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Nothing but symbolic: Chinese new authoritarianism, smart government, and the challenge of multi-level governance

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ABSTRACT

This study investigates the impact of Chinese new authoritarian principles on the approach to multi-level governance that China has implemented during the national transition to smart government. Employing a case study analysis, we illustrate the phenomenon of symbolic compliance, where sub-national public and private actors comply with state-level mandates but while being aware that their actions will fall short of achieving the desired improvements. This behavior, hitherto undocumented in the literature, contributes to the implementation of data-driven public service management solutions that inadequately address local governmental issues. Our findings prompt a re-evaluation of multi-level governance theory and practice in new authoritarian settings and underscore the need for a more pragmatic approach to smart government transitions in such contexts.

1. Introduction

In 2015, while the country was transitioning towards a new form of authoritarianism, the State Council of China implemented a five-year plan (2016–2020)[1] for national socioeconomic development, which includes a key policy document called Key Points for Government Information Disclosure Work. This policy emphasizes the need to establish smart government systems nationwide (Gov.cn, 2015), while signifying the adoption of a more open and participatory approach to public deliberation (Han, 2014; He, 2014) and the acceleration of digital transformations via information and communication technologies (ICT) within the public sector. This policy encourages local governments to leverage smart technologies to increase the availability of government information and enhance data management processes (State Council, 2014). It also advocates a data-driven approach to public administration procedures and public services (Zhang, Bates, & Abbott, 2022).

To sustain this digital transformation, Chinese governmental actors operating at different administrative levels have started combining politics and policies. The intent has been to integrate public administration and government information perspectives into the smart city context to help identify challenges and opportunities in public service delivery, including aspects like digital participation and the role of

partnerships and collaborations with non-state actors (Grossi, Meijer, & Sargiacomo, 2020). For example, the national government issued a Smart Urbanism Construction Masterplan (Zeng, 2020), while municipal governments and their agencies have been experimenting with new policies to facilitate the development of digital applications for information management (e.g., smart mobility services, city operating systems, and smartphone apps) and the growth of a data-driven public administration culture (Ge, Liu, Tang, & West, 2017; Huang, 2021; Szewcow & Andrews, 2020). Collectively, these data-driven practices have generated a need for multi-level governance mechanisms, which are required to connect the various institutional and administrative systems of the Chinese government while orchestrating the management and distribution of data across actors and sectors.

Although multi-level governance studies are hardly novel in the examination of public management practices (Isett & Miranda, 2015; Lodge & Wegrich, 2005; Schmidt & Wood, 2019; van Popering-Verkerk & van Buuren, 2016; Wegrich, 2015), scientific research has yet to explore how emerging theoretical constructs perform in new-authoritarian settings. Recognizing this gap and the importance of expanding our understanding of government information management in the smart technology era, this study uses public administration and government information studies as an analytical lens for examining how

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Chinese new-authoritarian principles affect the multi-level governance underpinning the national transition to smart government.

This study demonstrates that state-level pressures can exacerbate local administrative and coordination challenges, compromising the effectiveness of smart government solutions. Our findings show that symbolic compliance plays a crucial role: public and private actors at sub-national levels of administration operate in line with the national smart government agenda, but they are conscious that their actions are trivial and incapable of producing the improvements expected by the national government. Therefore, municipalities symbolically comply with the national agenda on smart government by introducing new data-driven solutions in public service management, which fail to adequately address local governmental issues or enhance government data management.

Based on a five-year case study analysis of a Smart Transportation System (STS) implemented by a large Chinese city,[2] we reevaluate the current theoretical understanding of multi-level governance in Chinese new-authoritarian conditions, advocating for a more pragmatic approach to smart government transitions in such regimes. This approach necessitates a restructuring of inter-governmental and cross-sector power relations. In respect to the case study, the municipal government has employed STS technology to integrate urban transportation data across public and private organizations in an effort to eliminate administrative barriers. Our analysis reveals that the technological upgrade falls short of meeting these expectations because it originates from the national government's perspective, which assumes a technologically deterministic and politically legitimate form of public governance. Local governmental actors comply vertically with top-level mandates, while non-governmental actors participate horizontally in public-private partnerships to co-create public value. These partnerships occur in a context marked by insufficient local autonomy in decision-making and centralized administration, normalization, and regulation. This approach to smart government underscores the importance of examining "power struggles" (Swyngedouw, 1996, p. 1518) to understand multi-level governance dynamics in China.

The rest of this article proceeds as follows. Section 2 establishes the theoretical framing of this study, building on the comprehensive literature on multi-level governance dynamics in democratic settings and China. Section 3 discusses the data collection procedures and methods used to conduct the case study analysis, while Section 4 presents its findings. Section 5 concludes our study by noting its theoretical and practical implications, limitations, and recommendations for future research.

2. Theoretical framework

Multi-level governance refers to a coordinated system of political structures and decision-making processes in which central government authority is distributed both vertically (i.e., across multiple levels of public administration) and horizontally (i.e., among multiple public and private actors) (Hooghe, Marks, & Marks, 2001; Liesbet & Gary, 2003; Piattoni, 2010). Public administration scholars have frequently applied this concept in an effort to compare multi-level policymaking approaches and institutional arrangements in both democratic and authoritarian contexts. Scholars have primarily focused on Europe (see Bache & Flinders, 2004; Behagel & Arts, 2014; Ehnert et al., 2018; Mulder & Snijders, 2022; Oosten & Esselbrugge, 2004; Wegrich, 2015), with some studies on China (Hensengerth, 2015; Liu, Guo, Zhong, & Gui, 2021; Ongaro, Gong, & Jing, 2019).

Such research has helped address some relevant gaps affecting multi-level governance theory. For example, Ongaro (2015) called for a more comprehensive understanding of what local conditions ensure effective

multi-level governance design and implementation, unraveling the "missing linkages" (p. 1) in current theorizing. Elaborating on these local conditions, Piattoni (2010) stressed the importance of ensuring "simultaneous activation" (p. 250): the coordination and cooperation among governmental and non-governmental actors at the local level. This concept underscores the complexity and interconnectedness of governance systems, emphasizing the importance of coordinated efforts to effectively tackle various policy issues.

This perspective addresses the shortcomings of conventional governance models that rely on more centralized and hierarchical systems (Hooghe et al., 2001). For instance, conventional models promote centralized decision-making and top-down policy implementation, leading to a disconnect between the government and local needs and resulting in inefficiencies. Conventional models also encourage compartmentalized decision-making by separate governmental departments and mainly focus on state actors, excluding non-state actors like civil society organizations and private sector stakeholders from decision-making processes (Bindu, Sankar, & Kumar, 2019; Cordella & Paletti, 2019; Hooghe et al., 2001; Nograšek & Vintar, 2014).

However, for simultaneous activation to occur, changes to conventional policymaking approaches and existing power structures are necessary (Schreurs, 2017). As the literature on public administration and government information highlights, simultaneous activation at the local level is crucial for effective multi-level governance, and its effectiveness is contingent on two national agenda-imposed requirements. First, local actors should collaboratively and persistently manage complex public administration processes (Hensengerth & Lu, 2019; Ongaro et al., 2019 ; Piattoni, 2010), effectively complying with national objectives and ensuring that benefits are equally shared among all parties. Second, the national government should delegate power to support local decision-making, a phenomenon Cairney (2019) calls power distribution over multiple centers.

Simultaneous activation is a common approach in democratic contexts and some authoritarian settings, as demonstrated the experiences documented in government information and public administration research. In many democracies, it emphasizes mobilizing governmental actors at the local as well as regional and national levels, allowing for greater decentralization and empowerment. Regional and local governments otain increased autonomy and decision-making power (Ongaro et al., 2019; Piattoni, 2010). For example, Canada's healthcare system combines federal and provincial responsibilities (Hutchison, Levesque, Strumpf, & Coyle, 2011), with the former establishing principles and guidelines while the latter handle administration and service delivery.

Simultaneous activation is also frequently examined through research that tends to focus on improving public participation in service delivery. This tendency is exemplified by Brazilian Participatory Budgeting initiatives, which empower citizens to influence local budget allocations and prioritize public investments (Gonçalves, 2014). Such initiatives also involve collaboration between local governments, civil society organizations, and community members for more inclusive and responsive governance.

In authoritarian contexts like Singapore, despite a limited decentralization of power, neoliberal practices encourage private companies to develop smart technologies in collaboration with state actors (Ho, 2017). The collaboration is deemed relevant to ensure that central governments can harnesses smart technologies to consolidate the role of the state apparatus in promoting a solidarity economy (Ho, 2017; Kong & Woods, 2018), leading to the consolidation of shared interests and common goals between governmental and non-governmental actors.

