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The influence of the e-catalogue system on fraud prevention in goods and services procurement in the regional government of Mimika Regency

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Abstract
Purpose: This study aims to examine the influence of the e-catalogue system on fraud prevention in the procurement of goods and services within the Mimika Regency government and to assess how fraud prevention mediates the relationship between e-catalogue implementation and procurement effectiveness.
Research/methodology: A quantitative descriptive and explanatory approach was applied using path analyses. Data were collected through structured questionnaires from 50 purposively selected procurement officers and vendors in the study area. Regression and Sobel tests were used to measure the direct and indirect effects of the variables: e-catalogue implementation, fraud prevention, and procurement effectiveness.
Results: The findings indicate that the implementation of the e-catalogue system has a significant positive effect on fraud prevention but does not directly affect procurement efficiency. However, fraud prevention significantly influences procurement effectiveness and acts as a mediator between e-catalogue use and procurement performance. The model explains 75.5% of the variance in the procurement effectiveness.
Conclusions: The implementation of the e-catalogue system significantly enhanced fraud prevention in public procurement, reinforcing transparency and reducing irregularities. Although it does not directly impact procurement effectiveness, its influence becomes substantial when mediated through strong fraud prevention mechanisms. Thus, digital systems alone are insufficient; effective procurement depends on the integration of technology, robust oversight, and institutional integrity.
Limitations: This study is limited to a single regency and relies on self-reported perceptions, which may not capture the full scope of systemic or technical constraints in e-procurement.
Contribution: This study contributes to the literature on digital governance and public procurement by highlighting the strategic role of fraud prevention as a mediating factor. This underscores the need for integrated systems that combine digital tools with robust internal control mechanisms to ensure transparent and effective procurement.

Keywords: *e-Catalog, Effectiveness, Fraud Prevention, Path Analysis, Procurement of Goods and Services*

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1. Introduction

Procurement of Goods and Services is one of the key components in supporting the operational effectiveness of the government and the provision of public services (Ajis, Nugroho, & Eriswanto, 2024). Through good procurement practices, local governments can ensure the availability of essential public needs, such as infrastructure, education, and healthcare. With a significant portion of the budget allocated to the procurement of goods and services, this process is crucial for creating efficient and sustainable development. However, non-transparent procurement can lead to waste, inefficiency, and reduced public trust in the government.

The procurement of goods/services is one of the government activities under the Government Procurement Policy Agency (LKPP) (Prikustiawan, 2023). Accountable procurement of goods and services plays a critical role in promoting transparency, efficiency, and accountability in the government (Akbar & Syamsir, 2024), especially in Mimika Regency, which is a strategic area with significant economic potential. Accountability in the procurement of goods and services ensures that public funds managed by the local government are used appropriately and target the right objectives, preventing potential national losses due to misuse or fraudulent activities. With good management, the procurement of goods and services can increase public trust in the government while promoting sustainable development through more optimal budget allocations.

As a region facing geographical challenges and diverse development needs, the Mimika Regency requires a procurement system capable of addressing these complexities. This system must ensure that each procurement process is conducted openly, competitively, and with integrity, minimizing the potential for fraud, such as collusion, budget mark-up, or manipulation of tender processes. Accountable procurement also helps create a healthy business climate in which both local and national businesses can participate fairly and according to regulations. The application of accountability principles in procurement also serves as an instrument to improve governance (Rosidah, Kesumah, & Rizka, 2023). This is essential for achieving sustainable development goals, both in terms of improving the quality of public services and meeting the needs of the people of Mimika Regency more equitably. Therefore, building accountable procurement is a strategic step in promoting a clean, transparent, and responsible government in Mimika Regency.

Although important, the procurement of goods and services at the government level often faces various challenges. One prominent issue is the risk of fraud, such as corruption, collusion, and nepotism, in the procurement process. These practices not only harm the country financially but also hinder its development goals. Data from various sources show that fraud in the procurement of goods and services remains a serious issue in many regions of Indonesia, including at the district level. This indicates the need for more effective solutions to mitigate fraud risk in the procurement process. Problems in procurement, such as corruption, collusion, and nepotism (KKN), remain serious challenges that can harm state finances and hinder the achievement of fair and equitable development (Samudra, Siburian, Hasanah, & Siregar, 2024). Corruption often appears in the form of budget manipulation, bribery, or price inflation (mark-up), causing procurement to be inefficient and the quality of goods/services obtained to be low. Collusion, which typically involves illegal cooperation between suppliers and procurement officials, often leads to tender-setting practices, where the project winner is already determined, thus eliminating the principle of healthy competition.

Nepotism stems from the abuse of power by awarding procurement projects to parties with personal or familial relationships without considering their competence or eligibility. This not only tarnishes the integrity of the procurement process but also harms those who are competent and entitled to the opportunities. The combination of these KKN problems results in double losses: budget waste and low-quality procurement outcomes, ultimately harming the public, the main beneficiaries of the project. The main causes of these KKN issues include weak oversight systems, a lack of transparency in procurement processes, and insufficiently strict penalties for violations (Suganda, 2024). Therefore, preventive and enforcement efforts must be made through the implementation of technology-based systems, such as e-catalogues, which can create a more transparent, monitored, and less manipulable procurement process by irresponsible individuals (Kesumadewi, 2020).

