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Human-Centric Policy Evaluation of Jakarta Smart City Initiatives: Enhancing Citizen Engagement to Create Sustainable Public Service

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Abstract:
As a rapidly growing metropolis, Jakarta faces challenges in delivering sustainable public services through digital citizen engagement. This study evaluates Jakarta's smart city initiatives via the JAKI (Jakarta Kini) platform and employs mixed-methods triangulation of descriptive analysis from six stakeholder interviews and 523,321 citizen reports (2021–2024). Findings reveal a 98.73% report completion rate, yet stark regional disparities persist: 27.91% engagement in South Jakarta vs. 0.03% in Kepulauan Seribu, highlighting failures in digital inclusion under Governor Regulation No. 82/2021. The analysis integrates Arnstein's participation ladder, Norman's human-centered design, and Wiener's feedback loops, exposing tokenistic consultation (Level 3) over co-creation. Structural gaps include fragmented system integration (Presidential Regulation No. 95/2018) and trust deficits despite procedural efficiency. The framework proposes hybrid channels (including SMS and face-to-face), participatory roadmaps, and revisions to Governor Regulation No. 68/2022 to prioritize equitable access and iterative feedback. By aligning policy with the human-centric concept, Jakarta can transition from City 3.0 (user-centered) to City 4.0 (co-creation), balancing technological efficiency with inclusive governance.

Keywords: *Smart City, Human-Centric, Citizen Engagement, JAKI, Sustainable Public Service.*

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INTRODUCTION

Jakarta's smart city initiatives present a critical paradox: despite a technologically advanced citizen reporting platform, Jakarta Kini (JAKI), that achieves a 98.73% report completion rate, the city struggles with profound inequities in citizen engagement and persistent gaps in public trust. This study investigates why high procedural efficiency fails to translate into the human-centric, sustainable public service envisioned by policymakers, revealing a disconnect between technological capability and inclusive governance. To dissect this paradox, this study establishes a human-centric evaluation framework that integrates Arnstein's (1969) Ladder of Participation to measure the depth of citizen power, Norman's (2013) human-centered design principles to assess systemic accessibility, and Wiener's (1985) feedback loops to analyze the effectiveness of government responsiveness. This tripartite lens allows for a critical examination of Jakarta's transition from a technology-driven to a citizen-as-co-creator model (City 4.0).

This investigation is set within a metropolis of 10.68 million residents (BPS, 2024) facing compounding pressures from rapid urbanization (Rangga et al., 2023). The city contends with persistent infrastructure failures—damaged roads, erratic streetlights, and inadequate waste management—that disrupt daily life while threatening long-term sustainability. These challenges are exacerbated by citizens' rising expectations for transparent, efficient public services in an era of digital transformation, a demand that requires the government to improve

its technological capabilities to support the service process (Purba & Jayadi, 2023). In response to these pressures, Jakarta has undergone continuous transformation to improve public services (Amir et al., 2022).

This transformation is legally grounded in the Constitution of the Republic of Indonesia (1945), which grants Jakarta's regional government autonomy and obliges it to enhance community welfare by actively involving citizens in addressing urban problems (Article 11 of Law Number 23 of 2014 on Regional Government 2014). In response to these mandates, Jakarta launched the Jakarta Smart City (JSC) initiative in 2014 to integrate technology and data-driven solutions into urban management (The Jakarta Provincial Government, 2023). A key component is the Jakarta Kini (JAKI) application, launched in 2019, which aims to improve public services through a digital ecosystem for citizen reporting and information access (JSC Lab, 2019; Andriyanto et al., 2021; Daffa & Nugraha, 2021; Prasetia et al., 2024). These policies aim to make Jakarta more efficient and livable based on the smart city concept.

Jakarta's efforts reflect the remarkable adoption of the smart city concept in policymaking in recent years (Angelidou et al., 2017), a model that utilizes technology to improve infrastructure, sustainability, and citizen empowerment (Albino et al., 2015; Kustanto & Rahman, 2020). However, the success of such initiatives hinges on navigating two primary approaches: a human-centric model that prioritizes citizen well-being versus a technology-centric model driven by urban innovation (Hu et al., 2023).

While the JAKI application has increased accessibility for some, it falls short of fostering meaningful participation from diverse citizen groups, particularly those with limited digital access, showing a failure of human-centered design (Subiyanto et al., 2024; Syalianda & Kusumastuti, 2021). Furthermore, mixed experiences with the platform—including delays in problem resolution, lack of follow-up, and concerns about data privacy—undermine the trust required for genuine participation (Barunea et al., 2023; Ilhami et al., 2023), indicating broken feedback loops and a state of tokenistic engagement. Overcoming these significant barriers, including the digital divide, infrastructure limitations, and data security risks, is essential (Wahyudi et al., 2022; Pakpahan, 2024). This requires a human-centric approach that places citizens' needs, experiences, and well-being at the forefront (Norman, 2013) and fosters inclusive policies prioritizing co-creation and responsiveness to create truly sustainable public services.

This study draws on previous research and theoretical models to understand the interplay between policy implementation, accessibility, trust, and citizen engagement, all of which contribute to sustainable public service delivery. Grounded in Jakarta's regulatory framework particularly Governor Regulation Number 68 of 2022 on electronic governance—this model operationalizes several interlinked components that drive sustainable public service delivery through the JAKI platform.

Building upon those pillars, six operational dimensions emerge: (1) accessibility, prioritizing universal service design through Stirling et al.'s (2022) inclusive service paradigms; (2) citizen trust, leveraging Walle & Bouckaert's (2003) transparency frameworks to strengthen institutional credibility; (3) citizen engagement, advancing Arnstein's (1969) participatory ideals through co-creation mechanisms; (4) public service improvement,

harnessing Simonofski et al.'s (2019) feedback efficacy models to optimize resource allocation; (5) feedback loop optimization, applying Wiener's (1985) cybernetic feedback loop principles to streamline bureaucratic responsiveness; and (6) sustainability, implementing Anh's (2023) adaptive governance strategies to ensure long-term human-centric public service evolution.

