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Singapore's Smart Nation Program and potential lessons for the European Union's Digital Decade program

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Singapore's Smart Nation Program and potential lessons for the European Union's Digital Decade program

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Abstract

Although Singapore's Smart Nation initiative is relatively new, this paper will assess some of enablers, challenges and early successes of the program, with the view of potentially providing a roadmap for the European Union's Digital Decade program. Specifically, this paper will analyze; i) the infrastructure requirements necessary to support the services; ii) the legal reforms required to enable some of the services; iii) the effectiveness of government initiatives and subsidies to encourage adoption of such services. In these respects, and in regards to Digital Decade program, health initiatives in the this paper also will examine, as a case-study, how one of the program's health initiatives was able to effectively deal with the SARS-CoV2 crisis, by rapidly allowing health-care providers to switch to tele-heath as an alternative delivery system. However, this was made only possible in part through two major government programs, the first initiated nearly 2 decades ago, and exemplifies the infrastructure and service platforms requirements necessary to support the Smart Nation Program. The various government policies created to accelerate

adoption of this health initiative was guided by its experiences with past initiatives where it faced some challenges and obstacles to achieving the desired outcomes.

Specifically, one of the programs, Integrated Health Information Systems (IHIS) is the technology agency for the public healthcare sector and was created in 2008 as a cohesive approach to the development and management of IT systems in public healthcare with the objective of improving the Singapore population's health and health administration by integrating intelligent, highly resilient, and cost-effective technologies with process and people. Currently, IHIS supports the operations of 46 public healthcare institutions including acute hospitals, specialty centers, and polyclinics, as well as over 1,400 partners such as community hospitals, nursing homes, general practitioner clinics and voluntary welfare organizations. In November 2016, it merged with Singapore's Ministry of Health (MOH) Holding's Information Systems Division essentially assuming the role of the technology agency for Singapore healthcare¹.

In general, the experiences from past broadband and information infrastructure initiatives has helped instruct the Singapore government on the factors for successful implementation of the Smart Nation program, specifically i) public policies that stress user-centric design for the goal of universal inclusion; ii) Infuse Digital Literacy into National Consciousness; iii) Private-public partnerships that empower Community and Businesses to Drive Widespread Adoption of Technology; and iv) Promote Digital Inclusion by Design.

¹ iHIS Integrated Information Services Annual Report 2018, https://www.ihis.com.sg/About_IHiS/Documents/IHiS0110_18%20Annual%20Report%202016_17_05Dec18_FA.pdf

Introduction

In 2014, Singapore launched the Smart Nation Program, designed to harness ICT, networks and data to improve the quality of life of its citizens, enable businesses to be more productive and to exploit new opportunities in the digital economy, and help government agencies serve citizens better, particularly in the face of increasing urban density and as aging population. The Smart Nation Program is designed to radically transform the health, transport, urban solutions, finance, and education domains.² For the past several years, Singapore has been ranked the top Smart City in the world³. The Smart Nation program was the planned extension of Singapore's 10-year Intelligent Nation masterplan (iN2015) begun in 2004 to develop the infocomm infrastructure to support the Internet of Things (IoT) and enable cyber physical systems (CPS). iN2015 was thus designed to use infocomm technologies to enrich lives, enhance the growth, competitiveness of and innovation in key economic sectors and build a well-connected society⁴.

Based on iN2015, 9 out of 10 Singapore homes have broadband and soon every home will have fiber. Singapore's smart phone penetration is one of the highest in the world at 85%.

The Singapore government, however, sees the need to take "a whole-of-Government, whole-of-nation approach to building a Smart Nation"⁵. One of the most interesting characteristics of Singapore's Smart Nation is its method of integration among different Governmental agencies. Although specific formation of integrated platform is yet to be fully developed, the underlying idea is to avoid physically integrated platform and instead, to agree on rules and regulations for

1. SmartNation, "Smart Nation: The Way forward" <https://www.smartnation.gov.sg/about-smartnation/transforming-singapore>

³ IMD SCO Smart City Observatory, Smart City Index 2021. <https://www.imd.org/smart-city-observatory/home/>

⁴ Infocomm Development Authority of Singapore, 2010. iN2015 Masterplan, <http://www.ida.gov.sg/Tech-Scene-News/iN2015-Masterplan> accessed 4 May 2015.

⁵ Lee H. L., 2014. Speech at Smart Nation Launch on 24 Nov 2014, <http://www.pmo.gov.sg/mediacentre/transcript-prime-minister-lee-hsien-loong-speech-smart-nation-launch-24-november> accessed 4 May 2014

data integration. Singaporean Government only sees the needs to develop an integrated data sharing platform, where all agencies can access commonly shared information, collected from shared smart sensor network⁶.

To achieve this, it has established a Smart Nation Program Office to plan, coordinate and execute it. Some of the initiatives involving the different organizations include⁷.

- Involving its universities through multi-billion annual research and development (R&D) investments.
- Cultivating a fast-growing community of tech start-ups with large pools of investment capital.
- Inviting industry to be a partner in creating new technologies that will enable a smart nation i.e. to deliver innovative Infocomm and Media (ICM) solutions that will optimize her national resources, drive productivity for critical industries, and build globally competitive Singapore-based companies.
- Engaging the multi-national corporations to co-found joint laboratories to create high value jobs and develop local research experts.
- Working with local globally competitive companies to strengthen their competitiveness in the global market through research and innovation, so that they will grow.
- Increasing the productivity of small-medium enterprises by creating ready to deploy technology that improves productivity and reduces manpower requirement.

Europe's Digital Decade:

In her State of the Union speech of September 2020, European Commission President Ursula von der Leyen was quoted as highlighting the need for 'a common plan for digital Europe with

⁶ Lee, S.K., et. al., "International Case studies of Smart Cities," Inter-American Development Bank, Discussion Paper No. IDB-DP-462. June 2016.

