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Digitalization Towards Services Resilience: Analysis of Autogate Policy Implementation in Transforming Indonesian Immigration Services

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Abstract: The digital transformation of immigration clearance through autogates raises not only issues of technology adoption but also challenges related to policy implementation, inter-organizational coordination, organizational adaptation, and service continuity. This article examines autogates as digital public policy instruments and explains how the quality of policy implementation contributes to the resilience of immigration services. The study employed a qualitative multisite case-study design at the immigration checkpoints of Soekarno-Hatta International Airport and I Gusti Ngurah Rai International Airport. Data were collected through in-depth interviews with 14 informants representing central policymakers, operational managers, frontline officers, airport and security partners, and service users, supplemented by field observations and document analysis. Thematic analysis was informed by William N. Dunn's policy analysis framework, George C. Edwards III's policy implementation framework, Linkov et al.'s system-resilience perspective, and street-level bureaucracy. The findings show that autogate implementation constitutes an organizational transformation process that develops through five levels of implementation maturity: policy alignment, collaborative governance, organizational adaptability, system resilience, and organizational learning and policy renewal. Service resilience does not emerge solely from technological sophistication. Instead, it results from an organization's ability to align policy directions, manage cross-actor collaboration, adapt procedures and human-resource capacities, maintain service continuity, recover from disruptions, and transform implementation experience into policy learning. This article repositions system resilience as an institutional capacity built through policy implementation and proposes a digital-policy implementation maturity model to strengthen resilient immigration services.

Keywords: public policy analysis, policy implementation, autogate, immigration, system resilience.

INTRODUCTION

Digital transformation has changed the way public organizations design, deliver, and evaluate services. In public administration, digitalization should not be understood merely as the replacement of manual procedures with electronic devices. Technological change is almost always accompanied by changes in business processes, the distribution of authority, coordination patterns, competency requirements, and relationships between public officials and service users. The digital-government literature emphasizes that effective transformation is a process of co-evolution among technology, organizations, and institutions rather than a stand-alone technology project (Luna-Reyes & Gil-Garcia, 2014; Janowski, 2015; Mergel et al., 2019).

In immigration services, this complexity is even greater because border services must pursue two objectives simultaneously: facilitating international mobility efficiently while continuing to perform the state's immigration-control functions. Autogates are one policy instrument that promise greater efficiency because travel-document inspection and biometric verification can be conducted automatically. However, Automated Border Control does more than reduce inspection time. It also changes decision-making arrangements, interactions between officers and travelers, data management, and the service's dependence on digital infrastructure (Frontex, 2015; Chaki, 2021; Noori, 2022).

Indonesia has expanded the use of autogates at several international entry points. Data from the Directorate General of Immigration indicate that, between January 1 and October 31, 2025, 22,900,034 crossings were processed through autogates, representing a 133 percent increase compared with the same period of the previous year. Soekarno-Hatta and I Gusti Ngurah Rai were the two locations with the highest crossing volumes. This development indicates that autogates have evolved from supplementary facilities into one of the main channels for digital immigration clearance. Consequently, policy implementation has become increasingly important because disruptions in coordination, resources, systems, or procedures may directly affect service continuity on a large scale (Directorate General of Immigration, 2025).

Policy challenges arise when technological expansion is not accompanied by an equivalent level of organizational readiness. Autogate implementation involves central policies, technical units, officers at immigration checkpoints, airport operators, technology providers, institutions within the border-management ecosystem, and service users. Therefore, implementation success cannot be measured solely by the number of machines, the number of users, or processing speed. More substantive questions concern whether policy objectives are understood consistently, resources are available, implementers possess supportive dispositions, coordination structures function effectively, fallback mechanisms exist when digital services are disrupted, and implementation experience is used to improve policy.

William N. Dunn's public-policy analysis perspective positions autogates within a broader public-policy process involving problem structuring, instrument selection, implementation, monitoring, evaluation, and policy recommendation (Dunn, 2018). Meanwhile, Edwards III (1980) demonstrates that communication, resources, dispositions, and bureaucratic structure are important determinants of implementation. In the context of digital services, these four factors must be considered alongside an organization's capacity to withstand disruptions, recover operations, and learn from experience. Linkov et al.'s (2018) system-resilience framework identifies four capacities: preparedness, absorptive capacity, recovery capacity, and adaptive capacity.