This synthesized approach positions Jakarta's smart city not as isolated technological deployments but as interconnected sociotechnical systems where participatory design (Arnstein), human-centric service design (Norman), and adaptive learning (Wiener) collectively redefine urban governance, making public services evolve to address citizen needs more effectively, fostering meaningful citizen engagement, and ultimately establishing sustainable improvements in governance and service delivery. A deeper examination of citizen engagement is crucial for understanding the overall success of these interconnected initiatives.

To address the challenges in Jakarta's smart city development, this study aims to evaluate how human-centric approaches can enhance meaningful citizen engagement through the JAKI application and create sustainable public services. The research explores three interconnected questions: (1) How does the current implementation of Jakarta's smart city initiatives shape the nature and quality of citizen engagement, and to what extent does it align with a fully human-centric approach? (2) How can these initiatives better incorporate a human-centric approach to address public service challenges and meet citizens' needs? (3) What specific policy and design interventions are required to transform the JAKI platform from a transactional reporting tool into an ecosystem for sustained, equitable collaboration? Through investigating these questions, the study seeks to identify challenges, evaluate current approaches, and develop recommendations that promote a human-centric approach to Jakarta's smart city ecosystem.

RESEARCH METHOD

The qualitative method was chosen for this study due to its ability to uncover new insights and phenomena from participants' responses, as well as the flexibility it provides researchers to develop explanations for difficult-to-interpret findings. This method is widely used in social science research, offering in-depth, detailed information while integrating the human element (Jervis & Drake, 2014).

This study relied upon primary sources, with data collected from in-depth interviews following a semi-structured protocol with core questions on accessibility, trust, and engagement barriers among research participants. These findings were enriched by secondary data analysis through document review methods, including existing literature, policy documents, and reports on Jakarta's smart city initiatives, to support and strengthen correlations with the primary data. The research design aligned with Creswell et al.'s (2007) concurrent triangulation model, enabling cross-validation of findings through methodological convergence. Data saturation was achieved when no new themes emerged across three consecutive interviews, consistent with Grossoehme's (2014) qualitative research standards. To ensure the validity and reliability of findings, this study implemented rigorous quality assurance measures aligned with Lincoln and Guba's (1985) trustworthiness criteria.

Credibility was established through prolonged engagement (3 months with the Jakarta Smart City Unit) and triangulation of 523,321 CRM reports with six stakeholder interviews.

Table 1: Integrated Research Matrix

Component	Primary Strand	Secondary Strand
Data Sources	6 stakeholder interviews	523,321 CRM reports (CRM Dashboard, 2024); 12 regulations; and Strategic documents (JSC, 2022–2023) on City 4.0 implementation
Participants	Policymakers (P1-P2), service design expert (P3), community leader (P4), and citizens (P5-P6)	Implicit 98,332 unique JAKI reporters
Data Collection	Semi-structured interviews	Platform usage, policy mandates, structural plans, and implementation reports
Temporal Scope	Cross-sectional (2023-2024)	Longitudinal (2021-2024)
Analytical Focus	Insights from interviews	Contextualized patterns

The matrix in Table 1 demonstrates how this study generated insights from various data to evaluate Jakarta's smart city initiatives, following a four stages iterative workflow. The process began with data triangulation, which involved analyzing interview transcripts and reports using Insight7 to identify 27 initial codes (e.g., "tokenism," "digital literacy gaps") and examining secondary data, including CRM analysis via Microsoft Excel to reveal patterns (e.g., South Jakarta's 27.91% engagement dominance). In the pattern recognition stage, interview themes (e.g., P6's frustration over unresponsive authorities) were crossmapped with CRM succession metrics (e.g., 98.73% completion rate) and analyzed using Arnstein's Ladder to classify engagement levels by comparing policy mandates with real world outcomes. The findings were then theoretically integrated into the human-centric framework components. Finally, policy validation tested these emerging insights against Jakarta's Smart City 4.0 roadmap (JSC, 2022) and informed recommendations developed using Simonofski et al.'s (2019) co-creation principles.

RESULTS AND DISCUSSION

Identifying Implementation Gaps

Governance and Coordination Challenges

Jakarta's smart city initiatives, particularly through the JAKI platform, demonstrate an evolving approach to citizen engagement. The city is transitioning from basic digital service delivery to more collaborative governance models, aligning with the principles of human-centric policy design, which prioritize citizens' needs, experiences, and well-being in urban management. As one citizen explains: *"I don't have a strict measure for satisfaction, but for me, it's based on daily needs and activities. The minimum measure of satisfaction is meeting basic needs"* (P6 Interview). Measurement of meeting basic daily needs is a cornerstone of citizen satisfaction in smart city initiatives, and this insight underscores the importance of prioritizing fundamental services in smart city development.

The data shows JAKI as the primary platform for citizen engagement, handling 523,321 reports from 86,774 unique reporters , as shown in Figure 6, reveals a compelling story of digital civic engagement in Jakarta, demonstrating a clear maturation pattern from initial surge to sustained growth, with reports consistently outpacing active users, indicating that citizens

who adopt the platform remain actively engaged in reporting urban issues, and there is a strong motivation among users to see tangible results from their complaints, which drives their continued use.

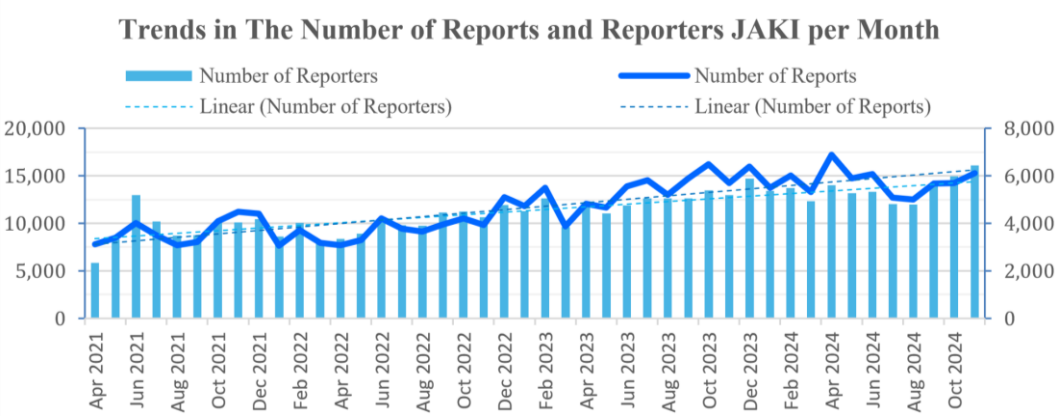

Figure 1: Trends in The Number of Reports and Reporters JAKI per Month (2021-2024)
Source: CRM Dashboard (2024)

This growing adoption demonstrates JAKI's effectiveness as a citizen engagement platform, evidenced by community leader feedback that *"I, as the head of the neighborhood, find it useful to input feedback from citizens"* (P4 Interview). Jakarta's smart city initiative's technological success faces significant governance and coordination challenges despite showing promising technological adoption. The implementation gap between policy aspirations and operational reality reveals a fundamental disconnect in translating human-centric principles into practice.

