

Examining Seoul's Smart City Development Through the Lens of Social Constructivism

*Phan Thị Oanh

Institute of Asia-Pacific Studies, Vietnam Academy of Social Sciences, Hanoi, Vietnam

*Corresponding Author

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ABSTRACT

This article applies social constructivism to decode Seoul's smart city evolution, moving beyond the theoretical bottleneck of technocratic determinism to draw policy implications for Vietnam. Employing a qualitative research methodology, the study integrates process tracing, policy discourse analysis, and in-depth case studies of key strategic frameworks. The findings trace Seoul's paradigm shift from a top-down, infrastructure-heavy "u-City" model to a human-centric "Smart Seoul" governance framework. This transition unfolds across three empirical pillars: smart urban management and enterprise innovation anchored by the integrated TOPIS platform; a sustainable digital environment integrating a 3D Digital Twin with green initiatives such as the Climate Card; and humanist governance leveraging public big data to protect marginalized communities through the late-night Owl Bus, an integrated Safety Center, and inclusive digital welfare programs. Furthermore, civic participation is operationalized through three critical constructivist variables: citizen participation depth, normative consensus, and institutional trust, backed by rigorous empirical metrics. The study demonstrates that a smart city is not a static technological artifact, but a continuous process of socio-technical co-creation between responsive municipal administration and civic actors. For rapidly urbanizing countries like Vietnam, Seoul's trajectory underscores the need to transition from technocratic mandates to participatory governance, dismantle bureaucratic data silos to enable cross-sectoral analytics, partner with local research institutions for context-aware technology localization, and ground digital transformation firmly in social equity.

Keywords: smart Seoul, smart city, social constructivism, co-creation, digital welfare.

INTRODUCTION

Amid accelerated globalization and rapid technological advancement, the smart city has emerged as a central pillar of national development agendas worldwide. Confronted with intensive urbanization, demographic growth, infrastructural strain, and compounding environmental risks such as climate change, metropolises are compelled to pursue structural transitions to sustain competitiveness and ensure urban livability. Among contemporary urban paradigms, Seoul stands out as a leading benchmark. The city's evolutionary trajectory - transforming from a war-torn capital burdened by rapid population influx, environmental degradation, and systemic traffic congestion into a globally recognized smart metropolis - offers an instructive model that garners sustained attention from scholars and policymakers alike.

However, existing scholarship on smart cities including analyses of Seoul - reveals a significant theoretical bottleneck: a prevailing tendency to examine urban transformation predominantly through a technocratic lens (Reuter, 2020). This line of reasoning presumes that urban smartness is directly proportional to the deployment density of digital technologies, such as the Internet of Things (IoT), artificial intelligence (AI), big data analytics, and telecommunication networks. Such a mechanistic approach reduces smart urbanism to a purely engineering challenge, fostering the flawed assumption that multiplying sensors, amassing data, and automating municipal functions will inherently generate effective governance. The critical defect of this techno-centric worldview lies in overestimating the autonomous efficacy of technology. From a social constructivist perspective, technology is fundamentally a social construct; its utility and legitimacy are mediated by institutional structures, political

priorities, and local civic cultures. Devoid of social consensus, institutional trust, and substantive civic participation, even the most sophisticated systems risk degenerating into isolated technological silos. Under these circumstances, technical interventions not only fail to resolve complex urban pathologies, but also squander public resources (Kochever, 2020) and entrench the digital divide (Filion et al., 2023).

To address these limitations, this study adopts social constructivism as its core analytical framework to examine the Seoul smart city phenomenon. Viewed through this theoretical prism, Seoul's smart city evolution is not a mechanical aggregation of algorithms and digital hardware, but an ongoing process of socio-technical construction. Within this paradigm, state–society interactions transcend a unidirectional provider–beneficiary dichotomy; instead, municipal authorities and residents function as interconnected co-creators. Shared understandings of civic rights, public service ethics, and a human-centric urban identity fundamentally constitute and sustain this smart governance ecosystem.

This paper analyzes the Seoul smart city model through the lens of social constructivism, elucidating how normative values, institutional arrangements, and civic interactions shape digital interventions such as the TOPIS transit platform, the Owl Bus service, sustainable environmental systems, and targeted welfare nets for vulnerable populations. Drawing from these empirical insights, the study derives strategic policy implications for Vietnam's smart city roadmap amid its accelerating urban digital transformation.