Procurement corruption is a global problem. According to a report from the United Nations Office on Drugs and Crime (UNODC), procurement corruption results in the loss of national funds by approximately 10-25 percent. Meanwhile, in 2014, the Organisation for Economic Co-operation and Development (OECD) released a report titled "The OECD Foreign Bribery Report," which stated that 57 percent of bribery cases involved public foreign officials to obtain public procurement contracts. The complexity of the procurement process creates an opportunity for perpetrators to take advantage, especially when the implementation is done manually or face-to-face (Abdullah, Lahaling, & Rusmulyadi, 2024). This condition has prompted the discourse of shifting from manual to electronic processes to limit the interaction between parties and prevent corruption (Pitara, Susilo, & Pitoyo, 2017).

Based on this idea, Presidential Regulation No. 54 of 2010 on Government Procurement of Goods/Services was issued. This regulation marked the beginning of the implementation of electronic procurement, which is now applied in Indonesia. One form of implementation of this regulation is the e-purchasing method launched by the Government Procurement Policy Agency in 2015, where public institutions can directly purchase through electronic catalogs. The e-catalogue system emerged as a significant innovation in the procurement of goods and services to address these issues. As a digital-based platform, e-catalogues allow the procurement process to be more transparent and efficient (Rasji, Novianti, & Nathasya, 2024). With features such as open price offers and extensive information access, this system is designed to reduce opportunities for malpractice, including price manipulation and abuse of authority. The e-catalogue system also expedites the procurement process, ensuring that the required goods and services are fulfilled more quickly.

The e-catalogue system is considered an effective solution to address corruption, collusion, and nepotism (KKN) in the procurement of goods and services because of its ability to create a transparent, efficient, and data-driven process. The e-catalogue displays all information about goods and services, including specifications, prices, and providers, and is available openly and can be accessed by the relevant parties (Malinda & Hardjomuljadi, 2018). This minimizes opportunities for budget manipulation and price inflation (mark-up) because all transactions are electronically recorded and easily auditable. This transparency also closes the gap for collusion practices, where tender winners are predetermined, as procurement is based on direct choices from a validated catalog. Additionally, the e-catalogue system eliminates the potential for nepotism in procurement because registered suppliers undergo a strict independent verification process. This mechanism ensures that only qualified suppliers can offer their products or services, thereby reducing the risk of abuse of authority by certain individuals. This system also reduces direct human involvement in the selection process, which is one of the main triggers of KKN practices.

Another advantage of the e-catalogue system is its efficiency in speeding up the procurement process without compromising accountability (Saidah, Ningtyas, Sari, & Purwoko, 2024). The government can save time and costs by using this system while ensuring that the goods and services obtained meet the needs and budget. Therefore, the implementation of the e-catalogue system not only helps prevent fraud but also improves the quality of governance in procurement, making it cleaner and more professional. According to Salusra Widya, the Secretary General of the Government Procurement Policy Agency (LKPP), the direct payment system or e-purchasing is one of the government's efforts to prevent irregularities and corruption in the procurement of goods and services. In addition, this method is considered to accelerate the procurement process without neglecting accountability. Efficient, transparent, and well-managed procurement is key to organizations’success in achieving their goals. In the face of the dynamics of the business environment and advances in information technology, organizations are required to continuously innovate and utilize technology to increase procurement process efficiency (Haidir & Maliki, 2024).

On the other hand, ministries, agencies, and local governments are also required to use e-purchasing for goods/services that involve fulfilling national and/or strategic needs as determined by the Minister, Head of Agency, or Head of Region. Furthermore, to strengthen the use of e-purchasing, in 2022, the

government through LKPP targeted increasing the number of products in the e-catalogue to 1,000,000 (one million), especially for domestic products. This is done to make more commodities available, facilitating public institutions in purchasing goods and services. Based on the procurement profile data released by LKPP, in the last three years, the number of goods/services procured using e-purchasing has averaged 10% of total government procurement. In 2019, there were 347,557 packages with a transaction value of Rp 69.2 trillion; in 2020, there were 295,532 packages with a value of Rp 49.5 trillion; and in 2021, there were 228,207 packages with a transaction value of Rp 49.7 trillion.

Mimika Regency, as one of the regions with a dynamic economic activity, faces its own challenges in the procurement of goods and services. With significant budget allocation to support development, the risk of procurement irregularities remains a primary concern. The implementation of the e-catalogue system in Mimika Regency is expected to become a solution to improve transparency and accountability while minimizing the risk of fraud that may occur in the procurement process. With the increasing use of e-purchasing and the absence of studies specifically mapping e-purchasing fraud, this research is relevant for the government to develop systems or policies that can detect fraud in e-purchasing. This research is highly relevant for evaluating the impact of the e-catalogue system on fraud prevention in the procurement of goods and services. The results of this study are expected to make a significant contribution to improving procurement governance in Mimika Regency. Furthermore, this research can serve as a reference for other regions facing similar problems, enabling them to optimize the implementation of the e-catalogue system to improve procurement throughout Indonesia.

2. Literature review

2.1 E-Catalog System

The e-catalog system has both positive and negative impacts on the industry. The positive impacts include shopping efficiency, faster procurement of goods and services, and the freedom for users to choose the required goods through the e-catalog. There is also healthy business competition because each provider openly and transparently offers prices (Sihaloho, Ariza, & Munandar, 2024). Before the local e-catalog, local governments had to submit procurement proposals to the central government, which took more time. With the local e-catalog, the time for procurement is shortened and becomes faster (Nafi'ah, 2022). On the other hand, the negative impacts include confusion in price determination, disruption in the supply chain, weakening business turnover in local areas, and the greatest impact is felt by businesses selling Information Technology products (Iqbal, 2020).