In reflecting upon the differences between democratic settings and other authoritarian contexts, Chinese new authoritarianism emerges as a distinct case. Here, multi-level governance practices are triggered by inter-agency and inter-governmental bureaucracies imposed by the national government (Hensengerth, 2015; Ongaro, 2015; Zhu, Huang, & Zhang, 2019). This distinctiveness is encapsulated by examining how

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[2] To ensure data anonymization, within this article, we will refer to the city under the pseudonym of Alpha.

the national government comprehends and implements political legitimacy, strategic coordination and normalization, citizen participation, and market-oriented logics (Fig. 1)—the building blocks of Chinese new authoritarianism. Table 1 outlines the differences between the key features of democratic and Chinese new authoritarian forms of multi-level governance.

2.1. Political legitimacy

In the reference framework of China, multi-level coordination between various forms of government arises from simultaneous activation at the local level, with local actors that are expected to adopt a networked approach (Ciasullo, Troisi, Grimaldi, & Leone, 2020; Kooiman, 2016; Stoker, 2006) and are granted a degree of autonomy in policy-making (Hensengerth, 2015). However, their decisions are subject to national-level approval. This controlled form of empowerment, based on authoritarian leadership, is rooted in China's approach to multi-level governance in public administration (Zhai, 2022) and the smart city transition (Dameri, Benevolo, Veglianti, & Li, 2019; He, Li, & Deng, 2022). The need for approval influences power relations across

administrative levels as well as networked collaboration and local autonomy (Ongaro et al., 2019; Shue, 2018). Examining the interplay between these three factors—networked collaborative approach, local autonomy, and power relations—is crucial to understanding how simultaneous activation occurs within China's conception of multi-level governance.

First, by promoting a networked approach, Chinese new authoritarianism emphasizes the importance of harmonizing governance at the local level. Collaborative and participatory power dynamics and ecosystem strategies play a central role in this harmonization process, where diverse local actors and their objectives should unite as a cohesive force. Harmonization aims to generate new opportunities for national growth and development (Ciasullo et al., 2020).

Second, to sustain this harmonization process, local actors are required to engage in concerted efforts. Their objective is to collaborate in organizing development actions, despite a limited administrative latitude constrains their ability to take local contingencies into account (Bruszt, 2008; Hensengerth, 2015). This autonomy is further restricted when decision-making becomes heavily data-driven—a key feature of smart city transitions (Matheus, Janssen, & Maheshwari, 2020; Zhang,
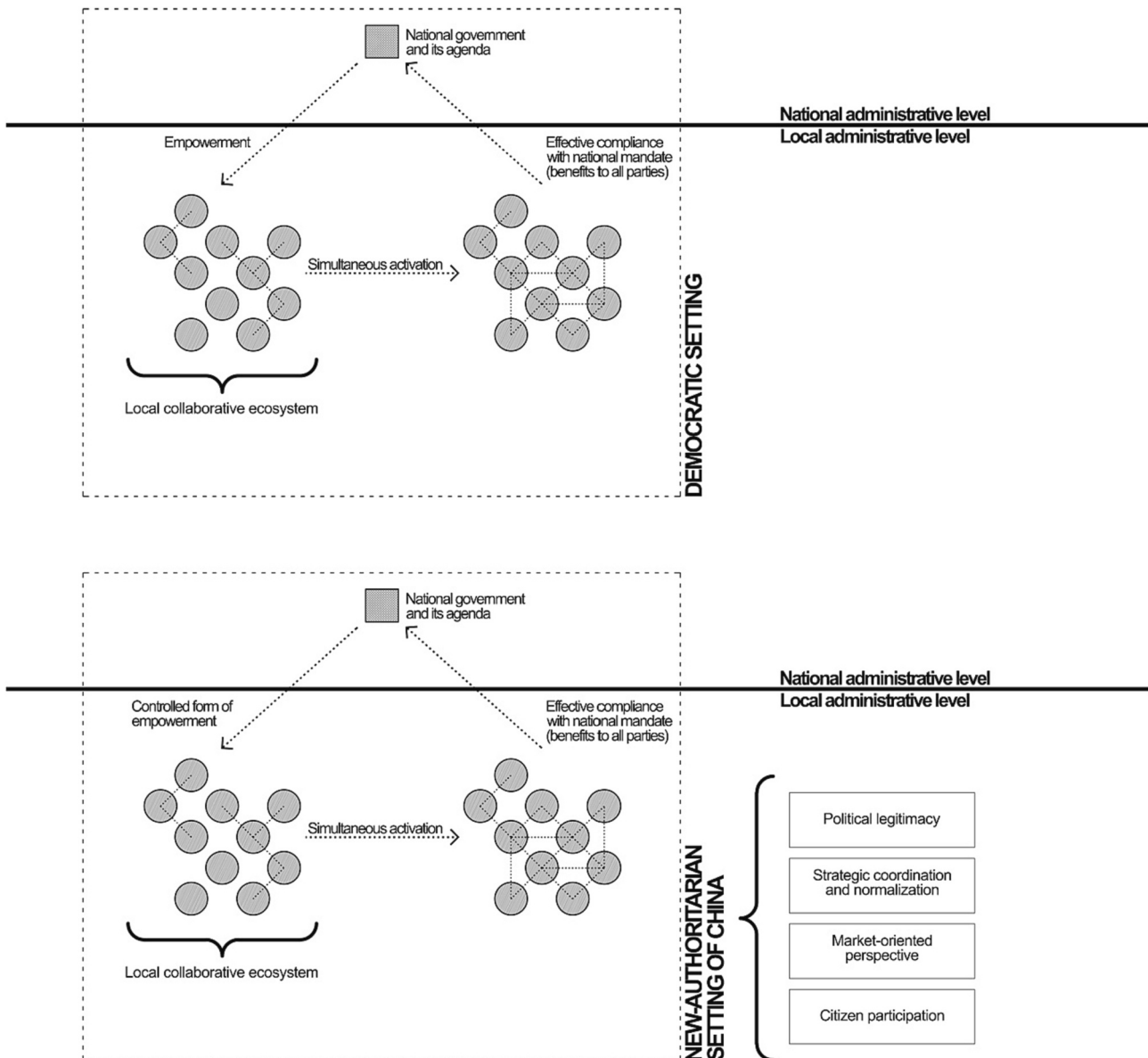

Fig. 1. Multi-level governance theory.

Table 1

Simultaneous activation in multi-level governance: comparing democratic and Chinese new authoritarian settings.

Factors characterizing simultaneous activation in multi-level governance	Democratic setting	Chinese new authoritarian setting
Mobilization of actors	Empowerment of local actors	Controlled empowerment of local actors
Modality of decision-making	Decentralization and local autonomy	Centralization and within-remit accountability
Networked collaboration	Responsive and synergistic governance	Inter-agency cohesiveness and harmony
Power dynamics	Distributed power structure	Hierarchical power structure
Coordination and normalization	Openness and transparency of state apparatus	Command-and-control rationality
Driver of public involvement	Active input and protection of rights	Building trust and fostering social accountability
Market approach	Public-private nexus	Implementation of market tools and centralized planning

Li, & Wang, 2023). In such cases, local governments can take ownership of and centralize data sources controlled by technology companies, rendering local autonomy rather superficial (Zhang et al., 2022).

Third, local actors operate under the political legitimacy exerted by the Chinese state, and their actions need to be aligned with the mandate of the national government (Bulkeley, 2005; Ongaro, 2015). In this dynamic, the national government focuses on centralizing political authority and decision-making power, rather than delegating decision-making freedom to local jurisdictions. Furthermore, within the context of data-driven smart city projects, power relations are arranged hierarchically. As the value of data and demand for top-down data sharing and integration increase, smart governance systems reshape the realm of data control and access (Große-Bley & Kostka, 2021). This shift inevitably upsets the established power structures. Such hierarchical arrangement facilitates the delegation of approval authority from national governments to provincial and municipal government tiers (Brenner, 2019). Schreurs (2017) illustrates this mechanism through an example of multi-level climate governance in China. When new policies or development programs are initially tested locally, the local government possesses the necessary authority to approve such trials. As the learned lessons are then escalated to the national level, decision-making power migrates from the local to the national government.

2.2. Strategic coordination and normalization

According to Ongaro et al. (2019), China's multi-level governance is framed within a highly intentional and ambitious course of action that strengthens the political legitimacy of the national regime. By regulating power relations, this top-down legitimacy is a primary cause of institutional tensions (Brenner, 2004; Bulkeley, 2005) among local actors, which manifest as incongruous administrative routines (Hensengerth, 2015).

