Smart City Maturity Analysis Based on COBIT 2019 and SNI ISO 37122:2019

Syuaib Ahkam[1] and R. V. Hari Ginardi[2]
[1] School of Interdisciplinary Management and Technology, Institut Teknologi Sepuluh Nopember
Kampus ITS Tjokroaminoto, Surabaya, 60264, INDONESIA
[2] Department of Information Technology, Institut Teknologi Sepuluh Nopember
Kampus ITS Sukolilo, Surabaya, 60111, INDONESIA
Corresponding author: [1]syuaib.ahkam@gmail.com

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Abstract
In the current era of digital transformation, the development of Smart City is crucial for regions that want to improve public services, stimulate economic growth, and improve the quality of life of their citizens. West Sumbawa Regency, with its tourism and creative economy potential, has adopted the Smart City initiative. However, its effectiveness is hampered by suboptimal IT governance, limited digital infrastructure, and a lack of standardized integrated evaluation models. This study aims to analyze and assess the maturity of Smart City in West Sumbawa Regency by combining the COBIT 2019 framework for IT governance and SNI ISO 37122:2019 for smart city performance indicators. Using a mixed-methods approach—including a survey of 150 stakeholders for quantitative analysis and in-depth interviews with 50 key informants for qualitative analysis—as well as PLS-SEM analysis, capability maturity assessment, and GAP analysis, the results show that most IT governance processes are at maturity levels 2–3. This indicates a significant gap between existing IT governance practices and the achievement of Smart City indicators, particularly in aligning corporate objectives and risk management. The main contribution of this research is the development of an integrated evaluation model that provides a holistic evidence-based roadmap for local governments to formulate more effective Smart City policies to achieve sustainable smart city transformation.

Keywords: Community Engagement, Information Systems, Organizational Capability, Stakeholder Participation, Sustainable Development.

Introduction

The strategic shift towards the concept of smart cities has become a global imperative for local governments, to address complex urban challenges and improve the quality of life of its citizens (Cook & Karvonen, 2024). The implementation of smart city—defined as technology-based urban systems for the continuous improvement of public services (Kim & Yang, 2021)—is proving to be particularly relevant in developing areas, including West Sumbawa Regency, Indonesia. With significant potential in the tourism and creative economy sectors that continue to grow, the West Sumbawa Regency Government has officially launched the Smart City initiative in recent years. However, its implementation still faces substantial obstacles, such as suboptimal IT governance, lack of adequate digital infrastructure, and the absence of a standardized integrated maturity evaluation model (Aljowder et al., 2023).

A phenomenon that often occurs in many developing regions is the misalignment between the vision of Smart City and the reality of IT governance capabilities on the ground (Sharif & Pokharel, 2022). Most Smart City research so far tends to focus on only one framework, both IT governance capabilities and urban performance indicators (Ghazinoory et al., 2024; Micozzi & Yigitcanlar, 2022). Therefore, this study seeks to fill the gap by developing an integrative evaluation model. This model combines the COBIT 2019 IT governance framework (Lee & Kim, 2022) with SNI-based urban performance metrics ISO 37122:2019 (a national standard aligned with ISO 37122) (Kristiningrum & Kusumo, 2021). With this approach, the study is expected to provide a more comprehensive,

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evidence-based, and replicable Smart City maturity assessment method, thus serving as a practical guide for policymakers (Aragão et al., 2023).

Specifically, this study aims to comprehensively evaluate the maturity of Smart City in West Sumbawa Regency. The main objectives include: (1) evaluation of existing IT governance capabilities using the COBIT 2019 framework; (2) measurement of the achievement of Smart City dimension indicators based on SNI ISO 37122:2019; and (3) identify the driving and inhibiting factors of digital transformation at the regional level.

Literature Review

Fundamental Theory of Smart City

The understanding of Smart City has now gone beyond just the application of technology. It is interpreted as a complex integrated system, where advanced technology, governance, and the joints of urban life intertwine to create revolutionary urban management (Chourabi et al., 2021; Hui et al., 2023; Mora et al., 2023). According to Kourtzanidis et al. (2021), the form can be diverse, ranging from digital infrastructure, the preparation of human talent, to innovation in government. Basically, all of these efforts are driven using information and communication technology (ICT), data analysis capabilities, and the active involvement of the community itself, with the goal of building a more sustainable, efficient, and resilient city (Gil-Garcia et al., 2023; Bibri, 2021).