2.2 Concept and Principles of Goods and Services Procurement

The procurement of goods and services is a strategic process carried out by organizations, both government and private, to fulfill their operational needs through the purchase or provision of certain goods and services. In the context of government, the procurement of goods and services plays an important role as a key instrument in the use of state budgets to support public services and development (Hardiyan, 2023). This process involves various stages, starting from needs planning, budget preparation, and provider procurement to the execution and monitoring of procurement results. The success of effective procurement depends heavily on the application of established principles to ensure transparency, accountability, and efficiency at every stage.

The principles of procurement of goods and services include several key aspects, such as: Here are the procurement principles that must be met (Syafar & Razak, 2022).

1. Efficient
   Goods and services procurement must be done economically, without wasting resources, and in accordance with the planned needs without reducing quality or the final goals to be achieved.
2. Effective
   The procurement process must be able to produce goods or services that meet the needs, with adequate quality, and have a positive impact on the users and society.
3. Transparent
   All stages of procurement must be open, with information easily accessible to the public or relevant parties to ensure that there is no manipulation or deviation in the process of procurement.
4. Open

The procurement process must provide broad and fair opportunities for all goods and service providers who meet the requirements, without discrimination or conflict of interest.

5. Competitive
   Procurement must be conducted with a healthy competition mechanism, where all providers have equal opportunities to participate and compete fairly based on established criteria.
6. Fair or Non-Discriminatory
   The procurement process must be conducted without giving special treatment to any party, ensuring that all participants are treated equally, according to the applicable rules.
7. Accountable
   Every decision and step in the procurement process must be legally, administratively, and morally accountable to the public and supervisory authorities.

These principles are designed to create a procurement system with integrity, ensure the optimal use of public funds, and prevent fraud, abuse, and unethical practices. Therefore, the application of these procurement principles serves not only as a technical guideline but also reflects a commitment to good governance.

2.3 Process of Goods and Services Procurement

The operational principles of the e-catalog, as regulated and applied in practice, include several crucial stages: The e-catalog requires the procurement party to collect product and service information electronically. This involves preparing an electronic catalog that meets the specified criteria and formats (Ariza, 2024). The procurement process is then carried out electronically, including provider registration, requests for offers, and evaluation of offers. Openness and transparency are key focuses, in line with regulations that emphasize healthy competition in procuring goods and services. The e-catalog consists of national, sectoral, and local electronic catalogs (Faniyah, Pratama, & Yendri, 2024). In practice, the e-catalog not only provides efficiency in information access but also ensures system security and its reliability. The parties managing the e-catalog are responsible for maintaining data security and integrity, ensuring the trust of all parties involved in the procurement process. Routine evaluation of system performance and updates in accordance with regulations are important steps to maintain the relevance and effectiveness of the e-catalog as technology and user needs evolve. By implementing these principles, the e-catalog not only becomes an efficient tool for procurement but also upholds standards of integrity, transparency, and security in line with applicable regulations..

2.4 Process of Listing Goods and Services in the E-Catalog

Goods/services procurement must be open to providers who meet clear and transparent requirements to create healthy competition (Faujianto, Indrayana, & Rohmatiah, 2023). The urgency of the policy on procurement through the e-purchasing mechanism with the electronic catalog system (e-catalog) is aimed at supporting the procurement process in the era of the Internet of Things to align with the progress of time. (Arifin, Daga, & Anshar, 2023). According to Presidential Regulation No. 16 of 2018 on Government Goods/Services Procurement, Article 72 explains that

1. The selection of products listed in the electronic catalog is carried out by Ministries/Institutions/Local Governments or LKPP (paragraph 3)
2. The selection of electronic catalog products is done through tender and negotiation methods (Section 4). This means that Ministries/Institutions/Local Governments or LKPP can choose products to be listed in the electronic catalog as long as they pass the verification carried out by the LKPP team. Additionally, the product selection process in the electronic catalog can be done through two methods: tender or negotiation

2.5 Purchasing Goods/Services with Price Negotiation Method

The Government Procurement Policy Institute is a government institution responsible for handling public affairs (Widhi, 2023). Until now, the electronic catalog system only accommodates purchases through price negotiation and mini-competition methods. A competitive catalog is not available. In this section, the researcher focuses on examining the potential for fraud in purchasing products/commodities in the electronic catalog that uses the price negotiation method. This method requires ministries, institutions, and local governments to negotiate prices before purchasing products. According to the

Director of System Development Circular No. 27199/D.2.2/10/2022 on October 25, 2022, it was mentioned that the displayed product price in the electronic catalog was not final and needed price correction/checking through the negotiation process. Generally, for purchases above 200 million IDR, the ordering/package creation is done by the PPK. For packages under 200 million IDR, ordering/package creation is done by PP.

The e-catalog system is a digital platform designed to simplify the procurement of goods and services efficiently, transparently, and accountably. The e-catalog functions as an online directory containing information about goods or services, including their specifications, prices, and verified providers. This system allows users, especially government agencies, to place orders directly without going through time-consuming auctions or tendering processes. This concept aims to reduce potential deviations, such as price mark-ups, collusion, and nepotism, by providing data that are open and accessible to all relevant parties.