RESEARCH METHODOLOGY

This study adopts a qualitative methodology integrating process tracing and policy discourse analysis. Specifically, process tracing is employed to reconstruct policy paradigm shifts within the Seoul Metropolitan Government, detailing the transition from an early emphasis on physical infrastructure to a human-centric digital governance paradigm. Complementarily, discourse analysis is utilized to decode strategic white papers, master plans, and policy declarations across successive municipal administrations, thereby unpacking how normative concepts of urban identity and participatory governance were constructed within the collective civic sphere.

Furthermore, the study utilizes an in-depth case study design to examine specific transportation, environmental, and digital welfare initiatives across Seoul, thereby grounding its theoretical arguments in empirical reality. Secondary data were triangulated from authoritative sources, including policy white papers from the Seoul Metropolitan Government, municipal strategic blueprints (notably the Seoul Digital Master Plan series), budgetary records, evaluations by international bodies and research consultancies (such as McKinsey & Company), and peer-reviewed scholarly literature.

Context And Policy Ideational Shifts In The Seoul Smart City

Accelerated Urbanization and the Crisis of Nascent Technocratic Models (u-City)

To comprehensively understand this paradigm shift toward an enabling governance framework, Seoul's trajectory must be situated within the multidimensional crises the megacity historically encountered. Rapid 20th-century industrialization and urbanization left profound socio-spatial repercussions, notably acute demographic pressure, environmental degradation, and severe transport deficits. Compounding these structural burdens, the capital now grapples with a drastic demographic transition characterized by accelerated population aging and one of the world's lowest fertility rates - a demographic cliff that precipitously contracts the labor force and strains the municipal welfare safety net. Simultaneously, the decline of conventional manufacturing alongside sluggish employment generation in emerging knowledge sectors has intensified youth underemployment. Confronted with these converging headwinds, the municipal administration has faced an imperative to activate novel growth engines, enhance risk governance, elevate urban livability, and sustain its global competitive standing.

During the initial digitalization wave (from the late 1990s to 2010), embodied by early e-Government initiatives and the national Ubiquitous City (u-City) framework, the Seoul Metropolitan Government approached urban governance through a decidedly technocratic lens. Strategic priorities centered primarily on channeling

substantial public capital into hardware-centric infrastructure: deploying extensive broadband fiber-optic backbones, constructing fragmented departmental data centers, and digitizing internal administrative workflows.

However, the u-City paradigm rapidly revealed profound structural limitations. Driven by a top-down developmental alliance between municipal authorities and major ICT conglomerates, this model inadvertently alienated citizens from the process of collaborative spatial placemaking. Residents were relegated to passive consumers of pre-packaged, vendor-driven services. Simultaneously, municipal data repositories operated within closed, stovepiped architectures, severely lacking cross-departmental interoperability and public data-sharing mechanisms. Consequently, despite deploying state-of-the-art infrastructure, the administration's capacity to resolve complex socio-spatial crises remained severely constrained. Devoid of grassroots civic consensus, major technological deployments generated substantial fiscal inefficiencies, squandering public resources on high-cost infrastructure that delivered negligible civic utility.

The Transition to the Human-Centric “Smart Seoul” Model

Recognizing the systemic limitations of its previous techno-deterministic trajectory, the Seoul Metropolitan Government initiated a decisive paradigm shift after 2012 by unveiling the Smart Seoul 2015 master plan and subsequent long-term vision frameworks. This recalibration fundamentally redefined the municipal digital agenda, shifting strategic priorities from a hardware-centric paradigm toward citizen-centric smart urbanism that positions residents at the core of all developmental and decision-making processes.

This transition precisely mirrors the core tenets of constructivism, as the Seoul Metropolitan Government proactively reconfigured its institutional identity - shifting from a technocratic administrator to a collaborative societal co-creator. Under this recalibrated philosophy, the ultimate benchmark of a smart city lies not in the aggregate volume of deployed digital artifacts, but in the institutional capacity to harness technology to advance the public interest, alleviate socio-spatial divides, preserve the ecological environment, and cultivate civic capital. This strategic orientation was operationalized through a framework comprising six core values and nine focal development agendas, which functioned as a normative compass guiding all subsequent municipal capital investments.

