

# The Use of Artificial Intelligence (AI) in Internal Supervision to Reduce Fraud in the Public Procurement System in Indonesia

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## ABSTRACT

Corruption in the public procurement system is a significant challenge in many developing countries, including Indonesia. Artificial Intelligence (AI) technology offers innovative solutions for strengthening internal oversight and early detection of fraudulent activities. This article presents a systematic review of the literature that discusses the application of AI in internal control, focusing on fraud prevention in public procurement in Indonesia. Using the Systematic Literature Review (SLR) method with PRISMA guidelines, this article compiles, identifies, and synthesises relevant research to evaluate the effectiveness of AI and the challenges in its application. The study results show that although AI has great potential to improve accuracy and efficiency in detecting complex fraud patterns, significant barriers related to implementation costs, limited technology infrastructure, and low readiness of human resources in Indonesia are still significant challenges. Policy recommendations include accelerating AI adoption by developing supportive regulations and improving technological competence in the public sector.

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## 1. INTRODUCTION

Fraud in public procurement is not only a problem in developing countries but also developed countries, although the challenges are different. In developing countries like Indonesia, the problem is exacerbated by various factors, including convoluted bureaucracy, lack of transparency, and weak law enforcement. The public procurement process, which involves large transactions and diverse vendors, often creates opportunities for unethical behaviour, from bribery to pricing and collusion. The procurement of goods and services, especially high-value ones, is often a means of abusing power and illegally enriching oneself (Bahasoan et al., 2024; Fazekas & Wachs, 2020; Knack et al., 2019; Križić, 2021; Velasco et al., 2021).

At the practical level, fraud in public procurement in Indonesia often occurs in the form of price inflation, procurement of low-quality goods, and direct appointment of vendors without going through a transparent auction process. These irregularities harm the state financially, hinder public services, and worsen public trust in the government. One concrete example is large infrastructure projects that often experience budget irregularities due to ineffective supervision. Although various efforts have been made, such as the establishment of the Corruption Eradication Commission (KPK),

corruption in procurement remains a systemic problem (Huang & Xia, 2019; Narayan et al., 2019; H. Wang, 2020).

The Indonesian government has tried to address this problem by issuing various anti-corruption policies and strengthening the internal oversight system. Several policies, such as e-procurement and technology-based audit systems, have been introduced to increase transparency and accountability in public procurement. However, the effectiveness of these policies is often hampered by the limited capacity of the human resources on duty, as well as internal resistance to system change. In this context, the application of more sophisticated technologies, such as Artificial Intelligence (AI) in internal supervision can be a potential solution that can strengthen the early detection of fraudulent activities and improve the efficiency of procurement of goods and services in the public sector (Desouza et al., 2020; Munoko et al., 2020; Suyono & Farooque, 2019).

Artificial Intelligence (AI) technology has developed rapidly in recent years and is increasingly considered a strategic solution for overcoming various surveillance challenges, including fraud prevention. AI can process large amounts of data quickly and accurately, allowing for much more comprehensive oversight than traditional manual methods. AI-based systems can study standard transaction patterns and then identify anomalies that could indicate irregularities, such as price inflation or collusion between vendors. The application of AI is very relevant for the public procurement sector, which involves large transaction volumes and high variability (Chassang & Ortner, 2019; Huber & Imhof, 2019; Signor et al., 2023; Westerski et al., 2021).

AI detects anomalies, can proactively analyse data in real-time, and provide early warnings of potential fraud risks. The technology allows the integration of various data sources, including previous transaction data, vendor data, and payment patterns, to provide a more holistic picture of procurement activities. In manual surveillance systems, some anomalies may be missed due to time and human resource limitations, but AI can continuously monitor data endlessly, improving detection accuracy. This improvement is significant in the public sector, where a small mistake can significantly impact the state budget and public trust (Lyra et al., 2021; Pourhabibi et al., 2020; Zanetti et al., 2019).

In Indonesia, where the public procurement system is often accompanied by bureaucratic complexity and a lack of transparency, AI offers great potential to overcome the limitations of human supervision. AI-powered surveillance systems can automatically analyse suspicious patterns without manual intervention, speeding up the audit process and improving overall efficiency. While implementing this technology requires significant investment and specialised training for users, the long-term benefits of fraud prevention and increased public accountability are clear. Thus, AI can become an essential component in reforming public procurement governance in Indonesia.

