Implementation of Artificial Intelligence-Oriented Digital Government Policy in Malang City: A Quantitative Analysis of Index Achievement and Institutional Readiness, 2022-2026

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Abstract

This study examines how Malang City's digital government policy has performed on a conventional maturity index between 2022 and 2024, and asks how far that performance has been matched by concrete institutional readiness for artificial intelligence (AI) specifically, following the city government's November 2023 declaration of an ambition to become an "Artificial Intelligence City." A descriptive quantitative, ex post facto design was used, drawing on official secondary data from Malang City Government releases, national digital-government regulations, and credible mass media, analyzed through time-series trend analysis, a target-achievement gap analysis, an elapsed-time lag analysis measuring the interval between the AI-city declaration and each subsequent verifiable AI-related action, and a content-analysis inventory of the city's binding digital-government planning instruments. Malang City's Electronic-Based Government System (SPBE) index rose sharply, from 2.60 in 2022 to 3.82 in 2023 and 4.24 in 2024, reaching 140% of the 3.02 target set for 2024-2026 in Mayoral Regulation No. 5/2023 and placing the city among the eight best-performing cities nationally. Yet neither of the city's two binding digital-government planning instruments in force during the observation period, the 2022 Smart City Master Plan and Mayoral Regulation No. 8/2023 on the Electronic-Based Government System, contains any explicit provision for artificial intelligence. The first concrete, verifiable AI-based public service, a multilingual chatbot named TANIA, was launched approximately 21 months after the declaration, not by the core city government but by a semi-autonomous municipal water utility; the first city-government action explicitly branded as an AI program, a digital-literacy workshop, followed at approximately 29 months and was itself described by the issuing agency as only an initial stage. The study concludes that Malang City's strong, well-documented progress on conventional digital-government maturity has not yet been matched by a comparable degree of formal AI governance, and that the imminent national shift to an AI-inclusive digital-government evaluation instrument makes closing that institutional gap an increasingly urgent priority.

Keywords: *Artificial Intelligence, Digital Government Policy, Policy Implementation, SPBE Index, Malang City.*

A. INTRODUCTION

Malang City has, in recent years, positioned itself as one of Indonesia's more assertive local governments on digital transformation. In November 2023, Acting Mayor Wahyu Hidayat publicly declared an ambition to make Malang an "Artificial Intelligence City," pointing to the city's Malang Creative Center (MCC), its base of 57 higher-education institutions and roughly 800,000 students, and a creative economy

sector that contributed 10.01% to the city's economic growth in 2022, as the local assets he expected to drive that transformation (detikJatim, 2023). The declaration was framed as a natural extension of the city's existing digital-government program rather than as a wholly new policy area.

That existing program has, on its own conventional terms, performed strongly. Malang City's implementation of an Electronic-Based Government System (Sistem Pemerintahan Berbasis Elektronik, or SPBE) is governed by Mayoral Regulation No. 8/2023, which establishes the governance structure, management protocols, and monitoring mechanisms for the system (Malang City Government, 2023a), while Mayoral Regulation No. 5/2023 on the Regional Development Plan (RPD) for 2024-2026 sets a target SPBE index of 3.02 for that period (Malang City Government, 2023b). Against that target, the city's SPBE index climbed from 2.60 in 2022 ("Baik"/Good) to 3.82 in 2023 ("Sangat Baik"/Very Good) and 4.24 in 2024 ("Memuaskan"/Satisfactory), placing Malang among the eight best-performing cities in the Ministry of State Apparatus Empowerment and Bureaucratic Reform's (KemenPANRB) national evaluation and seventh among East Java's 38 regencies and cities (Malang City Government, 2025a; Prokota.com, 2025a, 2025b).