⁷ Chia, ES. Singapore's Smart Nation Program – Enablers and Challenges
https://www.researchgate.net/publication/306113634_Singapore%27s_smart_nation_program_-_Enablers_and_challenges

clearly defined goals for 2030, such as for connectivity, skills and digital public services'. The Commission President called for a principled approach, focusing on the right to privacy and connectivity, freedom of speech, free flow of data and cyber security. COVID-19 has laid bare the risks of failing to act on the 'digital decade'. The pandemic has exposed the profound and disrupting impact of digitalization on domestic societies and international relations. The protection of digital freedom of speech, transparency and inclusiveness is at stake as governments resort to (sometimes intrusive) digital means to monitor and combat the virus. At the same time, upholding economic competitiveness in the digital age requires innovative approaches to research, development and – in particular – commercialization of innovation. The pandemic reaffirmed the need for improved resilience at home as well as cooperation among like-minded partners that wish to uphold an open and inclusive cyber domain. For the EU and its member states, this requires an update – that is, a broadening and deepening – of the digital dimension of the EU's connectivity strategy of 2018, with clear links to the 2020 EU Digital Strategy. Options for EU action are defined and confined by the US–China technology rivalry, which is reshaping the global tech landscape and global governance, including in the digital field. Specifically, it calls for:

- 1) a digitally skilled population and highly skilled digital professionals, with the aim of achieving gender balance, where: (a) at least 80 % of those aged 16-74 have at least basic digital skills; (b) at least 20 million ICT specialists are employed within the Union, while promoting the access of women to this field and increasing the number of ICT graduates;
- 2) secure, resilient, performant and sustainable digital infrastructures, where: (a) all end users at a fixed location are covered by a gigabit network up to the network termination point, and all populated areas are covered by next-generation wireless high-speed

networks with performance at least equivalent to that of 5G, in accordance with the principle of technological neutrality. (b) the production, in accordance with Union law on environmental sustainability, of cutting-edge semiconductors in the Union is at least 20 % of world production in value; (c) at least 10 000 climate-neutral highly secure edge nodes are deployed in the Union, distributed in a way that guarantees access to data services with low latency (i.e. a few milliseconds) wherever businesses are located; (d) the Union has, by 2025, its first computer with quantum acceleration, paving the way for the Union to be at the cutting edge of quantum capabilities by 2030

- 3) the digital transformation of businesses, where: (a) at least 75 % of Union enterprises have taken up one or more of the following, in line with their business operations: (i) cloud computing services; (ii) big data; (iii) artificial intelligence; (b) more than 90 % of Union SMEs reach at least a basic level of digital intensity; (c) the Union facilitates the growth of its innovative scale-ups and improves their access to finance, leading to at least doubling the number of unicorns;
- 4) the digitalization of public services, where: (a) there is 100 % online accessible provision of key public services and, where relevant, it is possible for citizens and businesses in the Union to interact online with public administrations; (b) 100 % of Union citizens have access to their electronic health records; (c) 100 % of Union citizens have access to secure electronic identification (eID) means that are recognized throughout the Union, enabling them to have full control over identity transactions and shared personal data.⁸

⁸ Official Journal of the European Union, <https://eur-lex.europa.eu/eli/dec/2022/2481/oj>

Essentially, the EU's digital strategy is divided into four pillars: technology that works for people; the digital economy; digital society; and a digital global perspective. The contours of this fourth element – that is, the international context to digital policy-making – were touched upon earlier in the EU strategy on connecting Europe and Asia of September 2018. This so-called 'connectivity strategy' highlights the importance of digital connectivity in an increasingly globalized world, along with transport, energy and human connectivity. On paper, the EU seems ready to act on connectivity in the digital age, but in practice, it is stumbling along. As many in Brussels acknowledge, the half page on digital policy in the EU connectivity strategy needs to be operationalized and put into action through joint, coherent efforts by EU institutions and member state stakeholders, as well as in multilateral institutions and in coordination with (networks of) like-minded partners. Now, as the impact of COVID-19 is still unfolding and the US–China tech-data rivalry is intensifying, the EU and its member states need to unpack, instrumentalize and act upon digital connectivity. The broad domain of digital connectivity can be divided into three categories that are not mutually exclusive and have significant overlaps in practice. As visualized in Figure 1, these categories are: regulation (standards and rule-setting in data governance); business (the global race for supremacy in innovation and artificial intelligence (AI), but also e-commerce and e-finance); and (tele)communications infrastructure (cyber security). All of these categories must be tackled at home (within the EU) and in third countries, and can benefit from cooperation and coordination with (like-minded) partners as well as be strengthened by digital official development assistance (ODA)⁹

The digital rights and principles outlined in the declaration will complement existing rights, such as those rooted in the Charter of Fundamental Rights of the EU, and data protection and privacy

⁹ Brigitte Dekker and Maaïke Okano-Heijmans, "Europe's Digital Decade," Clingendael Report, October 2020.

legislation. They will provide a reference framework for citizens on their digital rights, as well as guidance for EU Member States and for companies when dealing with new technologies. They are intended to help everyone in the EU get the most out of the digital transformation.¹⁰

The proposed rights and principles are

1. Putting people and their rights at the center of the digital transformation
2. Supporting solidarity and inclusion
3. Ensuring freedom of choice online
4. Fostering participation in the digital public space
5. Increasing safety, security and empowerment of individuals
6. Promoting the sustainability of the digital future

Singapore's Smart Nation Initiative

Launched in November 2014, Singapore defined a Smart Nation as a Singapore where people will be more empowered to live meaningful and fulfilled lives, enabled seamlessly by technology, offering exciting opportunities for all. It is where businesses can be more productive and seize new opportunities in the digital economy. It is a nation which collaborates with our international partners to deliver digital solutions and benefit people and businesses across boundaries.

Smart Nation is integral to Singapore's next phase of nation building. Technology disruption is a global force that it feels it must confront and harness to the country's advantage. Developments

¹⁰ https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en

in digital technology present opportunities for Singapore to enhance our strengths, overcome its national challenges and physical limits, and build new sources of comparative advantage.

Digitalization will be pervasive and to continue to prosper and stay relevant, Singapore must embrace digitalization and the benefits it brings. This new era of digital transformation will power Singapore to SG100 and beyond.

Singapore has laid out mutually-reinforcing plans to build a Digital Economy, Digital Government and Digital Society. This means every industry, business and government agency stepping up to accelerate its digitalization efforts, to drive a whole-of-nation movement powered by a society of digitally ready citizens and communities. To execute these plans, strong system foundations are in place, powered by our people and culture. This widespread transformation is exemplified through major national projects, in areas such as digital infrastructure and service delivery, and involving the public, private and people sectors.¹¹

In a Smart Nation, we will see transformation in key domains – health, transport, urban solutions, finance, and education. For example, the government hopes that homes and estates will be safer, more comfortable and more sustainable with the use of sensors and smart systems. Smart Nation will also involve every person and organisation, taking action to learn about and adopt digital technologies.

