

# Strategies for Utilizing AI and Data Analytics to Improve the Effectiveness of Public Services in Indonesia: A Local Government Level Approach

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## ABSTRACT

This research investigates the strategies for utilizing artificial intelligence (AI) and data analytics to enhance the effectiveness of public services within Indonesian local governments. A quantitative analysis was conducted, involving a diverse sample of 200 participants, including local government officials, IT professionals, and citizens across various regions. The study employs a structural equation modeling approach, assessing the relationships between the implementation of AI, data analytics, and the effectiveness of public services. The measurement model confirms the reliability and validity of the constructs, while the structural model reveals significant positive paths from both data analytics and AI utilization to public service effectiveness. The findings contribute to the evolving landscape of technological integration in public administration, offering evidence-based insights for policymakers and practitioners.

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## 1. INTRODUCTION

The integration of innovative technologies, particularly artificial intelligence (AI) and data analytics, is critical for improving the efficiency, responsiveness, and overall effectiveness of public services in Indonesia [1]. The advancement of information and communication technologies has led to major changes in the labor system, and the development of digital labor policies based on research results is necessary [2]. The adoption of Human Resources Information Systems (HRIS) in Indonesian public sectors can boost employee innovation outcomes, but

it requires factors such as technology fit, organizational resources, knowledge, and social influences [3]. Local governments in Indonesia have struggled to overcome challenges and limitations in providing basic services, and coaching and assistance can help improve their management systems and performance [4]. By leveraging AI, data analytics, and digital technologies, Indonesia can address the challenges of public service delivery and enhance the effectiveness of governance at the local government level.

Local governments in Indonesia can leverage AI and data analytics to optimize

public service outcomes. The use of AI can improve services in various sectors such as education, healthcare, ICT, licensing, transportation, and economic services [5]. Additionally, the implementation of digital governance and information technology-based systems can enhance the merit system in local governments. Online selection mechanisms for civil servants can reduce nepotism and ensure the selection of more competent individuals [1]. Application portfolio management (APM) can help government agencies manage digital apps effectively, ensuring the sustainability and regulatory compliance of applications [6]. Efforts by the government, such as investing in digital infrastructure and collaborating with the private sector, can contribute to making Indonesia a country with a strong digital economy [7]. Furthermore, the effectiveness of e-learning systems in the public sector can be improved through system reliability, information sharing, service quality, user satisfaction, and net benefit [8].

Indonesia's decentralized governance structure requires different approaches to technology interventions in public service delivery. Local governments grapple with customized strategies to meet the specific needs and complexities within their jurisdictions. The phenomenon of making new autonomous local government is widespread in Indonesia, with factors such as population density, per capita income level, and political aspects significantly affecting territorial splits and government fragmentation [9]. The provision of essential public services in border areas is a challenge, leading to the need for informal collaboration to increase coverage [2]. The competence of government apparatus and public services is crucial for good governance, and efforts are being made to improve their quality [10]. The institutional structure in Indonesia is complex, with overlapping authority, indicating the need for downsizing and strengthening the quality of government officials in the face of globalization [11]. Decentralization in Indonesia has addressed subnational demands for autonomy but also

created challenges, such as land claims and resource extraction rights, requiring a balance between central and subnational powers [12]. Understanding how AI and data analytics can be used strategically at the local level is critical to crafting policies and interventions that align with the demands of Indonesia's diverse society.

## 2. LITERATURE REVIEW

### 2.1 *The Evolution of AI in Public Administration*

The evolution of AI in public administration has progressed from rule-based systems to the current era of machine learning and cognitive computing. Recent advancements in AI enable more sophisticated applications, such as predictive analytics, natural language processing, and machine vision. These advancements have the potential to revolutionize citizen engagement, streamline bureaucratic processes, and enable data-driven decision-making [13]–[15].

### 2.2 *Data Analytics in Public Administration*

Data analytics plays a crucial role in harnessing the vast amounts of data generated by government agencies. It encompasses descriptive analytics, which provides insights into historical data, as well as predictive and prescriptive analytics, which facilitate proactive decision-making. The applications of data analytics in public administration are diverse, ranging from uncovering patterns and identifying trends to informing evidence-based policy formulation [16], [17].