Previous studies on autogates in Indonesia have largely examined technological implementation, biometric-inspection procedures, service experiences, or technology adoption (Putra & Arifin, 2020; Pramana et al., 2022; Nursanto et al., 2024). Although these studies make important contributions, there remains an opportunity to explain how digital-policy

implementation builds the institutional capacity necessary to maintain services under pressure or disruption. This gap is the focus of the present article. The central question is not simply whether autogates function technically, but how their implementation develops into a process of organizational strengthening and service resilience.

Based on this context, the article addresses two research questions. First, how does autogate policy implementation operate as an organizational-transformation process in immigration services? Second, how does this process generate service-resilience capacity and policy renewal? The purpose of this article is to develop a public-policy perspective that positions system resilience as an institutional outcome of policy-implementation quality and to formulate a digital-policy implementation maturity model relevant to immigration services.

According to Dunn (2018), public-policy analysis is oriented toward producing knowledge relevant to solving public problems. Policy does not end with a formal decision; it encompasses a series of interconnected processes, including problem structuring, forecasting, recommendation, monitoring, and evaluation. This framework is important for studying autogates because it enables researchers to connect policy rationale, implementation practices, service consequences, and the need for policy improvement within a single analytical sequence.

At the operational level, Edwards III (1980) identifies communication, resources, dispositions, and bureaucratic structure as the four main determinants of implementation. Communication explains how policy objectives and instructions are transmitted and understood. Resources include human resources, information, authority, and facilities. Dispositions concern implementers' attitudes, commitment, and acceptance. Bureaucratic structure influences the division of tasks, procedures, fragmentation, and coordination. In autogate services, these dimensions are reflected in shared policy understanding, officer readiness, technical support, standard operating procedures, and coordination mechanisms between central authorities and service units.

However, digital-policy implementation is dynamic. When technology changes work processes, frontline actors do not merely follow standard operating procedures. They also interpret policy, assist users, redirect travelers for further inspection, or make decisions regarding additional examinations. The perspective of street-level bureaucracy explains that frontline officials possess discretion when translating policy into concrete situations (Lipsky, 2010). In a digital context, discretion does not disappear; rather, it changes form and interacts with automated systems.

In this article, system resilience is not understood merely as software or network reliability. Instead, it is conceptualized as the ability of a public organization to maintain service functions, absorb pressure, restore operations, and adapt after a disruption. Linkov et al. (2018) classify resilience into four capacities: preparedness, absorption, recovery, and adaptation.

This perspective is consistent with the literature on resilience in public-sector organizations, which emphasizes the importance of institutional capacity, leadership, organizational learning, innovation, and control systems in maintaining services during crises or operational pressures (Bracci & Tallaki, 2021; Casalegno et al., 2023). Accordingly, service resilience does not exist separately from policy implementation. It is a capacity that can be strengthened or weakened by the way a policy is communicated, coordinated, adapted, and evaluated.

Based on these two perspectives, this article adopts the analytical proposition that mature digital-policy implementation moves beyond procedural compliance. Mature implementation creates policy alignment, collaborative governance, organizational adaptability, service resilience, and, ultimately, institutional learning that generates policy renewal. This proposition is examined inductively through multisite findings.

METHODS

This study employed a qualitative approach using a multisite case-study design. The research sites were the immigration checkpoints at Soekarno-Hatta International Airport and I Gusti Ngurah Rai International Airport.

The study involved 14 informants selected purposively based on their roles, experience, and involvement in autogate implementation. The informants represented five actor groups: central policymakers, managerial and operational supervisors, frontline officers, airport operators and security partners, and service users.

Table 1 Informant Profile

Code	Position	Institution / Research Site	Actor Group
Informant 1	Head of the Immigration Checkpoint Directorate Team	Directorate General of Immigration	Central policymaker
Informant 2	Coordinator of the ICT Security Function	Directorate of Immigration Systems and Information Technology, Directorate General of Immigration	Central policymaker
Informant 3	Head of the Immigration Checkpoint Division	Class I Special Immigration Office, Soekarno-Hatta Immigration Checkpoint	Managerial and operational implementer (interviewed twice)
Informant 4	Head of Inspection Section II	Class I Special Immigration Office, Ngurah Rai Immigration Checkpoint	Managerial and operational implementer (interviewed twice)
Informant 5	Head of Administration Division	Class I Special Immigration Office, Ngurah Rai Immigration Checkpoint	Operational supervisor at the immigration checkpoint
Informant 6	Intermediate Expert Immigration Analyst	Directorate of Immigration Systems and Information Technology, Directorate General of Immigration	Central policymaker
Informant 7	Supervisor of the Passenger Analysis Unit / Autogate Assistance	Class I Special Immigration Office, Soekarno-Hatta Immigration Checkpoint	Frontline officer (supervisor)
Informant 8	Autogate Assistance Officer	Class I Special Immigration Office, Soekarno-Hatta Immigration Checkpoint	Frontline officer (implementer)
Informant 9	Autogate User (foreign national)	I Gusti Ngurah Rai International Airport	Service user
Informant 10	Autogate User (foreign national)	I Gusti Ngurah Rai International Airport	Service user
Informant 11	Security Screening Supervisor	Avsec InJourney Angkasa Pura, Soekarno-Hatta	Airport operator / security partner