To dissect this complexity, academics and practitioners often refer to popular six-dimensional models: Smart Economy, Smart Governance, Smart Environment, Smart Mobility, Smart Living, and Smart People (Meijer & Bolívar, 2021; Bokhari & Seunghwan, 2024). More than just a theoretical concept, the practical validity of this framework has been demonstrated by various studies that conclude that the implementation of its six pillars significantly accelerates the process of fundamental transformation of a city (Komninos et al., 2022; Stokols, 2023; Lee, 2023).

IT Governance and Smart City Maturity

In a smart city ecosystem, IT governance serves as a central nervous system that ensures the entire technology investment is connected to the city's strategic vision, while maintaining a balance of risk, accountability, and transparency (Caselli et al., 2022; ISACA, 2018). The health of these systems directly determines a city's capacity to innovate through digital services, adapt to change, and serve its stakeholders effectively (Gil-Garcia et al., 2023; Chourabi et al., 2021).

Unfortunately, this system is often disrupted by various implementation constraints at the local government level, such as limited human resources, inter-institutional silos, and digital literacy gaps (Aragão et al., 2023; Sharifi et al., 2024; Fachinelli et al., 2023). To address this dysfunction, capability assessments serve as a crucial diagnostic tool. The use of frameworks such as COBIT 2019 (Gorgona, 2021; Haster & Hartomo, 2022; Guo et al., 2023) enable systematic examinations to identify areas of need for intervention, design capacity building programs, and trigger continuous recovery and improvement cycles (ISACA, 2019; De Haes et al., 2021; Lee & Kim, 2022).

Smart City Indicators and Performance Measurement

The efficacy of Smart City initiatives relies on objective performance measurement and benchmarking, making the standard an essential tool (Cortese et al., 2022; Gil-Garcia et al., 2023; Micozzi & Yigitcanlar, 2022). Frameworks such as SNI ISO 37122:2019 have emerged as a common conceptual foundation in this standardization movement. Its comprehensive evaluation matrix has been adopted as a universal assessment language, enabling meaningful dialogue and comparisons between cities in Europe and Asia (BSN, 2019; Kim & Yang, 2023; Schaffers et al., 2020; Utomo & Tamma, 2022; Guenduez & Mergel, 2022; Çınar et al., 2021).

The strategic advantages of standardization in resource allocation and transparency are real (Smith et al., 2023; Widiyastuti et al., 2021). However, behind this efficiency, lurking the pitfalls of a 'one size fits all' approach risks negating the local context. The successful implementation of Smart Cities, therefore, lies not in the choice between standards or contexts, but rather in the 'art' of its synthesis: the ability to 'translate' the universal structure of a framework into solutions that are organically integrated with the local socio-economic order (Bibri & Krogstie, 2021; Fachinelli et al., 2023). It is this adaptive capability that ultimately unlocks the full potential of the framework to drive authentic and effective transformation (Bibri et al., 2023).

Synthesis and Critical Review

Conceptual Background

Realizing the vision of Smart City, articulated in its six main pillars (Myeong et al., 2022), demands more than just the formulation of goals. Its success depends on the integration of an inseparable 'strategic triangle': first, robust IT governance as an engine for aligning technology investments with city strategies, guided by frameworks such as COBIT 2019; and second, reliable measurement instruments such as SNI ISO 37122:2019, which provides objective dashboards to validate the effectiveness and sustainability of such implementations.

Criticism of Previous Research

A critical review of the existing literature shows that the Smart City research landscape is often partial and disintegrated. A critical review reveals that Smart City research often operates in two isolated intellectual silos. The first silos, namely 'governance', are introspective and obsessed with the internal processes of the organization. The second silos, 'city performance', exclusively looks outward, measuring and comparing external achievements. The result of this separation is a critical blind spot: a failure to understand the direct causal chain from the effectiveness of internal governance to the quality of urban development. In developing countries, these blind spots widen into abysses, leaving a knowledge gap that is crucial for effective and targeted policy interventions.

