

Singapore Smart Nation And Digital Government

Open Digital Ecosystem (ODE) Case Study

1. Context

The transformative power of digital technology and its ability to elevate societies and create an interoperable and efficient ecosystem has been recognized by governments and businesses across the world. Singapore, in particular, has been at the forefront of digital readiness and adoption. It was ranked number one on Cisco's Digital Readiness Index 2019 and Accenture's Government as a Platform (GaaP) Readiness Index 2018, and in the World Economic Forum Global Information Technology Report 2016. Singapore's success is strongly driven by government-backed efforts and investment in building digital capabilities and digitizing products and services.

In 2014, Singapore launched the Smart Nation Program. Its main goal was to leverage technology to improve the quality of lives of the people and to transform the economy by creating more jobs and opportunities. The Singapore Smart Nation Program is a nation-wide movement that aims to transform sectors like health, education, and transportation through a multi-pronged approach of Digital Government, Digital Economy, and Digital Society. The Digital Government initiative focuses on harnessing technology to enable efficient and user-centric public service delivery, Digital Economy focuses on guiding businesses and the workforce to leverage technology, and Digital Society aims to empower Singaporeans by increasing access to services, promoting inclusion and improving awareness and digital literacy. In this case study, we focus on the Digital Government initiative.

2. Solution

The Digital Government initiative aims to transform the functioning of public agencies – operations, service delivery, and policy making – by leveraging common digital platforms. By placing individuals at the heart of service delivery, it intends to create a more agile, cross-functional, and technologically advanced government.

The Digital Government Blueprint (DGB) sets forth a six-point agenda,¹ with clear milestones to be achieved by 2023.

- i) Integrating services around citizen and business needs.
- ii) Strengthening integration amongst policy, operations, and technology.
- iii) Building common digital and data platforms.
- iv) Operating reliable, resilient, and secure systems.
- v) Raising digital capabilities to pursue innovation.
- vi) Co-creating with citizens and businesses, and facilitating the adoption of technology.

The Singapore government is at different stages of achievement on the above principles. In this case study, we will delve into a few of the successes and challenges as well as outline few recommendations.

To oversee the Digital Government initiative, the Prime Minister (PM) of Singapore formed the Smart Nation and Digital Government Group (SNDGG) comprising personnel from various ministries, and housed it under the Prime Minister's Office (PMO). This enabled the PM to personally monitor the progress of the initiative and provide the leadership focus it requires, thereby ensuring a 360-degree view of the government. The SNDGG is further split into two units - Smart Nation and Digital Government Office (SNDGO) and Government Technology Agency (GovTech). While the SNDGO

assumes the more strategic role of planning and prioritizing key national projects, GovTech acts as the implementation arm of SNDGO. In addition to leading a set of key projects, it is tasked with the responsibility of ensuring that government agencies smoothly adopt technology.

The Digital Government agenda deals with two types of projects. First, the Strategic National Projects which are the key digital initiatives underpinning the Smart Nation Program and owned by the SNDGG and second, projects undertaken by individual ministries which are supported by the SNDGG. Further, the Strategic National Projects focus on either of the two imperatives:

- To build core public digital platforms that can be leveraged to create more solutions. For example, Core Operations Development Environment and eXchange (CODEX), a platform that provides reusable digital components and resources for government agencies to build services on such as the National Digital Identity (NDI) and e-payments, or
- Projects that are likely to have a direct impact on the lives of the people, for example, the Moments of Life application (app) which provides access to government services at key life junctures such as immunizations for children, and supporting senior individuals in accessing government benefits.

3. Key Features and Learnings from Digital Government

In this section, we describe how the Digital Government approach follows a few key principles of the Open Digital Ecosystem (ODE) approach, identify best practices as well as areas where it can be strengthened.

3.1 Digital Platform

- **Open data platforms built on open application programming interfaces (APIs) and open standards for interoperability**

Through CODEX, the Government of Singapore provides common standards and APIs to facilitate data sharing and interoperability among various public agencies. This has led to the development of apps such as Moments of Life that access information about an individual housed across multiple agencies and provides a seamless service delivery experience.

The government has also led efforts to collect and share the data gleaned from public agencies with developers to enable them to build solutions. Data.gov.sg provides open data sets from 70 public agencies, 14 APIs and a dedicated developers' portal that has become a one-stop portal for builders. Some agencies, such as the Monetary Authority of Singapore (MAS) and Inland Revenue Authority of Singapore have created their own portals to open data for use by private companies. However, these efforts are still in a nascent phase with low adoption rates and are being furthered to foster an integrated ecosystem.