To actualize this constructivist vision, the Seoul Metropolitan Government has sustained a robust fiscal commitment, reflecting long-term institutional resolve. Annually, the municipality earmarks approximately 1% of its aggregate budget for smart city initiatives. As early as 2012, the city allocated USD 100 million (equivalent to 0.57% of its total municipal budget) to early Smart Seoul projects (Ministry of Land, Infrastructure and Transport, 2024). As digital governance agendas broadened, these public allocations expanded substantially. In 2020, the administration directed KRW 101.4 billion toward foundational initiatives anchored in IoT, big data analytics, and artificial intelligence (Seoul Metropolitan Government, 2020). This trajectory escalated during the COVID-19 pandemic, with capital commitments reaching KRW 321.3 billion across 1,045 digitalization projects in 2021 (SMG, 2021), before culminating in an unprecedented KRW 1.126 trillion in 2022 to embed emerging frontier technologies—including the metaverse and generative AI- into core public services (SMG, 2022).

Through the lens of constructivist political economy, mobilizing large-scale investment capital of this magnitude is viable only when anchored in a shared epistemic framework regarding the notion of “efficiency”. Smart city initiatives inherently entail extended implementation and capital recovery lifecycles (typically spanning 5 to 10 years); even short-term pilot projects (1 to 2 years) cannot be adequately evaluated via purely financial metrics. In the absence of strategic resolve and a shared institutional trust uniting the state, investors, and citizens, such investments are highly susceptible to public stigmatization as fiscal waste. Nonetheless, by establishing a novel epistemic norm that frames technological investment as an investment in augmenting societal structural capacity, the Seoul Metropolitan Government demonstrated that when pivotal sectors such as transportation and environmental management are operationalized through smart solutions, overall societal operating efficiency increases by 2% to 3% (according to McKinsey & Company, 2018). This transition not only generates sustainable economic surplus value but also decisively repositions and enhances the international competitiveness of the smart city.

Three Pillars Of Seoul's Smart City Praxis Through The Lens Of Social Constructivism

The Economic Pillar and the Institutional Innovation Ecosystem

From the perspective of social constructivism, the economy of a smart city is not merely a locus for digitized commercial transactions, but rather an Institutional Innovation Ecosystem, wherein regulatory frameworks and public resources are restructured to unlock the endogenous creative capacity of private economic agents and young entrepreneurs.

Promoting Entrepreneurship, Transforming the Labor Market, and Generating Sustainable Employment

A constructivist smart city harnesses technology to reconfigure labor market structures, foster high-caliber emerging professions, and resolve the youth unemployment crisis. According to the results of the 2017 National Census of Establishments, Seoul concentrated approximately 20% of South Korea's smart city-related industries; its economic footprint encompassed 21,947 enterprises employing up to 414,950 workers, with general-purpose technology firms accounting for 13,434 enterprises and 209,297 specialized personnel (Joo & Yoon, 2021). Under the Seoul Digital Master Plan 2020, the city trained 330,000 professionals via the Gaepo Digital Innovation Park, while the G-Valley IoT Academy trained over 1,240 advanced technology specialists (Hankook Ilbo, 2016). Applying the Bank of Korea's Employment Inducement Coefficient, municipal digitalization investments directly yielded 3,807 jobs in 2020, 3,245 in 2021, and 3,494 in 2022 across projects in Big Data, the Metaverse, VR/AR, and intelligent surveillance (SMG, 2020, 2021, 2022). During the COVID-19 pandemic, a public data curation initiative generated 450 short-term jobs for youth aged 18–39, proactively prioritizing the recruitment of 10 persons with disabilities (among 33 mapping personnel) to map pedestrian accessibility (SecurityWorld, 2020).