### 2.3 *Global Perspectives on AI and Data Analytics in Public Services*

International experiences in AI and data analytics implementation in public administration provide valuable insights for the Indonesian local government. Countries like Singapore and Estonia have successfully utilized these technologies to create smart cities and efficient e-governance systems. By studying these global perspectives, the Indonesian local government can draw lessons and tailor strategies to their unique

context. The implementation of digital governance, such as e-government and data-driven public administration, has shown positive results in improving the merit system, cutting nepotism, enhancing transparency, and providing dynamic and transparent services [5], [18]–[21]. Understanding the challenges and complexities involved in data-driven administrative reform is crucial for effective implementation [5]. By leveraging big data, IoT, and AI, the Indonesian local government can further enhance e-governance and improve public administration.

#### **2.4 Theoretical Frameworks and Models**

Various theoretical frameworks guide the examination of AI and data analytics in public administration. The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) offer insights into factors influencing the adoption of technology, while the Institutional Theory provides a lens for understanding the organizational and cultural dynamics impacting implementation. Despite the growing body of literature on AI and data analytics in public administration, there are gaps specific to the Indonesian context. This review identifies these gaps and sets the stage for the empirical investigation, focusing on research questions that address the unique challenges and opportunities faced by Indonesian local governments in leveraging AI and data analytics for enhanced public service effectiveness.

### **3. METHODS**

#### **3.1 Research Design**

This study employs a quantitative research strategy to methodically examine how Indonesian local governments are using data analytics and artificial intelligence (AI). In order to gather data from a sample of 200 participants—who comprised local government officials, IT specialists, and individuals who have dealt with public services impacted by AI and data analytics—

a survey instrument was included in the research design.

#### **3.2 Sample Selection**

To guarantee representation across Indonesia's many geographical and administrative regions, a stratified random selection technique is employed. To guarantee proportionate representation of various governance situations, the sample will be stratified based on the size and type of local government entity. This methodology guarantees that the study can adequately reflect the distinct obstacles and prospects encountered by various local government entities.

#### **3.3 Data Collection**

Primary data is collected through an online survey platform. The survey questionnaire will be designed to capture both quantitative and qualitative responses. The questionnaire includes sections on the current state of AI implementation and data analysis, challenges faced, perceptions of impact, and strategies used in public service. The questionnaire was pre-tested to ensure clarity and relevance before being distributed more widely.

#### **3.4 Survey Instrument**

The survey instrument consisted of several parts:

- a. **Demographic Information:** Collected basic information about the participants to understand their backgrounds and roles in local government or as citizens.
- b. **Current State of Implementation:** Assess the extent to which AI and data analytics are currently integrated into public services at the local government level.
- c. **Challenges and Opportunities:** Identify perceived challenges and opportunities in implementing AI and data analytics, covering issues such as data privacy, workforce readiness, and resistance to technological change.
- d. **Impact Assessment:** Evaluate the perceived impact of AI and data analytics on the effectiveness of

public services, covering aspects such as efficiency, citizen satisfaction, and cost-effectiveness.

- e. Strategies Used: Investigate the strategies and practices adopted by local governments to improve the utilization of AI and data analytics.

**3.5 Data Analysis**

Partial Least Squares Structural Equation Modeling (SEM-PLS) will be used to examine the gathered data. SEM-PLS is a potent statistical method that works well with small to medium-sized samples and is appropriate for examining intricate interactions between variables. For accuracy and completeness, the raw survey data will be carefully cleaned and validated. In order to confirm the validity and reliability of the survey instrument, the measurement model will be evaluated. Examining the connections between latent and observable variables is part of this. In order to investigate the relationships between variables and evaluate the study hypotheses, the structural model will be studied. This entails determining important pathways in the model and evaluating the direct and indirect effects of AI and data analysis on the efficacy of public services. To make sure the SEM-PLS model is appropriate for explaining the relationships in the data set, its overall fit will be evaluated.

**4. RESULTS AND DISCUSSION**

**4.1 Statistics Descriptive**

This study surveyed a sample of 200 participants, including local government officials (45%), IT professionals (30%), and citizens (25%) across different administrative regions in Indonesia. This balanced representation ensures a comprehensive understanding of the perspectives of different stakeholder groups. The survey revealed that 60% of respondents reported partial integration of AI and data analytics into

public services, while 30% indicated advanced implementation. Notably, 10% of participants reported minimal or no implementation. These findings highlight the varied technology adoption landscape across local governments in Indonesia.