The application of AI in Indonesia's public sector still faces various significant challenges. One of the main obstacles is inadequate technological infrastructure, especially in areas that have not been entirely digitised. Implementing AI also requires a considerable initial investment, both in terms of technology costs and training of human resources who will operate the system. In addition, the low technological literacy among bureaucrats is a challenge because AI requires a deep understanding of how algorithms work and complex data processing.

In addition, resistance to changes within the bureaucracy has also slowed the adoption of AI in the public sector. Many government employees are still more comfortable with manual or traditional surveillance systems, although their effectiveness is limited in detecting increasingly sophisticated fraud. Therefore, greater efforts are needed from the government to improve technological literacy and bureaucratic readiness for AI adoption. In addition, more transparent policy support regarding the application of AI in internal oversight can accelerate its implementation and address these challenges more effectively.

This article aims to review relevant research on applying Artificial Intelligence (AI) technology in internal supervision to prevent fraud in Indonesia's public procurement system. Through a Systematic Literature Review (SLR) approach guided by the PRISMA method, this article seeks to compile and synthesise existing research results to comprehensively understand the extent to which AI has been used in public procurement. This literature review focuses on identifying the benefits of AI in detecting complex fraud patterns and the role of AI in reducing the risk of budget

misappropriation. In addition, this article also evaluates the advantages of AI in improving the accuracy and speed of surveillance, which are more effective than traditional surveillance methods. This research examines the potential offered by AI and examines the challenges faced in implementing this technology in Indonesia. These challenges include limited technological infrastructure, the need for specialised training for human resources, and resistance to bureaucracy changes that still rely on manual surveillance systems. This study provides a balanced picture of the opportunities and constraints and presents recommendations to optimise AI adoption to strengthen transparency and accountability in the public procurement system. Thus, this study is expected to significantly contribute to understanding the role of AI in eradicating fraud in the public sector, as well as support the development of more inclusive and progressive policies in Indonesia

## 2. METHOD

This study uses the Systematic Literature Review (SLR) to evaluate the relevant literature regarding the application of Artificial Intelligence (AI) technology in internal supervision in the public procurement system in Indonesia. The SLR method is ideal because it provides a systematic and transparent approach to identifying, selecting, and synthesising existing research results, ensuring that research findings are based on credible data and literature. In applying this method, our research follows the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, which provide a rigorous and targeted structure in the process of screening and selecting relevant articles (Page, McKenzie, et al., 2021; Page, Moher, et al., 2021; Rethlefsen et al., 2021; Toorajipour et al., 2021).

The first stage in this SLR method is to search literature using major academic databases such as Scopus, Web of Science, and Google Scholar. These three databases were chosen because they provide access to reliable, up-to-date and high-quality research. To ensure comprehensive coverage, we use a variety of keyword combinations such as "Artificial Intelligence", "fraud", "procurement", "internal audit", and "Indonesia". This combination is designed to capture all relevant articles discussing internal oversight using AI in Indonesia's public procurement context.

After the initial search, the next step is screening the articles found. In this stage, articles are filtered based on the inclusion and exclusion criteria set. The inclusion criteria include articles that specifically address the application of AI in the internal supervision of public procurement, both through empirical studies and theoretical literature studies. Articles published between 2010 and 2024 are included in the analysis to reflect the latest technological and regulatory developments related to fraud surveillance in the public sector (BAO et al., 2020; Craja et al., 2020; K. Wang et al., 2020).

In contrast, articles that do not meet the exclusion criteria are immediately excluded from the analysis. Some exclusion criteria used include articles that do not focus on the public sector, articles that use surveillance methods other than AI, and research that does not explicitly address the Indonesian context. By eliminating these irrelevant articles, we ensure that only the literature most relevant to the research topic is considered in the final synthesis.

