product recommendations and tailored dashboards for ministries and departments. Altogether, AI makes procurement through GeM more transparent, efficient, reliable, and user-friendly, ensuring better value for money and effective governance. However, when using AI in these systems, it is important to ensure proper governance, privacy, and ethical considerations to mitigate potential risks and biases.

REFERENCES

- [1]. Saurabh Bansal & Neelesh Jain, "A Study on the Impact of Artificial Intelligence Techniques in Enhancing Electronic Public Procurement System."
- [2]. Devendra Pai, "GOVERNMENT E-MARKETPLACE: A GEM OF AN IDEA."
- [3]. El Asri, H., & Benhlila, L. (2022, August 15). Artificial Intelligence-Based Process Automation in eProcurement: A Systematic Literature Review. *Journal of Theoretical and Applied Information Technology*, 100(15). ISSN: 1992-8645. Retrieved from <http://www.jatit.org>.

- [4]. Buvaneswari, P. S., & Perveen, F. (2019). Government e-market: Procurement re-imagined. *Adalya*, 8, 1387-1396.
- [5]. PIB. (2024). Government e-Marketplace registers highest ever Gross Merchandise. Retrieved from <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1945150>
- [6]. The Government e-Marketplace. (n.d.). Government e-Marketplace: A game changer. Retrieved from <https://static.pib.gov.in/WriteReadData/specificdocs/documents/2023/apr/doc2023427188401.pdf>