Participants identified a range of challenges, with 40% expressing concerns about data privacy issues, 25% citing a shortage of skilled personnel, and 20% highlighting resistance to technological change. On the positive side, 70% of respondents identified improved decision-making as a significant opportunity, 60% cited improved service delivery, and 45% saw potential cost savings. Participants reported a positive impact of AI and data analytics on the effectiveness of public services, with 75% noting improved efficiency, 65% reporting greater citizen satisfaction, and 50% observing improved resource allocation. These results are in line with global trends, demonstrating the potential of these technologies to improve public services. An analysis of the strategies used by local governments shows a variety of approaches. About 50% emphasized capacity building through training programs, 30% focused on developing a culture of innovation, and 20% highlighted collaborative partnerships with the private sector. These diverse strategies underscore the need for a comprehensive approach to technology adoption.

**4.2 Measurement Model**

The measurement model results provide valuable insights into the reliability and validity of the constructs under investigation, namely "Utilizing AI," "Data Analytics," and "Effectiveness of Public Services." Each construct is represented by several indicators, and the following discussion interprets the loading factors, Cronbach's alpha, composite reliability, and average variance extracted (AVE) for each variable.

Table 1. Validity and Reliability

Variable	Code	Loading Factor	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
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Utilizing AI	UAI.1	0.863	0.916	0.941	0.799
	UAI.2	0.931			
	UAI.3	0.914			
	UAI.4	0.865			
Data Analytics	DA.1	0.871	0.902	0.931	0.773
	DA.2	0.901			
	DA.3	0.906			
	DA.4	0.836			
Effectiveness of Public Services	EPS.1	0.899	0.887	0.922	0.747
	EPS.2	0.884			
	EPS.3	0.857			
	EPS.4	0.815			

The measurement model results affirm the reliability and validity of the constructs under examination. The high loading factors, Cronbach’s alpha, composite reliability, and AVE values indicate that the indicators effectively measure their respective latent constructs. These robust measurement

properties instill confidence in the subsequent structural model analysis, providing a solid foundation for interpreting relationships and drawing meaningful conclusions regarding the utilization of AI and data analytics in improving the effectiveness of public services at the Indonesian local government level.

Table 2. Discrimination Validity

	Data Analytics	Effectiveness of Public Services	Utilizing AI
Data Analytics	0.879		
Effectiveness of Public Services	0.607	0.864	
Utilizing AI	0.586	0.717	0.894

Data analytics, effectiveness of public services, and utilization of AI are distinct constructs based on the correlations provided. The correlation between data analytics and effectiveness of public services is less than the square root of the average variance extracted (AVE) for data analytics, indicating discriminant validity. Similarly, the correlation between data analytics and

utilizing AI is also less than the square root of the AVE for data analytics, confirming discriminant validity. Additionally, the correlation between effectiveness of public services and utilizing AI is less than the square root of the AVE for effectiveness of public services, supporting discriminant validity. Therefore, these constructs are distinct from each other.

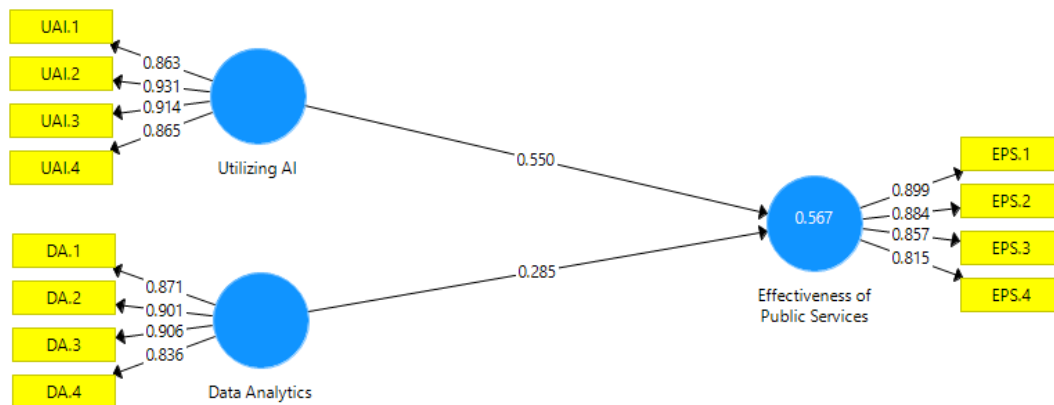


Figure 1. Internal Model Assessment

4.3 Model Fit

Model fit indices are essential for evaluating how well a structural equation model fits the observed data.