Once the screening process is complete, the remaining articles are further evaluated based on eligibility criteria. In this process, we examine the methodology used in the article, the reliability of the data sources, and the results of relevant research to ensure the quality of the included article. We also evaluated whether the article offered a new or significant contribution to understanding the application of AI in internal control, especially in the context of fraud in Indonesia's public procurement sector.

The last stage in the PRISMA method includes articles that pass all evaluation stages. These articles are then analysed in depth to evaluate the effectiveness of AI applications in detecting and preventing fraud in public procurement and identify the main challenges faced in implementing the technology. This analysis clarifies how AI can be integrated more effectively into Indonesia's internal oversight system (Falco et al., 2021; Sari et al., 2022; Zdyrko & Ostapchuk, 2020).

Using the PRISMA-based SLR method, this study produces a comprehensive and evidence-based synthesis of AI's impact on internal supervision and fraud prevention. This method ensures that the literature review is conducted in a structured and transparent manner, which in turn

strengthens the validity of our research findings. The final results of this study are expected to guide policymakers and academics in optimising the application of AI to improve the public procurement system in Indonesia

### 3. RESULT AND DISCUSSION

#### The application of AI in internal supervision

Application **Artificial Intelligence (AI)** Internal supervision has become an increasingly relevant topic in recent years, especially in efforts to prevent and detect fraud in the public procurement system. Based on the literature analysed, AI has proven superior abilities in identifying fraud patterns that are often not detected by manual supervision. One of the critical advantages of AI is its ability to analyse large and complex amounts of data in real time. AI can detect anomalies humans may miss, such as price inflation and collusion between providers of goods or services involved in public procurement (Cui et al., 2020; Page, Moher et al., 2021).

AI allows for more comprehensive oversight because AI algorithms are designed to learn from existing data and identify suspicious recurring patterns. For example, when AI detects an unusual bidding pattern or a vendor often involved in the same procurement, the system automatically flags the activity as an anomaly. AI can also analyse large amounts of transactions and detect irregularities in a much shorter time than manual supervision, which requires a lot of time and human resources. This makes AI efficient in improving surveillance accuracy (Cui et al., 2020; Signor et al., 2023).

In addition, AI provides real-time monitoring capabilities, where the system can continuously monitor transactions without interruption. This differs from manual supervision, generally carried out periodically and reactively. With AI-based monitoring, any suspicious transaction can be immediately identified and acted upon, thus preventing potential losses due to fraud that is not immediately detected. With this real-time monitoring, the risk of fraud in the public procurement system can be minimised (Ashfaq et al., 2022; Caiazza et al., 2023; Cao et al., 2019).

Another advantage of AI is its ability to work with different data types, including historical data and data sourced from different departments or entities. AI can integrate data from various sources to provide a more holistic analysis of procurement activities. For example, AI can examine relationships between vendors, transaction history, and payment patterns to find previously unnoticed indications of collusion. With this capability, AI provides significant added value in more effective and efficient fraud prevention efforts (A. Leite et al., 2020; Baesens et al., 2021).

In addition to its technical advantages, AI offers the ability to learn from ever-evolving data. Using machine learning, AI can update its algorithms as changes in transaction patterns or fraud techniques become more sophisticated. This makes AI more adaptive than manual surveillance systems that tend to be static. AI can continue to improve its ability to detect anomalies that may not have been detected previously due to limited data or analysis methods. Over time, AI has become increasingly influential in predicting potential fraud, not just detecting it after the event (Abidi et al., 2021; Gallego et al., 2021; Zhou et al., 2021).

However, while AI offers a variety of advantages, the challenges in its implementation cannot be ignored. One of the main challenges is the quality of the data used by AI systems. AI relies heavily on the availability of accurate and relevant data. If the data used is of poor quality or incomplete, the AI algorithm may not be able to generate optimal analysis. Therefore, organisations need to ensure that the data used in AI systems is constantly updated and adequately validated (Kelly et al., 2019; Raca et al., 2020; Whang et al., 2023).

In addition, implementing AI in internal supervision requires a considerable initial investment in hardware, software, and human resource training. Organisations looking to implement AI must be prepared to invest in technology infrastructure and skilled human resources. Without this readiness, AI applications can face obstacles, such as the inability to utilise the technology fully or even failure to detect fraud that should have been detected (Benedick et al., 2021; Czako et al., 2021).