The TOPIS Transport System and Urban Operational Governance

Before 2002, severe congestion cost Seoul KRW 5 trillion annually alongside vehicle fuel costs of KRW 4.1 trillion, while single-occupancy vehicles occupied 72% of road space and bus modal share collapsed from 37% in 1995 to 27% in 2002 (Kang, 2015). In 2004, SMG introduced an integrated smart card system unifying bus and subway ticketing and establishing distance-based fares (World Bank Group & Global Smart City Partnership Program, 2022). The Seoul Transport Operation & Information Service (TOPIS) synthesized transaction data with GPS tracking from buses and taxis to provide real-time updates through the Bus Information System (BIS) and roadside Variable Message Signs (VMS), establishing public transit as the city's preferred modal choice (SMG, 2011).

Circular Economy and Resource Governance

The Gangnam Resource Recovery Facility (RRF) institutionalized waste-to-energy conversion, turning municipal solid waste into residential district heating (Kang, 2020). In residential energy management, the deployment of Smart Grid systems and smart meters stimulated conservation awareness, yielding a 10% reduction in total municipal household electricity consumption and nearly KRW 500 billion in energy savings (SMG, 2011).

Smart Tourism Ecosystem

With 80% of inbound international visitors selecting Seoul, smart services are heavily concentrated in cultural tourism (41%, second only to public administration at 80%) (Center for Information Systems Intelligence, 2017). In Bukchon Hanok Village, IoT sensors and public Wi-Fi deployed in 2015 sought to reconcile resident quality of life with visitor traffic (SMG, 2020).

The Environmental Pillar and Virtual Ecological Spaces

Under social constructivism, the urban environment is socially constructed as a shared ecological space where digital technologies mediate citizen-environment interactions to foster pro-environmental behaviors.

The “3D Virtual Seoul” Digital Twin

By 2021, SMG completed the spatial digitization of the entire 605.23 km² territory, modeling 630,000 buildings and structural blueprints of 304 subway stations to simulate wind flows, solar radiation, and drainage to optimize ecological planning and disaster preparedness (SMG, 2021).

Clean Energy Strategies and “Solar City Seoul”

The Energy Independent Village initiative expanded to 100 communities by 2018, achieving a 17% reduction in electricity consumption and a 1.7% increase in localized decentralized generation (Lim et al., 2019). In the Magok District, a multi-stakeholder alliance targeting 30% energy self-sufficiency by 2022 projected annual abatements of 190 metric tons of fine dust and 180,000 metric tons of greenhouse gas emissions (Lim et al., 2019). By the end of 2019, the Solar City Seoul initiative deployed 99.4 MW of solar capacity to 122,000 households (reaching a cumulative 250 MW across 284,000 households), supplemented by the Eco-Mileage program offering reward points for domestic energy savings (SMG, 2020).

Green Mobility and the Climate Card

Enforcing penalties on Grade 5 polluting vehicles within the historic center via Automated License Plate Recognition (ALPR) from December 2019 rapidly cut high-emission traffic (SMG, 2020). In January 2024, SMG launched the Climate Card at KRW 65,000 per month for unlimited transit and public bike access, saving over KRW 340,000 annually for more than 500,000 commuters, removing roughly 13,000 cars from daily circulation, and reducing 32,000 tons of greenhouse gas emissions annually (MOLIT, 2024).

The Social Pillar and Human-Centric Governance

The “Owl Bus” Project:

Addressing nocturnal spatial injustice where low-income night-shift workers faced acute transit poverty after midnight, SMG partnered with a private telecommunications provider to analyze billions of nocturnal Call Detail Records (CDRs) crossed with smart transit card logs to map nighttime working-class mobility and optimize late-night bus routes.

Integrated Safety Control Systems

The Smart Seoul CCTV Safety Center integrated video feeds across all 25 autonomous districts (gu), the National Police, and the Fire Department, linking with the Digital Citizen Mayor’s Office across five emergency services and utilizing AI for anomaly detection (Eom, 2019). Concurrently, the u-Seoul Safety Service deployed smart wearable location trackers for children, elderly individuals living alone, and dementia patients to transmit instant emergency alerts (ITU, 2013).

Digital Welfare:

Initiatives include u-Healthcare telemedicine, smart health stations (“u-Health Zones”) in residential complexes, and tailored digital services for marginalized populations.

Empirical Analysis Of Citizen Participation In Seoul’s Smart City Co-Creation

Through the lens of social constructivism, citizen participation in the co-creation/coproduction of the Seoul Smart City is not a neutral technical process, but an ongoing shaping driven by three interrelated variables: the depth of participation, normative consensus, and institutional trust (Cho & Chae, 2021; Lee & Lee, 2019).