- **Creating unbundled (reusable and shareable) digital building blocks to make service delivery time and cost-efficient**

The Digital Government initiative has perpetuated a shift in the government's approach from developing End-to-End (E2E) solutions to building common digital building blocks, thereby making service delivery efficient. This was achieved through CODEX which is a centralized digital platform that provides reusable software components and micro-services to developers across agencies. For example, the Singapore Government Technology Stack (SGTS), a key component of CODEX, provides common micro-services such as authentication, notification and payment, and platforms such as NECTAR (platform-as-a-service that supports application development) and APEX (applications gateway). It has enabled the building of applications such as MyInfo for banks (using government registered profiles to access bank services), Ideas! (a citizen engagement portal), and MyCareersFuture.sg (a portal that uses Machine Learning (ML) to provide relevant matches to job seekers and employers). Building these applications on CODEX has resulted in significant time savings. For example, MyInfo, which would have ordinarily taken one year to build, was delivered in just four months.²

Principle 2: Make unbundled, extensible, and federated

One of the key national projects is to redesign and replace existing Information Technology (IT) systems to provide common digital platforms that will be shareable across agencies and used to deliver better and faster services to people.

For example, MyCareersFuture.sg was developed by Workforce Singapore and GovTech using existing components of SGTS. This shortened the development time from two years to eight months and reduced development cost by about 40%.

Source: Tung, Y (2018) How Singapore's GovTech is building a robust public e-services ecosystem. Retrieved from <https://e27.co/singapores-govtech-building-robust-public-e-services-ecosystem-20180918/>.

- **Adopt an iterative methodology to develop and scale fast**

GovTech is increasingly adopting an iterative approach for platform development. The methodology, however, has not been adopted for all solutions.

The Government Digital Services (GDS) division of GovTech uses agile methods such as Kanban, XP, Scrum, and LeSS to deliver digital services. For example, GDS developed myResponder, an app that aims to provide rapid help to heart attack victims, in six months using the agile approach. It was developed iteratively through a series of workshops with defense force officers and individuals, in order to ensure a user-centric experience.

Another division of GovTech – Open Government Products – that develops digital public goods, is also an active proponent of agile development. For example, FormsSG, built by the division, went from idea to platform in a year. The platform enables public officers to create digital forms that can be integrated with government systems. Used across 90 agencies, it has resulted in savings of S\$5k - 150K per form.³ Migrating to an agile and iterative development approach has not been a straightforward journey. Public officers have acknowledged that more than a shift in processes it requires a change in mindsets, hierarchies and roles, and building of significant trust.

Principle 5: Develop minimally and iteratively

Govtech's Open Government Products division exemplifies how an agile and iterative development methodology can be adopted by the government to build new solutions quickly.

For example, Parking.sg, a mobile app that allows users to pay for parking, was developed as a prototype and evolved with user testing. It adopted agile methodology such as pair programming (when two programmers work together) and continuous delivery architecture for a shorter delivery cycle.

Source: Ganesan, V, Lam, Y, Lin, D. (2019) How Singapore is harnessing design to transform government services. Retrieved from <https://www.mckinsey.com/industries/public-sector/our-insights/how-singapore-is-harnessing-design-to-transform-government-services>

3.2 Community

- **Ensure universal access**

Singapore follows the approach of ensuring inclusiveness by design which promotes deep consumer-centricity. For example, guidelines on User Interface Design for older adults were

issued by the government. These included features such as readable font size, color and contrast, and presentation of information. Applications are also released in vernacular languages to reach out to the non-English speaking population. Some apps also incorporate machine translation for people who only speak their vernacular language. For example, when the Moments of Life app was launched for senior citizens, multiple languages were added and the design of the application was tweaked to change font size, and add icons and symbols to enable intuitive navigation.

- **Facilitate participation of individuals and businesses in the development process**

The DGB recognizes the importance of co-creating with individuals and businesses in order to develop services that cater to their specific needs, hence, driving adoption. GovTech has developed various initiatives to facilitate the participation of agencies, private sector entities, institutes, and end-users. For example, the InnoLeap program opens up opportunities for government agencies to crowdsource ideas and co-create solutions with the wider community. The SNDGO also launched Smart Nation Co-creating with our People Everywhere (SCOPE), a citizen engagement program. Through this program, trial versions of digital products are tested with end-users to gather feedback for improvement. Finally, GovTech organizes hackathons inviting developers and students to build digital solutions. For example, GovTech organized a hackathon at the National University of Singapore to crowdsource ideas for wearable technology for the elderly. The winning solution – an ear mounted device – was proposed to be further developed and tested by GovTech.