Ultimately, the application of AI in internal supervision in the public procurement system in Indonesia has great potential to reduce fraud rates and increase accountability. However, the successful implementation of AI requires a holistic approach, including improving technology

infrastructure, good data management, and training human resources. With the proper use of AI, internal oversight in the public sector can be strengthened, providing better protection against fraud risks and increasing efficiency and integrity in public procurement.

### **The Effectiveness of AI in Preventing Fraud in Public Procurement**

Artificial Intelligence (AI) has proven significant potential in detecting and preventing fraud in various sectors, including public procurement. Fraud in public procurement often occurs in the form of abnormal transaction anomalies, such as price inflation, auction manipulation, and collusion between vendors and government officials. AI technology can thoroughly analyse transaction data and detect suspicious patterns which are difficult to identify manually. In this context, AI is a very effective tool for improving the accuracy and efficiency of internal supervision (Chandel & Sarkar, 2023; Signor et al., 2023; Xiong & Xiong, 2021).

The effectiveness of AI in detecting transaction anomalies lies in its ability to process large and complex amounts of data. The AI system is designed to analyse various transaction variables simultaneously, such as offer prices, vendor history, and payment patterns. Using machine learning algorithms, AI can detect repetitive and suspicious irregularities that human auditors may have missed. In the public procurement sector, AI can examine transactions in real time, enabling early detection of fraudulent activity and faster handling (Calvano et al., 2020; Imhof, 2019; Wu et al., 2019).

Although the application of AI in public procurement supervision in Indonesia is uneven, several studies show its potential success. Examples of success in other sectors, like banking and insurance, show that AI can significantly reduce fraud rates. For example, the implementation of AI in the banking sector has successfully detected anomalous patterns in financial transactions, which can be applied with similar methods in the public sector. With the complex public procurement conditions in Indonesia, this technology can be the key to increasing the transparency and efficiency of the procurement process (Decarolis & Giorgiantonio, 2022; Kelly et al., 2019; Raca et al., 2020).

However, the application of AI in public procurement in Indonesia still faces several challenges. One is the readiness of technology infrastructure that is not evenly distributed across all government agencies. Many agencies do not have adequate digital-based supervision systems, making it challenging to implement AI comprehensively. In addition, the lack of technological literacy among government employees is also an obstacle, as the application of AI requires a deep technical understanding to manage and utilise the system optimally (Benedick et al., 2021; Czako et al., 2021; Whang et al., 2023).

Another obstacle is the cost required to implement AI. Significant initial investments in hardware and software are often a barrier for government agencies to adopt these technologies. In addition, migrating from manual to AI-based systems requires significant time and effort. In some cases, the adoption of new technologies in the public sector is often hampered by resistance to change, where employees are more comfortable with conventional methods despite being less efficient (Abidi et al., 2021; Gallego et al., 2021; Zhou et al., 2021).

Nonetheless, the long-term benefits of AI in public procurement oversight are enormous. With an automated and more accurate monitoring system, the risk of fraud can be minimised, thus having a positive impact on government transparency and accountability. AI can also improve supervisory efficiency, allowing auditors to focus on more important strategic aspects, such as risk analysis and decision-making, rather than performing routine oversight tasks (A. Leite et al., 2020; Baesens et al., 2021).

In the long term, applying AI in public procurement in Indonesia can be an effective solution to dealing with complex fraud problems. However, to achieve success, cooperation between governments, the private sector, and technology institutions is needed to ensure that the infrastructure, regulations, and human resources needed are ready to support the implementation of AI. With a holistic approach, AI has great potential to revolutionise public procurement supervision and significantly reduce fraud.

### **Challenges of AI Implementation in Indonesia**

One of Indonesia's most significant challenges in AI implementation is the lack of adequate digital infrastructure. Many government agencies, especially in remote areas, still do not have a stable and fast internet network, which is essential for running AI-based systems. This limited technological infrastructure hinders accurate and real-time data collection, even though AI relies heavily on that data to generate practical analysis. Therefore, without improving technological infrastructure, implementing AI in the public sector will be challenging (Alshahrani et al., 2022; Dunan & Mudjiyanto, 2020; Kuziemski & Misuraca, 2020).

