E-ISSN: 3031-8637
Vol. 3, No. 3, July - December (2026), pp. 63 – 72

Analysis of Human Resource Readiness Among Civil Servants for Realizing a Smart City in Cilegon City

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Abstract

The acceleration of information and communication technology (ICT) in local government governance has triggered a paradigm shift in public service toward the smart city concept. However, the successful adoption of this technology is largely determined by the readiness of bureaucratic actors the driving force behind the initiative. This study aims to analyze the readiness of human resources (civil servants/apparatus) in implementing the smart city program in Cilegon City and to identify the internal obstacles encountered. A descriptive qualitative research method was employed, utilizing data collection techniques such as in-depth interviews with key informants (selected via purposive sampling), field observations, and an analysis of local policy documentation. The findings indicate that while the Cilegon City Government has demonstrated a strong regulatory commitment through its Smart City Masterplan, the readiness of its human resources is only partial. The primary obstacles center on a significant gap in digital technical competence both across generations and between different government agencies where ICT literacy is concentrated within technical departments, while frontline bureaucratic units (such as sub-districts and urban villages) remain less prepared. Furthermore, the study identifies a shortage of IT personnel, a scarcity of advanced technical expertise (leading to a reliance on third-party providers), psychological resistance to shifting away from conventional work cultures, and a silo mentality that hinders data interconnection. In conclusion, the acceleration of digital infrastructure in Cilegon City has outpaced the development of human capacity. It is recommended that the local government promptly implement policies for minimum digital competency standards within career management, ensure an equitable distribution of ICT facilities, and intensify digital leadership programs to transform the bureaucratic mindset toward one that is more collaborative and adaptive.
Keywords: Human Resource Readiness, Smart City, Cilegon City, Public Service, Digital Governance.

INTRODUCTION

The acceleration of information and communication technology (ICT) in governance has triggered a global paradigm shift in public service toward the smart city concept. In Indonesia, the implementation of a smart city is no longer merely about utilizing digital tools; rather, it serves as a sophisticated strategy to create an efficient, transparent, and accountable bureaucracy (Mozin et al., 2025). The central government is aggressively promoting regional digitalization to address the complexities of urban dynamics and the growing demands of the public. Nevertheless, the integration

of technology into local government ecosystems often encounters structural obstacles rooted in the capacity of the individuals responsible for its implementation (Bilqis et al., 2025).

The success of a transformation toward a smart city cannot be measured solely by the sophistication of physical infrastructure or the number of applications launched. The most critical determinant is the readiness of the human resources the government officials who act as the driving force and managers of these systems (Yulianah, 2025a). Advanced technology will remain a passive instrument if bureaucratic officials lack the intellectual and technical capacity to operate it optimally. Therefore, aligning the development of digital infrastructure with the capacity building of human resources is essential to ensure that investments in technology do not result in functional failure (Yulianah, 2025b).

Empirical evidence from various government agencies reveals a significant gap between the pace of technology adoption and the level of digital literacy among government officials. Limited cognitive competence in operating digital platforms, managing data securely, and resolving operational technical issues remains a systemic problem (Rumata & Nugraha, 2020). The phenomenon of technological ineptitude among bureaucrats not only hinders the effectiveness of data interconnection systems but also risks causing a waste of state budget resources. When civil servants fail to keep pace with the speed of digitalization, the implemented technology may, in fact, trigger new inefficiencies within the bureaucratic chain (Iriansyah et al., 2023).

The challenge of implementing smart cities is further complicated by a conventional work culture deeply rooted within the bureaucracy. The transition from manual, paper-based work mechanisms to automated, electronic-based systems often triggers psychological anxiety and a resistance to change (Mahayani, 2024). Some civil servants perceive the adoption of ICT as a threat to their comfort zones or as an additional, confusing workload. Shifting the bureaucratic mindset moving away from a rigid, siloed work culture toward an adaptive and collaborative digital culture requires a commitment to radical change (Nazmudin & Yusup, 2026).