Justification for Integrated Models

This research illustrates that building a Smart City is like building a magnificent building: its effectiveness cannot be judged by its façade alone. It demands a strong structural foundation as well as a functional external impact. In this analogy, the IT governance guided by COBIT 2019 serves as an internal foundation that ensures strategic integrity. Meanwhile, the SNI ISO 37122:2019 standard acts as an external measuring tool that assesses the quality of facades and their impact on city residents. The study's main contribution is to present an 'integrated blueprint'—a holistic model capable of conducting a comprehensive structural assessment. This model allows us to examine the strength of the foundation (governance) as well as its exterior functionality (performance). This architectural approach is crucial to go beyond decorative judgments and understand the true integrity of modern urban development (Ghazinoory et al., 2024; Alizadeh & Sharifi, 2023).

Methodology

Research Design

A credible assessment of the maturity of Smart City demands a methodological dialogue between internal processes and external impacts. To facilitate this dialogue, the research in West Sumbawa Regency was designed with a mixed method approach that synergistically brings together two evaluation lenses: the COBIT 2019 lens to dissect the

internal governance 'process', and the SNI ISO 37122:2019 lens to measure real 'results' at the city level. This two-lens approach, which integrates quantitative and qualitative data, is key to generating an understanding that is not only empirically valid, but also contextually rich. The goal is to unpack the complexity of this phenomenon into contextually rich insights that can be pragmatically actionable by policymakers (Mattoni et al., 2020; Chen & Chan, 2023; Patton, 2022; Bowen, 2021).

Data Collection

At the heart of the primary data collection of this study is a commitment to capture a multi-faceted view of the Smart City ecosystem, by actively engaging representatives from government, business, academia, and the community. This cross-sectoral engagement reflects best practices in Smart City evaluations that are rooted in stakeholder theory (Oh & Seo, 2021; Burbayeva & Mendybayev, 2022). The research builds on a multi-layered data architecture that is intentionally designed to achieve depth and validity. The quantitative foundation was formed through a structured questionnaire derived from the COBIT 2019 framework and SNI ISO 37122:2019. This foundation is then enriched with a qualitative layer, namely semi-structured interviews that explore the context and nuances behind the numbers. These two layers of primary data, which were collected between October 2024 and January 2025 after going through instrument validation (ISACA, 2019; BSN, 2019; Creswell & Poth, 2021), are further contextualized and cross-validated with a third layer: secondary data from official documents such as the RPJMD, statistical reports, and scientific publications. This three-layer triangulation strategy is crucial to produce a holistic understanding and place findings in a real policy context (Hajduk, 2020).

Population and Sample

From the large research population, namely all Smart City stakeholders in West Sumbawa Regency, the sample determination was carried out carefully. By applying a combination of purposive sampling techniques to select key informants and stratified sampling to ensure representation from different walks of life (Patton, 2022), this selection process produced a solid final sample. The sample consisted of 150 questionnaires that had been filled out completely and validly, as well as 50 respondents who participated in the interview. This sample size is not only representative, but also significantly meets the minimum number prerequisites for data analysis using Structural Equation Modelling (SEM), as recommended by Hair et al. (2021) and Khan et al. (2019).

Quantitative Methods

The decision to use Partial Least Squares-Structural Equation Modelling (PLS-SEM) was the main driver behind the quantitative data collection strategy in this research (Hair et al., 2019). For this reason, a solid data foundation is needed, which is collected through a structured questionnaire from 150 respondents. The key to the validity of this foundation lies in the application of stratified random sampling techniques, which crucially ensure that every stakeholder group—government, business, academia, and society—is proportionately represented. This strategy is in line with Smart City evaluation practices that emphasize the importance of careful sample architecture for analytical integrity (Kumar et al., 2023).

Qualitative Methods

To bridge the gap between quantitative data and field reality, this study explored qualitative narratives through semi-structured interviews. The analysis process involves

systematically encoding the transcripts of 50 key informants to unravel the 'story behind the numbers', following the thematic analysis framework popularized by Braun & Clarke (2021). This step allows for the extraction of deep contextual insights—capturing the nuances of practical challenges and subjective perceptions—that would be impossible to achieve through surveys alone.