2.6 Comparison of E-Catalog and Non-E-Catalog Systems

1. Time Efficiency: E-catalog enables faster selection and purchasing processes compared to the manual tender system, which requires a lengthy evaluation period.
2. Transparency: E-catalogs provide open data that can be accessed by the public, whereas manual systems tend to be less transparent.
3. Data Security: E-catalog uses a digital system with a clear audit trail, whereas the manual system is more susceptible to manipulation.
4. Risk of Fraud: The risk of fraud, such as price mark-ups, collusion, and nepotism, is lower in the e-catalog system because of the presence of standards and automatic monitoring.
5. Flexibility: E-catalogs allow users to choose goods/services according to their needs without having to wait for the tender process to complete, while the manual system is more limited in flexibility.

2.7 Definition of Fraud

Fraud is an unlawful act committed by someone within or outside an organization, with the intent of gaining personal or group benefits and directly or indirectly harming other parties. Fraud is a deliberate act by one or more individuals in management or those responsible for governance, employees, and third parties involving deception to gain unfair or illegal benefits (Rozak & Gayah, 2017). Fraud involves obtaining benefits by presenting something that is not in accordance with the actual situation. It includes elements of surprise, trickery, cunning, and dishonesty that harm others' interests. Fraud (fraud) should also be distinguished from error.

3. Research methodology

This study used a descriptive and explanatory quantitative approach to analyze the impact of the e-catalog system on fraud prevention in the procurement of goods and services in the Mimika Regency Government. This method allows testing causal relationships between the independent variable (implementation of the e-catalog system), the mediating variable (fraud prevention), and the dependent variable (procurement effectiveness). Primary data were obtained through the distribution of structured questionnaires to 50 respondents selected using purposive sampling from a population of 65 procurement officials (PPK and procurement officers) and service providers directly involved in the e-purchasing process. The questionnaire used a five-point Likert scale to measure perceptions of transparency, efficiency, accountability, and fraud potential.

Path analysis was used to identify both direct and indirect relationships between variables and to test for mediation effects. Validity and reliability tests were conducted to ensure the quality of the instruments. Data processing was performed using statistical software to generate accurate, measurable, and reliable analysis results. This study also refers to good governance theory and the principles of efficient, transparent, and accountable procurement. This study is expected to contribute to efforts to improve public procurement governance that is clean and free from fraudulent practices.

4. Results and discussions

4.1 Research Results

4.1.1 Descriptive Statistical Analysis

This analysis serves to describe the basic characteristics of the collected data, such as the respondent profile (age, gender, education, work experience), and an overview of respondents' responses to the research variables (Implementation of E-Catalog, Fraud Prevention, Procurement Effectiveness). This analysis does not aim to draw general conclusions but provides an initial understanding of the data.

1) Data Quality Test (Validity and Reliability)

The validity test ensured that each item (question) in the questionnaire truly measured the concept or variable it was intended to measure. This is essential for ensuring the accuracy of the measurement tools used. The reliability test measures the consistency or stability of the questionnaire results when measurements are repeated at different times or under different conditions. A reliable instrument provides trustworthy data.

4.1.2 Stage I Regression Analysis

This analysis aims to measure and test the influence (causal relationship) of one or more independent variables on one dependent variable. Stage I (Simple Regression) analyzes the direct effect of the implementation of the E-Catalog (EC) on Fraud Prevention (FP).

The first stage of path analysis was conducted to determine the effect of the e-catalog implementation (EC) on fraud prevention (FP). This analysis was carried out using simple linear regression with the help of SPSS software. The results of this analysis will form the basis for examining the direct influence of the independent variable on the first dependent variable before moving on to the next stage of analysis. Detailed information regarding the regression coefficient values, significance, and strength of relationships is presented in the analysis results table, which is discussed further in the next section.

Table 1. Stage I Regression Analysis Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.346	8.010		1.541	.134
	E-Catalogue System(EC)	.685	.186	.571	3.684	.001

a. Dependent Variable: Fraud Prevention (FP)

Source: Processed Data (2024)

Based on the regression analysis results, the regression equation that describes the effect of the implementation of the E-Catalogue System (EC) on Fraud Prevention (FP) is as follows:

$$PF=12.346+ 0.685EC$$

From the equation above, it can be concluded that when the E-Catalogue System (EC) increases by one unit, Fraud Prevention (FP) will increase by 0.685, assuming that all other factors remain constant. The constant value of 12.346 indicates that Fraud Prevention (FP) will have a baseline value of 12.346 when the E-Catalogue system (EC) is not implemented (zero). The significance test result shows that the coefficient for the implementation of the E-Catalogue System (EC) has a p-value of 0.001, which is smaller than the significance value of 0.05. This indicates that the effect of the implementation of the E-Catalogue System (EC) on Fraud Prevention (FP) is significant. Thus, it can be concluded that the implementation of the e-catalogue system contributes positively to fraud prevention efforts in the organization being studied.

Furthermore, the partial determination coefficient value (Standardized Beta Coefficient = 0.571) also shows that the contribution of EC to FP is strong and relevant, making EC an important predictor in

this model. This suggests that organizations that implement the e-catalogue system more thoroughly have a higher chance of reducing fraud potential in procurement. In other words, the implementation of EC is not only a technological innovation but also an instrument to strengthen effective governance in support of good governance principles, particularly transparency and accountability.