To bridge the gap between macro-level policy targets and the reality of micro-level capacity on the ground, conducting a readiness assessment of civil servants has become both an academic and practical necessity (Supriadi et al., 2026). Through a comprehensive readiness analysis, local governments can precisely identify areas of weak competence, potential resistance, and specific needs for training and development interventions. Without measurable readiness indicators, the formulation of smart city strategic policies will lack direction, become reactive, and fail to establish a foundation for sustainable digital governance (Samudra & Mubin, 2025).

The City of Cilegon, a strategic industrial hub in Banten Province, is currently actively accelerating policies to realize its vision of becoming a smart city. The local government has initiated various electronic-based service innovations, catering to both internal bureaucratic needs and external public services. However, given its dynamic industrial landscape, the Cilegon City Government faces several challenges, a diverse demographic profile among its civil servants, a generational gap in

computer literacy, and varying levels of regulatory commitment across different regional government agencies (Organisasi Perangkat Daerah/OPD). This transitional phase serves as an ideal case study for understanding how the internal dynamics of a local bureaucracy respond to the modernization demands of a contemporary industrial city.

Given these complexities, research focused on evaluating the internal capacity of bureaucratic actors in a city undergoing such development is crucial. The disparity between the local government's digitalization ambitions and the actual state of human resource readiness necessitates an in-depth scholarly analysis to formulate tactical recommendations. This article specifically aims to examine, analyze, and map the internal capacity of the bureaucracy. In light of this urgency, this study is presented in a research paper titled An Analysis of Human Resource Readiness Among Civil Servants for the Realization of a Smart City in Cilegon.

METHOD

This study employs a qualitative approach with a descriptive method to provide a comprehensive overview of the phenomenon under investigation. This method was chosen to facilitate an in-depth exploration and understanding of the meanings, perceptions, and empirical realities concerning the readiness of government personnel, without restricting the phenomenon to numerical variables (Rukin, 2019). Primary data were collected through in-depth interviews with key informants selected via purposive sampling including structural officials, human resources administrators, and operational technical staff within the relevant local government. Meanwhile, secondary data were obtained through the examination of documents such as local regulations, master plans, institutional performance reports, and other pertinent strategic policy documents.

To ensure the authenticity and validity of the data collected in the field, the researcher applied both source and method triangulation. The gathered data were then analyzed using an interactive analysis model, which involves three simultaneous processes: data reduction, data display, and conclusion drawing/verification. This assessment of readiness is examined through an analytical framework encompassing three primary dimensions: technical competence in digital literacy; the psychological aspects of bureaucratic work culture in relation to change; and structural support, specifically the availability of training facilities and facilitating regulations.

RESULT AND DISCUSSION

Existing Conditions and the Digital Competency Readiness Map for Civil Servants

The implementation of smart city policies within a local government ecosystem requires a solid legal foundation and well-developed planning documents to guide the transformation process (Djunaedi et al., 2020). Based on a review of local documentation, the Cilegon City Government has demonstrated a serious political and administrative commitment through the development of a Smart City Masterplan. This strategic document formally outlines the six core pillars of a smart city: smart governance, smart

society, smart living, smart economy, smart environment, and smart branding. Theoretically, this masterplan serves as a regulatory guide for various government agencies, enabling them to align their annual work programs with the region's digitalization vision, thereby fostering a harmonious integration between macro-level planning and micro-level governance.

Local government agencies (OPD) have launched a variety of innovations based on information and communication technology (ICT). The proliferation of these sectoral applications ranges from internal administrative platforms such as e-correspondence, e-planning, and e-budgeting systems to external public service applications that directly engage the community, including integrated licensing systems and emergency response applications. On the surface, the sheer volume of digital products reflects a strong drive toward bureaucratic modernization. However, this trend of increasing the number of applications presents new challenges regarding their effective utilization; the quantity of technology produced does not necessarily translate into the quality of service outcomes experienced by the public.