Whether that same momentum extends specifically to artificial intelligence is less clear from the public record. The city's governing digital-government instruments predate, or at least do not incorporate, the 2023 AI-city declaration: the 2022 Smart City Master Plan, built around six conventional "smart city" pillars (Governance, Branding, Economy, Living, Society, and Environment), makes no mention of artificial intelligence as a strategy or program (Malang City Government, 2022), and Mayoral Regulation No. 8/2023 on the SPBE, issued the same year as the AI-city declaration, likewise contains no AI-specific provision (Malang City Government, 2023a). The most concrete AI-based public service documented in the city to date, an around-the-clock multilingual chatbot named TANIA that handles billing inquiries and service complaints, was launched in August 2025, not by a core city agency but by Perumda Tugu Tirta, the municipally owned water utility, described in the announcement as the first Indonesian water-sector BUMD to deploy an AI-based customer service system (Malang City Government, 2025b). The most recent city-government action explicitly branded as an AI initiative, an April 2026 digital-literacy workshop run by the city's Communication and Informatics Office (Diskominfo), was itself described by that office as only an initial stage, arising from a community development-planning proposal rather than a standing AI policy (Malang City Government, 2026).

This pattern, strong and well-documented conventional digital-government achievement alongside a far thinner and more fragmented record on artificial intelligence specifically, has not yet been examined systematically. Existing coverage of Malang's digital-government progress consists of government press releases and news reporting on individual events (the SPBE score, the TANIA launch, the literacy workshop), without a study that quantifies the size of the gap between the city's declared AI ambition and its measurable institutional readiness, or that situates Malang's experience against the imminent national shift, formalized in mid-2026,

toward a digital-government evaluation framework that explicitly scores AI adoption. This study accordingly sets out to: (1) analyze the trend in and target-achievement of Malang City's SPBE index from 2022 to 2024; (2) measure the elapsed time between the November 2023 AI-city declaration and each subsequent verifiable, AI-specific governmental action; (3) conduct a content-analysis inventory of the city's binding digital-government planning instruments to establish how far AI has been formally institutionalized as of the observation cutoff; and (4) interpret these patterns through complementary theories of innovation diffusion and e-government maturity.

The study draws on three theoretical lenses. Rogers's (2003) theory of the diffusion of innovations, which models adoption as a sequence running from knowledge and persuasion through decision, implementation, and confirmation, is used as the primary framework for interpreting the interval between Malang's AI-city declaration, essentially a persuasion-stage announcement, and the sparse, decentralized implementation evidence that has followed it. Layne and Lee's (2001) four-stage model of e-government maturity, cataloguing progression from simple information catalogues through transactional, vertically integrated, and horizontally integrated services, is used as a secondary lens for situating Malang's strong SPBE trajectory within the conventional e-government literature. Because that model, published in 2001, does not anticipate artificial intelligence at all, the study also draws on Hujran, Alarabiat, Al-Adwan, and Al-Debei's (2023) SMARTGOV framework, which explicitly extends e-government maturity models to account for AI, data analytics, and related technologies as markers of a distinct "smart government" stage beyond conventional e-government, and which this study uses to interpret where Malang's TANIA pilot and its broader digital-government profile currently sit relative to that extended spectrum.

B. METHODS

This study takes a descriptive quantitative, ex post facto approach, analyzing official records and credible media coverage of Malang City's digital-government and AI-related policy actions without manipulating any variable directly. The population consists of the full set of publicly available official documentation and credible news coverage of Malang City's digital-government and AI-related actions from 2022, when the current Smart City Master Plan was published, through September 2026, the observation cutoff for this study; because this constitutes a census of the available record rather than a sample drawn from a larger population, no random sampling was performed. Readers should note at the outset that verifiable, AI-specific events in Malang City's public record remain few in number as of the observation cutoff; the analyses that follow are accordingly descriptive and exploratory rather than inferential, a limitation this study returns to in the discussion.

Four categories of secondary data were used. The first is Malang City's official SPBE index releases, as published by the city government and reported by credible regional media (Malang City Government, 2025a; Prokota.com, 2025a, 2025b). The second is the regulatory record: Mayoral Regulation No. 8/2023 on the SPBE, Mayoral

Regulation No. 5/2023 on the 2024-2026 Regional Development Plan, and Ministry of State Apparatus Empowerment and Bureaucratic Reform Regulation No. 8/2026 on Digital Government Performance Evaluation, which introduces the Digital Government Index (Indeks Pemdi) that will supersede the SPBE evaluation framework from June 2026 (Kementerian PANRB, 2026; Mitra Berdaya, 2026). The third is official Malang City Government press releases and corroborating news coverage documenting the November 2023 AI-city declaration, the August 2025 TANIA launch, and the April 2026 digital-literacy workshop (detikJatim, 2023; Malang City Government, 2025b, 2026; Bisnis.com, 2025; MalangVoice, 2025; Kompas.com, 2025). The fourth is Indonesia's National Artificial Intelligence Strategy 2020-2045, used as the higher-level national policy context against which Malang City's local actions can be read (Ministry of Communication and Informatics, 2020). All data were gathered through documentary study of these sources.