Variable 1: Citizen Participation Depth

Regarding the variable Citizen Participation Depth, empirical indicators demonstrate a significant structural lag between symbolic digital democracy and substantive decision-making power (Cho & Chae, 2021; Kim & Lee,

2020). Even though digitized channels record substantial interaction traffic, administrative direction remains overwhelmingly dominant; typically, on the mVoting voting platform, over 80% of votes were initiated top-down by public authorities, while less than 20% originated directly from citizen initiatives (Kim & Lee, 2020).

A quantitative analysis by Cho and Chae (2021) on the Democracy Seoul platform indicated that among thousands of proposals submitted annually, only 3% to 5% surpassed the initial consensus threshold (securing a minimum of 50-100 endorsements) to undergo expert review, and the actual conversion rate into regulatory policies or budget allocations remained below 1.5%. This depth of participation is further critically fragmented by demographic bias: the 20 - 39 age group accounted for over 60% of online interactions, whereas older adults aged 65 and above (representing over 17% of the urban population) contributed less than 4% of platform engagement (Cho & Chae, 2021).

This situation directly stems from the actual digital capability divide documented by the Seoul Digital Foundation (2024) across a survey of 5,500 residents: the usage rate of automated kiosks reaches nearly 100% among young people, but drops sharply to 50.4% in the 65-74 age group and reaches only 19.1% among those aged 75 and older; concurrently, 59.6% of older adults and 60.9% of persons with disabilities face major difficulties when interacting with digital interfaces, giving rise to the risk of democratic disenfranchisement within the co-decision-making cycle (SDF, 2024). Functional digital adoption mirrors this gap: only 38.4% of seniors in Seoul use online shopping applications, 30% utilize digital food delivery, 27.4% independently purchase transit tickets online, and only 28.4% hold personal digital certificates (compared to the city average of 63.6%) (SDF, 2024). The national digital divide report similarly confirms that older adults register an overall informatization level hovering at only 68% to 70% of the general population baseline (Ministry of Science and ICT & National Information Society Agency, 2023).

Variable 2: Normative Consensus

The consequences of this disparity directly affect the variable Normative Consensus, manifested in the concept of interpretive flexibility among diverse social groups regarding the core objectives of urban technology (Lee & Lee, 2019).

This normative divergence is clearly evident in the living lab model of the Bukchon Hanok IoT Living Lab: while 75% of public officials and tech enterprises evaluated the project as a success based on contractual acceptance criteria regarding the quantity of installed sensors and technical devices, 68% of surveyed local residents opposed it, arguing that the camera and IoT sensor systems failed to enhance daily livability and merely served overtourism while infringing on personal privacy, ultimately triggering a wave of collective petitions demanding the removal of monitoring infrastructure (Lee & Lee, 2019).

Normative divergence regarding the ideal of “citizen-led governance” is also manifest in the dimension of fiscal authority: funding from the Citizen Participatory Budgeting System allocated to smart technology projects proposed by residents reached only around 10 billion KRW (approximately 8-9 million USD) per year, accounting for less than 0.03% of the city's annual budget exceeding 40 trillion KRW, thereby reflecting institutional hesitation in devolving substantive fiscal autonomy to the community (Lee & Lee, 2019).

Variable 3: Institutional and Social Trust

In the face of such divergences and conflicts, the variable Institutional & Social Trust functions as a regulatory mechanism that restores throughput legitimacy to the entire urban governance system (Kim et al., 2021). Public trust is reinforced when the government effectively translates societal voices into open and transparent actions (Kim et al., 2021).

An analysis by Kim et al. (2021) of a large-scale dataset comprising approximately 160,000 citizen petitions over an 11-year span (2006–2017) from the Oasis of 10 Million Imagination portal demonstrates that the administration's systematic responsiveness to shifting public demands from technical infrastructure toward environmental quality and social welfare substantially bolstered institutional legitimacy. This level of public

trust is further measured through routine daily engagement at the 120 Dasan Call Center, which handled an average of 22,000 grievance calls per day in 2016 (Kang, 2020).