Empirical evidence on the ground indicates that the rapid rollout of these digital platforms has not been matched by the cognitive capacity of the civil servants tasked with implementing them. A significant gap exists between the advancement of sophisticated technological infrastructure and the underlying level of digital literacy among bureaucrats. Government officials are often positioned as end-users, compelled to adapt instantly to new systems without receiving a thorough conceptual grounding. Consequently, the use of applications in the field tends to be merely ceremonial and mechanical; officials may know the steps for data entry, but they lack an understanding of the underlying philosophy the rationale for the efficiency of the data they are managing.

An in-depth analysis of the demographic structure of government officials in Cilegon City reveals a disparity in digital capacity, heavily influenced by age and length of service. There is a clear polarization between younger officials (Millennials and Gen Z) who are highly tech-savvy and senior officials (Baby Boomers and Gen X), who often experience digital anxiety. While younger officials can adopt new features quickly and flexibly, many senior officials require significantly more time to adapt and frequently encounter recurring technical difficulties. This demographic polarization creates operational communication barriers within work units as digital systems are implemented comprehensively.

Beyond demographic factors, this ICT competency gap is also sharply polarized across different government agencies or regional government units (OPD) within the city's administrative structure. A high level of digital readiness and responsiveness is generally concentrated within specialized technical agencies most notably the Cilegon City Communication, Informatics, Encryption, and Statistics Agency. Conversely, in non-technical agencies particularly those at the forefront of basic public services, such as the Population and Civil Registration Agency, the Health Agency, and offices at the sub-district and urban village levels the index of technical competency remains in the low-to-moderate range.

This situation undermines the system as a whole, given that sub-districts and urban villages serve as the primary gateways for public interaction with the government. Low levels of digital literacy

among street-level bureaucrats those working at the sub-district and urban village levels pose a significant obstacle to the realization of smart public services. Many administrative staff at this level still rely on assistance from colleagues just to input data into integrated database systems. Simple technical issues—such as login authentication failures, document upload errors, or local connectivity disruptions frequently bring the entire public service process to a standstill for hours. This lack of basic digital literacy underscores the fact that the introduction of technology has yet to reach the grassroots of the bureaucracy effectively, thereby hindering the acceleration of smart governance at the local level.

One of the crucial findings of this study is the significant deficit both in terms of quantity and quality of personnel with specialized functional expertise in the fields of computer science and information technology. The number of Computer Practitioner functional officials distributed across various regional government agencies (OPD) is extremely low and disproportionate to the workload generated by organizational digitalization. The current bureaucratic structure is dominated by general administrative staff who lack formal educational backgrounds in information technology. Due to this shortage of experts, tasks such as maintaining information systems, addressing basic cybersecurity incidents, and performing periodic data updates at the agency level frequently suffer from systemic delays.

More specifically, the technical competence of the few existing ICT personnel is limited to basic hardware and network maintenance. Cilegon City faces a scarcity of the advanced digital skills essential for a modern smart city such as expertise in big data analytics, integrated database management, and cybersecurity. The absence of competent data analysts means that the vast amounts of public service data collected daily from various applications remain passive, failing to be transformed into strategic information (actionable insights) to support decision-making by the regional head.

A direct consequence of this internal ICT capacity deficit is the Cilegon City Government's heavy reliance on external service providers or third-party vendors. Nearly every stage from system design and application coding to routine server maintenance is outsourced to the private sector through project-based arrangements. This pattern of dependency not only places a persistent burden on the regional budget (APBD) but also creates risks regarding data sovereignty and the long-term sustainability of the systems. When contracts with external vendors expire or become the subject of disputes, local government agencies often find themselves paralyzed, unable to carry out necessary improvements on their own.

In reality, the Cilegon City Communication and Information Office, in collaboration with the Human Resources Development and Personnel Agency (BKPSDM), has initiated various periodic computer literacy training programs and technical guidance sessions. However, evaluations indicate that the effectiveness of these training initiatives is hindered by methodological issues and limitations regarding participant selection. The training sessions are held too infrequently and are too brief, preventing participants from absorbing the material in any meaningful depth. Furthermore, the process for selecting participants is often misdirected; rather than sending the technical staff who handle

applications on a daily basis, agencies frequently send structural officials who have no direct involvement in system operations.