Analysis proceeded in four stages. First, a time-series trend analysis traced how Malang City's SPBE index changed from 2022 to 2024. Second, a gap analysis, calculated as Gap = Realization - Target, measured the city's 2024 SPBE achievement against the 3.02 target set for the 2024-2026 period in Mayoral Regulation No. 5/2023, expressed both in index points and as a percentage of target achieved. Third, an elapsed-time lag analysis calculated the number of months between the November 2023 AI-city declaration and each subsequent verifiable, AI-specific governmental action identified in the record (the TANIA launch, the digital-literacy workshop, and the effective date of the new AI-inclusive national evaluation instrument), calculated from published dates using calendar months and reported to the nearest month; because the underlying events are calendar dates rather than a measured process, this lag analysis is treated as a straightforward descriptive computation rather than a statistical test. Fourth, a content analysis was conducted on the two binding digital-government planning instruments in force in Malang City during the observation period, the 2022 Smart City Master Plan and Mayoral Regulation No. 8/2023 on the SPBE, coded as a simple binary inventory of whether each document contains an explicit provision for artificial intelligence, expressed as a proportion. All descriptive computations were carried out in Python.

C. RESULTS AND DISCUSSION

1. Trend and Target-Achievement of Malang City's SPBE Index, 2022-2024

Malang City's SPBE index rose from 2.60 in 2022 to 3.82 in 2023, an increase of 1.22 points, and then to 4.24 in 2024, a further increase of 0.42 points (Table 1). Because Mayoral Regulation No. 5/2023 on the 2024-2026 Regional Development Plan was issued in 2023 and sets its target for that three-year period, no directly comparable formal target exists in the sources reviewed for 2022 or 2023; the 3.02 target applies to the 2024-2026 period as a whole and is compared here against the 2024 realization. Against that target, the 2024 index of 4.24 represents an achievement of 140% (a gap of +1.22 points), and placed Malang City among the eight best-performing cities

nationally in KemenPANRB's evaluation, seventh among East Java's 38 regencies and cities (Malang City Government, 2025a; Prokota.com, 2025a, 2025b).

Table 1. Malang City's SPBE Index, 2022-2024

Year	SPBE Index	Predicate	2024-2026 RPD Target	Gap vs Target
2022	2.60	Good (Baik)	n/a	n/a
2023	3.82	Very Good (Sangat Baik)	n/a	n/a
2024	4.24	Satisfactory (Memuaskan)	3.02	+1.22 (140%)

Source: compiled from Malang City Government (2025a), Prokota.com (2025a, 2025b), and Mayoral Regulation No. 5/2023.