Code	Position	Institution / Research Site	Actor Group
Informant 12	Autogate User (Indonesian citizen)	Soekarno-Hatta International Airport	Service user
Informant 13	Autogate User (Indonesian citizen)	Soekarno-Hatta International Airport	Service user
Informant 14	Head of Administration Division	Class I Special Immigration Office, Soekarno-Hatta Immigration Checkpoint	Operational supervisor at the immigration checkpoint

Source: Primary data collected through in-depth interviews, 2026.

Data were collected through in-depth interviews, field observations, and document analysis. Interviews were conducted with the 14 informants listed in Table 1. Field observations examined autogate operations, officer-user interactions, passenger flow, and service procedures. Document analysis included policy documents, standard operating procedures, and performance data.

Data were analyzed thematically through data reduction, coding, categorization, theme development, interpretation, and synthesis. The findings were interpreted using Dunn's (2018) policy-analysis framework, Edwards III's (1980) implementation framework, Linkov et al.'s (2018) resilience framework, and Lipsky's (2010) street-level bureaucracy perspective.

RESULTS AND DISCUSSION

Autogates as Policy Instruments Rather Than Mere Technologies

The findings show that actors perceive autogate implementation not simply as the installation of automated inspection machines but as a change in how immigration inspection is organized. This change includes the redistribution of officers' responsibilities, adjustments to inspection procedures, the need to integrate Border Control Management, user assistance, and more intensive coordination among policy units, technology units, immigration checkpoints, airport operators, and other relevant partners.

These findings reinforce the public-policy argument that the selection of a technological instrument has institutional consequences. When inspection channels shift from manual counters to autogates, organizations must change not only their equipment but also their implementation structures. From Dunn's (2018) perspective, autogates can be understood as policy instruments selected to address queues, service speed, and immigration-control requirements. However, the benefits of this instrument can only be realized when implementation translates policy objectives into consistent practice.

First Stage: Policy Alignment as the Foundation

Thematic analysis shows that successful implementation begins with a shared understanding of policy direction. Informants emphasized the importance of leadership, policy communication, regulatory clarity, and shared understanding among units. When policy objectives are interpreted differently, implementation may become fragmented. Some actors may view autogates primarily as tools for accelerating service, while others may emphasize control, security, or resource efficiency.

This finding is directly related to the dimensions of communication and disposition in Edwards III (1980). Clear transmission of instructions is insufficient if it does not produce consistency in interpretation. Therefore, this study uses the term policy alignment to describe a condition in which policy objectives, regulations, implementer interpretations, and operational priorities are relatively aligned. Policy alignment serves as the foundation because

technical coordination is difficult to stabilize when the policy orientation is not commonly understood.

Second Stage: Collaborative Governance in the Border Ecosystem

Autogate implementation was found to be an inter-organizational process. The Directorate General of Immigration cannot operate the service independently because airport operations depend on spatial arrangements, passenger flows, networks, technology providers, airlines, customs and immigration functions, airport security, and internal immigration units. Problems in one component may affect the service flow as a whole.

Therefore, coordination in autogate implementation is better understood as collaborative governance rather than merely as a hierarchical relationship. Collaboration includes aligning procedures, exchanging information, handling disruptions, integrating business processes, and resolving operational problems across sectors. This finding expands the bureaucratic-structure dimension of Edwards III's framework: fragmentation exists not only within internal bureaucracy but also throughout the service ecosystem, which involves organizations with different authorities.

The policy implication is the need for permanent, function-based coordination mechanisms rather than ad hoc coordination activated only when disruptions occur. Cross-actor forums, escalation protocols, responsibility-sharing arrangements, and operational communication channels are part of the policy infrastructure and are as important as digital infrastructure.

Third Stage: Organizational Adaptability

The findings further show that the availability of resources does not automatically produce effective implementation. What matters is the organization's ability to use and adapt those resources to changing circumstances. Officers must be able to adjust to system updates, changes in user categories, revisions to standard operating procedures, surges in passenger volumes, and users who require assistance.