Research indicates that strategically coordinating and normalizing processes are essential steps for easing these tensions. For example, Schmidt and Wood (2019) propose introducing normative parameters such as accountability, transparency, openness, and inclusiveness, arguing that their application may help address existing incongruences between actors and evaluate the pros and cons of multi-level governance. Likewise, in the context of smart city governance, Grossi et al. (2020) highlights the significance of using urban auditing as a means to improve accountability and transparency in smart city initiatives by assessing the performance of public organizations and holding them

accountable for their actions and decisions.

In positioning this thinking in the context of Chinese new authoritarianism, Guan and Delman (2017) note that the design and enforcement of policy instruments for multi-level governance are heavily influenced by normative parameters defined by the Chinese national government and imposed on local actors. They propose to replace the normative preferences suggested by Schmidt and Wood (2019) with central planning rationalities and command-and-control approaches that favor the state and its political legitimacy. However, these reflections remain theoretical; more empirical research is needed to critically evaluate how local contingencies and normative parameters can be harmonized to maximize simultaneous activation (Hensengerth, 2015).

While reducing institutional tensions necessitates normative parameters, normalization can lead to additional struggles if local contingencies are not adequately addressed. For example, Stubbs (2005) challenges the lock-in mindset of normativism applied by the Chinese new authoritarian regime, which can result in premature, overly rigid, and abstract administrative processes and provoke power struggles between local actors. To overcome this challenge, Stubbs (2005) and Hay (2011) suggest combining normativism with an interpretivist approach that pays attention to local actors and their ideas, coordination, and the institutional settings in which those ideas and interactions emerge.

2.3. Citizen participation and market-oriented logics

Transitioning to a resilient and viable form of multi-level governance requires a clear understanding of what local strategies are capable of alleviating institutional tensions (Hensengerth, 2015). This understanding also sets the stage for the transition to a smart government (Chang, Jou, & Chung, 2021). However, resilience and viability extend beyond simply balancing centralization (e.g., legitimacy, normalization) and decentralization (e.g., power distribution, local autonomy) (Sinkkonen, 2021).

China's new authoritarianism has introduced administrative rearrangements in the public sector to reduce institutional tensions. Such reforms seek to enhance citizen participation (Nathan, 2017) and incorporate a market-oriented perspective in multi-level governance (Huang, 2019). According to the state's vision on smart city transitions, these rearrangements should strengthen local institutions and foster trust among actors (Dong, Li, Li, Zhu, & Zheng, 2022; Ongaro et al., 2019). Hensengerth and Lu (2019), for example, argue that China's citizen-centric approach to smart city transofrmations can strengthen social accountability mechanisms within its multi-level governance structure. By leveraging participatory processes of co-shaping smart city transitions, citizens can communicate their needs and views to local public authorities more effectively (Li & de Jong, 2017).

Consequently, citizens are expected to actively participate in policymaking and advocate for public participation laws and the establishment of local institutions to protect their right to be involved in smart city initiatives. To encourage citizen participation, the national government has invited local actors to propose initiatives that promote participatory processes in project activities (Schreurs, 2017). However, when public administrations become heavily reliant on data assets (i.e., datafied)—for instance, in data-driven smart city projects—citizens may face disempowerment and opt for passive compliance with public authorities rather than pursuing more valuable forms of engagement (Broomfield & Reutter, 2022).

In addition to citizen participation, Chinese new authoritarianism encourages the convergence of a centralized political regime and market-oriented logics rooted in collaborative practices, such as industrial alliances, advocacy coalitions, and public-private partnerships (Zhang et al., 2023). This approach differs from the dominant business-led logic of marketisation, privatization, and techno-utopianism in neoliberal smart city transformations (Grossi & Pianezzi, 2017; Mora & Deakin, 2019). Rather, it results in a free market with state regulatory

interference, which Wu (2018) refers to as the simultaneous application of "market instruments" and "planning centrality" (p. 4). This combination is intended to alleviate the pressure public administrations experience in supporting local development while adhering to state planning requirements. For example, most low-carbon solutions in China are developed by public actors but promoted by local private companies to reduce carbon emissions at the local level (Huang, 2019). This public-private synergy has materialized in numerous application domains, including smart government (Ma, Christensen, & Zheng, 2023).

The data-driven nature of smart government practices originates from smart city initiatives, with the involvement of troves of urban big data introducing additional complexities and multifaceted barriers to public-private collaborations and institutional adaptation (Meijer & Bolívar, 2016; Mora, Gerli, Ardito, & Messeni Petruzzelli, 2023). The data required to support these initiatives are sourced from marketplaces spanning multiple practice sites, resulting in intricate ownership, standardization, and privacy challenges (Givens & Lam, 2019; Seaman, 2020). To overcome these obstacles, the Chinese national regime authorizes local governments to control heterogeneous proprietary data for public purposes and centralized decision-making (Zhang et al., 2022).

3. Methodology

3.1. Case study and empirical setting

To conduct our study, we adopted a case study approach, which has enabled the scrutiny of a complex phenomenon while elucidating the intricate interplay of factors involved in its development (Yin, 2012). Our analysis focuses on smart government practices and contributes to developing a richer and more holistic understanding of how Chinese new authoritarianism can influence the simultaneous activation of local actors positioned at different administration levels and the outcome of the multi-level governance processes. Using inductive reasoning, we concentrate on a single case analysis of the implementation process for a data-integrated smart transportation system (STS) in Alpha, a Chinese city with over 10 million inhabitants. This digital mobility system incorporates a range of smart technologies, such as local data-integrated platforms with digital twin technology, satellite navigation systems, and 5G-enabled visualization tools provided by private companies. The goal is to align with the state's smart government vision, which emphasizes the adoption of a data-driven approach in urban mobility decision-making.

Alpha's STS has received special attention and approval as a best practice of smart government from the national government, transportation industry, and provincial government. This project is considered as an example of how local governments can improve STS management and operations by adopting a data-integrated, networked, multi-dimensional, and synergistic approach.

A single case study approach has limitations, which are mainly related to the generalizability of findings across different contexts. Given the unique nature of each case, extrapolating the findings to other situations with varying sociopolitical and economic contexts can be challenging. However, a detailed analysis of a specific case allows for the development of new theoretical insights and a better understanding of what mechanisms can be at play in similar scenarios (Yin, 2012). Focusing on Alpha's STS implementation process and the impact of Chinese new authoritarianism, this study provides valuable insights into multi-level governance dynamics that may be relevant for examining and making sense of other smart government initiatives in China and beyond.

3.2. Data collection

Qualitative data were collected from July 2017 to September 2021,

in two stages: during the project's planning and implementation (Stage 1, July 2017–March 2020) and after the municipality began using the STS (Stage 2, March 2020–September 2021). This allowed assessment of multi-level governance dynamics after the project's completion. Moreover, data were triangulated from multiple sources using various collection methods, including focus groups, one-to-one interviews, direct observation, and secondary data analysis. This data collection processed made it possible to capture the perspectives of all stakeholders that have been directly (i.e., municipal government, public authorities, private companies, citizens) or indirectly (i.e., national government) involved in the STS project.

Six focus groups were organized with citizens aged 25–70; participants were selected through purposive sampling, and they represent frequent STS users in Alpha. Their insights informed us on citizen expectations and their engagement in participatory processes. Additionally, 27 semi-structured interviews were conducted with private and public local actors directly involved in the STS project: 19 with STS company representatives and 8 with local transportation agency representatives. Interviewees were purposively sampled based on their direct involvement in the project.

Direct observation of STS operation and control rooms facilitated additional conversations with government officials, providing further insight into the system's functioning and management. Secondary data were gathered from relevant government work reports and policies, identified through in-depth searches of Alpha's municipal government and national government online repositories. A concise overview of data sources is provided in Appendix A.

3.3. Data management and analysis

Guided by the theoretical framework of multi-level governance in the Chinese context, we applied a Gioia-inspired methodology comprising three stages of thematic coding (see Gioia & Chittipeddi, 1991; Gioia, Corley, & Hamilton, 2013). First, we generated first-order codes by identifying emerging concepts describing the simultaneous activation during the STS project and its outcome. Second, we grouped these concepts into thematic areas based on similarities and differences. Third, we connected the thematic areas to the building blocks of Chinese new authoritarianism (i.e., political legitimacy, strategic coordination and normalization, citizen participation, and market-oriented perspective), which served as "aggregate dimensions" (Gioia et al., 2013, p. 21). This approach allowed us to consider "data and existing theory in tandem" (p. 21).

We employed NVivo to manage the substantial amount of structured qualitative data during the coding process. Interviews and focus groups were recorded and manually transcribed to gain familiarity with the data and ensure their quality and reliability (Clarke, Braun, & Hayfield, 2015). As the data were in Chinese, a native Chinese speaker translated them into English, with translations proofread and edited to preserve original meanings. The entire research team participated in the coding process. Some members independently completed first-order coding and engaged in open discussions to reach a consensus on the final data structure (Aguinis & Solarino, 2019). Others monitored the overall process and evaluated the outcome, ensuring the internal and external validity of the observed results (Yin, 2012).