Notably, to reinforce quantifiable administrative accountability, the Seoul Metropolitan Government restructured the operational regulations of the Democracy Seoul platform: lowering the threshold to open an online public deliberation forum (Gongronjang) from 500 to 100 supporters, while reducing the threshold requiring the Mayor's mandatory personal response from 5,000 to 1,000 participating discussants (Hwang & Kim, 2025; SMG, 2020). By integrating this official forum with early-warning civic monitoring on spontaneous social media (Hwang & Kim, 2025) and the Quadruple Helix governance framework within Living Labs where citizens directly participate from problem formulation (identifying pain points) to sensor co-testing and environmental measurement via the S-Net network (SMG, 2022), skepticism regarding digital data risks has been substantially alleviated. Consequently, Seoul has progressively overcome the “techno-centric trap”, transforming institutional trust and social consensus into core drivers for shaping a sustainable, human-centric smart city (Hwang & Kim, 2025; Lee & Lee, 2019).

Current Status And Structural Bottlenecks In Smart City Development In Vietnam

Policy Framework and Initial Milestones

Smart city initiatives in Vietnam are guided by Resolution No. 06-NQ/TW of the Politburo, Resolution No. 148/NQ-CP of the Government, and Decision No. 950/QĐ-TTg (Project 950). The country is currently transitioning from Phase 1 (2018–2025: Foundations and Piloting) to Phase 2 (2026–2030: Networked Connectivity and Scalability). Nearly all 63 provinces and centrally affiliated municipalities have enacted Smart City Master Plans, and over 50 localities¹ have commissioned Intelligent Operations Centers (IOCs). Strategic regional focus areas include Hanoi's citizen digital services (the iHanoi app) and ITS; Ho Chi Minh City's shared municipal databases and GIS spatial mapping; Da Nang's open data leadership; Thua Thien Hue's civic engagement via Hue-S; and Binh Duong's Triple Helix manufacturing model.

Three Core Bottlenecks

Through the lens of social constructivism, implementation in Vietnam faces three structural bottlenecks:

First, the “dashboard exhibition” syndrome and data compartmentalization: many IOCs prioritize visual displays while lacking real-time data integration; cross-sectoral data-sharing across transit, land, environment, and healthcare remains fragmented into closed “data silos”, undermining coordinated response and wasting public capital.

Second, the structural misalignment between digital solutions and physical infrastructure deficits: unlike Seoul, which deployed smart layers on fully developed physical foundations (extensive subterranean metro networks and deep stormwater drainage tunnels), major Vietnamese cities grapple with unresolved foundational traffic congestion and severe localized flooding. Consequently, digital tools merely treat symptoms (e.g., traffic alerts) rather than resolving physical root causes.

Third, the digital divide and constrained civic agency: citizens remain predominantly passive consumers or reactive complaint reporters rather than collaborative policy co-creators; simultaneously, rapid automation without inclusive safeguards threatens to disenfranchise elderly and low-income populations.

Strategic Lesson And Policy Recommendations For Vietnam

Four Foundational Lessons from Seoul

Pivoting from technocratic mindsets to human-centric social constructivism

¹ The data employed reflects the period prior to July 2025, preceding Vietnam's implementation of the Resolution on the reorganization of administrative units to streamline the state apparatus.

Physical hardware is merely the outer shell; the core of a smart city is using technology to enhance public welfare and protect vulnerable demographics (e.g., Owl Bus, TOPIS). Projects must be measured primarily by citizen well-being and livability.

Institutionalizing open data governance and mandatory interoperability

Open data must be governed as a public utility through an integrated municipal platform (such as S-Data) managed by a centralized coordinating entity, paired with legal mandates requiring cross-agency interoperability.

Empowering intermediary actors and institutionalizing co-creation (Sandboxes and Living Labs) Universities and research institutes must serve as independent evaluators to adapt and localize technologies to local contexts; institutionalized Living Labs and regulatory sandboxes should test innovations in field conditions prior to widespread scaling.

Implementing digital equity strategies and inclusive digital welfare

Expand free public Wi-Fi, build accessible, voice-enabled interfaces, and maintain grassroots training networks for elderly and disabled residents to prevent the emergence of an “elderly tax”.

