HARVARD Kennedy School
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Technology and Governance in Singapore's Smart Nation Initiative

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Decades of rapid economic growth and urbanization in Singapore have given rise to new and increasingly complex policy problems. Singapore's policymakers have sought to address these problems by leveraging emerging technological solutions such as data analytics. This has culminated in the "Smart Nation" initiative, a nationwide and whole-of-government effort to digitize Singapore's policy processes and urban environment. More importantly, the initiative has given rise to administrative reorganization and increased state-citizen engagement. These changes portend more fundamental shifts in Singapore's governing milieu.

THE COSTS OF URBANIZATION

As a city-state with a population of 5.54 million and a land mass of 719.1 square kilometers (approximately 277.6 square miles), Singapore ranks among the world's most densely populated countries, with a population density of 7,807 people per square kilometers of land area (World Bank 2016). Such high population density, driven by the rapid economic growth, urbanization, and immigration that Singapore has experienced in the past few decades, has resulted in overcrowding in the city, strained public infrastructure, and driven the high cost of housing.

These emerging urban issues have in turn given rise to public discontent and a relatively steep decline in vote-share for the ruling People's Action Party in the 2011 General Elections (Cunha 2012; Tan 2012). At the same time, Singapore's ongoing shift to a knowledge-based economy has stimulated growing interest, among both policymakers and businesses, in exploiting data as a potential economic resource (Lim 2015; Calder 2016; Tan 2016). This confluence of economic opportunity and urban complexity has prompted broad-scale shifts in the introduction and governance of smart city technologies and modalities.

SMART NATION INITIATIVE

Introduced in late 2014, the "Smart Nation" initiative represents a large-scale effort by the Singapore government to apply data and information and communications technologies (ICTs) to resolve complex urban policy issues as well as explore potential emerging industries associated with these technological solutions (Lee 2014). Under the aegis of a newly-formed Smart Nation Programme Office (SNPO) under the Prime Minister's Office (PMO), the Smart Nation initiative was established to "support better living, stronger communities, and create more opportunities, for all" (Smart Nation Programme Office 2016).

However, it is important to note that the Smart Nation initiative was not established tabula rasa, but rather, represents a culmination of earlier efforts aimed at digitizing public service delivery, or "e-government" (Tan and Pan 2003; Sriramesh and Rivera-Sánchez 2006; Chan et al. 2008). This began in the late 1980s through the 1990s in the government's "Civil Service Computerisation Programme," which was followed by the "IT2000" strategic plan and e-Government Action Plans of the early 2000s, the iGov 2010 initiative, and the 2015 eGov Masterplan (Soh et al. 1993; Arun and Yap 2000; GovTech Singapore 2017a).

However, these earlier efforts differ from the Smart Nation initiative in their scope and scale. While those e-government programs were more or less focused solely on raising efficiency in public service delivery through the use of digital technologies and platforms, the Smart Nation initiative represents a complete 'digital transformation' that involves a nationwide and whole-of-government approach to digitizing the various facets of urban life, often involving collaborations with industry and societal partners (Smart Nation Programme Office 2016; Loke 2017).

At its inception, the Smart Nation initiative focused on five key domains: transport, home and environment, business productivity, health and enabled aging, and public-sector services. These have since been expanded, particularly with the recent emphasis

on artificial intelligence (Choudhury 2017). Digitization in these various domains is achieved through a set of "enablers" (Smart Nation Programme Office 2016):

- Test-bedding and collaboration with industry and research institutions
- An open-data portal and a Smart Nation Platform that allows for the consolidation and sharing of government data
- Investments in research and development (R&D)
- Laboratories for the development and piloting of technological solutions
- Start-up accelerators to nurture creative start-ups and innovations
- Cybersecurity measures for the safeguarding of data, systems, and networks
- Building computational capabilities among citizens through educational programs at various levels, including young children, secondary-school students, and working professionals

Given ongoing developments in Singapore's Smart Nation initiative, it is important to note that these "enablers" have, since the initiative's inception, expanded to include other policy enablers or initiatives. For instance, the Monetary Authority of Singapore (MAS), as part of the Smart Nation initiative, has established a "regulatory sandbox" that allows start-ups to pilot new products and solutions under clearly defined regulatory boundaries without posing systemic risks to the rest of Singapore's economy (Monetary Authority of Singapore 2016).

The regulatory sandbox has since allowed for the successful incubation of financial technology (or fintech) start-ups such as PolicyPal, a firm that was incubated by PayPal. PolicyPal was able to experiment with technological applications and product offerings during its trial period within the MAS's regulatory sandbox. This has culminated in the launch of its app, which utilizes artificial intelligence to simplify and digitize the management of insurance policies (Yahya 2017). PolicyPal has since 'graduated' from the sandbox and begun operations as a registered insurance provider.

The success of the MAS's regulatory sandbox has since raised the possibility of establishing regulatory sandboxes in other policy domains (Salaberry 2017), emphasizing the utility and significance of the regulatory sandbox as a policy tool in smart city initiatives. More importantly, these Smart Nation "enablers," or policy tools, have

provided the government's various stakeholders with platforms upon which they can co-create policy solutions with public agencies and policymakers.