Principle 8: Cultivate a network of innovators

GovTech has taken several initiatives to motivate and aid businesses in the build of innovative user-facing services and solutions.

For example, in 2017, GovTech opened the source code of Beeline, an app that provided bus rides based on community-generated demand. This enabled technology companies such as Grab to build on Beeline and launch Grab Shuttle – an on-demand shuttle service.

- **Drive end-user adoption through multiple channels**

Singapore has undertaken several initiatives such as developing partnerships with the private sector and providing one-on-one assistance to augment user adoption. The government encourages businesses to nominate employees to SkillsFuture (the education and training portal) and educate their customers on digital services. For example, the government also set up Digital Clinics to provide personalized assistance to senior citizens on the use of phone applications such as e-payments, in order to facilitate adoption. However, social acceptance remains a challenge for Singapore considering the diverse and ageing population. To ensure wider adoption and retention, Singapore will have to stay committed to innovation and user-centricity.

3.3 Governance

- **Creating a designated institution to provide strategic direction to Smart Nation objectives**

To lead the Smart Nation Program, SNDGO was constituted by integrating various units across ministries that were performing policy and strategy roles. Similarly, GovTech, which

was operating under the Ministry of Communications and Information and had already undertaken Information and Communications Technology (ICT) initiatives, was appointed as the implementation arm of SNDGO.

SNDGO and GovTech, together known as the SNDGG, were placed under the purview of the PMO. This accrued myriad benefits. First, it established a clear line of accountability for the SNDGO. Second, it provided the Smart Nation Program with national focus and strategic direction. Finally, having the support of the senior-most leadership helped the program gain priority at an agency level. While the PMO drove the digital agenda in Singapore, other nations have seen similar success by creating their agencies under the Ministry of IT or an equivalent authority. However, for optimal results, the institutional mandate and powers for multi-agency strategic planning and decision-making need to be sufficiently devolved to such an institution.

Principle 11: Define accountable institutions

The SNDGG was created as a designated agency under the PMO to give strategic direction and maintain accountability of the Smart Nation objectives. It has allocated responsibilities for management and implementation, defined reporting relationships, and created accountability at an agency level.

For example, SNDGG has the power to work with the Ministry of Finance to evaluate agencies' proposals for funding. This helps in coordinated implementation by avoiding duplication of effort and in the adoption of SGTS.

- **Revised organization structure for effective coordination with SNDGG**

For the different government agencies to adopt technology at the core of their operations, it was critical to restructure the organization for technology-centricity. This was achieved through various steps. The SNDGG appointed a Chief Digital Strategy Officer (CDSO) in every ministry to oversee the digitization plans and measure performance against Key Performance Indicators (KPIs) defined in the DGB. While the CDSO reports to the Ministry Chief Information Officer (CIO), it has authority over the Ministry's ICT and Digitalization Steering Committees, CIOs, Chief Data Officers and Chief Information Security Officers (CISOs).⁴ The primary objective of establishing these relationships was to ensure that technology integration is prioritized at the highest level in every ministry. However, for this objective to be realized in entirety, simply creating new roles would not suffice. There should be a concerted effort to ensure that the CDSO has the right balance of authority and responsibility and the KPIs that have been outlined can accurately measure the performance and effectiveness of the role. Additionally, the profiles and deliverables of the various digital heads should be continuously evaluated. This will help determine the roles and hierarchy levels that are most effective in steering technology adoption in the ministry.