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,

¹¹ Smart Nation the Way Forward, [smart-nation-strategy-nov2018.pdf \(smartnation.gov.sg\)](#)

or “e-government”^{12 13}. This began in the late 1980s through the 1990s in the government’s “Civil Service Computerisation Program,” 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.¹⁴ However, these earlier efforts differed 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.¹⁵

The government of Singapore has been particularly aggressive in promoting the deployment of new technologies and broadband access, as manifested in several initiatives, which are discussed below. Given Singapore’s lack of natural resources, its government has pursued an international-oriented business focus for a number of years. One result of this plan is that the total production of U.S. MNC affiliates constituted some 13% of Singapore’s Gross Domestic Product (GDP). Altogether, there over 7,000 MNCs located in Singapore¹⁶.

The Singapore government has been most aggressive in promoting the deploying of new technologies and broadband access, as manifested in several initiatives. Relatively high labor

¹² Sriramesh, K. and M. Rivera-Sánchez. 2006. “E-government in a corporatist, communitarian society: the case of Singapore.” *New Media & Society*, 8 (5): 707–30.

¹³ Chan, C.M.L., Y. Lau, and S.L. Pan. 2008. “E-government implementation: A macro analysis of Singapore’s e-government initiatives.” *Government Information Quarterly*, 25 (2): 239–55.

¹⁴ Jun Jie Woo, “Technology and Governance in Singapore’s Smart Nation Initiative” Ash Center for Democratic Governance and Innovation, 2018.

¹⁵ Loke, K.F. 2017. “Government to call for S\$2.4b of ICT tenders this year for Smart Nation projects.” *Channel NewsAsia*, May 24. Accessed May 25, 2017. <http://www.channelnewsasia.com/news/singapore/government-to-call-for-s-2-4b-of-ict-tenders-this-year-for-smart-8879506>.

¹⁶ Lim, R. (2006). Masterplan to transform InfoComm. *The Business Times*, Singapore, July 3.

costs in Singapore, as shown in Figure 3, coupled with a high employee turnover rates, particularly in the IT sector, manpower shortage and high overall cost of doing business in Singapore is motivating the government, in this respect, as some have observed, to eventually encourage firms to adopt.¹⁷

One of the first two Singapore government initiatives was the deployment of TradeNet, and the Singapore ONE program. TradeNet, which facilitates trade documentation online, processes 99% of all trade permit declarations, and is used by over 2,400 companies. This service has reduced processing time from several days to five minutes. TradeNet Plus, a more complete and efficient version that incorporates other online features, such as payment and insurance, is expected to further reduce processing time to between one and three minutes. Furthermore, it is estimated that the system generates an annual cost savings of over S\$2.8 billion¹⁸.

The Singapore ONE (One Network for Everyone) program, is a high-speed optical fiber network that manifests the government's IT2000 master-plan, a blue-print to deploy IT in almost every government department with the end goal of transforming the state into an "intelligent island"¹⁹. The IT2000 master-plan was designed to allow all of Singapore's over 800,000 households to connect to a hybrid-fiber co-axial network, irrespective of whether they intended to subscribe to the various services²⁰. The Singapore ONE initiative strove to develop a nationwide broadband network to link businesses, homes and schools, to deliver interactive, multimedia applications and services²¹. It is estimated that by 2005, some forty-three percent of all households had

¹⁷ Lim, V. & Teo, T (2000). To work or not work at home: An empirical investigation of factors affecting attitudes toward teleworking. *Journal of Managerial Psychology*, 15 (6) 560-586.

¹⁸ Shih, T.H. (1999). Singapore at home and abroad. *Business Times*, April 8, p.2.

¹⁹ Economist, The (2000). Government and the Internet: A survey. *The Economist*, June 24, p.17.

²⁰ Cable and Satellite Asia (1997). No couch potatoes? *Cable and Satellite Asia*, July, p.18

²¹ Santiago, T. (2000). Singapore's e-commerce net strategy bears fruit. *Electronic Engineering Times*, June 10

connected to this broadband network ²². The government invested \$82 million to seed the development of the Singapore ONE network, a multimedia broadband initiative launched in June 1996. A multi-agency effort by the Telecommunication Authority of Singapore (TAS), National Science and Technology Board (NSTB) and the NCB, Singapore ONE will enable a potentially unlimited range of multimedia services to be delivered to the workplace, the home and the school.

To support the Singapore One initiative the government created the Internetwork Hub (i-hub). Built on the existing narrowband Singapore Internet Backbone, the I-Hub is a converging point for all the key networks and communications infrastructures in Singapore. These various networks include Internet service providers, commercial network service providers and government networks. The I-Hub facilitates the exchange of information carried by participating networks. It introduces a new set of services providing greater reliability, security and better response time to both users and service providers. Under the I-Hub initiative, network infrastructures will have the bandwidth of their connections doubled. With the industry, plans are being put in place to bring about a T3 connection to I-Hub and to run a bandwidth reservation trial.

In this respect, the Singapore government's eCitizen Center, an integrated service delivery system, was designed to ensure that the public sector operated, and was seen to operate, as a single entity. This particular project is aimed at bringing together useful services and delivering them to Singaporeans in convenient and easily accessible packages. The Singapore government

²² Burton, J. (2005). High speed links to the Internet encounter consumer slowdown. *Financial Times London*, March 21

hopes that eCitizen will enhance the ability of the public to be increasingly familiar and comfortable with IT, which has become a critical component in the knowledge²³.

The Singapore government also initiated several common services to run on the network specifically:

i). Infrastructure for Electronic Identification (IEI)

The Infrastructure for Electronic Identification (IEI) is a nationwide system for establishing and authenticating the identities of users communicating in an open network environment such as the Internet. The IEI pilot will incorporate the necessary protection from electronic imposters as well as allow the secure exchange of confidential and private information. The IEI will be used for both government and private sector applications such as electronic form submission systems, electronic procurement systems, electronic information systems, and electronic shopping and commerce, where the user needs to be identified to the system.

ii. Electronic Commerce Hotbed

The NCB launched the Electronic Commerce Hotbed (ECH) program in August 1996 to pilot electronic commerce applications and to address the security, legal and regulatory issues facing practitioners involved in electronic commerce.