4. Findings

Table 2 presents the results of the coding process. The findings reveal a misalignment between theory and practice, as Chinese new authoritarianism has produced symbolic bureaucratic power structures and multi-level collaboration, similar to local actors' responses. We present our findings using a selection of the most significant coded passages, that is, rephrased text segments or direct quotations extracted from the analyzed material (Appendix B). When referencing coded passages, a code in brackets is provided which links to Appendix A.

Table 2
Data structure.

CONCEPTS First-order coding	THEMES Second-order coding	AGGREGATE DIMENSIONS Third-order coding
• Policymaking for emerging technology • Policy circulation and propaganda • Transparency of private data sources	Policy enactment and enforcement for smart technologies	Political legitimacy
• Private data handover to government • Normalization of government datasets • Regulatory oversight of the transportation industry	Political mandate and centralization of power	
• Special Purpose Vehicles (SPV) • Inter-organizational data sharing and governance schemes • Synergy between the local government and private companies	Building coordination mechanisms	Strategic coordination and normalization
• Red tape and the pecking order • Government moves the goalpost	Administrative inertia	
• Uncritical adaptation of international models • Social evaluation of STS implementation problems • Indigenizing global STS development trends	Indicator-driven technology selection	Market-oriented perspective
• Innovation dilemma • Need for exhaustive analysis of place-based contingencies of STS development	Technological misfit	
• Citizen-generated data flows • Impartial evaluation of civic propositions	Quantified citizen feedback	Citizen participation

4.1. Political legitimacy: state-steered technological determinism and a one-size-fits-all mentality

The municipality of Alpha began developing the STS project after the State Council of China launched its national policy on smart government. Emerging STS companies provided big-data solutions and digital platforms (e.g., bike-sharing apps, smart bus networks, road information modeling), several of which were implemented in the city. For instance, in 2014, AMap, a dominant Chinese smart navigation system, was introduced in partnership with the Traffic Management Bureau for real-time mapping and traffic guidance. Roads and buildings were equipped with detection sensors and CCTV cameras that worked in conjunction with AMap (P.01). The STS also required investment in constructing physical and data infrastructure, such as central databases and cloud data centers (I.03). Diverse data sources were collected from public and private sites, assembled in these data centers, and utilized by two local transportation agencies for centralized transport infrastructure management and control (I.04).

The implementation of private technological solutions and the upgrade of municipal infrastructure assets needed to create the STS in Alpha required state legitimacy (I.17), producing multiple institutional tensions. AMap and similar technologies were "unquestionably a response to what the national government requested" (I.11). This congruency demonstrates the alignment between the political commitments of two administration levels: the legitimization of technological innovations at the national level and their authorized development and usage at the local level. It shows that networked governance linking public and private actors at different levels was in place. However, private companies had limited autonomy in leveraging their know-how

for creating a place-based roadmap for STS development in Alpha (I.05).

The need to align with the state mandate led private companies to prioritize the national agenda over local development needs. The political legitimacy exerted by the state imposed a deterministic and one-size-fits-all understanding of local technological development, one assuming that technological innovation is the fix to all urban challenges and does not require adaptation to local contexts (I.17). Political legitimacy provides the national government with the power to steer local smart government practices. This legitimacy and its technological deterministic view emerge as key features of the national agenda for smart government, and they are considered enablers of long-term sustainability in digital transformation practices (I.06).

The state's need to impose its political legitimacy has restrained the capability of STS technology to respond to Alpha's local development needs. Data integration practices exemplify the limitations of this approach to smart government. Technical (e.g., system construction, infrastructural design) and non-technical (e.g., stakeholder management, managerial frictions across organizations, socioeconomic conditions) dynamics have been persistently subjected to the logic of "data politics" (I.01, I.18). National and local governments interpret data politics as a means to increase their power and control over other local actors. Alpha's municipality has acquired power by manipulating data gathered from different stakeholders, but without exposing a clear strategic vision they are informed about. As one interviewee noted:

> From a purely technological point of view, data integration is a piece of cake. However, this is indeed not an easy task because there exist so many complex issues rooted in the political regime; [for instance,] what kind of data are useful for government and what are the criteria [for selecting them]? How are those various data sources collected? Is there a consensus between different vested interests on the use of these data for integration? [...] This is fundamentally a question of politics; it is [political legitimacy] other than smart technologies that are the main force of data integration. (I.06).

Our findings indicate that data integration practices in Alpha's STS project epitomized power centralism. The big data solutions, which formed the project's foundation, were politicized from the beginning, and any adjustments to data integration practices had to adhere to the state's constraints.

4.2. Strategic coordination and normalization: navigating bureaucracy, data politics, and public-private tensions

Rooted in state-level political legitimacy, the one-size-fits-all approach produced institutional tensions within multi-level governance arrangements. These tensions were influenced by alliances with public and private local actors to manage the project's data governance. Alpha's municipal government envisioned the STS project as an ecosystem connecting all transportation sector actors and resources, including data. However, local transportation agencies made symbolic interventions that failed to adequately address STS data integration needs (I.08, I.09). Agencies managed data sources within their remit but did not actively collaborate with and failed to overcome administrative challenges.

This symbolic compliance was a consequence of "administrative inertia" (I.25) rooted in local agencies lacking the ambition to improve transportation services and focusing on maintaining the status quo (I.23). The root cause of this issue is twofold. First, a combination of inter- and intra-government bureaucratic challenges impacted the STS project, with a mentality of blind adherence described by one interviewee as "entwined with red tape" and "stuck in the pecking order" (I.08). Second, a longstanding "relationship society" (I.09) existed, where the distribution and devolution of power depended on personal social relationships—commonly known as "guanxi"—rather than passing through merit-based administrative procedures. Local transportation agencies with weak relationships with influential government

officials had to navigate bureaucratic obstacles. Often, these informal maneuvers failed, leading agencies to symbolically comply with the state's one-size-fits-all mentality without challenging political legitimacy and authority (I.09). This resulted in STS-related vanity projects and superficial achievement of state objectives failing to consider long-term sustainability or local development needs (I.23). As an interviewee explained:

> You know … we [the municipal government] only do what we are mandated to do. We do not dare to do anything that we are not asked to do … [Although] you see the city image is changing a lot, none of the big changes are outside the bound of [the political] legitimacy [of the state]. So, you can see that innovations are almost the same, like those hundreds of cloud data centers with no meaningful differences. (I.20).

In response to these cookie-cutter approaches, the national government mandated public-private coordination mechanisms at the local level to develop smart government practices (I.16). This change was intended to foster sector integration and reduce bureaucratic issues. Such mechanisms had to be project-driven and led by municipal governments, subjecting private organizations to a command-and-control system (I.19).

For Alpha, the newly introduced coordination mechanisms reduced existing bureaucratic challenges while creating new institutional tensions. Local transportation agencies and private firms had no choice but to follow the municipal government's coordination mechanisms, which dictated how third-party data were used for the STS project. Consequently, these agencies and companies were forced to share their data but had little autonomy in determining its use to benefit all parties (I.17). With limited decision-making power, local actors symbolically complied, providing the required data despite recognizing that doing so would not benefit any of the parties involved. Agencies and companies lost the ability to claim data ownership or use their expertise to inform decision-making, and the municipal government struggled to effectively use the data for STS development (1.16).

In Alpha, the public-private coordination mechanism was called Special Purpose Vehicle (SPV): a temporary team of government officials and private company experts tasked with safeguarding government interests and political leadership in the STS project (I.19). The SPV served as an independent coordinator with legal and regulatory power and was charged with two primary tasks. The first task was creating local dividend policies (I.12). Alpha's municipal government distributed dividend payouts (government grants) among private companies to encourage STS innovation, generating entrepreneurial opportunities for local development and maximizing public interests through government intervention. However, the dividend payouts were insufficient, leading to symbolic actions: companies cleverly competed for dividends in various ways while becoming less focused on developing meaningful solutions (I.12).

The second task was to construct standardized data systems (I.06). Although the SPV required new STS data infrastructures, the government did not establish data standards and protocols to unify metadata, structures, and formats for all transportation data (I.14). For private actors, the standardized systems symbolized state-centralized data ownership and power, thus governing through data-informed decision-making by relying on data traceability. Standardized and traceable datasets could be utilized by the government for regulatory oversight. According to interviewees, standardization was a political lock-in that negatively affected private interests (I.06, I.14). The municipality of Alpha decided against completing the standardized data systems due to the comprehensive trade-offs involved (I.04). While the local government would have benefitted from standardized data procedures for regulatory purposes, they were concerned about the potential negative impact on the productivity and innovation capacity of local tech firms, whose solutions were considered key drivers of economic prosperity and competitiveness. The local government believed that the increased standardization of data systems would likely result in decreased productivity for private companies (I.06).