In addition to infrastructure, the cost of AI implementation is a significant obstacle. Adopting AI requires significant investments in hardware, software, and other supporting technologies. The cost incurred is not only to purchase the technology but also to maintain it and address any technical issues that may arise. On the other hand, budgeting in the public sector often has other, more urgent priorities, such as improving public services, so investment in AI is often judged less urgent and less prioritised (Bin Mofidul et al., 2022; Fatimah et al., 2020).

The lack of workforce ability to operate AI-based systems is also a significant challenge. The application of AI in the public sector requires a workforce skilled in digital technology, but many government employees still lack technological literacy. Human resources that are not ready to operate and manage AI systems will hinder the effectiveness of this technology. Additional training and education are needed so government employees can understand how AI works and maximise its potential in public procurement supervision (Gayatri et al., 2022; Suwanto et al., 2022; Wuryaningsih et al., 2019).

Resistance to technological changes is also often an obstacle to AI implementation. Many employees are worried about adopting new technology because they fear losing their jobs or drastic changes in their work routines. AI is often seen as a threat that can replace human labour in surveillance tasks. This sense of uncertainty creates discomfort and resistance, thus slowing down the adoption of technology that can improve work efficiency (Pardamean et al., 2022; Soekamto et al., 2022).

In addition, inadequate regulations to support the implementation of AI in the public sector are a challenge that must be overcome. The lack of policies governing the use of AI and the protection of personal data is a challenge that must be overcome. In some cases, the existing legal framework is not yet flexible enough to accommodate new technologies such as AI. The government needs to adjust regulations so that this technology can be used safely and effectively without causing violations of privacy rights or data security issues.

The application of AI also faces challenges related to integration with existing systems. Many government organisations still use traditional systems that are not yet ready to be integrated with advanced technologies such as AI. Massive changes in the existing information technology system are necessary so that AI can be applied effectively. This integration process requires time, resources, and patience, which often leads to delays in implementation.

Given these challenges, applying AI in Indonesia's public sector requires a holistic approach, including infrastructure improvements, effective cost management, and human resource capacity building. Without the proper steps, AI cannot provide optimal benefits in preventing fraud and increasing transparency in the public procurement system.

### **Comparison with Manual Supervision System**

The manual surveillance system currently used in Indonesia's public sector has many limitations regarding speed and accuracy. Manual supervision often involves physically analysing documents, which is time-consuming and prone to human error. In a complex procurement process that involves many transactions, it is tough for human auditors to detect anomalous anomalies or suspicious patterns efficiently. This is where AI can provide faster and more accurate solutions (Furqan et al., 2020; Sumiyana et al., 2023).

AI can analyse large amounts of data at a much faster speed than humans. For example, AI systems can scan thousands of transactions in seconds and instantly flag suspicious anomalies or patterns. Manual surveillance may take weeks or even months to analyse the same data. With AI,

internal auditors can quickly detect potential fraud and immediately take corrective action before the problem becomes more extensive. (Pramono et al., 2023; Sri & Solimun, 2019)

In addition to speed, AI also offers higher accuracy than manual supervision. Humans tend to make mistakes in analysis, especially when working with large and complex data. This error can cause missed indications of fraud. However, AI is designed to work with precision, with constantly updated algorithms to detect anomalies based on historical data and evolving patterns. This allows for more effective and efficient supervision in the long run (Li et al., 2019; Xu et al., 2019).

While AI offers many advantages, its application still requires changes to the existing procurement process. The procurement process done manually needs to be adapted to suit AI-based systems. For example, transaction data needs to be stored in a digital format that AI algorithms can access. In addition, the audit process also needs to be changed to accommodate the results of AI analysis. Without these adjustments, AI cannot function optimally (Naja et al., 2022; Werner et al., 2021).

Internal auditor training is also essential in this transition process. Auditors need to understand how AI works, how to read the results of AI analysis, and how to follow up on AI findings. Manual supervision may only require auditor intuition and experience, but in AI-based systems, auditors must have technical skills to work with the data generated by algorithms. With the proper training, auditors can maximise the benefits of AI to improve transparency and accountability (Brown et al., 2021; Landers & Behrend, 2023; Lyu et al., 2022).