4.1.3 Stage II Regression Analysis

Stage II (Multiple Regression) analyzes the effect of the implementation of the e-catalog (EC) and fraud prevention (FP) together on the Effectiveness of Procurement of Goods and Services (BJ). In the second stage of the regression analysis, multiple regression was performed to test the influence of the implementation of the E-Catalogue System (EC) and Fraud Prevention (FP) on the Effectiveness of Procurement of Goods and Services (BJ). The purpose of this multiple regression analysis is to determine whether these two independent variables, EC and FP, simultaneously affect BJ as the dependent variable. The results of this multiple regression analysis will provide information on the contribution of each independent variable to the Effectiveness of Procurement of Goods and Services (BJ) and the significance level of the relationship. By combining these two independent variables in one model, it is expected to depict more accurately the complex and realistic factors affecting procurement effectiveness. The results of the second-stage regression analysis are shown in table below.

Table 2. Stage II Regression Analysis Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	14.248	5.012		2.843	.008
	E-Catalogue System(EC)	.086	.136	.089	.630	.534
	Fraud Prevention (FP)	.596	.114	.743	5.248	.000

a. Dependent Variable: Procurement Effectiveness (BJ)

Source: Processed Data (2024)

Based on the results of the second-stage regression analysis involving the two independent variables, the E-Catalogue System (EC) and Fraud Prevention (FP) on the dependent variable Effectiveness of Procurement of Goods and Services (BJ), the multiple linear regression equation is as follows:

$$BJ = 14{,}248+0{,}086EC+0{,}596PF$$

From the equation above, it can be explained that the constant value of 14.248 indicates that when both EC and FP are zero, the effectiveness of procurement is predicted to be 14.248. The regression coefficient for the E-Catalogue System (EC) is 0.086, which shows a positive but insignificant effect on the Effectiveness of Procurement of Goods and Services (BJ) because the significance value is 0.534 (greater than 0.05). This means that increasing the implementation of the e-catalogue does not significantly affect procurement effectiveness.

On the other hand, the Fraud Prevention (FP) variable has a regression coefficient of 0.596 with a significance value of 0.000 (less than 0.05), meaning that FP has a positive and significant effect on the Effectiveness of Procurement of Goods and Services (BJ). This indicates that the higher the fraud prevention efforts, the higher the effectiveness of procurement processes. This result emphasizes the importance of integrity and control in procurement, showing that procurement success is determined more by fraud prevention mechanisms than by digital systems such as e-catalogs.

4.1.4 Path Analysis

Path analysis was used to test a more complex causal relationship model between variables, including the measurement of both direct and indirect effects. In this study, path analysis was used to examine how EC affects BJ, both directly and indirectly, through PF as a mediating variable. After testing the validity and reliability of the instruments and conducting a descriptive analysis of the variables, the next step in this research was to test the structural model through path analysis. This model was used to

determine the direct and indirect effects between the variables defined in the research framework. In this case, the E-Catalogue System (EC) variable serves as the independent variable (X), Fraud Prevention (FP) as the first dependent variable (Y1), and Procurement Effectiveness (PE) as the second dependent variable (Y2).

This structural model aims to measure the extent of each variable's contribution to influencing other variables, both directly and indirectly through the mediating variable. The results of the path analysis will provide a comprehensive overview of the causal relationships between variables and test the hypotheses formulated in this study. The structural model used in this study is illustrated below.

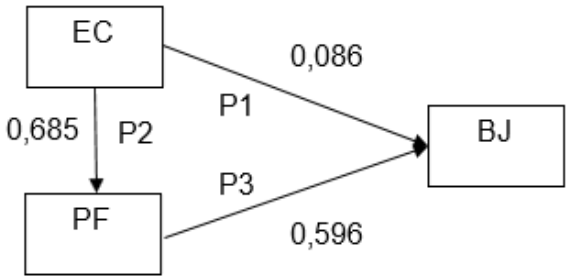

Figure 1. Path Analysis Model

The interpretation of each path is outlined as follows:
1. The direct effect of EC on PF has a path coefficient of 0.685
2. The direct effect of EC on BJ has a path coefficient of 0.086
3. The direct effect of PF on BJ has a path coefficient of 0.596
4. The indirect effect of EC on BJ through PF is 0.685 x 0.596 = 0.408
5. The total effect of EC on BJ through PF is 0.086 + 0.408 = 0.494

4.1.5 F-Test

The F-test or simultaneous test is used to determine whether the independent variables together (simultaneously) have a significant effect on the dependent variable in the regression model. This test is important to ensure that the overall model can be used to explain the relationships between the variables under study. In this study, an F-test was conducted to assess whether the E-Catalogue System (EC) and Fraud Prevention (FP) variables simultaneously affect Procurement Effectiveness (BJ). The results of the F-test analysis are presented in the table below.

Table 3. F-Test Results

	Model	*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
1	Regression	340.236	2	170.118	23.539	.000[b]
	Residual	195.131	27	7.227		
	Total	535.367	29			

a. Dependent Variable: Procurement Effectiveness (BJ)

b. Predictors: (Constant), Fraud Prevention (FP), E-Catalogue System(EC)

Source: Processed Data (2024)

Based on the F-test results in the table above, the F value is 23.539, with a significance of 0.000. Since the significance value is less than 0.05, it can be concluded that the regression model built, which includes the E-Catalogue System (EC) and Fraud Prevention (FP) variables, significantly affects the Procurement Effectiveness (BJ) variable. Therefore, the regression model used in this study was appropriate for explaining the relationships between the variables..

