The Making of a Smart Nation

by Chan Heng Chee

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Ladies and Gentlemen,

There is a race going on in the West and equally in Asia. It is not an arms race but a smart race. Cities vie to be smart. Smart Cities rankings proliferate. There are so many metrics used that you are sometimes measuring apples and oranges. I will leave aside definitions of smart. That debate was done some time ago. We all recognise that smart cities involve the use of ICT to solve problems for our citizens and to improve the quality of governance. It leads to the digitalization of the economy and society. Some have argued smart must embody the concept of sustainability, that is, sustainability of the effort. Others have argued smart cities must be cities that have some success using the right technology to tackle problems of climate change and global warming. Smart Cities may now be a proxy for competitive cities and are regarded to be more forward looking and advanced than those that are not, and are better able to grow the economy.

I want to focus briefly on some countries in East Asia highlighting their attempts to be smart cities -- China, South Korea, and Southeast Asia. Singapore is seen to be a leader in implementing the smart city concept and its move to a Smart Nation is being watched. I will discuss our smart journey to point out where we have succeeded and where the challenges still lie.

Ever since IBM began a “Smart Planet” conversation in 2008, ’smart” became a buzzword globally. It is an assertion of a new worldview of how the world has changed in the way it

works. Technology will enable us to be more productive, efficient and responsive. Many countries in Asia get it. They know they have to embrace smart to manage megacities.

SMART ECONOMY

Recently Huawei compiled a Global Connectivity Index to map out the transformation into digital economies. It ranked 50 countries that in total account for 90% of the global GDP and 78% of the global population according to 40 indicators. The indicators include tech enablers such as broadband, data centers, cloud services, big data and IoT, and the supply, demand, experience and potential dimensions of using these enablers. The countries were categorised as Starters assessed to be at the stage of Foundation Innovation, Adopters are at the stage of Internet Innovation and Frontrunners are at Data Innovation. No country is at the next stage of Augmented Innovation.