The ECH brought together all the key players including financial institutions such as banks, VISA and NETS, technology and infrastructure providers, application providers and users in an environment where they can leverage on one another. Some of these

²³ Economist, The (2000). Government and the Internet: A survey. *The Economist*, June 24, p.17

applications can fully support electronic payment. These applications are: The Ascott and Palm Courtt Collection that offers on-line bookings and confirmation for its chain of serviced apartments worldwide; CyberMart, a virtual shopping mall with over 300 popular local and overseas magazine title and Small, a mall with stores for flowers, teddy bears, watches and pottery. Other applications include digital shopping malls, travel reservation services, and electronic newspapers The ECH is a major step towards Singapore's efforts to become an electronic commerce hub for the region.

iii. Content Hosting Program

The NCB has launched a Content Hosting Program to encourage more companies to set up Internet mirror sites in Singapore. This will bring about faster access and richer content and services on the Internet for Singaporeans. A quick start environment will be established by March 1997 to enable content to be hosted in Singapore. There will also be incentives for content providers to host their content here.²⁴

In June 2006, the Singapore government launched its latest 10 year masterplan, dubbed iN2015 (Intelligent Nation 2015) which established ambitious goals for the country: to establish Singapore as first in the world in harnessing ICT to add value to the economy; a two-fold increase in value-added of the ICT industry to S\$26 billion; a three-fold increase in ICT export revenue to S\$60 billion; the creation 80,000 additional jobs; a 90 per cent rate of home usage for broadband; and the achievement of 100 per cent computer ownership for all homes with school-

²⁴ Inforcomm Media Development Authority, "Singapore Well on its way to a National Information Infrastructure", 1996 <https://www.imda.gov.sg/content-and-news/press-releases-and-speeches/archived/ida/press-releases/1996/20050726143657>

going children²⁵ . The government hoped to accomplish these goals through programs and initiatives that include for example, the CXO program, which will facilitate strategic discourse among key decision makers, CEOs, CIOs and CFOs and the iEnterprise Challenge Program which will focus on developing innovative products and solutions as reference projects, which will have a strong impact across various sectors, while simultaneously creating new intellectual property²⁶ .

A third government initiative sought to raise the percentage of small and medium-sized enterprises (SMEs) conducting e-commerce to twenty-five percent within three years' time. According to a survey conducted late in 1999 by the Singapore IT Federation, while 91 per cent of the top 1,000 companies already had Internet access, only 4 per cent of the 92,000 SMEs were conducting e-commerce²⁷ . Sixty-six per cent of SMEs with sales below \$1 million cited lack of in-house IT skills and infrastructure, inadequate knowledge of e-commerce, and low budgets as barriers to implementing e-commerce²⁸ . As such, the Economic Development Board (EDB) began supporting businesses in their e-commerce strategy by paying up to 50 per cent of their external consultants' costs in formulating a business plan or business collaboration venture, conducting feasibility studies, or providing assistance in implementation, up to a maximum limit of S\$250,000²⁹ . The government also initiated a three-year, \$11.7 million plan to prod the city's growing logistics industry into doing more with the Internet. Singapore's transport and logistics industry contributed more than 7 percent to gross domestic product last year³⁰ .

²⁵ Business Wire (2006). Singapore iN2015 masterplan offers digital future for everyone. June 26.

²⁶ Lim, R. (2006). Masterplan to transform InfoComm. *The Business Times*, Singapore, July 3

²⁷ Raj, C. (2000). Singapore to pump up SMEs doing e-commerce. *Business Times*, April 11, p.7.

²⁸ Koh, J. (2000). E-biz yet to touch SMEs. *Business times*, July 17, p.14

²⁹ Lee, S.S. (2000). EDB 50% grant to aid switch to e-commerce. *The Straits Times*, April 12, p.71

³⁰ Bangsburg, P.T. (2000). Singapore to meld Internet logistics. *Journal of Commerce*, March 20, p.10

The Singapore government's GeBIZ initiative was an attempt to create a one-stop, round-the-clock center for the government's business dealings. The first phase was launched in April 2000. GeBIZ enables the financial systems of ministries and the procurement applications to work together. Trading partners can find invitations to tender and purchase orders on the site. Suppliers can also submit invoices, check payment status, post their catalogues and bid for contracts. Currently, purchases are capped at S\$30,000 (US\$17,341), but the Ministry of Finance estimated that once new payment and security systems had been introduced, 80% of all government procurement were transferred to GeBIZ. In 2005, some 41,000 small-value purchases worth some \$36 million were transacted over GEBiz³¹. As with other online B2B trading networks, the benefits come in the form of more competitive bidding, easy access to suppliers round the world, time saved by online processing of orders, lower stocks and automated collection of high-quality data³².

The success of the various initiatives had been achieved through several enablers including³³

- 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

³¹ Business Times (2006). New GEBiz features lets firms post electronic catalogue. *Business Times*, Singapore, March 25.

³² Economist, The (2000). Government and the Internet: A survey. *The Economist*, June 24, p.17.

³³ Smart Nation Program Office, 2016 op.cit

- 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 economy³⁴. 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.

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 policies³⁵. PolicyPal has since 'graduated' from the sandbox and begun operations as a registered insurance provider.

³⁴ Monetary Authority of Singapore. 2016. "MAS FinTech Regulatory Sandbox," MAS Website. Accessed January 18, 2017. <http://www.mas.gov.sg/Singapore-Financial-Centre/Smart-Financial-Centre/FinTech-Regulatory-Sandbox.aspx>.

³⁵ Yahya, Y. 2017. "Insurance start-up PolicyPal graduates from MAS fintech regulatory sandbox." Straits Times, August 29. Accessed April 19, 2018. <http://www.straitstimes.com/business/companies-markets/insurance-start-up-policypal-graduates-from-mas-fintech-regulatory>.

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 data³⁶. 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 practices³⁷. Similarly, the Singapore government's OneMap service allows firms and individuals to add their own data to the base-maps and allows for the crowdsourcing of location-based data³⁸. 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^{39 40}

³⁶ Jun, J.W., "Technology and Governance in Singapore's Smart Nation Initiative." Harvard Kennedy School Ash Center, May 2018.

³⁷ Bhunia, P. 2017. "BCA Singapore announces phased roll out of new initiatives arising from review of 3rd Green Building Masterplan." OpenGov Asia, December 21. Accessed September 20, 2017. <http://www.opengovasia.com/articles/8004-bca-singapore-announces-phased-roll-out-of-new-initiatives-arising-from-review-of-3rd-green-building-masterplan>

³⁸ Smart Nation Program Office. 2017b. "Self-Driving Vehicles (SDVs): Future of Mobility in Singapore." Accessed April 21, 2017. <http://www.smartnation.sg/initiatives/Mobility/self-driving-vehicles-sdvs-future-of-mobility-in-singapore>.