4.1.6 T- Test (Partial Test)

The t-test or partial test is used to examine the significance of each independent variable's effect individually (partially) on the dependent variable, while controlling for other independent variables in

the model. This test helps identify which independent variables significantly affect the dependent variable. After conducting the F-test to determine the simultaneous effects of the independent variables on the dependent variable, the next step was to perform the t-test to determine the partial effect of each independent variable on the dependent variable. The purpose of this t-test is to identify the contribution of each independent variable, namely the E-Catalogue System (EC) and Fraud Prevention (FP), to the Procurement Effectiveness (BJ) variable. The test results are presented in Table 5.2. previously. The results of the partial effect analysis are presented below.

1. Effect of E-Catalogue System (EC) on Procurement Effectiveness (BJ): The t-test results show that the E-Catalogue System (EC) variable has a regression coefficient of 0.086, with a t-value of 0.630 and a significance (Sig.) value of 0.534. Since the significance value is greater than 0.05, it can be concluded that the EC variable does not significantly affect Procurement Effectiveness (BJ). This means that the E-Catalogue System, on its own, is not strong enough to increase procurement effectiveness if it is not accompanied by other factors.
2. Effect of Fraud Prevention (FP) on Procurement Effectiveness (BJ). The Fraud Prevention (FP) variable shows a regression coefficient of 0.596, with a t-value of 5.248 and a significance value of 0.000. Since the significance value is less than 0.05, it can be concluded that the FP variable significantly affects Procurement Effectiveness (BJ). This shows that the better the fraud prevention efforts, the higher the effectiveness of the procurement process

Furthermore, the partial standardized coefficient (Beta Standardized Coefficient = 0.571) also indicates that the contribution of EC to PF is strong and relevant, making EC an important predictor in this model. This implies that organizations that more fully implement the e-catalogue system have a higher chance of reducing the fraud potential in procurement. In other words, the implementation of EC is not just a technological innovation but also an instrument to strengthen effective governance that supports good governance principles, particularly transparency and accountability. Other variables outside the model also contributed to the dependent variable. The determination test is explained as follows..

1) Determination Coefficient of Stage I Regression Analysis
Stage I regression explains the effect of EC on PF, as shown in the following table.

Table 4. Determination Coefficient of Stage I Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.571[a]	.326	.302	4.474

a. Predictors: (Constant), E-Catalogue System(EC)
Source: Processed Data (2024)

Based on the regression analysis results of the first model, the determination coefficient (R Square) was 0.326. This means that 32.6% of the variation in the Fraud Prevention (FP) variable can be explained by the independent variable, the E-Catalogue System (EC). Meanwhile, the remaining 67.4% was influenced by other factors outside the model that were not investigated in this study. This shows that although the implementation of the e-catalogue plays a role in improving fraud prevention, there are still external factors that influence the effectiveness of these efforts and need to be considered in developing procurement policies.

2) Determination Coefficient of Stage II Regression Analysis
Stage II regression explains the effect of EC on PF. The results of the determination test are presented in the following table.

Table 5. Determination Coefficient of Stage II Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.797[a]	.636	.609	2.688

a. Predictors: (Constant), Fraud Prevention (FP), E-Catalogue System(EC)

Source: Processed Data (2024)

Based on the regression analysis results of the second model, the determination coefficient (R Square) is 0.636. This indicates that 63.6% of the variation in the Procurement Effectiveness (BJ) variable can be explained by the two independent variables, the E-Catalogue System (EC) and Fraud Prevention (FP). The remaining 36.4% was influenced by factors not included in this model. The adjusted R Square value of 0.609 also indicates that this model is quite good at explaining the relationship between the variables studied, considering the number of variables used. These results confirm that both the implementation of the e-catalogue system and fraud prevention efforts significantly contribute to improving procurement effectiveness in the studied area.

3) Total Determination Coefficient
To determine the total coefficient of the relationship between variables, the effect of errors ε1 and ε2 must be calculated as follows:

a. Calculation of ε1
R^2 of Stage I regression = 0,326
$\boldsymbol{\varepsilon 1 = \sqrt{1 - 0,326}}$
ε1 = 0,821

b. a. Calculation of ε2
R^2 of Stage II regression = 0,636
$\boldsymbol{\varepsilon 1 = \sqrt{1 - 0,636}}$
ε1 = 0,603

The total variance in the data explained by the structural model can be measured using the following equation:
$R^2m = 1- Pe1^2. Pe2^2 ... Pem^2$

The interpretation of this model is as follows.
$R^2m = 1- (0,821)^2.(0,603)^2$
$R^2m = 1- (0,674) (0,364)$
$R^2m = 1- 0,245$
$R^2m = 0,755$

From this calculation, we know that R2m = 0.755. This indicates that the variance in the data explained by this model was 75.5%. In other words, the model can explain 75.5% of the phenomena under study, while the remaining 24.5% is explained by variables outside the model.