- **Transparent data governance through a well-defined regulatory framework**

Singapore has enacted various laws and defined multiple policies and standards to ensure data security and privacy. For example, the country enacted its Personal Data Protection Act (PDPA) in 2012 to govern the collection, use, and disclosure of individuals' personal data. It also instituted the Personal Data Protection Commission (PDPC) to enforce the law, conduct outreach activities for people and organizations, and manage data breach. However, recent

data breaches from public systems have raised concerns over the prevailing security practices. For example, a serious breach happened in 2018 when personal data of 1.5 million patients was stolen from SingHealth's records.⁵ This revealed two significant gaps in Singapore's data governance system. First, the government agencies are only governed by an internal Government Instructions Manual and do not fall under the purview of the PDPA. This raises concerns about their accountability and the quality of data protection standards adopted. Second, the government agencies could more actively adopt 'Privacy by Design' principles and appropriate security measures. In a recent review of the government systems convened by the PM, gaps were identified in areas such as encryption of emails, user access review, management and monitoring of privileged user accounts, and E2E security. The review committee, chaired by the Deputy Prime Minister and comprising data security experts from the private sector, also presented recommendations on improving processes, policies, and capabilities to be implemented by 2023.⁶

- **Attracting technology talent by creating a thriving culture of innovation**

Attracting and retaining talent is critical for executing the Smart Nation strategy. The need for differentiated skills was also recognized by Prime Minister Lee Hsien Loong in his speech at the Smart Nation launch. To address this need, Singapore adopted a talent management strategy focused on competitive remuneration and career development. For example, GovTech revised its Human Resource (HR) scheme to provide compensation that is competitive with the private sector, in order to attract leading talent. The revised HR scheme also allowed technologists to assume ICT roles in different agencies, providing opportunities for career growth. Further, GovTech developed a Smart Nation Fellowship Program to incentivize Singaporeans working abroad in technology companies to engage with the government on short stints of three to six months. The opportunity to work on large-scale digital projects and impact policy attracted the top engineers and data scientists in the industry.

Principle 14: Ensure the right capabilities

The key success driver behind innovation at GovTech has been the fostering of expert technology skills through a talent management strategy based on thriving culture, competitive remuneration, and opportunities for career development.

For example, Mr. Quek Yang Boon was inspired by the Smart Nation vision as articulated by Singapore's PM during an event in San Francisco. He left his job as lead engineer at Apple where he designed the sensors in the Apple Watch to join GovTech where he is now the director for Smart Nation Systems and Solutions Sensors and IoT (Internet of Things).

Source: Kwang, K. (2018). 'I've waited 10 years': Why a former Apple engineer wants in on Singapore's Smart Nation. Retrieved from <https://www.channelnewsasia.com/news/technology/i-ve-waited-10-years-why-a-former-apple-engineer-wants-in-on-9906190>.

4. Conclusion

Singapore's Digital Government approach has kick-started the country's ODE journey. It is already adhering to some guiding principles of ODEs such as creating reusable and shareable digital building blocks, investing in people capabilities to ensure smooth operations, and adopting a participatory approach to building solutions. However, there are a few key areas where the Singapore approach can be strengthened.

- Singapore's digital platforms are largely open to public agencies for the development of solutions. This presents an opportunity to enable a nation-wide collaboration by more proactively involving the private sector in building both digital infrastructure and services on top. The government can set standards and frameworks for all players to collaborate and truly adopt the ODE approach.
- The Public Service Division (PSD) under the PMO plays an important supporting role in fostering innovation in public services and developing leadership in public agencies – two key Smart Nation agendas are highlighted in the DGB. This presents an opportunity for SNDGG to collaborate with PSD for online-offline integration and further the Smart Nation mission. Some initiatives that can be jointly developed are a program to develop digital skills among the public officers and a multi-channel end-user engagement plan to create a constant feedback loop to evaluate the effectiveness of public services.

¹ GovTech. (2018). *Digital Government Blueprint*. Retrieved from https://www.tech.gov.sg/files/digital-transformation/dgb_booklet_june2018.pdf.

² GovTech. (2018). *Digital Government Blueprint*. Retrieved from https://www.tech.gov.sg/files/digital-transformation/dgb_booklet_june2018.pdf.

³ Open Government Products. (n.d.) *Forms SG*. Retrieved from <https://open.gov.sg/products/formsg/>.

⁴ Khern, N. (2019). *What is Smart Nation?* Retrieved from <https://www.csc.gov.sg/articles/digital-government-smart-nation-pursuing-singapore's-tech-imperative>.

⁵ BBC News. (2018). *Singapore personal data hack hits 1.5m, health authority says*. Retrieved from <https://www.bbc.com/news/world-asia-44900507>.

⁶ Mahmud, A. (2019). *Government accepts 5 measures to improve data security, to set up single contact for public to report breaches*. Retrieved from <https://www.channelnewsasia.com/news/singapore/government-improve-data-security-contact-public-report-breaches-12130700>.