³⁹ Smart Nation Program Office. 2017a. "Mobility-on-Demand: Real-time Demand-driven Transport through Apps." Accessed April 21, 2017. <http://www.smartnation.sg/initiatives/Mobility/mobility-on-demand-real-time-demand-driven-transport-through-apps>. Smart Nation Program Office. 2017b. "Self-Driving Vehicles (SDVs): Future of Mobility.

⁴⁰ Smart Nation Program Office. 2017b. "Self-Driving Vehicles (SDVs): Future of Mobility in Singapore." Accessed April 21, 2017. <http://www.smartnation.sg/initiatives/Mobility/self-driving-vehicles-sdvs-future-of-mobility-in-singapore>

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 ⁴¹.

Additionally, to enhance the effectiveness of the enablers, the Singapore government created several Public and Public-Private Initiatives. Specifically in terms of Public Initiatives, the Infocomm Media Development Authority (IMDA)'s Silver Infocomm Initiative (SII) was introduced in 2007 to encourage seniors to pick up IT skills and stay connected to reap the benefits of technology. Under the SII, the Silver Infocomm Junctions (SIJs) are senior-friendly infocomm learning hubs operated by Voluntary Welfare Organizations, the People's Association (PA)'s grassroots organizations, and non-profit organizations, offering accessible and affordable infocomm training for seniors through a customised curriculum. SkillsFuture Singapore (SSG) has a national training program, SkillsFuture for Digital Workplace (SFDW), to equip Singaporeans with foundational digital skills in key areas of mindset, data, technology, and innovation, and prepare them for technological changes in their workplace and daily lives. The Ministry of Education (MOE) has been deepening the use of information and communication technologies (ICT) in education over the years, with the aim of nurturing students who are future-ready and responsible digital learners. Most recently, MOE launched the Singapore Student Learning Space (SLS), an online platform where students and teachers have access to curriculum-aligned resources and a suite of learning tools. MOE has also implemented a Cyber Wellness framework to instil the principles of "Respect for Self and Others", "Safe and

⁴¹ Grab. 2017. "Grab Launches GrabShuttle, An Affordable Shuttle Service for Commuters." Grab Singapore, March 2. Accessed May 26, 2017. <https://www.grab.com/sg/press/others/grab-launches-grabshuttle-affordable-shuttle-service-commuters/>

Responsible Use”, and “Positive Peer Influence” to guide students in making thoughtful decisions in their online activities⁴².

As an example of some of the private-public sector initiatives, Microsoft has been actively involved in equipping our students with coding skills in a series of programs that cater to students from primary to tertiary levels. For example, its “Code for Change” program, in collaboration with IMDA since 2015, aimed to collectively develop conceptual thinking skillsets for up to 500,000 students in three years. The Microsoft Imagine Cup Competition is a series of technology competitions where students create games, apps, and integrative solutions. Also, TOUCH Community Services is a non-profit organisation with targeted programs to meet the needs of different segments in the population. For instance, TOUCH Cyber Wellness advocates cyber wellness and new media literacy for children, teenagers, parents, and educators, through education programs, counselling, and cyber wellness centers, built on research and development. Additionally, SG Enable is an agency dedicated to helping persons with disabilities gain access to disability services and schemes. One of its initiatives was the setting up of Tech Able, comprising the Singtel Enabling Innovation Center and the ST Engineering Enabling Technology Center. Tech Able is an integrated assistive technology space at the Enabling Village which features a technology showcase for persons with disabilities and provides them with assistive device assessment services. Persons with disabilities can find out about devices that will help them in their employment or daily living activities.

⁴² Ministry of Information and Communications ,Digital Readiness Blueprint, <https://www.mci.gov.sg/en/portfolios/digital-readiness/digital-readiness-blueprint>

In its strategy to achieve the Smart Nation, the government has drawn on the experience and, in some way, the failures of the past 20 years or so in the Digital transformation initiatives, to develop several, “guiding principles”, specifically.

- i) User-centric design for the goal of universal inclusion.

There is a plethora of digital applications and services available today. These can provide great convenience to both the user and the purveyor, but only if people can intuitively understand how to use them. In the same way that many children seem almost intuitively able to use mobile devices like iPads, we must also aim for the design of digital applications and services to be accessible by everyone, regardless of how digitally savvy they are. Designing these applications and services must therefore start with the user at the center. The user interface of our digital services and applications must be so easy to use that almost everybody can participate and transact digitally with little or no instruction.

Since digital inclusion is not only about than access but equipping people with the skills and know-how to use technology. While the government recognizes that there are many programs today that focus on giving people access to affordable devices and the internet, it also acknowledges that digitally ready is also about having the skills and know-how to use digital technology safely and confidently. The know-how to navigate the complex digital environment should result in a better appreciation among citizens of the benefits that technology can bring, ensuring that they are better placed to participate meaningfully in the digital society.

Furthermore, the government learnt that digital readiness requires effort from the whole society. For our digital readiness effort to be successful, it is critical that all sectors of society play a part. In other words, all efforts to get Singaporeans ready to participate in a digital society must include the strong partnership and collaboration of the Government, businesses, and the community. Only with the mandate of the public sector, the resources and knowledge of the private sector, and the networks, touchpoints, and understanding of the community sector will we be able to effect deep and wide impact for all Singaporeans.

According to IMDA's 2016 Survey of Infocomm Usage and the SingStat Key Household Income Trends Report, about 9% of Singaporean households do not have internet access. Thus, not all households in Singapore have access to the internet and these are in the bottom 20th percentile of household income. At the same time, the daily transactions such as bill payments are shifting towards digital services accessible by internet-enabled mobile phones. Though mobile phone ownership in Singapore is high, at about 150% of the population, there are still Singaporeans who do not have mobile phones. Access to a bank account with a card facility is also becoming increasingly essential as e-payments become more prevalent, for instance as we move towards a cashless public transportation system. While a high proportion of Singaporeans have bank accounts, about 40,000 Singaporeans still need help opening one. To make it easy and affordable for Singaporeans to open bank accounts, major retail banks have offered basic banking accounts with low initial deposit and minimum account balance requirements since 2002. Some banks also waive the account balance fall-below service fees for children, the elderly, full-time National Servicemen, and recipients of public assistance. The Monetary

Authority of Singapore (MAS) is working with the local banks to ensure that free bank accounts are made available to a wider group of Singaporeans who need assistance.