This situation is exacerbated by the absence of a policy establishing minimum digital competency standards required for specific roles within public service agencies. Local governments currently lack formal assessment tools to objectively measure the digital literacy levels of employees during transfers or promotions. Because there are no clear technological competency indicators integrated into career management, the placement of personnel in strategic information system roles is often based solely on formal administrative criteria, disregarding the candidates' actual track record of digital proficiency.

Overall, this analysis of technical competency suggests that the human resource readiness in Cilegon City is only partially ready insufficient to fully support an integrated smart city ecosystem. While the procurement of hardware and applications has accelerated rapidly, the development of the human cognitive capacity required to operate these systems continues to lag behind. Demographic imbalances, disparities in competency across agencies, a shortage of functional experts, and an over-reliance on third parties form an interconnected chain of weaknesses. Ensuring an equitable level of technical digital literacy throughout the entire bureaucratic structure from municipal departments down to the sub-district level is an urgent task that must be addressed immediately. Otherwise, Cilegon City’s smart city vision risks becoming nothing more than a political buzzword, devoid of any substantive progress.

Bureaucratic Work Culture Dynamics and Organizational Structural Support

A non-technical dimension that plays a crucial role in the successful implementation of a smart city in Cilegon City concerns the psychological and behavioral aspects of the civil servants. The massive penetration of information technology into the bureaucratic sphere necessitates a radical shift in daily work patterns. However, empirical observations reveal a significant degree of psychological resistance to change across various levels of the institution. The transition from conventional, paper-based work mechanisms to electronic, automated systems has triggered technostress. Some civil servants perceive the introduction of new digital platforms not as tools to facilitate their work, but as threats to the comfort of the established routines they have mastered over the years.

This psychological resistance does not always manifest as overt opposition; rather, it often appears in passive forms, such as a reluctance to learn the new features of regional information system applications. There is a psychological tendency among some staff to deliberately delay the use of digital systems—justifying this through claims of practicality or by citing frequent technical glitches. This mental block is further exacerbated by the perception that digitalization increases, rather than simplifies, their administrative workload. This phenomenon demonstrates that the procurement of expensive software does not automatically translate into a mental readiness among staff to adopt it, leading to the inefficient use of technology funded by the state.

Another work culture barrier identified within the Cilegon City Government is the persistence of a siloed or sector-centric bureaucratic mindset. Individual regional government agencies tend to operate in isolation when designing and launching digital innovations, lacking the robust cross-sectoral coordination required for effective implementation. This sectoral ego is evident in the reluctance of certain agencies to share or integrate their databases with others, often citing sectoral confidentiality or the perceived superiority of their own programs. Consequently, the smart city ecosystem in Cilegon has become fragmented into isolated, non-interoperable islands of applications a situation that ultimately confuses the public, who are the end-users of these services.

Theoretically, a smart city ecosystem requires a transformation in organizational culture: shifting from a rigid, hierarchical, and closed structure toward a flexible, collaborative, and transparent digital work culture (Purwita et al., 2025). Public officials are expected to adopt a work orientation focused on rapidly solving societal problems by leveraging integrated, cross-departmental data. However, the restructuring of the bureaucratic mindset in Cilegon toward a more dynamic approach has been exceptionally slow. A bureaucratic structure that remains strictly bound to conventional chains of command often restricts the scope for younger officials those eager to innovate or accelerate ICT-based service delivery effectively stifling grassroots digital creativity through formalistic bureaucracy.

This sluggish transition toward a digital work culture is strongly correlated with the quality of digital leadership at the managerial level within each regional government agency (OPD). In the smart city era, leaders are expected to go beyond mere administrative authority; they must act as catalysts who encourage, inspire, and personally model the use of technology in their daily leadership activities. In Cilegon, the level of commitment shown by the heads of various departments or agencies toward the digitalization agenda varies significantly. In agencies where the leadership is tech-savvy and possesses a strong digital vision, the acceleration of smart city initiatives has proven to be highly progressive. Conversely, in organizations led by officials who are passive toward ICT, the implementation of applications tends to stagnate and is positioned merely as a way to fulfill formal requirements.