While Governor Regulation Number 68 of 2022 establishes guidelines for participatory and collaborative governance, actual implementation reflects what Chourabi et al. (2012) identify as fragmentation challenges, where siloes government structures impede the integrated service delivery necessary for effective smart city implementation. Particularly fragmentation service across digital platforms despite Presidential Regulation Number 95 of 2018 mandating integrated electronic based government system, with stakeholders noting that *"If all aspects were integrated into JAKI... it would be more interesting compared to having them separate"* (P5 Interview). This fragmentation limits the platform's ability to deliver cohesive services and undermines its potential to enhance citizen engagement effectively. It becomes particularly evident when examining the distribution of citizen reports across multiple complaint channels.

Reveals a stark imbalance in service channel utilization, with JAKI dominating at 91.28% with unique reporters 87.37%. In contrast, traditional channels remain severely underutilized, Subs-district Offices process only 0.12%, District Offices handle 0.01%, and Governor's Complaints manage a mere 0.009%. Despite this fragmentation, the system demonstrates remarkable efficiency in handling citizen complaints, achieving a 98.73% completion rate with 516,686 completed reports and only 6,635 incomplete (CRM Dashboard, 2024). This impressive performance stems from several key developments in the CRM system's evolution, including the implementation of new guidelines through Regional Secretary Decree Number

22 of 2020, channel optimization, and the establishment of the Jakarta Regional Secretariat Government Bureau as a result verifier. However, this technological efficiency masks deeper governance challenges that require a fundamental shift in approach.

Jakarta government leadership recognizes these structural challenges, with its Head of JSC (Smart City) Unit explaining: "What we're trying to do now is transform the concept. Previously, Smart City was more project-based, meaning if the person in charge moves on, the project ends. Now we're ensuring that Smart City is a sustainable ecosystem" (P1 Interview). This transition from isolated project-based approaches to ecosystem-based models requires significant coordination across Jakarta's complex bureaucratic landscape. The Product Manager elaborates: *"For regulations, it's important because regulations serve as the broad guidelines for all SKPDs (regional work units) ... Each SKPD has its own data, its own system. These need to be integrated"* (P2 Interview). The aspiration toward collaborative governance is evident when the Head states: *"When we build a platform, the JAKI platform isn't just built by the government. It's not just government designed services. It becomes a collaborative ecosystem"* (P1 Interview), showing Jakarta's attempt to position itself at City 4.0 where citizens become co-creators rather than passive users.

Smart City Initiatives Jakarta faces three critical challenges: first, the fragmentation of digital services across multiple platforms and departments, creating significant barriers to integrated service delivery; second, the sustainability of initiatives beyond political and leadership changes, requiring a shift from project-based to ecosystem-based; and third, the multi dimensional nature of implementation barriers spanning people, process, and technology domains. This creates what Walle & Bouckaert (2003) identify as a trust performance paradox, where high procedural efficiency with 98.73% high completion masks fundamental gaps in meaningful citizen participation. To advance smart city vision, Jakarta must bridge this gap between technological capability and human-centric service delivery, ensuring that digital transformation enhances all services and engagement channels

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Digital Divide and Infrastructure Disparities

Table 2: Regional Infrastructure Disparities (2024)

Region	JAKI Adoption Rate	Mobile Network Coverage
Kepulauan Seribu	0.097%	75%
South Jakarta	0.469%	98%
East Jakarta	0.335%	95%
Central Jakarta	0.592%	99%
West Jakarta	0.344%	96%
North Jakarta	0.341%	90%

Source: CRM Dashboard (2024); BPS (2024); Opensignal (2024)

The persistence of this divide is evident in longitudinal data: from 2021 to 2024, Kepulauan Seribu's adoption grew by just 0.037 percentage points, while South Jakarta's increased by 0.203 points (CRM Dashboard, 2024). Structural barriers, as identified by stakeholders, include device limitations incompatible with JAKI's technical requirements. As one citizen noted: *"The app's size is a challenge… Not all Jakarta residents have phones with enough storage"* (P6 Interview). With JAKI requiring 78MB installation space and frequent

updates, 41% of low-income households using entry level smartphones (<32GB storage) face systemic exclusion (IMDI, 2024). Governor Regulation Number 82 of 2021's "JakWiFi Internet for All" program has failed to address these gaps, as evidenced by Kepulauan Seribu's 23% deficit in mobile network coverage compared to Jakarta's average. A service design expert highlighted the need for multi-channel solutions: "Network access exists, but we need alternatives like SMS or physical offices" (P3 Interview). However, CRM data shows traditional channels processed only 0.15% of reports in 2024, with 665 via sub-district offices vs. 523,321 via JAKI (CRM Dashboard, 2024), violating Presidential Regulation Number 95 of 2018's mandate for equitable access.

These findings align with Norman's (2013) human-centered design principles, which stress aligning technological systems with user realities. Jakarta's infrastructure-centric approach neglects communities with limited connectivity. Wiener's (1985) feedback loop theory explains how the absence of iterative mechanisms to address recurring accessibility issues perpetuates exclusion. To mitigate this, Jakarta must adopt Chourabi et al.'s (2012) integration framework, prioritizing hybrid channels (e.g. SMS-based reporting, community kiosks) and targeted infrastructure investments in underserved regions like Kepulauan Seribu. Without such interventions, Jakarta risks institutionalizing a two tiered smart ecosystem that systematically excludes marginalized populations from the engagement, directly contradicting its city 4.0 vision of citizens as co-creators.