Research Hypotheses and Variables

Variables

Table 1. Research variables

Variable Type	Variable Name	Description/Role
Independent (Exogenous)	IT Governance (X)	The main reference for the measurements carried out is the six design factors contained in the COBIT 2019 framework.
Dependent (Endogen)	Smart City Maturity (Y)	Operationally, this composite construct is defined as a composite score that represents the level of city compliance with the indicators in SNI ISO 37122:2019.
Moderation	Digital Infrastructure (Z1)	Digital infrastructure moderates the relationship between IT Governance and the Smart City dimension. This means that a solid technological foundation strengthens the positive impact of IT governance practices, thereby accelerating the achievement of Smart City goals.
Moderation	Stakeholder Participation (Z2)	Stakeholder participation moderates the relationship between IT Governance and the Smart City dimension. This ensures that the initiatives taken are relevant, inclusive, and supported through the active involvement of various groups (government, business, academia, and citizens), thereby strengthening the link between governance and the achievement of positive outcomes.

Operational Definition

Each variable and indicator in this study is clearly defined. For example, 'IT Governance' is measured based on indicators related to the six design factors of COBIT 2019, such as 'Enterprise Strategy' and 'Risk Profile'. Meanwhile, 'Smart City Maturity' is assessed using performance indicators from the six dimensions of SNI ISO 37122:2019, including 'Smart Governance' and 'Smart Environment'.

Research Hypothesis

Table 2. Research hypothesis and rationalization

Hypothesis	Path Relationships	Rationality
H1-H6	The six design factors of COBIT 2019, namely Enterprise Strategy, Risk Profile, Resource Model for IT, Enterprise Goals, Role of IT, and Compliance Requirements, significantly and positively affect the Maturity of Smart City.	Well-organized IT governance ensures technological alignment with city goals, effective risk management, and regulatory compliance. These three aspects are absolute prerequisites for the realization of a mature Smart City.
H7-H12	The maturity level of Smart City shows a positive and significant effect on each of the six dimensions of SNI ISO 37122:2019, including Smart Governance, Smart Branding, Smart Economy, Smart Living, Smart Society, and Smart Environment.	The higher the level of IT governance maturity of a city, the greater its readiness to achieve tangible results across urban dimensions.
H13	Digital Infrastructure (Z1) positively strengthens the relationship between IT Governance and the six dimensions of Smart City.	A solid digital infrastructure is a crucial technological foundation. Its existence reinforces the positive impact of solid IT governance practices, thereby accelerating the achievement of Smart City goals.

Hypothesis	Path Relationships	Rationality
H14-H19	Stakeholder Participation (Z2) positively strengthens the relationship between IT Governance and the six dimensions of Smart City.	The active involvement of diverse stakeholders—including governments, businesses, academics, and citizens—ensures that Smart City initiatives become relevant, inclusive, and supported. This in turn will strengthen the link between governance and the achievement of positive outcomes.