4.1.7 Sobel Test
The Sobel Test specifically tests the significance of the indirect (mediated) effect of an independent variable on a dependent variable through a mediating variable. In this context, it was used to determine whether FP significantly mediated the relationship between EC and BJ. In this study, the Sobel Test was employed to assess the significance of the indirect effect of the independent variable on the dependent variable through the mediating variable. This test aims to determine whether the mediating variable plays a significant role in bridging the relationship between the independent and dependent variables. In this analysis, the E-Catalogue System (EC) acts as the independent variable, Fraud Prevention (FP) as the mediating variable, and Procurement Effectiveness (PE) as the dependent variable. The calculation was performed using the Sobel formula, which considers the regression coefficients and standard errors of each path. The results of this test provide information on the strength and significance of the indirect effect occurring through the mediation mechanism. The Sobel test calculations are detailed as follows

1) Calculation of SP2P3
The SP2P3 calculation is as follows:
$$\boldsymbol{SP2P3 = \sqrt{P3^2SP2^2 + P2^2SP3^2 + SP2^2SP3^2}}$$

$$\mathbf{SP2P3} = \sqrt{\mathbf{0,596^2.0,186^2 + 0,685^2.0,114^2 + 0,186^20,114^2}}$$
$$\mathbf{SP2P3} = \sqrt{\mathbf{0,355.0,035 + 0,469.0,013 + 0,035.0,013}}$$
$$\mathbf{SP2P3} = \sqrt{\mathbf{0,012 + 0,006 + 0,000455}}$$
$$\mathbf{SP2P3} = \sqrt{\mathbf{0,018455}}$$
SP2P3 = 0,136

2) Calculation of Z Statistic
The Z statistic is calculated as follows:

$$\mathbf{Z} = \frac{\mathbf{P2P3}}{\mathbf{SP2P3}}$$
$$\mathbf{Z} = \frac{\mathbf{0,865.0,596}}{\mathbf{0,136}}$$
$$\mathbf{Z} = \frac{\mathbf{0,51554}}{\mathbf{0,136}}$$
Z = 3,791

3) Interpretation of Results
Based on the Sobel test calculation, the Z value obtained was 3.291, which significantly exceeded the Z Table value at the 5% significance level (α = 0.05), which was 1.96. This Z value indicates that the mediating effect of Fraud Prevention (FP) in the relationship between the E-Catalogue System (EC) and Procurement Effectiveness (BJ) is statistically significant. In other words, the FP variable effectively mediates the effect of EC on BJ; thus, the presence of FP in the path model is crucial and cannot be ignored. This finding strengthens the argument that the implementation of the e-catalogue system has not only a direct impact but also an indirect role in enhancing procurement effectiveness through the fraud prevention mechanisms. Substantively, this indicates that the better the implementation of the e-catalogue, the higher the fraud prevention efforts, which in turn positively impact efficiency, transparency, and accountability in the procurement process.

4.1.8 Hypothesis Testing Results
Based on all path analysis testing results, the hypothesis testing results of this study are as follows:
1. There is a significant effect between the E-Catalogue System (EC) and Fraud Prevention (FP), with a significance value of 0.001 ($p < 0.05$).
2. There is no significant effect between EC and Procurement Effectiveness (BJ), with a significance value of 0.534 ($p > 0.05$).
3. There was a significant effect between FP and BJ, with a significance value of 0.000 ($p < 0.05$).
4. Simultaneously, EC and FP significantly affected BJ, with an F-value of 23.539 and a significance of 0.000 ($p < 0.05$).
5. FP significantly mediates the effect of EC on BJ, proven through the Sobel test with a Z value of 3.291 ($Z > 1.96$)

4.2 Discussion
This study aims to analyze the relationship between the implementation of the e-catalogue system, fraud prevention, and procurement effectiveness within the scope of the Mimika Regency government. These three variables were chosen based on the urgency of improving the governance of public procurement to be clean, efficient, and accountable. In the context of regional autonomy and fiscal decentralization, the main challenge in public procurement is how the system can prevent fraud while ensuring efficient public spending. Therefore, the results of this hypothesis testing are an important foundation for strengthening procurement reform policies in the region, specifically in Mimika Regency.

The results of the first-stage testing show that the E-Catalogue System has a significant effect on fraud prevention efforts. This indicates that the more optimal the use of the e-catalogue system in the procurement process, the higher the effectiveness of reducing the potential for fraud. In the case of Mimika Regency, digitalization through the e-catalogue provides easy access to information, price

transparency, and standardization of goods/services specifications, making the room for data manipulation and procurement fraud smaller. These results align with the theory of internal control and good governance, in which an open and well-documented system creates more effective control over deviations. This finding also strengthens previous research, which states that the adoption of information technology in the procurement system significantly reduces opportunities for fraud.

The second-stage analysis proves that fraud prevention significantly affects the effectiveness of the procurement of goods and services. This means that the better the fraud prevention efforts made by procurement officials in Mimika Regency, the more effective the procurement process will be in terms of timeliness, quality, and budgetary efficiency. Fraud prevention is not only related to law enforcement but also includes the integrity of the process, the competence of procurement officers, and the multilayered supervision conducted by relevant institutions. In Mimika Regency, strengthening the role of the inspectorate and other internal supervisory institutions is crucial for supporting procurement effectiveness. This finding is consistent with the theory of managerial control, which states that control over behavior and processes is a determining factor in the success of public organizations in achieving efficiency and effective performance.