TECHNOLOGICALLY ENABLED POLICY CO-CREATION

One of the key policy implications of the Smart Nation initiative is the growing capacity and opportunity for policy co-creation, with technologically enabled data platforms allowing policymakers to tap the expertise and capabilities of non-state actors in formulating policies. A primary example of this is data.gov.sg, an open-data platform that consolidates and shares publicly available and machine-readable datasets from 70 public agencies, allowing the public to co-create solutions through the use of such data (Shanmugaratnam 2013; Smart Nation and Digital Government Office 2017).

For instance, the Building Authority of Singapore has recently allowed commercial building owners to disclose their energy consumption data on the open-data platform, with the aim of encouraging building owners to both compare energy consumption levels and share energy-saving practices (Bhunia 2017). Similarly, the Singapore government's OneMap service allows firms and individuals to add their own data to the basemaps and allows for the crowdsourcing of location-based data (Government of Singapore 2017). OneMap was also developed in collaboration with various private-sector solution partners who contributed their expertise and technological solutions.

Aside from the open-data platform, policy co-creation has also taken place through other channels. These include research collaborations between public agencies and research institutions; jointly developed pilot trials of new technologies between public agencies, regulators, and start-ups (Smart Nation Programme Office 2017a, 2017b); and even collaborations between public agencies and firms to provide new data-driven services, such as the recent introduction of GrabShuttle, a shuttle bus service mobile application that is built on a government-owned open smart mobility platform (Grab 2017).

Other platforms for policy co-creation are currently being developed, such as the National Trade Platform, which allows businesses and service providers in the trade and logistics industry to develop new applications in support of evolving business needs

(Singapore Customs 2016a). Interestingly, the creation of such platforms often involves a broader process of policy co-creation, albeit in the more institutionalized form that already exists in Singapore's policy processes (Woo and Howlett 2015; Woo 2016a).

For instance, the National Trade Platform project team is currently in the process of consulting with companies and individuals in the trade and logistics industry through interviews and workshops to gather feedback on industry needs as well as their preferences and concerns with regards to the National Trade Platform (Singapore Customs 2016b). Hence, while such consultative mechanisms of industry engagement represent an extension of existing policy co-creation mechanisms, the creation of new data-sharing platforms represents a technologically-enabled form of policy co-creation.

This new form of data-driven and technologically-enabled policy co-creation is not restricted to businesses and industry. The Smart Nation initiative has also introduced new platforms for policy co-creation with citizens at the individual level. For instance, a "OneService" mobile app was launched by the government's Municipal Services Office, which consolidates citizens' feedback on municipal issues such as estate cleanliness or public utilities and directs them to the relevant public agencies (Infocomm Development Authority of Singapore 2015; Ministry of National Development 2015).

More recently, the government has introduced "eCitizen Ideas," a government crowdsourcing portal that allows citizens to share or contribute ideas related to issues faced by the public, often through competitions, hackathons, and campaigns organized by various public agencies (GovTech Singapore 2017b; Singapore Government 2017). As is evident in these platforms, as well as the processes that have culminated in their creation, policy co-creation remains largely led and driven by the state. However, the application of data platforms and technologies to policy co-creation suggests an extent public-sector innovation, with these platforms and technologies serving to enhance the reach and efficacy of Singapore's policy co-creation mechanisms.

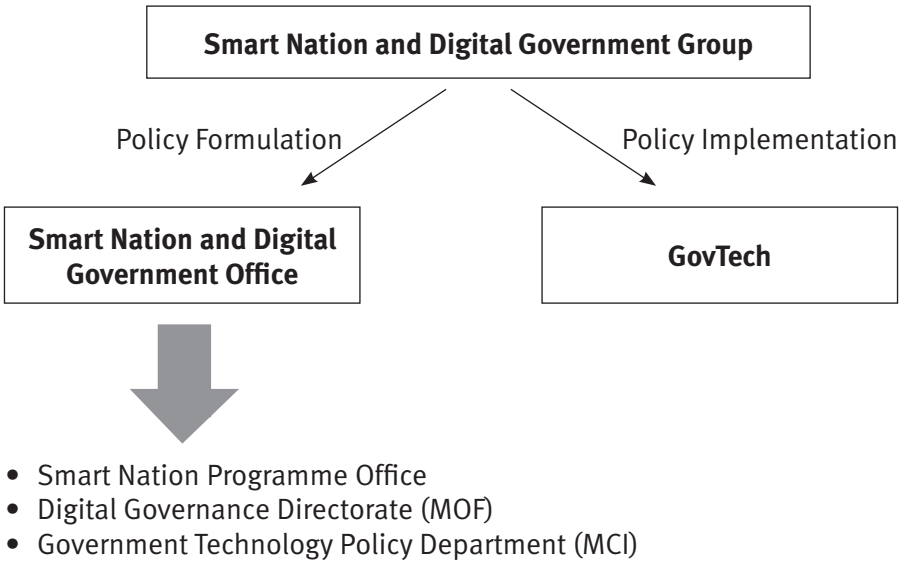
ADMINISTRATIVE CENTRALIZATION

Yet despite the introduction of these "smart" policy initiatives and platforms, there is a prevailing view that the Smart Nation initiative has not been fully successful, with Prime Minister Lee stating that Singapore's digital transformation was not moving as fast as it ought to (Lee 2017a, 2017b). In particular, the initiative was deemed to lack private-sector participation and support, with the sole exception being transport and mobility (Ho 2017; Tan 2017a, 2017b). This is despite the abovementioned efforts at spurring policy co-creation. In response to these challenges and limitations, the Singapore government has sought to consolidate its Smart Nation resources and capabilities through administrative reorganization.