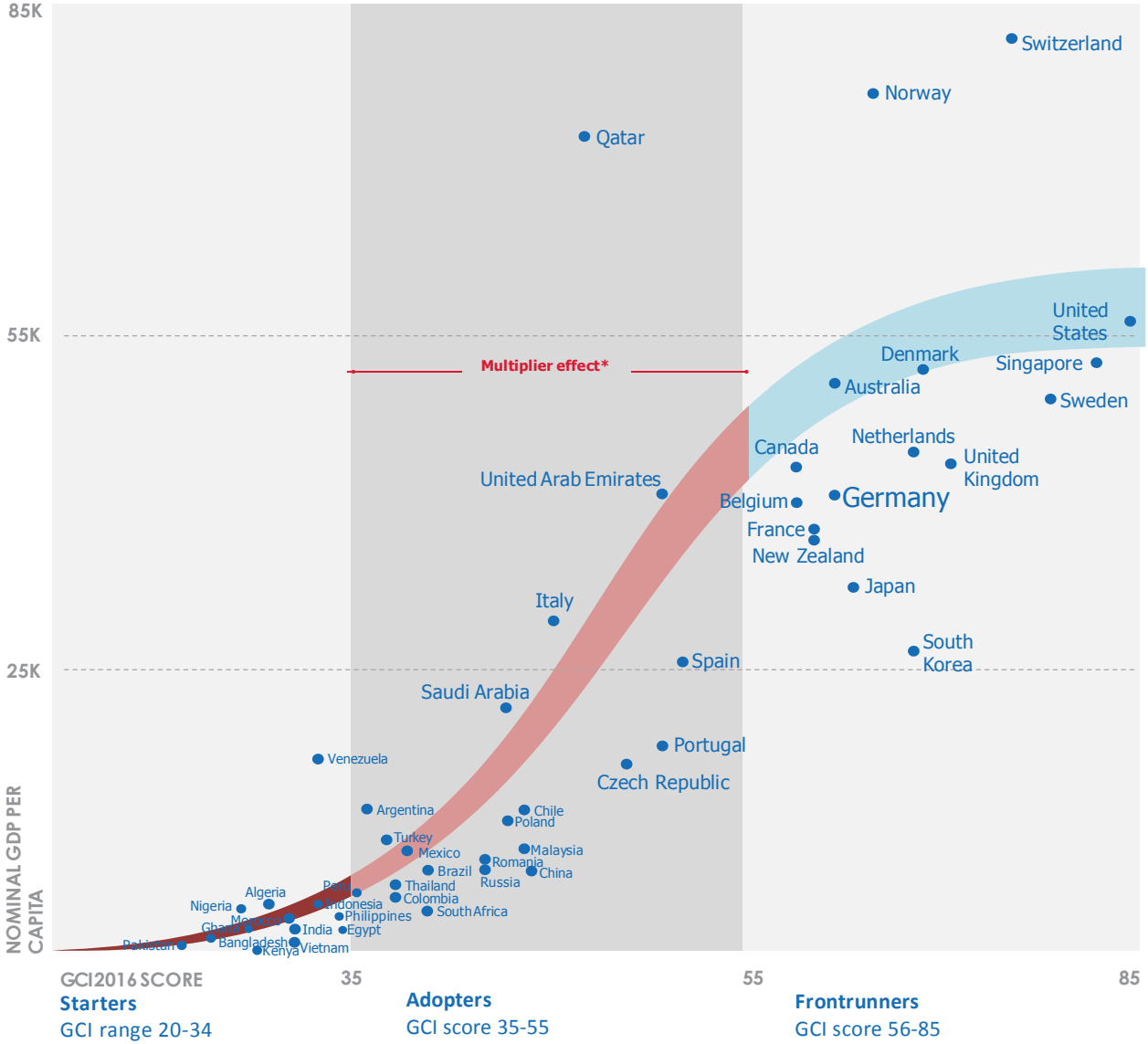
GCI 2016 Ranking Table

Frontrunners			SCORE
1		United States	74
2		Singapore	72
3		Sweden	70
4		Switzerland	68
5		United Kingdom	65
6		Denmark	64
7		South Korea	63
8		Netherlands	63
9		Japan	62
10		Norway	61
11		Australia	59
12		Germany	59
13		France	58
14		New Zealand	58
15		Canada	57
16		Belgium	57

Source:
Huawei 2016, "Connect where it counts: Mapping your transformation into a digital economy."

Figure 1. Where are you on GCI curve?

GCI performance versus GDP

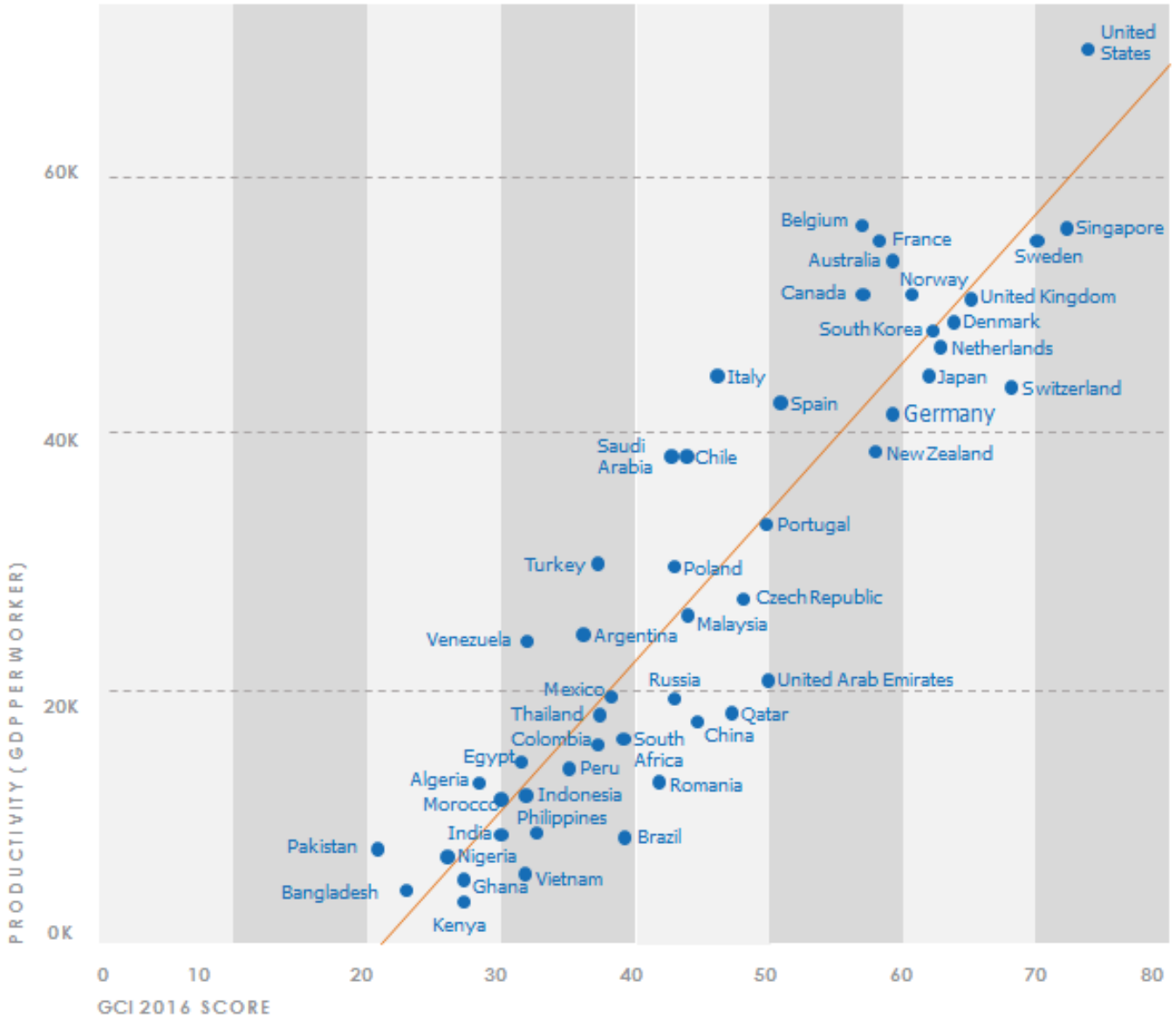


Source:
Huawei 2016, "Connect where it counts: Mapping your transformation into a digital economy."