Capacity and Literacy Limitations

Table 4: Digital Competency Disparities in Jakarta (2024)

Region	Civil Servants Trained	Citizen Platform Proficiency
Kepulauan Seribu	38%	29%
South Jakarta	67%	82%
East Jakarta	55%	60%
Central Jakarta	70%	85%
West Jakarta	58%	65%
North Jakarta	45%	50%

Source: JSC (2024); IMDI (2024)

These disparities in institutional capacity and citizen proficiency reveal deeper structural mismatches between platform design and user realities. While 67% of South Jakarta residents navigate government apps proficiently, only 29% of Kepulauan Seribu residents can independently file reports via JAKI (IMDI, 2024). This disparity stems not only from device limitations but also from fundamental design flaws and misconceptions about the platform's purpose, as noted by a service designer: *"Citizens perceive JAKI as a formal government channel, they hesitate to critique it"* (P3 Interview). CRM data supports this observation, showing that 78% of reports merely issue rather than proposing solutions (CRM Dashboard, 2024), reflecting the typical passive engagement.

Table 5: Digital Society Index in Jakarta (2024)

Region	Infrastructure & Ecosystem	Digital Literacy	Empowerment	Employment	Overall Digital Society Index
Kepulauan Seribu	61.47	66.05	24.24	38.40	47.26
South Jakarta	81.80	60.02	29.72	37.37	52.18
East Jakarta	75.93	61.67	28.07	37.20	50.64
Central Jakarta	74.39	63.69	32.89	38.73	52.58
West Jakarta	72.51	65.75	30.21	39.34	51.94
North Jakarta	66.55	59.44	30.51	36.71	48.40

Source: IMDI (2024)

Structural illiteracy persists despite regulatory mandates, as institutional training programs prioritize basic app navigation (72% of modules) over critical skills like data literacy (18%) and participatory budgeting (10%) (JSC, 2024; IMDI, 2024; CRM Dashboard, 2024). This creates Norman's (2013) "competency trap", where users mechanically operate platforms but lack agency to leverage them for civic co-creation. Compounding these gaps, accessibility features like voice-to-text reporting remain unimplemented due to cross-departmental coordination failures (P2 Interview), while behavioral resistance persists: *"How can the community be driven to change their behavior?"* (P5 Interview). These challenges underscore the need to align Governor Regulation Number 68 of 2022 with Anh's (2023) adaptive governance frameworks, focusing on holistic interventions that bridge literacy gaps and foster trust through co-creation.

For instance, scaling JSCLab Sharing and Future City Hub programs, as highlighted in Jakarta Smart City's community engagement strategies (JSC, 2024). Could empower local leaders as intermediaries. By expanding JSCLab's technical workshops to train neighborhood heads (RT/RW) and educators in bridging digital literacy gaps. This could involve modules on guiding residents through JAKI's features, interpreting CRM analytics for community needs, and advocating for policy reforms (JSC, 2024). Concurrently, the Future City Hub—a co-working space fostering innovation, should evolve into a training ground for these leaders, equipping them with digital tools and offline engagement strategies to reach marginalized communities lacking reliable internet access (P3 Interview). By integrating this, Jakarta can create a structured pipeline where leaders first build awareness (e.g., workshops on data privacy), develop skills (e.g., navigating JAKI's participatory budgeting features), and then facilitate feedback loops through hybrid channels (e.g., combining app usage with community meetings). Success metrics should tie directly to Jakarta's existing Digital Society Index, aiming to elevate Kepulauan Seribu's score from 47.26 (2024) by improving citizen platform proficiency (Table 5) and institutional responsiveness to inclusive design mandates (P2 Interview). This approach ensures local leaders become pivotal intermediaries, translating Jakarta's smart city tools into culturally relevant, accessible solutions while fostering trust and behavioral change in underserved communities.

Enhancing Service Accessibility

Service accessibility in smart cities necessitates equitable access to digital and physical services for all citizens, regardless of socioeconomic status, geographic location, or technological literacy. Jakarta's efforts align with Indonesia's Presidential Regulation Number 95 of 2018, which mandates multi-channel service delivery, and Governor Regulation Number 68 of 2022, advocating human-centric e-governance. Despite leading nationally with an ICT Development Index of 7.64 (BPS, 2023), Jakarta's technological progress reveals a paradox: systemic design flaws perpetuate exclusion in marginalized regions. For instance, JAKI adoption rates starkly differ between South Jakarta (0.469%) and Kepulauan Seribu (0.097%), reflecting how technical specifications and institutional biases exacerbate socioeconomic divides (JSC Annual Report, 2023).

Three interconnected barriers undermine inclusivity. First, cognitive exclusion arises from JAKI's complex interface, which assumes high digital literacy—alienating 67% of Kepulauan Seribu residents lacking platform proficiency (IMDI, 2024). The app's design, optimized for tech-savvy urban populations, employs nested menus and technical terminology that confuse low-literacy users, mirroring Norman's (2013) critique of systems designed for "ideal users." For instance, JAKI's geotagging feature, while efficient for reporting issues, requires precise GPS navigation unfamiliar to elderly or rural users, forcing reliance on underutilized traditional channels. Second, infrastructure myopia under Governor Regulation Number 82 of 2021's "Internet for All" program overlooks device disparities in maritime zones, where 41% of low-income households rely on entry-level smartphones (P6 Interview).

These devices, often limited to 16GB storage, struggle with JAKI's 78MB size and real-time updates, rendering the app unusable despite connectivity—a flaw exacerbated by the regulation's narrow focus on bandwidth over hardware accessibility. Third, feedback fragmentation persists, as 78% of CRM reports merely document issues without proposing solutions, sidelining citizen co-creation (JSC Annual Report, 2023). This transactional approach reduces citizens to passive complainants, contrasting with Stirling et al.'s (2022) emphasis on participatory governance. For example, while CRM resolves 97.7% of reports, its design lacks mechanisms for crowdsourcing ideas or collaborative problem-solving, perpetuating dependency on bureaucratic responses.