Beyond phones and bank accounts with card facilities, having a digital identity will also be increasingly important for secure digital transactions and services.

Furthermore, unlike the “digital natives”, vulnerable segments of the population such as the low-income, some seniors, and persons with disabilities, generally face more challenges in embracing technology. Beyond a basic digital access package, the government is considering customizing the support for such groups with specific needs. For instance, mobile devices for seniors must be designed with their needs in mind (e.g. poorer vision and fine motor skills) and come equipped with senior-friendly features such as large buttons, big readable font-types, and voice-enabled apps. Likewise, there is a need to review existing practices to facilitate access to online banking facilities for vulnerable groups like the chronically unemployed and ex-offenders.

The Government is also doing more with the private and people sectors to help persons with disabilities in the use of technology. In 2014, IMDA launched the Enable IT Program to help persons with disabilities access and use technology to improve the quality of their daily living and enhance their employability through technology. To date, IMDA has invested close to \$2 million in various projects which have benefitted more than 4,100 persons with disabilities. The Enable IT Programs has proven to be useful and there is strong demand for it. In 2017, IMDA enhanced the Enable IT Program by doubling the grant support to social services organizations to \$100,000 per project so that more persons with disabilities can benefit from projects that improve their access and use of technology.

ii) Infuse Digital Literacy into National Consciousness

Currently, there are many digital skills training programs offered by both the public and private sectors. These programs are typically workforce oriented in nature and appeal to those with a view to develop and achieve specific technical competencies and job outcomes. For example, the SkillsFuture for Digital Workplace (SFDW) program has identified foundational digital skills in four key areas, namely mindset, data, technology, and innovation. Beyond these individual skills courses and a program level approach, the government had noted that there is no systemic effort to define the fundamental skills that one, especially a digital non-native, ought to have in order to participate meaningfully in the digital society. Therefore, it intends to develop initiatives that would infuse Digital Literacy into National Consciousness.

The advance of technology has made it easier to generate and spread false information. Fake news is a global problem, and many countries have put in an array of measures to counter it. Of these efforts, public education has been singled out as an important bulwark against the proliferation of online falsehoods. While legislation could form part of the response strategy, the decision on whether to click on "share" or "forward" lies solely in the hands of the individual. This emphasis on being discerning and responsible consumers of online content is also in line with the proposed "Core Values on Digital Literacy for ASEAN"¹² which was tabled for adoption at the 14th Meeting of ASEAN Ministers Responsible for Information (AMRI) in May 2018. In this respect, the government is intent on strengthening focus on information and media literacy, to build resilience in era of online falsehoods

iii) Empower Community and Businesses to Drive Widespread Adoption of Technology.

As part of the efforts to improve adoption of technology among citizens, countries such as Wales and Scotland have implemented Digital Participation Charters as a way to expand digital inclusion efforts. Signatory organizations publicly commit to digital inclusion principles and also work at ensuring that their employees and volunteers have the confidence to develop digital skills. The desired outcome is for the beneficiaries and volunteers of the signatories to embrace digital solutions for the problems that they tackle. In Singapore, many organizations already have implemented their own initiatives to prepare their employees or the community to be digitally ready.

To further reduce the barriers to learning and using technology, the government intends to provide one-on-one assistance to make it easy for Singaporeans to adopt technology, especially those who find it challenging especially digital non-natives on the use of their digital devices or services. With such assistance, non-natives can, over time, become more confident and comfortable in using technology to participate in digital activities. IMDA and NLB currently have some initiatives in place providing assistance to seniors and mature adults in their navigation of technology. These initiatives should continue to proliferate through partnerships with the community so as to reach out to more people who require more guidance.

Simple-to-use and fun app-like experiences can encourage digital participation in community projects for better social outcomes and benefits. While we have a number of initiatives that promote social interaction among Singaporeans via the use of technology, some have a limited reach and may only be available to people who are aware of them (e.g.

closed Facebook community groups). The potential solution would be to provide support for projects that create opportunities for community participation

iv) Promote Digital Inclusion by Design.

The government believes that whether it is an app, website, workshop, or information booklet, digital initiatives must be designed in a way that makes it easy for everyone to get involved. The design, content, language, and applicability of the initiative to people's lives will go a long way in making sure that everyone can participate in our digital journey. Inclusion by design also goes beyond that which is directly digital. Policies and regulations that may hamper digital adoption may also need to be assessed and reviewed. There is also an equally important need to understand some of the impediments or "frictions" which prevent people from using digital products and services, so that we can overcome them to create a better ecosystem which supports the move towards a Smart Nation, both for consumers and businesses.

Currently, the government has established a multitude of events and platforms promoting the use of technology that are tailored to different user groups. Where possible, agencies and organizations of digital services have been encouraged to leverage these events and platforms for conversations with end-users to understand their pain-points and potential barriers which hinder the adoption of technology. In this way, it hopes that valuable insights can be gathered to help improve initiatives, or to review existing regulations and even policies that inhibit Singaporeans from using technology in a pervasive way. In addition, there should also be a channel to collect, and make available, the feedback

gathered so that everyone, from app developers to course providers and policy makers, is aware of the views expressed.

The government believe organizations should be encourage design for digital inclusion, since digital services can provide great convenience to users, but only if people can understand and use these services easily. There are already in place guidelines that developers of digital services can follow to ensure that everyone can use these services easily. These include, but are not limited to, the Web Content Accessibility Guidelines (known as WCAG 2.0), which is an internationally recognized set of recommendations for improving web accessibility, including for persons with disabilities. The government also reviewed all high-volume of its services, to assess where improvements can be made to ensure that all services provided by the Government are user-friendly and accessible to different population segments, including persons with disabilities. Additionally, the SS618 Guidelines on User Interface Design for Older Adults, supported by Enterprise Singapore and the Singapore Standards Council was jointly developed by the public, private, and people sectors to provide guidance to designers of digital devices and online services in designing user interfaces to enhance usability and experience for older adults of digital services, such as laptops and smartphones, as well as online services. It goes beyond basic considerations, such as readable font size for older adults, color and contrast, and presentation of information, to include considerations on senior-friendly designs and features.

A final but no less important aspect of strengthening the readiness of Singaporeans to participate digitally may not be digital at all. In a multi-racial, multi-lingual society like

Singapore, language can sometimes be one of the key barriers to the understanding, acceptance, and adoption of anything, including technology. Reach out to more Singaporeans by ensuring that relevant digital services are made available in vernacular languages.