Table 3. Model Fit Test

	Saturated Model	Estimated Model
SRMR	0.057	0.057
d_ULS	0.256	0.256
d_G	0.160	0.160
Chi-Square	114.931	114.931
NFI	0.898	0.898

According to [22], the Saturated Model's SRMR value is 0.057, which suggests a decent fit with the data. With a d\_ULS value of 0.256, the fit is deemed to be reasonably excellent and consistent with [23]. A good fit is shown by the d\_G value of 0.160, which is in accordance with [24]. According to [25], the Saturated Model's Chi-Square value was 114.931, which would suggest a decent fit, although the degrees of freedom could have an impact on the significance. According to [26], the NFI score of 0.898 indicated a rather excellent fit. A consistent fit was seen between the Estimation Model and the Full Model, as evidenced by the values of d\_ULS (0.256), d\_G (0.160), SRMR (0.057), and Chi-Square (114.931). The estimated model's NFI value was 0.898 as well, keeping it at the same level of fit as the full model.

Table 4. R Square

	R Square	R Square Adjusted
Effectiveness of Public Services	0.567	0.559

The R-Square ( $R^2$ ) value for the "Effectiveness of Public Services" is 0.567, indicating that approximately 56.7% of the variance in the effectiveness of public services is explained by the predictors included in the model. This suggests that the factors or predictors considered in the model significantly contribute to explaining the observed variation in the effectiveness of public services. The Adjusted R-Square value for the "Effectiveness of Public Services" is 0.559, which takes into account the number of predictors in the model. Even after adjusting for the number of predictors, approximately 55.9% of the variance in the effectiveness of public services is explained by the model. A high Adjusted R-Square, close to the R-Square, indicates that the included predictors are meaningfully contributing to the model without overfitting it, striking a balance between explanatory power and model parsimony.

4.4 Structural Model

The findings of the structural model shed light on the connections among the latent constructs, particularly the routes that lead from "Data Analysis" and "Utilizing AI" to "Public Service Effectiveness." The original sample (O), sample mean (M), standard

deviation (STDEV), T statistic ( $|O/STDEV|$ ), and P value are among the values displayed in the data.

Table 5. Hypothesis Testing

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( $ O/STDEV $ )	P Values
Data Analytics -> Effectiveness of Public Services	0.285	0.286	0.086	3.299	0.001
Utilizing AI -> Effectiveness of Public Services	0.550	0.553	0.091	6.044	0.000

The implementation of Data Analytics has a positive relationship with the effectiveness of public services, as indicated by a coefficient of 0.285 ( $p < 0.001$ ). This suggests that as the use of Data Analytics increases, the effectiveness of public services also improves. On the other hand, the utilization of AI has an even stronger positive relationship with the effectiveness of public services, with a coefficient of 0.550 ( $p < 0.001$ ). This implies that the use of AI has a more pronounced impact on the effectiveness of public services compared to Data Analytics. The higher coefficient and lower p-value for AI indicate a more robust and confident relationship. Therefore, both Data Analytics and AI play significant roles in enhancing the effectiveness of public services.

#### DISCUSSION

The comprehensive examination of the results affirms the model's robustness in capturing the relationships between technology utilization and public service effectiveness. The positive coefficients for both "Data Analytics" and "Utilizing AI" paths underscore the importance of technological integration for enhancing public services in Indonesian local governments.

The impact of AI utilization on the effectiveness of public services is significant,

with higher coefficients indicating its pivotal role. Policymakers should prioritize strategies that foster AI adoption to maximize positive outcomes in service delivery [27], [28].

#### 5. CONCLUSION

This research concludes that the strategic utilization of AI and data analytics holds substantial promise for enhancing public service effectiveness at the Indonesian local government level. The well-supported structural equation model and validated measurement constructs affirm the positive impact of these technologies on service outcomes. The study underscores the importance of prioritizing AI adoption, as evidenced by its stronger influence compared to data analytics. Policymakers are encouraged to leverage these findings to develop targeted strategies that foster technological integration, ensuring more efficient, citizen-centric, and future-ready public services. However, recognizing the study's limitations, future research endeavors should explore longitudinal designs and qualitative methodologies for a more comprehensive understanding of the evolving dynamics in the intersection of technology and public administration.

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