Organizational adaptability emerged from themes involving procedural flexibility, human-resource development, technology learning, decision-making speed, and the ability of service units to adjust operational arrangements. At this point, frontline officers remain essential. Automation does not eliminate discretion. Instead, officers decide when users should be directed, assisted, transferred to manual channels, or referred for further inspection. This finding is consistent with the concept of street-level bureaucracy (Lipsky, 2010) while adding that discretion in digital services functions as a mechanism of organizational adaptation.

Conceptually, adaptability bridges implementation and resilience. Organizations that possess technology but lack the ability to adapt procedures and competencies tend to be vulnerable when they encounter situations outside normal scenarios. By contrast, adaptive organizations can maintain policy objectives even when operational methods must change.

Fourth Stage: System Resilience as Institutional Capacity

Service resilience in this study was reflected in four capacities: preparedness, absorption, recovery, and adaptation. In autogate operations, preparedness includes standard operating procedures, human-resource readiness, network support, disruption-response procedures, and communication among relevant parties. Absorptive capacity is evident when services continue despite increased volumes or partial disruptions. Recovery capacity relates to technical support, problem escalation, and service-redirection mechanisms. Adaptive capacity emerges through evaluation and procedural changes after the organization gains experience from disruptions.

The empirical findings indicate two important pillars supporting resilience at the implementation level: service continuity and organizational adaptability. Service continuity is

supported by alternative inspection channels, including manual inspection and access to a Border Control Management system that may operate separately from autogates under certain conditions. Adaptability, meanwhile, is supported by officers' ability to make rapid decisions to redirect, assist, or conduct further inspections of users.

This demonstrates that system resilience is not identical to device uptime. Resilience results from the interaction of technology, people, procedures, governance, and the organization's ability to manage disruptions. Therefore, resilience capacity can be positioned as an intermediate outcome of policy-implementation quality.

Fifth Stage: Organizational Learning and Policy Renewal

The highest level of maturity was found when the organization did not stop at maintaining services but systematically used implementation experience to improve policy. This theme emerged through evaluation practices, reflection on field-level problems, knowledge sharing, documentation of good practices, data use, and feedback from implementers and service users.

Frontline officers' experiences function as a source of institutional knowledge. Recurring obstacles, user needs, disruption patterns, and the need to adjust standard operating procedures can be converted into evaluation material for managers and policymakers. From this perspective, discretion is not merely individual action. It can become an input for organizational learning when the organization has mechanisms to capture and utilize that experience.

This finding extends the interpretation of Edwards III's framework. Successful implementation in the digital era does not end when communication, resources, dispositions, and bureaucratic structures are adequate. Mature implementation produces a learning loop that returns implementation experience to the stage of policy alignment. Thus, digital-policy implementation is evolutionary and cyclical rather than linear.

Autogate Policy-Implementation Maturity Model

The synthesis of the findings produced five constructs. These constructs are not positioned as separate variables but as mutually reinforcing stages of implementation maturity.

Table 2 The Maturity Model

Stage	Construct	Policy Meaning	Main Indicators
1	Policy alignment	Alignment of objectives, regulations, interpretations, and priorities.	Leadership; communication; regulatory clarity; shared understanding.
2	Collaborative governance	Cross-organizational governance for integrating processes and solving implementation problems.	Coordination; procedure/data integration; escalation protocols.
3	Organizational adaptability	Ability to adjust procedures, human resources, and operations.	Flexible SOPs; competency; assistance; discretion.
4	System resilience	Ability to maintain and restore services under pressure or disruption.	Preparedness; absorption; recovery; adaptation; fallback/manual lanes; BCM.
5	Organizational learning and policy renewal	Ability to transform implementation experience into knowledge and policy improvement.	Evaluation; knowledge sharing; good practices; data and

	feedback; revised procedures.