Case study: Mobilizing Public-Private Partnerships for Tele-health

In Singapore, video consultations and telemedicine pilots began at six public health institutions as early as 2017. Telemedicine has been seen as a way to help tackle the problem of Singapore's overcrowded hospitals and specialist outpatient clinics, saving patients commuting and appointment waiting time. Apart from public hospitals, private sector healthcare providers are offering telemedicine as an option. Even Traditional Chinese Medicine (TCMs) firms acknowledge that the pandemic has disrupted the way they do business. They already sell products online but are now also offering teleconsultation services.⁴³

In the past, telemedicine was employed for review consult cases which were stable, where physical checks and tests were not required, and where patients had access to the appropriate devices and connectivity. The initial pilots were for disciplines such as mental health, renal medicine, pharmacy, epilepsy, and dementia. But only 1,947 patients used the service between 2017 and the start of 2020. Singapore has been able to reap some of the benefits of tele-health. For example, Singapore's Ministry of Health (MOH), reported 7,413 cases of stroke treated in the nation's public hospitals in 2016. Stroke survivors often experience physical limitations (such as loss of balance, mobility and dexterity) and require rehabilitation from health care

⁴³ International Trade Administration, Singapore Licensing of Telemedicine. ITA, Department of Commerce, International Trade Administration, 4/26/21 <https://www.trade.gov/market-intelligence/singapore-licensing-telemedicine-1>

professionals, to regain their functional independence during and after hospitalization.

Rehabilitation at both inpatient and outpatient settings can facilitate these individuals to achieve their goals of regaining and/or maintaining functional independence and potentially lower long-term health-care costs. However, it has been reported that a significant number of participants choose not to continue their rehabilitation after hospital discharge due to functional, financial and social barriers such as mobility and transportation problems, as well as the cost of treatment. In a recent study 124 eligible individuals were recruited into the trial between 2013 and 2016 from two participating hospitals in Singapore. Sixty-one individuals were randomly allocated to the tele-rehab group and 63 to the control group. Patients in the intervention group who had access to tele-rehabilitation and patients in the control group who had access to usual care (i.e. center-based rehabilitation) presented similar improvements in functional outcomes while self-reporting a similar amount of time spent on rehabilitation and exercise over the three-month trial period. Tele-rehabilitation may be a viable option for providing rehabilitation services in Singapore to reduce health services utilization barriers and nurture continuous participation in rehabilitation after discharge from hospital post stroke.⁴⁴

However, video consultations in telemedicine in Singapore rose throughout 2020 amidst the COVID-19 pandemic lockdown and by January 2021, 36,000 patients had sought medical help via video consultations⁴⁵. The response by the Nephrology Division at Singapore's the National University Hospital (NUH) illustrates how various medical groups adapted to the pandemic, in

⁴⁴ M. Asano et. Al. Home-based tele-rehabilitation presents comparable positive impact on self-reported functional outcomes as usual care: The Singapore Tele-technology Aided Rehabilitation in Stroke (STARS) randomized controlled trial. *Journal of Telemedicine and Telecare*, 2021, Vol. 27(4) 231–238

⁴⁵ International Trade Administration, Singapore Licensing of Telemedicine. ITA, Department of Commerce, International Trade Administration, 4/26/21 <https://www.trade.gov/market-intelligence/singapore-licensing-telemedicine-1>

this case, to make an urgent and wide-scale transition to tele-health services in a 10-week timeline. In Singapore, the Nephrology Division is an academic practice at the National University Hospital (NUH) of Singapore with a 1,160-bed tertiary hospital serving more than 670,000 outpatients and 49,000 inpatients a year. It has a collaborative service model with the National Kidney Foundation (NKF) with seven nephrologists perform monthly rounds on 960 HD patients across seven satellite community dialysis centers (DCs). The traditional model of care in community dialysis is nephrologist-driven. Frequent in-person rounds at DCs were mandatory before the pandemic. Inpatients at regional hospitals are reviewed by separate attending nephrologists.

In November 2018, NKF established an electronic medical record (EMR) for each HD patient, with integrated computerized physician order entry and task management tools. Physicians were given remote access via password-secured virtual private networks (VPN) on tablet computers, but many preferred paper documents. However, on February 7, 2020, after local authorities raised the risk posture of Covid-19, in-person dialysis rounds were ceased and one day later, replaced by remote review of dialysis treatment records and telephone discussion with dialysis nurses for all patients. However, a complete telemedicine practice was not possible, as on-site nurses were required for connecting patients to dialysis and monitoring purposes.

In a subsequent analysis, NUH found that overall outcomes and patient satisfaction with the rapid adoption of telemedicine to continue providing care to patients. It found that key biochemical performance indicators had been unaltered by reduced physician presence. Also, unpublished audit data in March 2020 revealed that serum hemoglobin, albumin, and dialysis dose targets continue to be achieved in 85%, 91%, and 93% of patients respectively, unchanged

from 6 months pre-Covid-19 at 86%, 90% and 92% respectively. It found no significant difference in hospital admission rates for cardiovascular disease or vascular access complications. Similarly initial feedback through an informal survey of patients at one DC found that most expressed satisfaction with the experience: 13 of 18 patients agreed that the telemedicine service had benefited their care, and 11 of 18 agreed that telemedicine offered a near-equivalent to in-person physician rounds.⁴⁶

However, the ability of health-care providers in Singapore to rapidly switch to tele-health as an alternative delivery system was made possible through two major government programs, the first initiated nearly 2 decades ago, and exemplify the infrastructure and service platforms requirement discussed above.

In 2014, Singapore launched the Smart Nation Program, designed to harness ICT, networks and data to improve the quality of life of its citizens, strengthen businesses, and help government agencies serve citizens better, particularly in the face of increasing urban density and as aging population⁴⁷. The Smart Nation program was the planned extension of Singapore's 10-year Intelligent Nation masterplan (iN2015) begun in 2004 to develop the infocomm infrastructure to support the Internet of Things (IoT) and enable cyber physical systems (CPS). iN2015 was thus designed to use infocomm technologies to enrich lives, enhance the growth, competitiveness of and innovation in key economic sectors and build a well-connected society.⁴⁸ Based on iN2015,

⁴⁶ Ngoh CL et al. Rapid Transition to a Telemedicine Service at Singapore Community Dialysis Centers During Covid-19. *NEJM Catalyst* May28, 2020.