4.3. Market-oriented perspective: a state-steered rather than free-market economy

The state's political legitimacy and its strong belief in technological determinism facilitated a state-steered market economy. As a result of the Chinese smart government transition, local private companies developed new data-driven technologies that were uncritically used to support the STS project in Alpha. This section explores the connection between technology adoption and symbolic compliance in greater detail.

Many municipalities, including Alpha, based their smart government initiatives on international implementation models created by multinational companies, primarily focusing on productivity, instrumentality, and efficiency. "Mechanically adapting models used elsewhere" (I.15) became the preferred practice for local governments, making these international models the main reference point for technology selection processes (I.23). Consequently, the Alpha municipality expected local private actors to provide STS solutions supported by multinational companies without assessing whether the technology was suitable for local needs. Participants argued that the local government controlled the direction of the smart government transition and exercised its power by determining which specific technologies, international models, and best practices should be applied (I.17). This approach disrupted STS market dynamics at local and national levels. Local private actors did not challenge this reasoning and focused their R&D efforts on the technologies preselected by the government, preventing local expertise from supporting place-based smart government practices (I.16). Meanwhile, the local government "used technology for propaganda purposes" (I.01), endorsing decisions on the most effective STS models. As a political force, such propaganda promoted state-led rather than free-market dynamics. The national government implemented a rigid set of quantitative indicators (e.g., system capacity, product trade value, number of registered patents, and R&D expenditures) that municipalities had to consider when benchmarking the performance of different STS solutions during selection phases (I.02).

In the STS project of Alpha, this led to further symbolic compliance. Indeed, local private companies designed their solutions to meet the requirements introduced by the state's evaluation systems, even though they knew these targets did not reflect local development needs and resulted in technological misalignment (I.03). STS technological solutions were not developed using a place-based approach but were a consequence of the local government's failure to recognize the diverse technological needs across cities. As two interviewees noted:

> As a project manager, honestly, I do not understand how well these [indicators] work […] but, as self-designated by the government, they seem to be very important to measure whether our solution is a good one. We just follow it because every company does. We have no choice but to accept that only these indicators are the so-called standard frameworks. (I.06).

> Government specifies what is needed and what is not. They use these [evaluation] systems to differentiate the good from the bad. […] We just follow. […] Solutions [are] better [when] the indicator says they are. (I.04).

4.4. Citizen participation: selective inclusion

The STS of Alpha requires the municipal government to collect heterogeneous data, including citizen-generated data. Citizens thus constitute essential data points for the local government by using available STS solutions and providing input for decision-making. However, this data sourcing represents a symbolic form of government-led

public participation that differs from the national smart government agenda's vision. Superficial and passive involvement is prioritized over proactive engagement. During focus group sessions, citizens expressed concerns about this limited participation mode and desired more meaningful involvement that would give them a voice in technology selection processes (F.02, F.06). In this respect, citizens can only engage through feedback mechanisms embedded in STS solutions. According to local government officials, citizen feedback must "reflect something imperative to be done, in order for their propositions to be heard" (I.16), with the extent to which their input is considered useful dependent on the opinion of the local government.

Alpha's municipality mandates equal treatment of every citizen, regardless of social standing, as valuable civic suggestions can come from anyone. This guiding principle promotes inclusivity and a level playing field, which local transportation agencies follow when engaging with citizen feedback (I.19). However, symbolic actions prevail. Citizen feedback is selectively incorporated into STS developments. Although individual comments are evaluated impartially, the aggregation process introduces the very selection bias the guiding principle aims to eliminate (I.24). Given the vast amount of feedback, manual data analysis is impossible, necessitating the use of automated systems powered by big-data analytics. Action is only taken for comments selected by the system, rendering the decision-making process unfair (I.24). Relevant comments, especially those from minority groups, may be ignored because they do not stand out in statistical representations.

Symbolic compliance in citizen participation is evident in how local transportation agencies design their feedback mechanisms. Citizens can use STS applications to report issues (e.g., traffic accidents or service quality) (F.06). However, when engaging with these technological solutions, citizens are often hindered by bureaucratic issues and burdensome administrative procedures. As an interviewee noted, the "information provided [is] largely useless, hyperlinks [are] mostly invalid, and contact numbers [are] always out of date" (F.03). Despite being described as transparent and inclusive online one-stop-shops for government procedures, citizens also reported frequent disruptions that prevented them from submitting their feedback online (F.03).

The quality of citizen participation is further impacted by the collection of livelihood data. Local transportation agencies collect and reuse data without informing citizens of the how, why, and when. Citizens expressed concerns about their right to be informed, especially in respect to who holds their data and where it can be found (F.01). Therefore, the participatory citizen concept promoted by national and local governments is more symbolic than substantive.

Moreover, although the municipality of Alpha controls private-sector data, it still relies on local private companies to create custom platforms for enhancing public participation in STS developments and gathering additional data from citizens. As one interviewee noted,

> [Government-designed] apps are cookie-cutter. As a user, you cannot set any preference on [those apps]. Citizens as users do not really like using them. We as tech firms are very active in the market in seeking to align our products with both state and citizen demands. […] We use machine learning and big data analytics to capture […] what citizens really want, and we thus send them what they want. […] Citizens also send us their feedback or even complaints. (I.10).

Our data show that citizens depend on these platforms, treating them like "personal assistants" (F.03) or a "secretary" (F.02). According to private companies, citizens are not only data producers but contributors of ideas to improve STS services. However, focus group participants noted that there is limited opportunity for citizens to participate in the design processes needed to address reported issues (F.05). Citizen input is restricted to upgrading and refining existing STS services, while their suggestions for designing new solutions are only symbolically collected. This symbolic compliance is evident in citizens' inability to be fully involved in decision-making processes for new solutions, despite their willingness to participate, resulting in a "wise-after-the-event" (F.05)

form of symbolic participation.

5. Discussion and conclusion

Fig. 1 explains how multi-level governance dynamics are perceived under the Chinese new authoritarian regime (see Section 2). However, when subject to examination under the framework of the national transition to smart government, this understanding is proven to be inaccurate due to the discovery of symbolic compliance. Symbolic compliance represents an unexpected behavioral factor that can influence multi-level governance dynamics, and it has not been observed in previous research. This study reveals the different forms of symbolic compliance embedded in multiple actions of local private and public organizations involved in the STS project of Alpha. These actions were conducted to meet the requirements set by the national smart government policy but in a trivial and ultimately meaningless manner. Accordingly, we propose reframing existing theorizing on multi-level governance per Fig. 2.

5.1. Theoretical contributions

This study makes three main theoretical contributions. First, we introduce the concept of symbolic compliance in multi-level governance theory. Intimately linked to simultaneous activation, symbolic compliance appears to be a critical risk in the Chinese context, indicating that the traditional understanding of simultaneous activation belonging to non-authoritarian settings may not be applicable to multi-level governance practices under China's new authoritarianism. Previous studies have explored challenges arising from multi-lvele governance when policy implementation and outcomes do not align with national objectives (Bache & Flinders, 2004; Liesbet & Gary, 2003), which can be attributed to factors such as institutional complexity, power imbalances, and insufficient local capacity (Di Gregorio et al., 2019). However, symbolic compliance was not previously mentioned.

Under Chinese new authoritarianism, pressured by state-level political legitimacy, local actors collaborate while responding to national requirements (Fig. 1). However, if their actions only symbolically comply with national requirements, simultaneous activation fails to result in effective multi-level governance dynamics. Symbolic compliance, whereby local actors merely appear to adhere to the national agenda without genuinely contributing to substantive local improvements, presents a challenge to effective multi-level governance (Fig. 2). While recognizing symbolic compliance as a distinct challenge of multi-level governance in our specific case study, it is important to note that this issue may manifest in differing ways or degrees in other contexts.

In the framework of our analysis, these symbolic actions are deliberately pursued to adhere to the mission, objectives, guiding principles, directives, and political will of the national government, reflecting the decoupling of planned and actual effectiveness. As observed in organizational contexts, formal policies can be separated from actual practices, with organizations appearing to comply with external demands without genuinely implementing the intended changes (Bromley & Powell, 2012). Decoupling is intended to maintain the appearance of conformity with institutional expectations (Meyer & Rowan, 1977). However, in the context of smart government, this decoupling seems to emerge in the multi-level governance of Chinese new authoritarianism, where state-level political legitimacy is solidified (Zhang et al., 2023). This leads local actors to follow government-imposed orders mechanically and uncritically, despite knowing that their actions will not produce the desired benefits. In this regard, the concept of symbolic compliance adds a new dimension to the multi-level governance literature, emphasizing the importance of understanding the political mechanisms and contextual factors that may lead to the decoupling of national objectives and local outcomes. This complex phenomenon has not been thoroughly explored in public administration and government information studies.