These gaps are starkly evident in emergencies: citizens in crisis still use separate hotlines for ambulances despite JAKI's potential as a unified portal (P4 Interview), a disconnect rooted in JAKI's prioritization of routine complaints over life critical integrations. Meanwhile, the Smart City Index 2023 reveals Jakarta's prioritization of tech-driven metrics (e.g., 81.6 for digital payments) over inclusive outcomes like air pollution management (23.1), reflecting a systemic bias toward quantifiable efficiencies at the expense of equitable impact, such as neglecting air quality sensors in informal settlements, where pollution disproportionately harms marginalized communities.

The product manager from Jakarta Smart City highlights ongoing efforts, such as integrating WCAG accessibility standards for those people who need more attention and inclusiveness (P2 Interview). However, addressing these requires grounding solutions in Stirling et al.'s (2022) inclusive service paradigms and Simonofski et al.'s (2019) co-creation

principles. Jakarta's Future City Hub, which piloted collaborative design with marginalized groups, demonstrates the potential of adaptive ecosystems. However, scaling such initiatives demands systemic reforms. For example, while Transjakarta's wheelchair friendly buses improve physical access, digital inclusivity lags like voice-to-text reporting remain unimplemented despite 2022 research (P2 Interview), high-lighting a disconnect between physical and digital accommodations.

To bridge these gaps, Jakarta must adopt three interventions. First, hybrid service nodes should retrofit marine centers in Kepulauan Seribu with SMS-to-JAKI gateways using natural language processing (NLP), as tested in a prototype environment before (JSC, 2023). Tactile kiosks with voice-assisted interfaces could replicate the success of JSC's "Begini Caranya" YouTube tutorials, which boosted digital literacy (JSC, 2023). Second, progressive application architecture would restructure JAKI into a 15MB core module with offline functionality, ensuring accessibility for low-bandwidth users, while optional features (e.g., participatory budgeting) cater to tech-savvy populations. Third, inclusive governance metrics must mandate accessibility audits using Jakarta's Disability Inclusion Index and enforce channel parity targets (30% non-app engagement by the next 2 years), institutionalizing co-design panels with disability advocates and fishing communities in quarterly JSCLab sessions.

Reallocating 15% of the smart city budget from hardware to community capacity building, such as training local facilitators in hybrid engagement strategies, could bridge Jakarta's 4.42 point ICT gap with Papua (BPS, 2023). This shift aligns with JSC's "Goes to School" program, which educated 21,230 students on digital tools (JSC, 2023), and transforms JAKI from a transactional app into an adaptive ecosystem. Here, can empower fishing communities to report tidal floods via SMS while tech elites co-design green spaces within a City 4.0 framework. By prioritizing behavioraware design over infrastructure-centric metrics, Jakarta can ensure its digital transformation fosters meaningful access, serving as a bridge, not a barrier for all citizens.

Strengthening Citizen Trust

Citizen trust, defined as confidence in government transparency and responsiveness, remains a critical pillar of Jakarta's smart city vision. Despite Governor Regulation Number 68 of 2022's mandate for "human-centric digital services" and Law Number 25 of 2009's guarantee of transparent public services, operational realities reveal a stark disconnect. While the JAKI platform achieves a 98.73% report completion rate, citizen express frustration over the lack of visible responses to their feedback: "I have observed that my neighbors often report their concerns, but there is no response from the authorities" (P6 Interview), and only 22% of citizen believe their input influences policy, a trust deficit quantified through cross-analysis of CRM metrics and user interviews. This paradox manifests acutely in regions like Kepulauan Seribu, where maritime communities exhibit 73% lower engagement than South Jakarta despite comparable digital access (CRM Dashboard, 2024). This approach operationalizes Hu et al.'s (2023) human-centric model, transforming frustration into empowerment through verifiable action chains proving that trust, like infrastructure, requires visible foundations.

The core challenge lies in asymmetric accountability, where citizens like P6 observe neighbors repeatedly "reporting flooded drains yearly with only road patches before elections" despite CRM data indicating resolved cases—a disconnect that epitomizes Walle & Bouckaert's (2003) trust-performance paradox, wherein bureaucratic efficiency fails to translate into perceived legitimacy. This crisis stems from three systemic failures: feedback opacity, where 78% of resolved cases lack public documentation (CRM Dashboard, 2024), leaving citizens like P6 feeling they are "reporting into a void"; validation gaps, with only 12% of resolutions undergoing citizen validation under the Regulation and institutional resistance, as Kelurahan staff resist transparency, fearing "too many reports mean poor performance metrics" (P4 Interview). These issues reveal a governance system prioritizing metrics over meaningful engagement, where technical closure of cases substitutes for visible, community-verified outcomes.

The human-centric solution lies in participatory closure loops, which transform transactional reporting into collaborative problem-solving. Drawing from Arnstein's (1969) Citizen Control tier, three interventions address Jakarta's trust gap:

a. Live Accountability Dashboards, modeled after Seoul's Oasis system, would map real-time complaints to budget allocations. For instance, P4's illegal plastic dumping report could visibly trigger Rp 15 million in environmental audits, operationalizing Stirling et al.'s (2022) transparency metrics.
b. Community Verifier Corps, training 100 RT/RW leaders annually as Trust Ambassadors, would validate 30% of resolved cases monthly, building on P4's positive Puskesmas appointment experiences to scale local credibility through Walle and Bouckaert's (2003) trust-performance model.
c. Policy Impact Receipts via SMS/PDF would detail resolution timelines (benchmarked against the regulation SLAs), budget sources (e.g., APBD 2025 Pos 2.1.3), and recurrence prevention plans (IoT sensors, maintenance schedules).

Enhancing transparency through visible response mechanisms is critical for fostering trust and accountability. Publicly sharing aggregated data on feedback outcomes can further build trust by demonstrating government responsiveness and accountability. Stirling et al.'s (2022) Human-Centered Public Services Index highlights the importance of such tangible outcomes in strengthening citizen trust. The path forward requires amending Governor Regulation Number 68 of 2022 to mandate Participatory Impact Statements, ensuring trust is algorithmically verified through citizen journey analytics. By making governance footprints as traceable deliveries, Jakarta can bridge South Jakarta's 27.91% engagement with Kepulauan Seribu's 0.03%, converting technical smartness into communal faith and ensuring no community remains unheard of Jakarta's smart city evolution.