Discussion of Results and Findings

PLS-SEM Structural Model

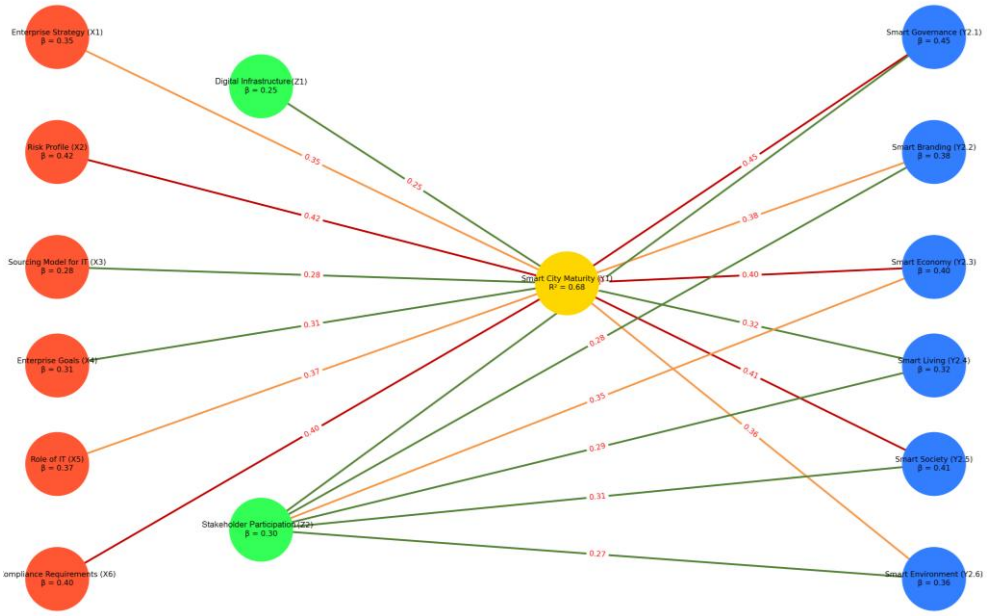

Figure 1. Structural Model of PLS-SEM Analysis Results

Based on the results of the analysis, it was found that the IT Governance variable (COBIT 2019 domains) had a significant positive effect on Smart City Maturity, so that the H1 to H6 hypothesis was accepted with a p value of less than 0.05. Furthermore, the Maturity of Smart City significantly affects the six performance indicators of Smart City (Smart Governance, Smart Branding, Smart Economy, Smart Living, Smart Society, and Smart Environment), resulting in the acceptance of H7 to H12 ($p < 0.05$), with the strongest impact observed on Smart Governance and Smart Economy. The moderation effects of Digital Infrastructure and Stakeholder Participation were also found to be statistically significant, suggesting their reinforcing role in key relationships, and the H13 to H19 hypothesis was accepted. The R^2 value for Smart City Maturity reached 0.68, indicating strong explanatory power, a finding supported by Hair et al. (2021).

Hypothesis Test Results

The results of the PLS-SEM test show that most of the hypotheses proposed in this study are proven to be correct. More specifically, we found that the six design factors of the COBIT 2019 framework had a significant positive impact on the maturity level of Smart City. In addition, the level of maturity of Smart City itself significantly affects the six dimensions set out in the SNI ISO 37122:2019 standard. Another important finding is that most of the IT governance processes in West Sumbawa Regency are at the maturity level of 'Managed' (Level 2) and 'Defined' (Level 3). Interestingly, some processes such

as APO02 (Managed Strategy) and EDM05 (Ensured Stakeholder Transparency) are even close to Level 4.

Table 3. Hypothesis Test Results

Hypothesis	Path Relationships	Path Coefficient (β)	P-Value	Conclusion
H1	Enterprise Strategy -> Smart City Maturity	0.35	0.003	Supported
H2	Risk Profile -> Smart City Maturity	0.42	0.000	Supported
H3	Sourcing Model for IT -> Smart City Maturity	0.28	0.015	Supported
H4	Enterprise Goals -> Smart City Maturity	0.31	0.006	Supported
H5	Role of IT -> Smart City Maturity	0.37	0.002	Supported
H6	Compliance Requirements -> Smart City Maturity	0.40	0.000	Supported
H7	Smart City Maturity -> Smart Governance	0.45	0.000	Supported
H8	Smart City Maturity -> Smart Branding	0.38	0.003	Supported
H9	Smart City Maturity -> Smart Economy	0.40	0.001	Supported
H10	Smart City Maturity -> Smart Living	0.32	0.008	Supported
H11	Smart City Maturity -> Smart Society	0.41	0.002	Supported
H12	Smart City Maturity -> Smart Environment	0.36	0.004	Supported
H13	Digital Infrastructure ⊗ Smart City Maturity	0.25	0.017	Supported
H14	Stakeholder Participation ⊗ Smart Governance	0.30	0.005	Supported
H15	Stakeholder Participation ⊗ Smart Branding	0.28	0.009	Supported
H16	Stakeholder Participation ⊗ Smart Economy	0.35	0.002	Supported
H17	Stakeholder Participation ⊗ Smart Living	0.29	0.006	Supported
H18	Stakeholder Participation ⊗ Smart Society	0.31	0.003	Supported
H19	Stakeholder Participation ⊗ Smart Environment	0.27	0.012	Supported

Results of Maturity and GAP Analysis

A comparison between the level of IT governance maturity (using COBIT 2019) and the achievement of Smart City indicators (based on SNI ISO 37122:2019) shows a striking gap. This gap is especially seen in the areas of digital literacy, regulatory compliance, and environmental management. This indicates that even though IT governance has been implemented, the results in achieving Smart City goals are still not optimal (Cortese et al., 2022; Fachinelli et al., 2023). Further details on this gap are presented in Table 4, which shows the comparison of the gap between COBIT 2019 results and SNI ISO 37122:2019 results.