From the perspective of organizational structural support, the Cilegon City Government has, in fact, made efforts to establish a reasonably adequate legal and policy foundation. Various Mayoral Regulations and regional head decrees concerning electronic-based governance (SPBE) provide legitimacy for the operationalization of a smart city at the local level. Theoretically, these regulations serve to provide a sense of security for civil servants as they execute digital-based programs. However, this collection of regulatory documents often serves merely to satisfy the administrative assessment indicators set by the central government; it has not yet been fully internalized into operational technical guidelines or Standard Operating Procedures (SOPs) that are truly applicable at the most fundamental levels of public service delivery.

Organizational structural support is also heavily determined by the equitable distribution of budget allocations and the provision of supporting infrastructure. Evaluations reveal disparities in ICT expenditure allocations across various regional government agencies (OPD) in Cilegon. Strategic

departments with larger revenue streams tend to possess the financial capacity to upgrade their hardware and provide high-speed internet access. Conversely, grassroots-level units such as sub-district and urban village offices frequently face limited operational budgets for computing, outdated software specifications, and unstable internet connectivity. This lack of standardization in physical infrastructure diminishes the effectiveness of frontline staff.

Another structural factor that dampens the motivation of civil servants to transition toward digital systems is the absence of an optimal, clearly defined mechanism for rewards and sanctions regarding compliance with technology usage. To date, the employee performance appraisal system in Cilegon only tracks attendance and general task reporting. There are currently no specific indicators that provide incentives or additional merit points for civil servants who successfully develop digital innovations, nor for those who shoulder a heavy technical workload as information system administrators. In the absence of structural consequences such as administrative sanctions for those who deliberately disregard digital systems the internal motivation to shift away from traditional, legacy work habits remains extremely weak.

Beyond formal training, an ideal form of structural support from an organization would be the provision of continuous institutional assistance. Whenever a new service application is launched, a work unit requires a technical assistance team one that remains available to guide the transition process until a new work culture is firmly established. In Cilegon City, this support model has been characterized as sporadic and reactive. The technical team from the Communication and Information Office typically provides intensive guidance only during the initial weeks following a system's launch. Once the introductory phase concludes, work units are left to manage the system independently, lacking a responsive technical support (helpdesk) system. Consequently, when operational issues arise, staff often revert to using manual methods.

CONCLUSION

Based on the research findings, it can be concluded that the readiness level of the civil service human resources (HR) for realizing a smart city in Cilegon City is currently categorized as partially ready. Although the Cilegon City Government has demonstrated strong political commitment through the development of a Smart City Masterplan supported by relevant regulations and macro-level planning the acceleration of digital infrastructure implementation on the ground has significantly outpaced the development of human capacity. The primary obstacles center on a gap in technical digital competencies, as well as a sharp polarization in cognitive capacity across different generations and agencies; optimal ICT literacy is largely concentrated within technical departments, while frontline bureaucratic units such as sub-district (kecamatan) and urban village (kelurahan) offices remain at a low level of proficiency. This situation is further exacerbated by a shortage of functional IT specialist personnel (Pranata Komputer) and a scarcity of advanced expertise in areas such as big data analytics and cybersecurity, leading to a high level of local government dependency on third-party providers.

Furthermore, the dimension of organizational behavior faces significant challenges, notably the psychological resistance among civil servants toward transitioning from conventional work cultures to integrated electronic systems. A bureaucratic mindset characterized by silo mentalities and inter-agency sectoral egoism acts as a major impediment to the horizontal interconnection of public service data. These weaknesses in digital work culture are compounded by uneven structural support such as disparities in the allocation of computing infrastructure at the grassroots level as well as the absence of a robust system of rewards and sanctions to enforce the adoption of ICT innovations within employee performance management frameworks. Therefore, to ensure that the smart city vision in Cilegon does not merely become a form of superficial digitalization, it is recommended that the local government promptly formulate a policy on minimum digital competency standards for career management, ensure the equitable distribution of ICT facilities, and intensify digital leadership programs to shift the bureaucratic mindset toward one that is more collaborative and adaptive.

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