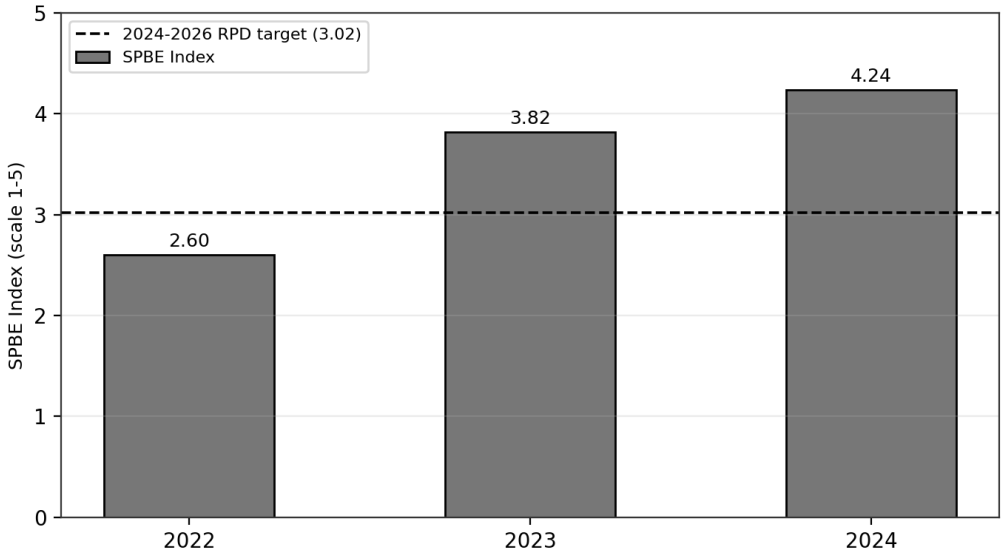

Figure 1. Malang City's SPBE Index, 2022-2024, Against the 2024-2026 RPD Target
Source: Compiled by the Author from the Data in Table 1

2. Elapsed Time Between the AI-City Declaration and Verifiable AI-Related Action

Measured from the November 2023 AI-city declaration, the first concrete, verifiable AI-based public service in Malang City, the TANIA chatbot, followed at an interval of approximately 21 months (Table 2 and Figure 2). The first action explicitly branded as an AI program by a core city-government agency, the Diskominfo digital-literacy workshop, followed at approximately 29 months, and the national regulatory instrument that will, for the first time, formally score AI adoption within local digital-government evaluation, KemenPANRB Regulation No. 8/2026 introducing the Digital Government Index (Indeks Pemdi), takes effect at approximately 31 months (Kementerian PANRB, 2026; Mitra Berdaya, 2026). Notably, the action with the shortest lag, TANIA, did not originate from the core city government apparatus at all, but from Perumda Tugu Tirta, a semi-autonomous municipally owned water utility (Malang City Government, 2025b).

Table 2. Timeline of AI-Related Events in Malang City Relative to the November 2023 Declaration

Event	Date	Responsible Actor	Months Since Declaration
AI-city declaration	Nov 2023	Acting Mayor (City Government)	0 (baseline)
TANIA chatbot launch	Aug 2025	Perumda Tugu Tirta (municipal water utility, BUMD)	~21
Digital-literacy "Bimtek AI" workshop	Apr 2026	Diskominfo (city Communication and Informatics Office)	~29
Indeks Pemdi with AI indicator takes effect	Jun 2026	KemenPANRB (national government)	~31

Source: compiled by the author from detikJatim (2023), Malang City Government (2025b, 2026), and Kementerian PANRB (2026).

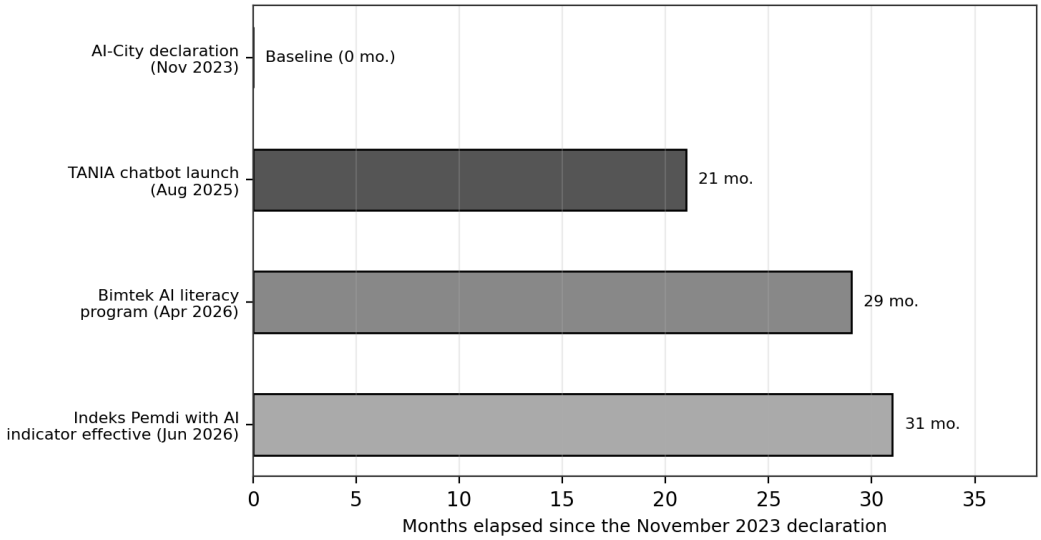

Figure 2. Months Elapsed Between the AI-City Declaration and Subsequent Verifiable AI-Related Action