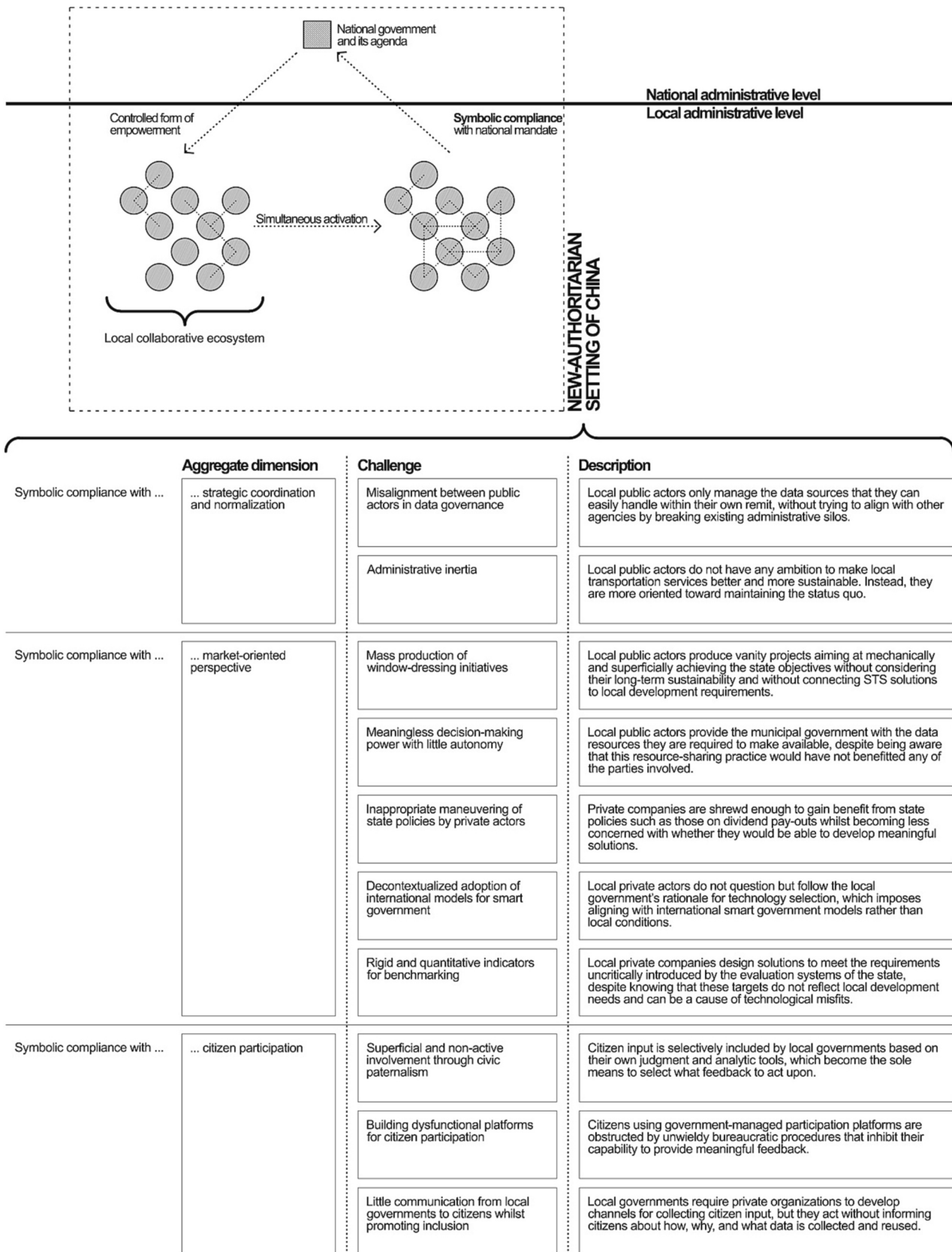Second, our study demonstrates that the citizen-centric focus of

	Aggregate dimension	Challenge	Description
Symbolic compliance with ...	... strategic coordination and normalization	Misalignment between public actors in data governance	Local public actors only manage the data sources that they can easily handle within their own remit, without trying to align with other agencies by breaking existing administrative silos.
		Administrative inertia	Local public actors do not have any ambition to make local transportation services better and more sustainable. Instead, they are more oriented toward maintaining the status quo.
Symbolic compliance with ...	... market-oriented perspective	Mass production of window-dressing initiatives	Local public actors produce vanity projects aiming at mechanically and superficially achieving the state objectives without considering their long-term sustainability and without connecting STS solutions to local development requirements.
		Meaningless decision-making power with little autonomy	Local public actors provide the municipal government with the data resources they are required to make available, despite being aware that this resource-sharing practice would have not benefitted any of the parties involved.
		Inappropriate maneuvering of state policies by private actors	Private companies are shrewd enough to gain benefit from state policies such as those on dividend pay-outs whilst becoming less concerned with whether they would be able to develop meaningful solutions.
		Decontextualized adoption of international models for smart government	Local private actors do not question but follow the local government's rationale for technology selection, which imposes aligning with international smart government models rather than local conditions.
		Rigid and quantitative indicators for benchmarking	Local private companies design solutions to meet the requirements uncritically introduced by the evaluation systems of the state, despite knowing that these targets do not reflect local development needs and can be a cause of technological misfits.
Symbolic compliance with ...	... citizen participation	Superficial and non-active involvement through civic paternalism	Citizen input is selectively included by local governments based on their own judgment and analytic tools, which become the sole means to select what feedback to act upon.
		Building dysfunctional platforms for citizen participation	Citizens using government-managed participation platforms are obstructed by unwieldy bureaucratic procedures that inhibit their capability to provide meaningful feedback.
		Little communication from local governments to citizens whilst promoting inclusion	Local governments require private organizations to develop channels for collecting citizen input, but they act without informing citizens about how, why, and what data is collected and reused.

Fig. 2. Revised multi-level governance theory: The risk of symbolic compliance.

Chinese new authoritarianism does not necessarily result in stronger simultaneous activation mechanisms, particularly in terms of participatory designs aimed at enhancing social accountability in multi-level governance (Schreurs, 2017). Prior research on citizen participation within the context of the Chinese smart government transition suggests that the transition itself, along with associated policies, could create opportunities for increased citizen involvement, such as in eco-city development (Li & de Jong, 2017). This may be achieved through the establishment of more accessible channels for public input, capacity building for local governments and citizens, and the development of robust legal frameworks to protect citizen rights. This perspective aligns with technology roadmapping as a reference framework for providing sustainable services to citizens, empowering them with access to information, and enabling them to debate, influence, and even create policies (Lee, Phaal, & Lee, 2013).

However, our study reveals that citizen involvement in participatory processes can remain limited, regardless of whether they engage passively or actively. The state ideology of civic paternalism (Fairbrother & Zhao, 2016) can render citizen participation measures and feedback mechanisms superficial. These mechanisms can be designed to support the symbolic interpretation of inclusivity advocated by the state, which promotes smart yet disempowered citizens. Consequently, despite the appearance of citizen-centric focus, Chinese new authoritarianism fails to foster genuine citizen participation and enhance social accountability in multi-level governance. Rather, the data-driven nature of the smart government transition makes citizen participation a discipline mechanism.

Third, our findings contribute to the advancement of theories within the realm of smart government. Local governments have faced criticism for implementing top-down strategies in the development of smart governance, with the limitations and consequences of these approaches examined extensively in the literature (Kitchin, Lauriault, & McArdle, 2015; Logan, 2018; Schindler & Marvin, 2018). However, prior research has not addressed the issue of symbolic compliance, which has remained obscured among the various outcomes of top-down digital transformation initiatives.

The smart transportation case examined in this study reveals that symbolic compliance arises from "administrative inertia" in the creation of smart government. The new authoritarian regime imposes top-down visions on local governance of smart government practices, granting local actors symbolic empowerment that heightens institutional tensions. Consequently, the top-down political mandate introduces bureaucracies in multi-level governance, leading to a situation in which local actors focus on pleasing the state. This situation risks fostering an uncritical form of smart government reliant on the same one-size-fits-all mentality found in corporate-driven approaches to digital transitions within the public sector (Esposito, Clement, Mora, & Crutzen, 2021; Mora, Bolici, & Deakin, 2017).