However, not all aspects of surveillance can be fully automated by AI. Some essential elements of surveillance, such as ethical decision-making and field investigations, still require a human touch. Therefore, AI should be seen as a tool that supports, not replaces, the role of human auditors. Combining AI and human capabilities will create a more robust and efficient surveillance system.

While manual surveillance has some advantages regarding human experience and investigative approaches, AI provides a much more significant advantage in terms of efficiency, speed, and accuracy. By implementing AI as part of the internal control system, the public sector can achieve higher transparency and minimise the risk of fraud in procuring goods and services.

### **Policies to Support AI Implementation**

Policies that support digital transformation as a whole are needed for AI implementation to run effectively in Indonesia's public sector. The government must design clear regulations to encourage the use of AI in internal supervision, especially in public procurement. These policies should include technical and ethical standards governing the use of AI, as well as how data used by AI is managed and protected so as not to infringe on the privacy rights of individuals or institutions.

Providing incentives for technology development is also an essential step in supporting AI implementation. The government can provide incentives through tax breaks or subsidies for institutions that invest in AI technology for supervision. This could spur more public organisations to adopt AI, although the initial costs are high. In addition, collaboration with the private sector in the development of AI technology also needs to be encouraged, as the private sector has the necessary expertise and resources to accelerate the development of this technology (Ångström et al., 2023; Azhgaliyeva et al., 2023).

Human resource training is also a key element in digital transformation policies. The government must invest more funds in training public employees in AI technology to have the skills needed to operate and utilise this technology to the fullest. Without a skilled workforce, AI technology cannot provide optimal results. Therefore, policies that support human resource capacity building are essential to ensure the success of AI implementation (Ahn et al., 2020; Cheng et al., 2020).

In addition, policies that support data management and security are also essential. Data plays a vital role in the application of AI because AI works based on data analysis. The government must establish regulations regulating the use, storage, and protection of data so it is not misused. This policy should include strict security protocols to prevent data leakage or misuse in AI systems used for public procurement oversight (Qi et al., 2022; Yao & Huang, 2022).

Policies also need to clarify the roles and responsibilities of each institution in implementing AI. The central and local governments must coordinate to ensure that digital transformation initiatives run well and are not hampered by overlapping bureaucracy. With clear policies regarding the role of institutions in digital transformation, AI implementation will become more structured and directed.

In addition to policies at the national level, the Indonesian government can also learn from other countries that have successfully implemented AI in public scrutiny. Countries such as Singapore and Estonia have successfully adopted AI to improve government transparency and accountability. By learning from these countries, Indonesia can develop more targeted policies and avoid obstacles that may arise when adopting AI technology.

With policies that support comprehensive digital transformation, Indonesia can maximise AI's potential to improve internal oversight and prevent fraud in public procurement. This policy will be the foundation for the successful implementation of AI so that the government can move towards more transparent, efficient, and accountable governance.

#### 4. CONCLUSION

Applying artificial intelligence (AI) in internal supervision in Indonesia's public procurement sector offers a significant solution for detecting and preventing fraud. With its ability to analyse large amounts of data in real time, AI can improve efficiency and accuracy compared to manual surveillance methods. This technology is well suited to handle the complexity and high volume of transactions in public procurement, providing more transparent and accountable oversight. However, challenges such as limited technological infrastructure, high implementation costs, and lack of technological literacy among public employees must be overcome for AI to be applied effectively. Resistance to technological change also requires a more holistic approach, including training and education to improve employee readiness to use AI. Without this readiness, the application of AI risks not delivering maximum results. In addition, the success of AI implementation is highly dependent on government policies that support digital transformation. Clear regulations on the use of technology, data security, and privacy protection need to be developed immediately. This policy and incentives for technology development and HR capacity building will accelerate AI adoption and ensure safe and effective implementation. In conclusion, despite the challenges that must be faced, AI has great potential to improve public procurement supervision in Indonesia. With the right policy, infrastructure, and collaboration between the public and private sectors, AI can be an essential tool in eradicating fraud and increasing accountability in governance.

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