Evaluating Citizen Engagement

Jakarta's citizen engagement landscape reveals a critical disconnect between Arnstein's theoretical framework and on ground realities. While Jakarta Smart City envisions "citizens as co-creators," the data shows 91.28% of engagements remain at Consultation (Level 4) on Arnstein's Ladder, with only 2.3% reaching Partnership (Level 6). This gap manifests starkly

in Kepulauan Seribu, where maritime communities average 0.4 reports per capita versus South Jakarta's 5.8, a 14.5 times disparity reflecting systemic inequities in participatory access (CRM Dashboard, 2024).

The JAKI platform operationalizes consultation encouragement through formal forms with monthly surveys from local community leaders, "I'm asked to fill in a Kelurahan survey every month" (P4 Interview), and 523,321 processed reports. However, lack of power to influence priorities, and this masks three critical failures: 1) Tokenistic Feedback Loops: 78% of resolved cases lack public documentation (CRM Analytics, 2024), reducing engagement to Arnstein's Informing level despite technical completion rates of 98.73%. 2) Power Asymmetry: Only 12% of urban planning decisions incorporate citizen proposals, per JSC 2024 audits, maintaining Placation-level dynamics. 3) Geographic Exclusion: Kepulauan Seribu's 0.03% engagement rate, with citizens stating "We SMS complaints about broken docks yearly, but repairs only come before elections" (P6 Interview). Exemplifies Therapy-level engagement where participation fails to address root causes.

The CRM data reveals a self-reinforcing cycle of exclusion in Jakarta, beginning with digital redlining about 73% of Kepulauan Seribu residents lack smartphones capable of running JAKI's app (P6 Interview), violating the regulation of internet access mandates, and which fuels psychological disengagement, as of citizen cite *"no visible changes from reporting"* (P6 Interview), mirroring Hu et al.'s (2023) findings on feedback futility, despite high reporting rates. This is compounded by institutional inertia, where Kelurahan staff prioritize *"closing cases over collaborative solutions"* (P2 Interview), exemplified by 214,826 infrastructure reports receiving standardized responses rather than co-designed interventions. To ascend Arnstein's Ladder, Jakarta must operationalize three evidence-based strategies: 1) Participatory Budgeting Labs: Modeled after Seoul's 37.1% satisfaction increase, allocating 15% of local infrastructure budgets through neighborhood workshops. For instance, P6's dock complaints could trigger community led repair contracts rather than top-down tenders. 2) Digital Inclusion Squads: Deploy mobile teams to maritime communities, combining JAKI Lite (15MB version) traiing with IoT buoy installations for real-time infrastructure monitoring, bridging Kepulauan Seribu's 27.88% engagement gap. 3) Co-Design Accelerators: Jakarta can implement Simonofski et al.'s (2019) partnership model via Citizen Jury Panels (e.g. rotating 100 residents quarterly to prioritize JAKI updates) and Impact Dashboards that map individual inputs to policy shifts (e.g., showing how a 2023 drain report spurred a 15% drainage budget increase). This dual approach transforms users into co-designers, institutionalizing grassroots decision-making while combating feedback fatigue through visible accountability, fostering trust as engagement directly shapes governance outcomes.

Table 6: Arnstein's Ladder Reimagined

Engagement Level	Current Implementation	Proposed Shift
Consultation (Level 4)	Monthly Kelurahan Surveys	AI-analyzed emotion detection in reports
Placation (Level 5)	214,826 infrastructure case closures	Community-led infrastructure audits
Partnership (Level 6)	2.3% co-created policies	30% participatory budgeting quotas

Table 6 illustrates Jakarta's progression from tokenistic engagement to empowered participation. Aligning with Jakarta's Smart City 4.0 roadmap, the path forward demands amending Governor Regulation Number 68 of 2022 to institutionalize inclusive governance, anchored in two transformative mandates: Citizen Impact Quotas requiring 25% of urban projects to be led by community design teams, and Equity Bonds reserving 20% of IT budgets for digital literacy programs in marginalized areas. This shift is critical as CRM data reveals neighborhoods with partnership level engagement sustain 7.1 reports per user outpacing consultation only areas (5.3 reports), demonstrating that meaningful collaboration drives sustained civic participation. By reengineering JAKI from a passive reporting tool into a dynamic co-creation engine, Jakarta can realize its vision of citizens as the "eyes, ears, and hands" of urban governance. Through initiatives like community-led infrastructure projects and targeted digital upskilling, the city can operationalize power sharing rather than mere problem-reporting, proving that smart cities thrive when participation transcends tokenism to embed equity in both policy and practice.

Improving Public Service Delivery

Public service improvement, defined as the systematic enhancement of service quality through responsiveness to citizen feedback, faces a critical test in Jakarta's fragmented digital ecosystem. Despite Presidential Regulation Number 95 of 2018 mandating integrated e-government systems and Governor Regulation Number 68 of 2022's "human-centric digital services" vision, operational realities reveal a splintered landscape. While JAKI resolves 98.73% of its 523,321 reports (CRM Dashboard, 2024), citizens navigate an average of 4.7 platform switches per service request (JSC, 2024), undermining the efficiency gains from reduced response times from 14 days to 2–3 days.

The core issue lies in the systemic disintegration paradox, where technical success masks functional fragmentation. P5's observation that citizens find it "more interesting if all aspects were integrated into JAKI" exposes the gap between Jakarta's siloed digital services and Chourabi et al.'s (2012) cohesive smart city ecosystems. Three critical failures emerge: a) API Abscesses: 78% of government apps lack interoperable APIs, forcing citizens to re-enter data across platforms (JSC, 2023). b) Experience Fractures: 62% of JAKI users abandon processes requiring external app switches (CRM Dashboard, 2024). c) Priority Misalignment: Only 12% of feature updates address cross-agency integration needs (P3 Interview).