Previous research acknowledges the importance of incorporating democratic principles into smart government initiatives to integrate structures and processes that may inadvertently, albeit unintentionally, undermine or strain constitutional provisions such as the separation of powers (Pereira, Parycek, Falco, & Kleinhans, 2018; Scholl & Scholl, 2014). The model of democratic governance, with its built-in checks and balances, not only applies but necessitates specifications, especially concerning governmental ICT structures and processes (Scholl & Al Awadhi, 2016). However, in our case study, symbolic compliance exemplifies a will-of-the-state mindset among local actors, one aligning with a "state-steered smart mentality" in governing data-driven solutions (Zhang et al., 2022). This state-steered nature of smart government often results in local state actors prioritizing political expectations while neglecting local contingencies for developing smart government solutions, despite possessing a better understanding of local contextual conditions. Therefore, a more ecosystem-oriented approach is needed to transform smart government into a platform where non-governmental actors can co-produce social values and participate in collaborative decision-making processes (Linders, 2012).

While symbolic compliance is rooted in the three theoretical contributions discussed above, further reflection on its existence in other authoritarian contexts, such as Singapore, is necessary. Despite an authoritarian regime pursuing a state-led agenda for smart government, symbolic compliance has not emerged in Singapore due to the presence of a solidarity ethos. This suggests that rather than facilitating positive change and transformation in people's lives, the technologies employed within Singapore's smart government initiatives may actually reinforce the prevailing pragmatic and depoliticized mindset of local communities (Ho, 2017; Rodan, 2016): a mindset that prioritizes practical solutions and downplays political debates. Consequently, these technologies inadvertently bolster authoritarian rule in Singapore by maintaining a social environment in which political discussions and power dynamics are neither openly challenged nor questioned. This system also empowers local actors to apply their expertise to local smart government projects. Despite being state-steered, this approach combines authoritarian logics with the sociopolitical dynamics of the "neoliberalism-as-developmental" strategy (Ho, 2017), resulting in a more trust-based local collaboration ecosystem while avoiding the detrimental effects of neoliberal practices, such as surveillance and data colonialism (Joo, 2023; Kong & Woods, 2018).

5.2. Practical contributions

Our analysis has two main practical implications. First, building on our findings, we indicate that public officials should approach smart government strategically, combining top-down methods with meaningful cross-departmental and cross-organizational collaborations (Mora, Deakin, & Reid, 2019). On this matter, research on Chinese public administration highlights the importance of "guanxi" (personal relationships) in problem-solving (Liu & Zheng, 2018). Overcoming administrative and communicative barriers can be achieved through effective use of personal relationships or intermediaries, known as "guanxi brokers," to bridge gaps and facilitate communication and cooperation. Recognizing the uniqueness of urban contexts is crucial for combining technological development with local sociotechnical arrangements. Our case study demonstrates that adhering to supra-local technological agendas is insufficient for ensuring sustainable smart government practices. Although local governments should adopt a leadership role, their ability to do so depend on the multi-level governance mechanisms that support local actors in coordinating actions horizontally and vertically. Promoting context-sensitive policies through comprehensive local assessments and adaptable policy frameworks tailored to local conditions is essential, as is providing capacity-building support (e.g., training, technical assistance, and resources).

Second, we demonstrate that caution is necessary when evaluating smart government projects like the STS initiative in Alpha, which some media outlets have touted as a best practice. Rigorous observation is necessary to avoid compromising governance capabilities when sharing lessons, as symbolic compliance issues can arise in the absence of robust mechanisms for assessing outcomes and development processes.

Third, we recommend introducing safeguards against inaccurate good practice claims. The highly technological and experimental nature of smart government projects necessitates comparing technological solutions across different political contexts to obtain comprehensive evaluations of their scale-up and replication potential, with national political systems that can significantly impact project results.

5.3. Limitations and future research directions

This study has some limitations. First, in this study we reveal symbolic compliance and some of the critical challenges it poses to multi-level governance, but this phenomenon has only been explored in relation to smart government discourses. Further research is necessary to build on our findings and examine whether symbolic compliance

emerges as a sociopolitical issue in multi-level governance in other empirical settings.

Second, given the limited generalizability of a single case study design, future research should expand the number of cases and aim for national-level and cross-country comparative analysis. Doing so will clarify the extent to which symbolic compliance is diffused across China, whether it appears in other regions of the world, and whether it is unique to authoritarian settings or also emerges in relatively democratic contexts.

Finally, our key observations regarding symbolic compliance in multi-level governance alludes to a form of public administration treading the tricky path between top-down political regimes and bottom-up stimuli in smart government management (Allmendinger, 2021). Additional research is required to guide authoritarian governments in developing strategic approaches able to balance these two complementary forms of development in multi-level governance. Achieving this objective is crucial to ensuring a sustainable transition to smart government, the complexity of which requires cross- and intra-sector collaborative efforts beyond public-private collaboration. It is important to continue exploring how citizens can become trusted collaborators instead of mere participants (Leclercq & Rijshouwer, 2022).

CRediT authorship contribution statement

Jun Zhang: Conceptualization, Data curation, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing. **Luca Mora:** Conceptualization, Data curation, Methodology, Writing – original draft, Writing – review & editing, Visualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Data collection

Data type	Data sources	Description
Focus groups (Code F)	Citizens aged 20–30 (F.01) Citizens aged 30–40 (F.02) Citizens aged 40–50 (F.03) Citizens aged 50–60 (F.04) Citizens who are car users (F.05, F.06)	Each focus group lasted approximately one hour. All focus groups were recorded, and notes were taken. Additionally, two car-user groups were established to explore how citizens perceive data integration as advantageous/disadvantageous to their daily communications.
Semi-structured interviews (Code I)	Company A • Project Managers (I.01, I.23) • Data Scientists (I.02, I.03, I.04, I.05) Company B • Project Managers (I.06) • Strategic Directors (I.07) • Data Scientists (I.08, I.09, I.10, I.24) Company C • Project Managers (I.11, I.25) • Strategic Directors (I.12) • Data Scientists (I.13, I.14, I.15) Alpha Transportation Bureau • Deputy Directors (I.16) • Section Managers (I.17) • Data Scientists (I.18, I.19, I.26) Alpha Traffic Management Bureau • Deputy Directors (I.20) • Heads of Publicity (I.21, I.27) • Data Scientists (I.22)	Interviews lasted 45–75 min. All interviews were recorded and notes were taken. Note, as discussions sometimes involved politics and policies, company participants and their affiliations as well as government participants are anonymized.
Secondary data (Code P)	Over 30 government work reports and policies, including Chinese Smart Urbanism Transition policies, New-Type Urbanization Agenda (2014–2020), and Alpha STS policy documents at municipal, provincial, and national levels for the 2014–2020 period.	Document length varies from 3 to 60 pages.
Direct observation (Code D)	Direct observation at the STS operation and control rooms.	The researchers conversed with government officials and were shown how the system is managed and works, as well as how traffic data are collected and processed. Photos and notes were taken, with any identifying information in the photos subsequently redacted.

Appendix B. Representative coded passages

Second-Order Theme	Representative quotations
Policy enactment and enforcement for smart technologies	"The sensor-enabled Smart Transportation System scenario integrates high-definition surveillance technologies, the Internet of Things, and an intelligent journey planning system." (P.01)

(*continued*)