Table 4. GAP COBIT 2019 vs SNI ISO 37122:2019

COBIT 2019 Factors	Maturity Level	SNI ISO 37122:2019 Dimensions	Achievement (%)	GAP (%)
Enterprise Strategy	Level 3 (Defined)	Smart Governance	65%	35%
Risk Profile	Level 2 (Managed)	Smart Society	55%	45%
Sourcing Model for IT	Level 2 (Managed)	Smart Economy	60%	40%
Enterprise Goals	Level 2 (Managed)	Smart Living	62%	38%
Role of IT	Level 3 (Defined)	Smart Branding	58%	42%
Compliance Requirements	Level 3 (Defined)	Smart Environment	50%	50%

Results of In-Depth Discussion

Table 5. Thematic analysis results from in-depth discussions

Theme Analysis	Key Findings
IT Governance and Smart City Performance	IT governance maturity is an absolute prerequisite for Smart City performance. These findings directly confirm the validity of the theoretical framework that integrates COBIT 2019 and SNI ISO 37122:2019.
IT Governance Gap	The high GAP score on the 'Enterprise Goals' and 'Risk Profile' aspects is in line with what is disclosed in the COBIT 2019 literature. This indicates that the inability to align IT with strategic objectives will result in fragmented and less effective digital initiatives.
Local Government Perspective	In-depth interviews with respondents from local governments highlighted the weak implementation of standardized risk management frameworks. This fact directly contributes to the low level of maturity recorded on the 'Risk Profile' factor.
Community Members' Views	Input from the community emphatically voiced the need for a more inclusive digital platform. This dynamic is reflected in the quantitative findings, where the moderation effect of 'Stakeholder Participation' shows an uneven influence across the various dimensions of Smart Cities.

The central finding of this research is the strong relationship between the maturity of IT governance and the actual performance of a Smart City, which confirms the validity of the theoretical framework used. However, a deeper analysis reveals two crucial weak points: the 'Enterprise Goals' and 'Risk Profile' aspects, both of which show significant maturity gaps. The low score on 'Enterprise Goals' is in line with a warning in the COBIT 2019 literature: without strategic alignment, digital initiatives risk losing direction and impact (De Haes et al., 2020).

Meanwhile, the weakness in the 'Risk Profile' finds its concrete explanation in qualitative data, where interviews with local governments confirm the absence of a standardized risk management framework. On the other hand, interviews also dismantle the dynamics of public participation. The community's expectation of a more inclusive digital platform is key to interpreting why the role of 'Stakeholder Participation' varies significantly as a moderator factor across multiple dimensions.

Conclusions and Recommendations

The study concludes that although West Sumbawa Regency has shown commitment on its journey towards Smart City, its current maturity level is still at the basic stage, namely Levels 2 and 3. We identified significant gaps, particularly in aligning information

technology (IT) governance with the enterprise's strategic objectives, as well as in suboptimal digital risk management. This research strongly confirms that IT governance is a key driver for the maturity of Smart City, and this influence is further strengthened by the presence of a solid digital infrastructure and the active participation of various stakeholders.

Based on these findings, we recommend concrete steps for policymakers and the West Sumbawa Regency Government. They should focus more on improving IT governance capabilities, by pushing the process from 'managed' to 'defined' and 'optimized', which can be achieved through formal training on IT governance, standardization of Standard Operating Procedures (SOPs), and the establishment of dedicated IT governance committees. In addition, it is important to prioritize the development and optimization of digital platforms that actively involve local communities and businesspeople, especially Small and Medium Enterprises (SMEs), to increase participation and belonging to Smart City initiatives. Finally, local governments need to establish a formal collaborative framework that involves all stakeholders, including the government itself, the private sector, and academia, to jointly formulate policies and programs relevant to local needs and gain support from all parties.

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