Specifically, a centralized agency—the Smart Nation and Digital Government Group (SNDGG)—was established under the Prime Minister's Office to house the various units and agencies involved in Singapore's digital transformation (Seow 2017). The SNDGG comprises the newly-formed Smart Nation and Digital Government Office (SNDGO) and GovTech, with the SNDGO tasked with formulating Smart Nation initiatives and GovTech with implementing these initiatives; the SNDGO is in turn formed from the consolidation of staff from the Smart Nation Programme Office, the Ministry of Finance's Digital Government Directorate, and the Ministry of Communications and Information's Government Technology Policy Department (Prime Minister's Office Singapore 2017).

Figure 1 (below) provides a pictorial representation of these organizations. More importantly, this spate of administrative reorganization makes the SNDGG the lead agency for the Smart Nation initiative, a role that is similar to a 'pilot agency' in the archetypal Asian developmental state (Johnson 1982; Huff 1995; Leftwich 1995). This consolidation and centralization of state resources and capabilities in the SNDGG reflects a deep development focus in the Smart Nation initiative, with the state retaining its leadership role in deriving economic growth from Singapore's digital transformation.

Figure 1



TECHNOLOGY AND CO-CREATION: THE NEW (HE)ART OF GOVERNANCE?

As this policy brief has shown, Singapore's ongoing transformation into a smart city is predicated upon a need to address its growing urban complexity and, at the same time, manage a deeper underlying shift towards a knowledge-based economy. More than simply another iteration of its e-government efforts, the Smart Nation initiative represents a much broader and cross-sectoral approach to governing and managing Singapore's digital transformation. More importantly, the Smart Nation initiative involves two key shifts in Singapore's approach to policy and governance.

First, the advent of advanced data and ICT technologies has allowed for the creation of data-sharing platforms that allow public agencies to share data with the public, with the aim of encouraging firms and individuals to "co-create" technological solutions to pressing urban issues of the day. Such open access platforms allow for more fluid and real-life interactions between public agencies and their non-state partners. This technologically-enabled policy co-creation has also permeated civic life at the individual level, with mobile applications such as OneService and new platforms

such as eCitizen Ideas providing individual citizens with avenues through which they can engage policymakers and even provide feedback on existing policies.

Second, the high degree of complexity in Singapore's digital transformation has prompted the government to centralize its Smart Nation capabilities and resources in its newly formed SNDGG. The creation of the SNDGG as the lead agency for Singapore's digital transformation is relatively unusual given that the Economic Development Board (EDB) has traditionally played the role of lead agency for national-level economic development, with the sole exception being the Monetary Authority of Singapore (MAS) in the case of financial-sector development (Woo 2016a). In both cases of the SNDGG and MAS, the creation of a lead agency separate from the EDB is predicated upon the need for specialized technical knowledge in what are essentially highly complex policy domains (Woo 2016a, 2016b).

As Singapore's digital transformation continues apace, the Smart Nation initiative is likely to remain an important element of the government's policy agenda. However, closer attention needs to be paid to the sociopolitical changes that may occur as a result of the initiative, as well as more fundamental changes to Singapore's governing and policy processes. As the case of Singapore has shown, the digital transformation of a nation or city is not simply a technical issue, but involves deeper underlying political and policy processes. A closer analysis of the changes that may occur in these processes can provide a deeper understanding of the policy mechanisms that determine the success (or failure) of a smart city.

ONGOING CHALLENGES

Despite these efforts to reorganize and streamline the government's digitization efforts, the Smart Nation initiative continues to face several significant challenges and limitations. For instance, it has been noted that the initiative has been unable to capture the public's imagination and lacks a clear success story (Kwang 2017a). Ironically, the government's centralization of its digitization efforts may have further entrenched the state's role in driving the digital sector, in the process crowding out private-sector opportunities (Tan 2017a).

Indeed, it has often been noted that the success of Singapore's Smart Nation initiative continues to hinge on the government's ability to encourage user-driven innovations, especially through progressive and flexible regulations (Kwang 2017b). The Smart Nation initiative is also constrained by citizens' reluctance to share personal data as well as a lack of confidence in the government's ability to safeguard this data (Ang and Ong-Webb 2017).

While Singapore's determination to become a Smart Nation has been driven by the government's efforts to encourage policy co-creation through data-driven platforms and streamline its digitization efforts through administrative centralization, it continues to face significant challenges in its smart city transformation. In order to address these challenges, the government will need to encourage greater private-sector participation in the initiative and at the same time ensure the robustness and security of its data servers and platforms.

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