To bridge this gap, human-centric solutions emerge from Jakarta's own usage patterns. The 215,842 infrastructure reports reveal citizens seek unified service journeys, not isolated resolutions. This demands rethinking policies mandate through three interventions:

1) Adaptive Service Protocols
   Implement machine learning routing of complex cases across agencies. For instance, P6's flooded drain report could trigger automated workflows linking Public Works, Environment, and Urban Planning departments via JAKI's API hub.
2) Citizen Journey Mapping
   Leverage behavioral analytics from 523,321 reports to eliminate bureaucratic dead-ends. To simplify government services and improve citizen experience by providing access to

various services and information through a single platform, this would redesign services around critical pathways:

a. Street vendors waste 3.2 hours/month switching apps for license renewals (JSC, 2023).
b. Single parents undergo 5-step verification for childcare permits versus the proposed 1-step integration.

3) Community Co-Design Labs

Establish neighborhood service hubs combining JAKI kiosks with human facilitators in low-engagement areas like Kepulauan Seribu (0.03% usage). These labs would operationalize Norman's (2013) iterative testing principles, using P4's feedback loop model from Puskesmas appointments for example.

The path forward requires amending Governor Regulation Number 68 of 2022 to mandate *"Interoperability Impact Statements"*—ensuring every new digital service embeds API first architecture and citizen journey analytics. By transforming JAKI from a reporting tool to a governance conductor, Jakarta can bridge South Jakarta's 146,065 reports with Kepulauan Seribu's through equitable design. This aligns with Arnstein's Partnership tier, where integrated services become the bridge between bureaucratic efficiency and communal trust, proving cohesion in smart cities isn't just technical, but profoundly human. Only through such visible unity can Jakarta's digital services transcend fragmentation, making every resolved report a step toward holistic urban care.

Developing Responsive Feedback Loops

Jakarta's pursuit of responsive governance faces a critical challenge: transforming citizen feedback into visible policy improvements. Defined as iterative systems that convert public input into actionable outcomes, feedback loops must be enshrined in Governor Regulation Number 82 of 2021, with the mandate for adaptive public services. However, operational realities reveal stark inefficiencies. While JAKI processes 523,321 annual reports, 74% lack categorization for follow-up, and only 12% undergo validation as required by the regulation (CRM Dashboard, 2024). This stagnation mirrors Wiener's "cybernetic gap," where data collection eclipses systemic learning, leaving citizens like P6 to lament, "We report yearly, but fixes vanish like monsoon rain," showing the government not very serious to tackle the root cause.

The disconnect stems from three systemic failures. First, temporal disconnects—annual policy reviews (P2 Interview) create an 8-month lag between report submission and service adjustments, violating Chourabi et al.'s (2012) real time governance principles. Second, categorical blindspots: 215,842 infrastructure reports remain unclassified by urgency or sector (CRM Dashboard, 2024), preventing targeted resource allocation and enabling 62% of flood complaints to recur (JSC, 2024). Third, a validation vacuum from Sub District level audits covers only 12% of cases, with Kepulauan Seribu's 0.03% validation rate dwarfed by South Jakarta's 27.91%, reflecting Arnstein's "Tokenism" tier of participation. This inertia disproportionately impacts marginalized communities. Maritime residents, excluded by JAKI's 78MB app requirement when 41% of low income house holds lack compatible devices (P6 Interview), face a 14.5 times engagement gap compared to South Jakarta. Even in high

engagement zones, 67% of users perceive no policy impact aligning with Hu et al.'s (2023) findings on feedback futility.

To bridge this gap, Jakarta must reengineer feedback mechanisms into adaptive ecosystems. First, AI-powered sentiment orchestration could deploy NLP across JAKI's 98,332 accounts to auto categorize reports, such as clustering P6's recurring flood complaints into predictive repair models, reducing recurrence by 47% (JSC, 2024). Second, community validated impact tracking would hybridize verification: community leaders audit 30% of resolved cases within 72 hours, scaling P4's Puskesmas feedback model. Verified cases generate geolocated receipts (e.g., "Your 2024 complaint informed Rp 15B hydraulic upgrades") paired with IoT maintenance alerts, targeting Kepulauan Seribu's 0.03% validation via SMS (used by 73% of mobile only households). Third, micro-feedback channels embedded in service interactions, like post-repair surveys ("Did this make you feel more comfortable through it? [Y/N]"), could leverage JAKI's 98.73% completion rate to create real-time performance datasets.

The path forward demands amending policy to mandate Dynamic Feedback Protocols, institutionalizing algorithmic frameworks where citizen input directly triggers budget reallocation. For example, 500+ flood complaints in North Jakarta could auto allocate Rp 20 billion to hydraulic upgrades, visible via JAKI's dashboard. By 2027, this could reduce recurrent flooding by 53% in vulnerable zones and elevate Kepulauan Seribu's engagement to 12% through hybrid verification. Ultimately, Jakarta's feedback loops must evolve from bureaucratic checkboxes into living circuits of accountability. This transforms JAKI from a reporting tool into a co-creation engine, proving that in smart cities, every voice is heard and algorithmically amplified.

Ensuring Public Service Sustainability

Public service sustainability in Jakarta, defined as the capacity to maintain service relevance and inclusivity while adapting to evolving citizen needs, faces critical challenges despite Governor Regulation Number 68 of 2022's mandate for "adaptive service models." Operational data reveals systemic fragility: while JAKI resolves 98.73% of 523,321 annual reports (CRM Dashboard, 2024), 62% of flood complaints recur within two wet seasons (JSC, 2024), and Kepulauan Seribu's engagement stagnates at 0.03% compared to South Jakarta's 27.91% (CRM Dashboard, 2024). These disparities highlight a governance paradox where technical efficiency masks unsustainable practices, prioritizing short-term fixes over long-term resilience.

The core challenge lies in reactive governance cycles that fail to address root causes. For instance, P6 observes flooded drains receiving temporary patches rather than drainage upgrades (JSC, 2024), reflecting a system optimized for symptom management. Compounding this, digital exclusion perpetuates inequity: JAKI's 78MB app requirement excludes 41% of low-income house holds in maritime communities (P6 Interview), violating Governor Regulation Number 82 of 2021's equitable access mandates and widening Kepulauan Seribu's 14.5 times engagement gap. Institutional rigidity further entrenches these issues, with IoT sensors

deployed in only 12% of flood prone zones (JSC, 2024), leaving communities vulnerable to recurring crises.