Phased Implementation Roadmap (2026–2035)

Phase 2026–2028 (Institutional Standardization, Silo Dismantling, and Sandbox Piloting) Mandate compliance with the Sustainable Smart City Criteria – Version 1.0 (under Official Dispatch No. 6862/BXD-PTĐT); finalize data-sharing frameworks; upgrade IOCs to interactive command platforms; and deploy regulatory sandboxes in Hanoi, Ho Chi Minh City, and Da Nang.

Phase 2029–2030 (Regional Network Connectivity and Digital Co-Creation)

Deploy integrated shared database platforms across the Hanoi Capital Region and Southeast Economic Zone; upgrade platforms (iHanoi, Hue-S) into participatory consultation portals with participatory budgeting mechanisms.

Horizon 2031–2035 (Sustainable Smart Urban Corridors and Global Integration)

Synchronize smart urban corridors aligned with ASEAN regional standards, Net Zero emissions, and circular economy principles.

Multi-Stakeholder Roles and Responsibilities

Ministry of Construction: Coordinate spatial planning and oversee urban accreditation under the Smart City Criteria. Ministry of Science and Technology & Ministry of Information and Communications: Update ICT Reference Frameworks, issue IoT technical-economic norms, and oversee cybersecurity and data privacy. Provincial and Municipal People’s Committees: Assume ultimate accountability for practical outcomes, reform IOC operations to tie analytics to field response, and establish the role of Chief Digital Officer (CDO) to eliminate departmental silos. Technology Enterprises & Real Estate Developers: Shift from hardware vendors to digital infrastructure service partners investing in integrated smart townships. Research Institutes, Universities & Local Communities: Act as independent peer reviewers, measure citizen satisfaction (CSAT), and pilot municipal services via Living Labs.

Fiscal Mechanisms and Sustainable Financing

Delimiting public expenditure boundaries: Limit state budget allocations to shared, non-commercial foundational infrastructure (fiber networks, data centers, open data repositories, digital literacy programs), halting fragmented standalone software purchases by individual agencies. Resolving recurring operational expenditure bottlenecks (O&M): Establish standardized techno-economic norms for IT service leasing, legally

allowing municipalities to fund sensor maintenance, algorithm upgrades, and cloud hosting from annual operational budgets.

Unlocking Public–Private Partnerships (PPP) and international financing: Standardize municipal digital PPP contracts in revenue-generating areas (automated traffic enforcement, smart parking, EV charging networks, smart lighting), while mobilizing ODA and multilateral financing (World Bank, ADB, South Korea's K-Smart City initiatives) for climate adaptation and spatial planning in vulnerable coastal and Mekong Delta areas.

CONCLUSIONS

This study has decoded Seoul's smart city paradigm through the theoretical lens of social constructivism, contextualizing these insights against the ongoing urban digital transformation in Vietnam. A genuine smart city is not a mechanical assemblage of concrete, microchips, and proprietary algorithms. Rejecting technocratic determinism, this research reaffirms that technology is fundamentally a social product whose operational efficacy and transformative power are governed directly by institutional frameworks, shared cognitive norms, and active civic participation.

Seoul's transition demonstrates the imperative of evolving from a top-down, techno-centric model (u-City) to a human-centric model (Smart Seoul) centered on co-creation. Seoul's core strength lies in embedding public service ethics and social equity into technological governance - exemplified by big-data route optimization for the Owl Bus, integrated CCTV surveillance, the Climate Card, and distributed u-Health clinics. Crucially, empirical analyses of participation depth, normative consensus, and institutional trust demonstrate that sustainable smart governance requires continuous reconciliation between administrative intentions and grassroots realities. For Vietnam, moving beyond the “dashboard exhibition” syndrome, overcoming physical infrastructure deficits, and preventing digital marginalization necessitates embracing a human-centric, constructivist development model. By implementing a structured roadmap through 2035 supported by transparent stakeholder roles and sustainable financing, Vietnam can cultivate smart cities that are resilient, prosperous, and humanistic.

Author Note:

Phan Thi Oanh, MA, is a Principal Researcher at the Institute of Asia-Pacific Studies, Vietnam Academy of Social Sciences, Hanoi, Vietnam.

Declaration of Conflicting Interests:

The author declares that there is no conflict of interest.

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