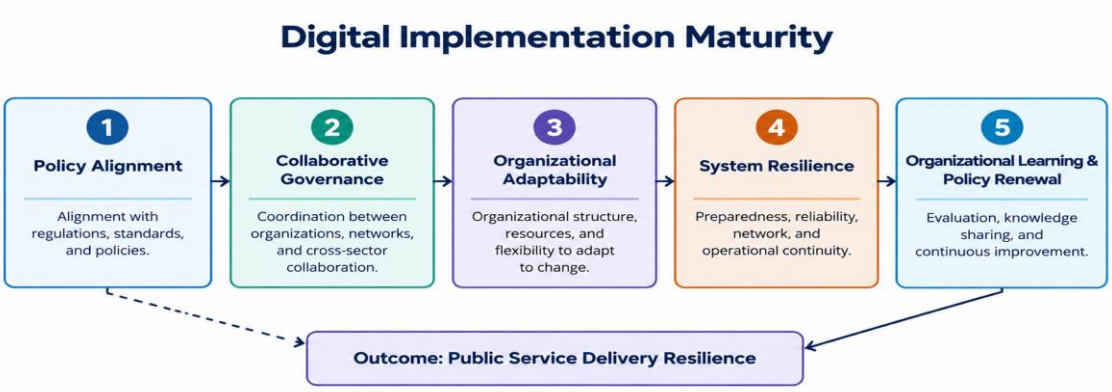


Figure 1. Model of Digital Implementation Maturity for Public Service Delivery Resilience

Source: Developed by the author based on literature review.

Contextual Factors and Policy-Analysis Implications

In addition to the five maturity stages, the study identified seven contextual factors that interact to determine implementation quality: leadership, inter-organizational coordination, human-resource quality, organizational culture, digital infrastructure, regulatory support, and service-user characteristics. These factors do not operate independently. Leadership, for example, influences communication consistency and priorities; human-resource quality affects adaptive capacity; digital infrastructure influences operational choices; and user characteristics determine the need for assistance and inclusive service design.

From a policy-analysis perspective, these findings indicate that autogate evaluation should move beyond output indicators toward implementation and resilience indicators. The number of users and inspection speed remain important, but they are insufficient for determining whether a policy can maintain services under pressure. Evaluation should also consider implementation consistency, fallback readiness, recovery time, cross-actor coordination, officer competency, user experience, and organizational learning capacity.

A second implication is the need to view technology investment and institutional investment as a single policy package. Adding machines without standardizing human-resource readiness, coordination, recovery procedures, and evaluation systems may increase technological dependence without strengthening service resilience. Conversely, strengthening resilience requires policy designs that integrate technology, organization, and learning mechanisms.

A third implication concerns the policy cycle. Within Dunn's (2018) framework, monitoring and evaluation results should become information for policy formulation and recommendation. The model developed in this study clarifies this mechanism: organizational learning and policy renewal return implementation experience as an input into policy alignment in the next cycle. Accordingly, the model is not a one-way sequence but a recurring policy-learning loop.

The primary contribution of this article is the repositioning of system resilience from a technical attribute to an institutional capacity produced through policy implementation. In the study of autogates, preparedness, absorptive capacity, recovery capacity, and adaptive capacity are not treated as characteristics of machines but as the ability of public organizations to maintain the continuity of policy implementation.

The second contribution is the extension of implementation theory. Edwards III's four determinants remain relevant for explaining the basic conditions of implementation. However, the findings show that digital policies include a post-implementation phase involving institutional learning and policy renewal. This indicates that implementation is an evolutionary process that generates new knowledge for the organization.

The third contribution is the development of the role of street-level bureaucrats in the digital context. Frontline officers do not merely use discretion to resolve service cases. They can also act as organizational-learning agents when operational experience is captured, documented, and used in policy evaluation. Thus, digital transformation does not eliminate the role of people. Instead, it shifts the critical point of human involvement from routine execution toward exception handling, adaptation, and learning.

CONCLUSION AND RECOMMENDATIONS

This article demonstrates that autogate policy implementation in Indonesian immigration services cannot be understood merely as a process of technology adoption. It is an organizational-transformation process that depends on the ability to align policy direction, manage inter-organizational collaboration, develop adaptability, build service-resilience capacity, and transform implementation experience into learning and policy renewal.

The study produces an implementation-maturity model consisting of five constructs: policy alignment, collaborative governance, organizational adaptability, system resilience, and organizational learning and policy renewal. The model shows that resilient immigration services are outcomes of consistent, collaborative, adaptive, and learning-oriented policy implementation rather than automatic consequences of technological sophistication.

Theoretically, the findings reposition system resilience as an institutional capacity in public-administration research and extend implementation theory by adding the dimensions of learning and policy renewal. Practically, the findings demonstrate the need to integrate technological and institutional investments. Policy communication, human-resource competency, coordination, fallback procedures, resilience evaluation, and learning mechanisms should be designed as parts of a single policy framework.

The study is limited by its focus on two major airport immigration checkpoints and its qualitative nature. Future studies could test this maturity model at other entry points, compare maturity levels across immigration checkpoints, or develop quantitative indicators to measure the relationship between implementation maturity, service continuity, user-experience quality, and public value.

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