Source: Compiled by the Author from the Data in Table 2

3. Content Analysis of Binding Digital-Government Planning Instruments

Of the two binding digital-government planning instruments in force in Malang City during the observation period, the 2022 Smart City Master Plan and Mayoral Regulation No. 8/2023 on the SPBE, neither contains an explicit provision for artificial intelligence (0 of 2, or 0%). The Smart City Master Plan, organized around six conventional pillars (Governance, Branding, Economy, Living, Society, and Environment), instead documents concrete but conventional digital-government targets: 68 active e-government applications, a Public Service Mall consolidating more than 400 licensing and non-licensing services, a regional data-integration platform, and modest smart-infrastructure pilots such as five smart traffic-light units and four e-parking locations (Malang City Government, 2022). Mayoral Regulation No. 8/2023 is likewise confined to SPBE governance structure, management protocols, and monitoring mechanisms, with no AI-specific chapter or clause (Malang City Government, 2023a). The only city-government document identified in this study's search that explicitly uses the term "artificial intelligence" in its own name is the April

2026 Bimtek AI announcement, which is a workshop description rather than a binding regulation or plan (Malang City Government, 2026).

Read through Rogers's (2003) diffusion-of-innovations framework, the November 2023 declaration functions most naturally as a persuasion-stage announcement, a public signal of favorable disposition toward AI adoption, rather than as evidence of a completed decision or implementation stage. What followed is consistent with how diffusion theory describes the early phase of an innovation's spread within an organizational system: adoption concentrated in a single, relatively autonomous unit, Perumda Tugu Tirta, ahead of any organization-wide decision, with the core city-government apparatus following considerably later and, even then, only at the literacy-building stage rather than the implementation stage proper. Rogers's model would characterize Tugu Tirta as an early adopter operating within a diffusion process that has not yet reached the confirmation stage anywhere in the broader city government, since no binding instrument yet institutionalizes AI use, monitors its outcomes, or provides for its continuation independent of the individuals currently championing it.

Layne and Lee's (2001) four-stage e-government model helps explain why Malang's SPBE achievement and its AI institutionalization can diverge so sharply. The SPBE index, and the model it descends from, was designed to measure catalogue, transactional, and integration maturity, precisely the dimensions in which Malang has excelled, climbing from 2.60 to 4.24 and comfortably exceeding its 2024-2026 target. Because artificial intelligence lies outside the conceptual scope of a stage model published in 2001, strong performance on that index carries no logical implication for AI readiness at all; Malang's case demonstrates concretely that a city can score "Memuaskan" on the conventional digital-government yardstick while remaining, on the evidence reviewed here, at an early and institutionally ungoverned stage specifically on artificial intelligence.

The SMARTGOV framework of Hujran, Alarabiat, Al-Adwan, and Al-Debei (2023), which explicitly extends e-government maturity to account for AI, data analytics, and related technologies as markers of a distinct "smart government" stage, offers a more precise reading of where Malang currently sits: a high-maturity e-government paired with only an isolated, single-agency smart-government feature. TANIA is a genuine instance of the AI-driven service Hujran and colleagues describe, an around-the-clock, multilingual, adaptive chatbot, but it remains a single pilot at one BUMD rather than a systemic capability spanning the municipal apparatus, and the conventional SPBE framework under which Malang has performed so well has no mechanism to detect, credit, or govern it. This is precisely the blind spot that KemenPANRB's new Indeks Pemdi, effective June 2026, is designed to close, since it explicitly scores the use of artificial intelligence for user-sentiment analysis within its user-satisfaction domain (Kementerian PANRB, 2026; Mitra Berdaya, 2026); Malang's excellent SPBE-era track record offers no guarantee of an equally strong result once that AI-sensitive criterion enters the evaluation.