⁴⁷ Chia, ES. Singapore's Smart Nation Program – Enablers and Challenges https://www.researchgate.net/publication/306113634_Singapore%27s_smart_nation_program_-_Enablers_and_challenges

⁴⁸ Infocomm Development Authority of Singapore, 2010. iN2015 Masterplan, <http://www.ida.gov.sg/Tech-Scene-News/iN2015-Masterplan> accessed 4 May 2015.

9 out of 10 Singapore homes have broadband and soon every home will have fiber. Singapore's smart phone penetration is one of the highest in the world at 85%.

Integrated Health Information Systems (IHIS) is the technology agency for the public healthcare sector. It was formed in Singapore in 2008 as a cohesive approach to the development and management of IT systems in public healthcare with the objective of improving the Singapore population's health and health administration by integrating intelligent, highly resilient, and cost-effective technologies with process and people.

Currently, IHIS supports the operations of 46 public healthcare institutions including acute hospitals, specialty centers, and polyclinics, as well as over 1,400 partners such as community hospitals, nursing homes, general practitioner clinics and voluntary welfare organizations. In November 2016, it merged with Singapore's Ministry of Health (MOH) Holding's Information Systems Division essentially assuming the role of the technology agency for Singapore healthcare⁴⁹.

LEAP in Tele-health in Singapore

Recognizing some of the legal and structural challenges to the deployment of tele-health services, Singapore's Ministry of Health (MOH) launched a new Licensing Experimentation and Adaptation Program (LEAP) beginning with telemedicine services, with the objective of identifying new and innovative models and services that have the potential to bring significant benefits to patients and support healthcare transformation. LEAP will provide regulatory

⁴⁹ iHIS Integrated Information Services Annual Report 2018, https://www.ihis.com.sg/About_IHIS/Documents/IHIS0110_18%20Annual%20Report%202016_17_05Dec18_FA.pdf

sandboxes that enable new and innovative models and services to be developed and refined in a safe and controlled environment. Participating providers and MOH will achieve this through clear boundary conditions, data governance measures and risk mitigation strategies.

Singapore's MOH hopes that under LEAP, *patients and caregivers* will benefit from early access to new healthcare models while being assured that essential safety and risk mitigation measures are in place. Being able to develop an appropriate and clear regulatory regime with LEAP will enable the growth of these services that can bring benefits to more patients and caregivers, while safeguarding their interest. For health care providers, it hopes that participating in the regulatory sandbox will be able to introduce new healthcare models or evolve their current models in a safe manner, with early visibility over the eventual regulatory environment. This positions them to transit more seamlessly into the eventual regulatory framework and meet patient safety and welfare requirements.

From LEAP, the Singapore Ministry of Health (MOH) hopes to better understand the risks associated with telemedicine and as of February 2021, are satisfied that it had achieved the objectives. It had in the interim, introduced a voluntary listing of direct telemedicine providers that have agreed to comply with the MOH telemedicine e-training. Currently, there are more than 600 telemedicine providers on the list including public hospitals, clinics and telemedicine firms. Only registered providers can offer consultations to patients under the Community Health Assist Scheme (CHAS) and tap Medisave (Singapore's compulsory national medical savings plan), for video consultations for follow-up of certain chronic conditions. As of October 2021,

twenty chronic conditions, including osteoporosis, psoriasis, rheumatoid arthritis and ischemic heart disease, were added to the list⁵⁰.

Phased Implementation to ensure smooth transition for licensees

Implementing HCS Regulations in Phases		
Phase 1 September 2021	Phase 2 June 2022	Phase 3 March 2023
1. General Regulations 2. Advertisement Regulations <u>Clinical Support Services</u> 3. Clinical Laboratory Service 4. Radiological Service 5. Blood Banking Service 6. Tissue Banking (cord blood) Service <u>Special Services</u> 7. Nuclear Medicine Imaging Service 8. Nuclear Medicine Assay Service <u>Non-Premises Based Services</u> 9. Emergency Ambulance Service 10. Medical Transport Service	<u>Non-Premises Based Services</u> 11. Telemedicine Service <u>Ambulatory Care Services</u> 12. Medical Clinic (including Mobile Medicine) Service 13. Dental Clinic Service 14. Health Screening Service 15. Ambulatory Surgical Centre Service 16. Renal Dialysis Centre Service <u>Special Services</u> 17. Assisted Reproduction Service 18. Radiation Oncology (including Proton Beam Therapy) Service 19. Blood Transfusion Service 20. Nuclear Medicine Therapy Service <u>Clinical Support Services</u> 21. Tissue Banking (human tissue; reproductive cell and/or embryo) Service	<u>Hospital Services</u> 22. Acute Hospital Service 23. Community Hospital Service <u>Long Term Care Services</u> 24. Nursing Home Service 25. Inpatient Palliative Care Service <u>Special Services</u> 26. Cell, Tissue and Gene Therapy Service 27. Clinical Genetic and Genomic Service 28. Organ Transplant Service 29. Specialised Interventional Procedures Service

MOH aims to license telemedicine services in mid-2022 as part of the phasing in of the upcoming Healthcare Services Act. The Health Services Bill was approved by Parliament in January 2020 and was supposed to be implemented in three phases, from early 2021 to end 2022. However, the pandemic derailed this and the new timeline is now scheduled for the end of 2023.

⁵⁰ Ministry of Health, Singapore. MOH Launches First Regulatory Sandbox to Support Development of Telemedicine <https://www.moh.gov.sg/news-highlights/details/moh-launches-first-regulatory-sandbox-to-support-development-of-telemedicine>

This will replace the Private Hospitals and Medical Clinics Act of 1980 which was last amended in 1999. The broadened scope of the new Healthcare Services Act will include healthcare services, allied health and nursing services, traditional medicine and complementary and alternative medicine. It aims to better safeguard the safety and well-being of patients amidst the changing healthcare environment while enabling the development of innovative services that benefit patients. It will also strengthen governance and regulatory clarity for better continuity of care to patients and address wider issues of patient welfare.

Conclusions

The success of both Singapore's Smart Nation initiative and the European Union's Digital Decade program will depend on several key factors namely: i) public policies that stress user-centric design for the goal of universal inclusion, including customizing access package for those with specific needs; ii) Infusing digital literacy into National consciousness especially to strengthen focus on information and media literacy, to build resilience in era of online falsehoods; iii) Private-public partnerships that empower community and businesses to drive widespread adoption of technology particularly those that provide support for projects that create opportunities for community participation and provide one-on-one assistance to make it easy for Singaporeans to adopt technology; and iv) Promote Digital Inclusion by Design.