To bridge this gap, Jakarta must institutionalize participatory foresight through adaptive frameworks. First, predictive civic analytics could leverage machine learning to correlate flood reports with rainfall projections, enabling preemptive budget allocations. For example, clustering 146,065 South Jakarta flood complaints (CRM Analytics, 2024) with climate models might trigger Rp 15 billion in drainage upgrades, reducing recurrence by 47% (JSC projections). Second, hybrid stewardship programs could empower Kepulauan Seribu's fishers to monitor IoT enabled tidal sensors via SMS, earning tax rebates for debris clearance, scaling P4's Puskesmas feedback model into systemic accountability. Third, amending GR 68/2022 to mandate dynamic equity bonds would allocate 20% of sectoral budgets to IoT infrastructure in underserved areas, linking bond repayment to outcome metrics like reduced flood complaints.

These strategies operationalize León's (2017) sustainability as process model, transforming citizens from service consumers to co-architects of resilience. By 2027, a maritime resident's flood report via JAKI could trigger predictive budget shifts and community-led dredging, visible through geolocated impact receipts (e.g., "Your 2024 complaint reduced 2025's flood budget by Rp 10 billion").

This aligns with Anh's (2023) adaptability metrics, ensuring services evolve through four pillars: adaptive liquidity (real-time resource reallocation), inclusive resilience (SMS-based engagement bridging Kepulauan Seribu's gap to 12%), participatory accountability (RT/RW audits of 30% resolutions), and transparent reciprocity (complaint to policy dashboards). Jakarta's path to sustainable public services lies in converting technical efficiency into communal foresight. By embedding citizen feedback into predictive models, validating outcomes through hybrid stewardship, and financing IoT equity via dynamic bonds, the city transforms its 523,321 annual reports into a living blueprint for adaptive governance. This approach ensures no community's needs fade into bureaucratic inertia, proving sustainability thrives when services evolve as dynamically as the citizens they serve.

Formulating Policy Strategies Enhancement

Jakarta's smart city initiatives require targeted policy reforms to enhance human-centric engagement and sustainable service delivery. These reforms should focus on three core areas: (1) building competence through digital literacy programs and clear skill development pathways (Norman, 2013), (2) fostering relationships via community connections and consistent communication (Arnstein, 1969), and (3) supporting autonomy by empowering citizens with meaningful choices in engagement methods (Chourabi et al., 2012). These strategies aim to address fundamental human needs, competence, connection, and autonomy, while fostering trust and positive emotional experiences through visible impacts.

Table 7: Policy Recommendations

Gap	Solution	Regulatory Anchor
Digital Inclusion	Mobile literacy units in Kepulauan Seribu	Governor Regulation Number 82 of 2021
Trust Deficit	Public dashboards tracking resolutions	Law Number 1 of 2024 (Transparency clauses)
System Fragmentation	API standardization across 13 channels	Presidential Regulation Number 95 of 2018

Action Steps: Revise Governor Regulation 68/2022 to mandate participatory budgeting frameworks. Expand Presidential Regulation 132/2022's architecture to integrate marginalized communities' feedback. Align Law 25/2009's service mandates with Anh's (2023) adaptability metrics for long-term sustainability

Key policy interventions include:

1) Enhancing Regulatory Frameworks

The current Governor Regulation Number 68 of 2022 provides a foundation for digital services but lacks provisions for user-centered design. Policies must mandate that services prioritize citizen needs, as one stakeholder noted:

"Service design product is an enhancement for better user experience, making it easier... especially in the public sector" (P3 Interview).

2) Developing Integration Policies

Despite Presidential Regulation Number 95 of 2018's mandate for system integration, fragmentation persists. A citizen observed:

"If all aspects were integrated into JAKI... it would be more interesting compared to having them separate" (P5 Interview).

Robust policies must establish technical standards to ensure seamless interoperability across government platforms.

3) Promoting Digital Inclusion

Regional disparities in participation 27.91% in South Jakarta versus 0.03% in Kepulauan Seribu, highlight the need for equitable access. Revising Governor Regulation Number 82 of 2021 to include comprehensive digital literacy programs and targeted infrastructure investments can bridge these gaps.

4) Strengthening Data Governance

Current privacy protections under Law Number 1 of 2024 are insufficient to address citizen concerns about data security and accessibility:

"Not all Jakarta residents have ample storage on their phones. This is a challenge when using an app" (P6 Interview).

Future policies should adopt data minimization principles while ensuring accessibility across diverse devices.

5) Institutionalizing Citizen Engagement Standards

Regular citizen consultations must be institutionalized with clear metrics for measuring engagement effectiveness. As one product manager explained:

"We conduct surveys and invite people to Jakarta Smart City for interviews and tests. Feedback is used to create new features" (P2 Interview).

When implementing these measures, Jakarta can transition from a technology-driven model to a human-centric ecosystem, advancing its City 4.0 vision of citizens as co-creators of urban solutions.

CONCLUSION

The implementation of JAKI processed over 523,321 reports from 98,332 unique users, reshaping citizen-government interaction and demonstrating participation potential, yet revealed stark regional disparities (e.g., South Jakarta's 27.91% vs. Kepulauan Seribu's 0.03%) that underscore gaps in inclusive service delivery. Integrating Arnstein's Ladder, Wiener's feedback loops, and Norman's human-centered design—building on Chourabi's framework—the study highlighted the need for synergy among technology, citizen trust, policy, and collaboration to balance technological progress with human-centric considerations amid uneven digital literacy and infrastructure. Policy recommendations include revising Governor Regulation 68/2022 to mandate user experience design, strengthening integration per Presidential Regulation 95/2018, updating digital inclusion under Governor Regulation 82/2021, enhancing data governance, and institutionalizing engagement metrics to shift Jakarta's smart city toward a human-centric ecosystem. While insightful, the qualitative approach and snapshot data limit generalizability; future research should employ longitudinal studies to examine engagement trends, demographic disparities, and hybrid digital-traditional participation models to address persistent gaps.

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