That the most concrete AI implementation originated from a semi-autonomous water utility rather than the core city government is itself a substantive finding, not an incidental detail. It suggests that, as of the observation cutoff, AI adoption in Malang City is being driven by individual public-enterprise initiative rather than by centrally coordinated municipal policy, a pattern diffusion theory would predict at this early stage but one that also carries a governance concern: TANIA processes customer billing and complaint data through a multilingual AI system without the oversight of any city-wide AI governance instrument, since neither of the two binding planning documents reviewed here extends to AI at all. Indonesia's National AI Strategy 2020-2045 (Ministry of Communication and Informatics, 2020) sets out the national-level policy that local AI initiatives are, in principle, meant to operationalize, but this study finds no evidence that Malang City has yet translated that national framework, or its own 2023 declaration, into a corresponding local instrument.

In practical terms, this gap points toward a specific and reasonably urgent recommendation. With the Indeks Pemdi's AI-sensitive scoring taking effect in June 2026, Malang City's government has a narrow window to formalize a municipal AI governance instrument, at minimum a Mayoral Regulation establishing basic principles for data use, oversight, and accountability for AI-based public services, before the first evaluation cycle under the new framework. Doing so would also let the city consolidate and scale the kind of pilot TANIA represents into a citywide capability, rather than leaving AI adoption to depend on which individual agency happens to champion it next, and would close the gap between Malang's public rhetoric of becoming an "Artificial Intelligence City" and the institutional substance needed to sustain that claim under closer national scrutiny.

A methodological caveat is worth stating plainly. Verifiable, AI-specific events in Malang City's public record remain few as of this study's observation cutoff, so the lag-timeline and document-inventory analyses reported here are necessarily descriptive and exploratory, built on a small number of dated events and two reviewed planning documents rather than on a large sample suited to inferential statistical testing. As Malang City's AI-related initiatives, and the public record documenting them, grow more numerous, a more statistically robust account of the pace and pattern of AI policy diffusion will become possible; this study should accordingly be read as an initial, quantitatively grounded baseline rather than a definitive verdict on the city's AI trajectory.

D. CONCLUSION

This study finds a pronounced divergence between Malang City's conventional digital-government achievement and its institutional readiness for artificial intelligence specifically. On the conventional measure, the city's SPBE index rose from 2.60 in 2022 to 4.24 in 2024, reaching 140% of the 3.02 target set in Mayoral Regulation No. 5/2023 and placing Malang among the eight best-performing cities nationally. On the AI-specific measure, however, the study finds that neither of the city's two binding digital-government planning instruments in force during the observation period

contains any explicit AI provision, and that roughly 21 to 31 months elapsed between the city's November 2023 declaration of an ambition to become an "Artificial Intelligence City" and each subsequent verifiable, AI-specific action, the earliest and most concrete of which originated not from the core city government but from a semi-autonomous municipal water utility.

The study concludes that strong performance on a conventional digital-government maturity index does not, on this evidence, imply comparable institutional readiness for artificial intelligence, a distinction existing e-government maturity models predating widespread AI adoption are simply not built to capture, and one the forthcoming national Digital Government Index (Indeks Pemdi), effective June 2026, is specifically designed to address.

Based on these findings, Malang City's government is encouraged to formalize a municipal AI governance instrument, at minimum a Mayoral Regulation setting out basic principles for data use, oversight, and accountability in AI-based public services, ahead of the first Indeks Pemdi evaluation cycle, and to develop a mechanism for identifying and scaling promising AI pilots such as TANIA into a coordinated citywide capability rather than leaving their adoption to individual agency initiative.

Future research should extend this study's descriptive baseline as Malang City's AI-related policy record grows, ideally through primary data collection, such as structured interviews with Diskominfo and Perumda Tugu Tirta officials, to test directly whether the diffusion pattern identified here, early, decentralized adoption preceding centralized institutionalization, holds as the city's AI initiatives mature, and to compare Malang's trajectory against other Indonesian cities pursuing similar "AI city" ambitions once comparable data becomes available.

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