Second-Order Theme	Representative quotations
	"Data-acquisition hardware such as sensors cannot be installed in some old-style public transports [e.g., traditional buses], so real-time positioning cannot be achieved. […] But the government has been upgrading public transport infrastructures to be smart, if you like. For example, many roads have various types of ADAS [Advanced Driving Assistant Systems] embedded so that data about traffic flows alike can be gathered in real time and uploaded to the cloud data centers." (I.03)
	"Therefore, we have started cooperating with private companies to get their data and use the data to facilitate the operation of traffic guiding system and assist with traffic control." (I.04)
	"*E*-bikes […] have brought about great convenience to people, but no specific legislation was made at its initial stage of implementation, meaning that it was initially not legitimate. […]. People really like it […]. [But] the problem is they can use e-bikes anywhere as they wish. As a result, the proliferation of e-bikes throughout the city has given rise to serious traffic congestion everywhere in the city, especially in the city center. […] [It] is not just a matter of municipal government, but the national government, which put legal and legitimate requirements into effect, so you see that e-bikes and other stuff are in operation." (I.17)
	"…Technology is not a problem at all and it is always the key thing." (I.17)
Political mandate and centralization of power	"The likes of AMap, those which have been legally authorized to work in Alpha, [were] unquestionably a response to what the national government requested." (I.11)
	"They [private STS firms] expect us to grant them more legal rights to be self-autonomous, so that they will not get stuck in a situation where they do not have the flexibility to make their own decisions regarding policy enactment and enforcement. […] They expect us, always, to fine-tune our policies and authorize their proposals, designs, or any kind of operating tasks based on their understanding of the city as they wish." (I.05)
	"We always need to pay heed to emerging technologies because if you talk about smart transportation, it is smart technology-enabled transportation. But technology per se is not a challenge at all. China is one of the leading technology countries in the world. We can do whatever we want, technologically speaking, but all that we are doing, including private firms, must meet national objectives [and requirements]." (I.06)
	"I think irregular management of shared bikes or the like would easily result in traffic disorder, which impacts the image of a city. For example, people who ride shared bikes [often] randomly stop and park. As a result, you can see bikes scattered disorderly across every corner of the city. […] Although this is apparently a management issue, we can force corresponding companies to use technical solutions to mitigate this issue." (I.18)
	"When collaborating with them, the government has full authority in making decisions and setting standards, which we see as a stumbling block. […] [They] usually amend the project proposal or re-set data standards, for instance, on their behalf without listening to our opinions. […] In STS, as everything is data-driven, [this] is really a matter of data politics. […] So, what usually happens is we keep re-inventing the wheel because of the change. They always move the goal posts." (I.01)
Administrative inertia	"From a purely technological point of view, data integration is a piece of cake. However, this is indeed not an easy task because there exist so many complex issues rooted in the political regime; [for instance,] what kind of data are useful data for government and what are the criteria [for selecting them]? How are those various data sources collected? Is there a consensus between different vested interests on the use of these data for integration? […] This is fundamentally a question of politics; it is [political legitimacy] other than smart technologies that is the main force of data integration, but of course, technologies are the trigger of the transition." (I.06)
	"This is a problem with administrative inertia. They [government officials] take responsibility for things they are in charge of only, without sustainable thinking…" (I.25)
	"… [This] results in many 'vanity projects', which are accomplished by government agencies at lower levels ticking the box [i.e., higher-level government officials seeking promotions], without carefully considering citizens' demands, resulting in a significant waste of time and resources." (I.23)
	"… [The] government does not prioritize less competitive private enterprises simply because the nature of bureaucracy and entrenched mindset of 'entwined with the red tape' and 'stuck in pecking order' allow them to overly rely on large firms, with whom they build longstanding collaborations to help them solve local transport issues." (I.08)
	"Such bureaucracy poses a pernicious threat to small firms and some local agencies because of their poor 'guanxi' with local government agencies. […] [Usually] they fail to do so because of the cumbersome hierarchical structures and stable legitimacy of state apparatuses." (I.09)
Building coordination mechanisms	"You know … we [the municipal government] only do what we are mandated to do. We do not dare to do anything that we are not asked to do … [Although] you see the city image is changing a lot, none of the big changes are outside the bound of [the political] legitimacy [of the state]. So, you can see that innovations are almost the same, like those hundreds of cloud data centers with no meaningful differences" (I.20)
	"… [We] have to make a strong declaration of our business advantages to the local transportation agencies. … The first step of this process is to gain support and project approval from the local government. … The second step is to discuss and make specific action programs with relevant agencies that oversee STS initiatives. The project does not start until these two steps are complete." (I.16)
	"They [the SPV] are granted permission to develop policies for supporting the STS project, distributing data sources, conducting quality checks of datasets, and reporting any illegal use of data. They are also empowered to participate in framing local legislation for big data and cyber security. […] [The] SPV has been working well, especially in standardizing business activities and introducing codes of practice across the transportation industry." (I.19)
	"For car-pooling firms, we are not interested in, and they would not share with us, their end-user-related data, such as real-time user location, driver information, etcetera. But we can absolutely ask for their data if there is a need." (I.17)
	"Sometimes, we [transportation agencies] know what we need to do, but we are not [empowered] to decide on doing so. It is not because we are not allowed to do it, but because no specific and clear documents from top leadership stipulate its legality. We cannot do anything but wait, dealing with daily routines." (I.16)
	"The government provides some but not too many dividend pay-outs to the collaborative shareholder organizations to encourage and promote urban innovations. […] Often, state-owned firms are a lot better than us in receiving such pay-outs. […] As a project manager, I feel we really need more of this kind of government subsidy so that we can be more motivated." (I.12)

(*continued*)

Second-Order Theme	Representative quotations
	"The differences between systems in terms of data format, data structure, and data geographical coordinate system hinder the process whereby the data produced by various systems are shared and used." (I.14)
	"I believe this is not a technical issue. [...] All commercial enterprises would follow such standards for their own purpose of development. ... Yet, it is a shame that we have not had such a nationwide standard. [...] [We] really need to weigh up whether it could be a danger to the innovation capacity of giant companies as well as market dynamics [from which] citizens benefit." (I.06)
	"The likes of us [private companies] can be impacted by standardization; for them [government] this means control, yet we are the driving force of market vitality." (I.04)
Indicator-driven technology selection	"… mechanically adapting models used elsewhere." (I.15)
	"There is a department called the Department of Frontier Technology, which is responsible for exploring new potential technological solutions and innovative ideas from all over the world. [...] [They] also investigate what is mentioned in the Government Work Report and national conferences. So, we always position ourselves at the front line." (I.23)
	"This is about a holistic view of top-level design, which is obviously led by the state. We know what is good and can benefit the society." (I.16)
Technological misfit	"… put technology into effect through and for propaganda." (I.01)
	"Technological initiatives, such as the vehicle plate number restriction system, were in nature KPI-driven, indicating the effectiveness of traffic control. It was first applied in Alpha in 2016. The government promoted such initiatives through media […], local transportation agencies further broke it down into specific actions, setting goals and creating action plans on execution." (I.02)
	"The plate number restriction system is not really a solution to Alpha's traffic congestion […]. As you can see, there is no substantial change. I don't think it makes the entire transportation system significantly different." (I.03)
	"As a project manager, honestly, I do not understand how well these frameworks [indicators] work […] but, as self-designated by the government, they seem to be very important to measure whether our solution is a good one. We just follow it because every company does. We have no choice but to accept that only these indicators are the so-called standard frameworks." (I.06)
	"Government specifies what is needed and what is not. They use these [evaluation] systems to differentiate the good from the bad. […] We just follow. [...] Solutions from other firms are better than ours, you know, because the indicator says they are." (I.04)
	"We simply just use whatever apps we are provided. We can use them to do many things we wouldn't bother to do without them; [for instance], reporting accidents. But for me, with many years of taxi driving experience, I wish I could play a part in adjusting traffic rules and regulations." (F.06)
	"Some technologies or applications are good, but some others are not. For example, oftentimes, the traffic information shown on my smartphone is misleading; it is different from what the reality actually is. I don't like them. They [technologies] are not good enough. […] They should listen to our view." (F.02)
Quantified citizen feedback	"…truly reflect something imperative to be done, in order for their propositions to be heard." (I.16)
	"We [local transportation agencies] need balance. [...] We should not only consider the privileged few, like those people who are richer or politically empowered. Neither should we pay special attention to the minority, like the urban poor. [...] We need to decide whose propositions should be considered. We need to see whether the proposition [citizen voice] is a good one with a long-term effect." (I.19).
	"… Big data analytics, machine learning, that kind of thing, are crucial. We see these techs as facilitators that can really help us screen out thousands of pieces of civic reports and messages we gather from our apps, websites, and broadcasting stations." (I.24)
	"… [Pretty] much quantified but we do need it [data mining] to help us make decisions on selecting good or bad and valuable or worthless comments coming from the public. [...] [It is] probably less objective [but] we need to be efficient, really." (I.24)
	"The information provided was largely useless, hyperlinks were mostly invalid, and contact numbers were always out of date." (F.03)
	"I don't feel comfortable with the fact that my personal information is disclosed somewhere I don't know. As a user, if STS data are to be integrated in one place, I must want to know at least how they collect my data. [...] [Generally] speaking, I just feel that the information I need is not accessible whereas my personal information is found everywhere." (F.01)
Digitally disempowered citizenry	"[Government-designed] apps are cookie-cutter. As a user, you cannot set any preference on [those apps]. Citizens as users do not really like using them. We as tech firms are very active in the market in seeking to align our products with both state and citizen demands. [...] We use machine learning and big data analytics to capture [...] what citizens really want and we thus send them what they want. [...] Citizens also send us their feedback or even complaints." (I.10)
	"To me, the custom-built integrated application is like my personal assistant." (F.03).
	"I agree, so it is like personal secretary" (F.02).
	"… I believe that if a new technology aims to be fantastic, it has to be really addressing our needs. [...] [But] this is not up to us. We are not involved in phases of design. We just report and provide feedback, quite wise-after-the-event, you know." (F.05)

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