However, the direct relationship between the e-Catalogue System and the effectiveness of procurement of goods and services was not significant. This indicates that the digitalization of the procurement system does not automatically improve procurement effectiveness if it is not accompanied by strong supervision and fraud prevention commitments. In other words, the system is merely a tool, while success depends on the people and institutions managing it. In the case of Mimika Regency, although the e-catalogue system has been officially used, its implementation still faces challenges in technical and administrative aspects, such as limited Internet access in certain areas, a lack of understanding among human resources, and resistance to change. Therefore, this result emphasizes the importance of strengthening institutional capacity and reforming the work culture within the procurement bureaucracy.

The mediation test using the Sobel test shows that fraud prevention significantly mediates the relationship between the E-Catalogue System and procurement effectiveness. This finding contributes significantly to both the theoretical and practical frameworks. Theoretically, this supports the integrative model, where technology and risk management cannot be separated in modern public procurement systems. The e-catalogue system does not immediately improve procurement output without a clean work culture and accountability. Practically, this means that strengthening internal controls and monitoring fraud potential is key to optimizing the benefits of the digital procurement system. In the context of government procurement implementation in Mimika Regency, the dynamics between digital system implementation, fraud prevention strategies, and procurement effectiveness form a complex ecosystem. The designed structural model shows the connection between digitalization as a modern policy intervention and the strategic role of fraud prevention, which ultimately impacts the efficiency and success of procurement processes at the regional level.

The path analysis results revealed an important finding regarding the relationship pattern between the three main variables. The e-Catalogue System has a significant direct effect on fraud prevention. This finding shows that the higher the level of adoption and utilization of the e-catalogue system, the stronger the fraud prevention mechanisms in procurement processes. In Mimika Regency, the implementation of this system is driven as part of digital bureaucratic reform and transparency, in line with the central government's efforts to strengthen the e-government system. The e-catalogue system functions not only as an administrative tool but also as an internal control instrument that can close loopholes for corruption, especially in the selection and procurement of goods and services.

Furthermore, fraud prevention is a significant determinant of the effectiveness of the procurement of goods and services. This means that the stronger the fraud prevention system applied, the higher the likelihood that procurement will be carried out optimally, on time, of good quality, and with the right targets. In the framework of good governance theory, fraud prevention reflects the principles of integrity and public accountability. Mimika Regency, which has its own geographical and demographic

challenges, requires a system-based fraud prevention approach, not just relying on individual controls. Strengthening a culture of integrity through an integrated system becomes the foundation for creating procurement processes that are not only administratively efficient but also ethically sound.

However, when examining the direct relationship between the E-Catalogue System and the effectiveness of procurement of goods and services, the research results show that its direct effect is not significant. This indicates that, although the digitalization of the procurement process provides a framework for transparency and efficiency, the success of procurement is not solely determined by the adoption of digital systems. In practice, other factors, such as human resource capacity, network and technology infrastructure availability, and the quality of internal supervision, play a moderating role in determining final effectiveness. Therefore, the role of the e-catalogue system is stronger when mediated by fraud prevention success rather than as an independent factor. These results are consistent with public procurement management theories that emphasize technology as an enabler, not a sole solution. Digital literacy and systemic monitoring are essential components to ensure that system implementation leads to a positive impact on procurement goals. In the context of Mimika, challenges such as accessibility to remote areas, limited technical capacity of civil servants, and resistance to change also contribute to the non-significant direct effect of the e-Catalogue on procurement effectiveness.

The findings of the mediation test reinforce this argument. The E-Catalogue System has a significant indirect effect on the effectiveness of procurement of goods and services through the fraud prevention variable. This means that the digital system contributes significantly to procurement success if it is internalized within fraud prevention mechanisms. In other words, the e-catalogue system acts as a catalyst that strengthens internal control instruments, reducing the potential for deviation at every procurement stage. Thus, procurement effectiveness becomes the final output of a clean, transparent, and accountable process. From a regional policy perspective, these results are important for redesigning the procurement approach that not only emphasizes technology-based systems but also underscores the importance of monitoring and fraud prevention systems integrated into the procurement cycle. Mimika Regency needs to strengthen the synergy between the e-catalogue system and internal monitoring systems so that digitalization does not merely become an administrative formality but truly serves as an effective control mechanism.

5. Conclusions

An accountable procurement process is one that is conducted openly, is accountable, and complies with legal provisions and good public financial management principles. Accountability in procurement means that every stage, decision, and use of the budget must be auditable and explained transparently to interested parties, especially the public and the supervisory bodies. This can be realized by implementing the e-catalogue system in the provider selection mechanism.

The E-Catalogue System has a positive and significant effect on fraud prevention, indicating that the digitalization of the procurement process can strengthen transparency and reduce opportunities for fraud in the procurement of goods and services. Fraud prevention has a positive and significant effect on procurement effectiveness, indicating that the success of procurement depends on systematic efforts to prevent fraud at every stage of the process.

The E-Catalogue System does not have a direct significant effect on procurement effectiveness, which indicates that the existence of a digital system alone is not enough to guarantee procurement success without strong internal control. The E-Catalogue System has an indirect effect on procurement effectiveness through fraud prevention as a mediating variable, showing the importance of integrating digital systems and monitoring strategies to achieve effective procurement. The relationship model between the variables in this study has been proven to be significant simultaneously, reinforcing that the combination of electronic procurement systems and fraud control policies is the main foundation for creating transparent, accountable, and effective procurement in local government environments.

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