Interesting point the study makes is that a high GCI score provides an environment for innovation and productivity and drives competitiveness.

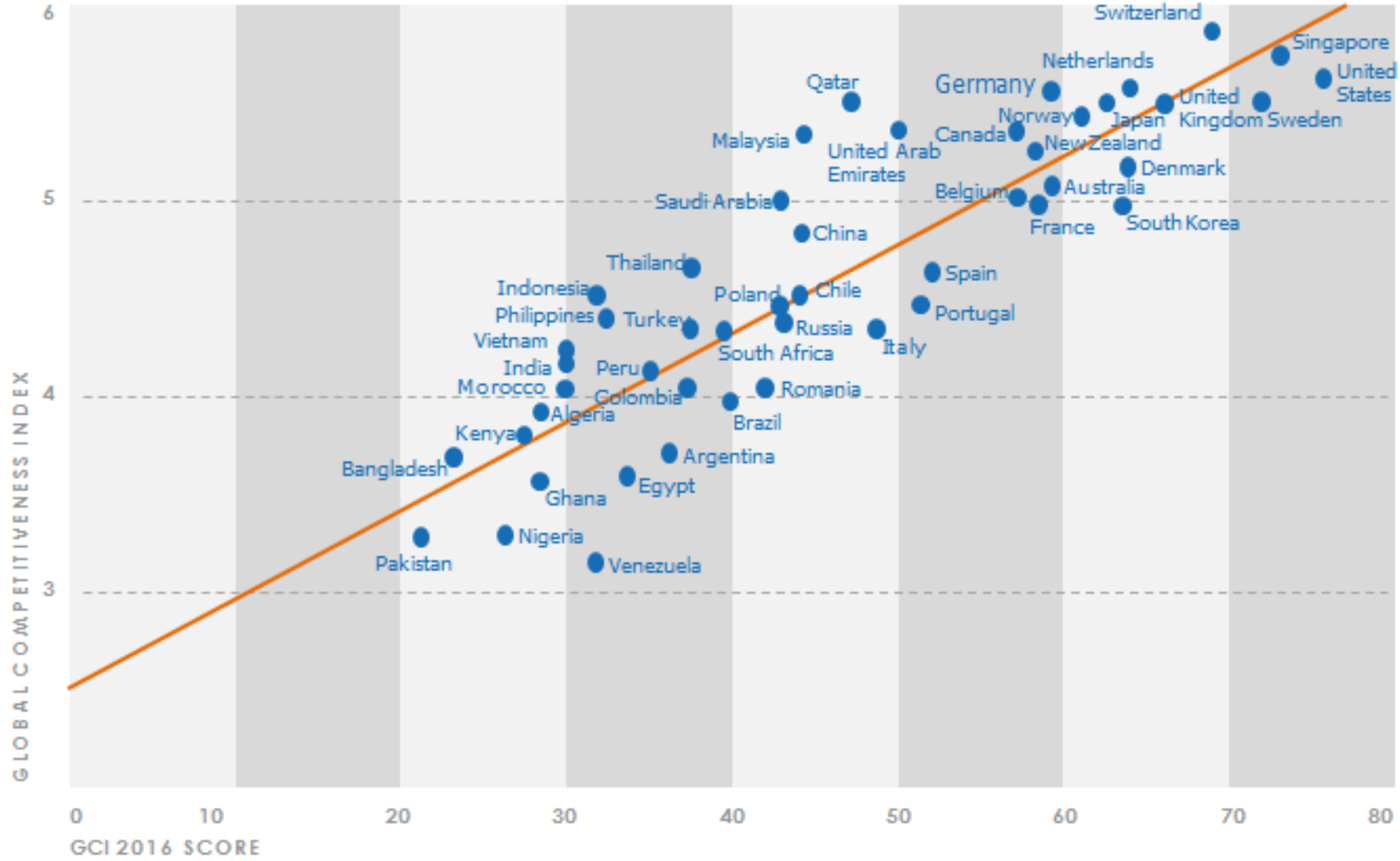
Huawei study maintains that an increase in 1 point on the GCI score correlates with a 2.3% increase in productivity, a 2.1% improvement in the Global Competitiveness Index and a 2.2% increase in the Global Innovation Index. There is high correlation in the three indexes.

Figure 2. High-GCI nations that invest in the five technology enablers are more competitive, productive, and innovative



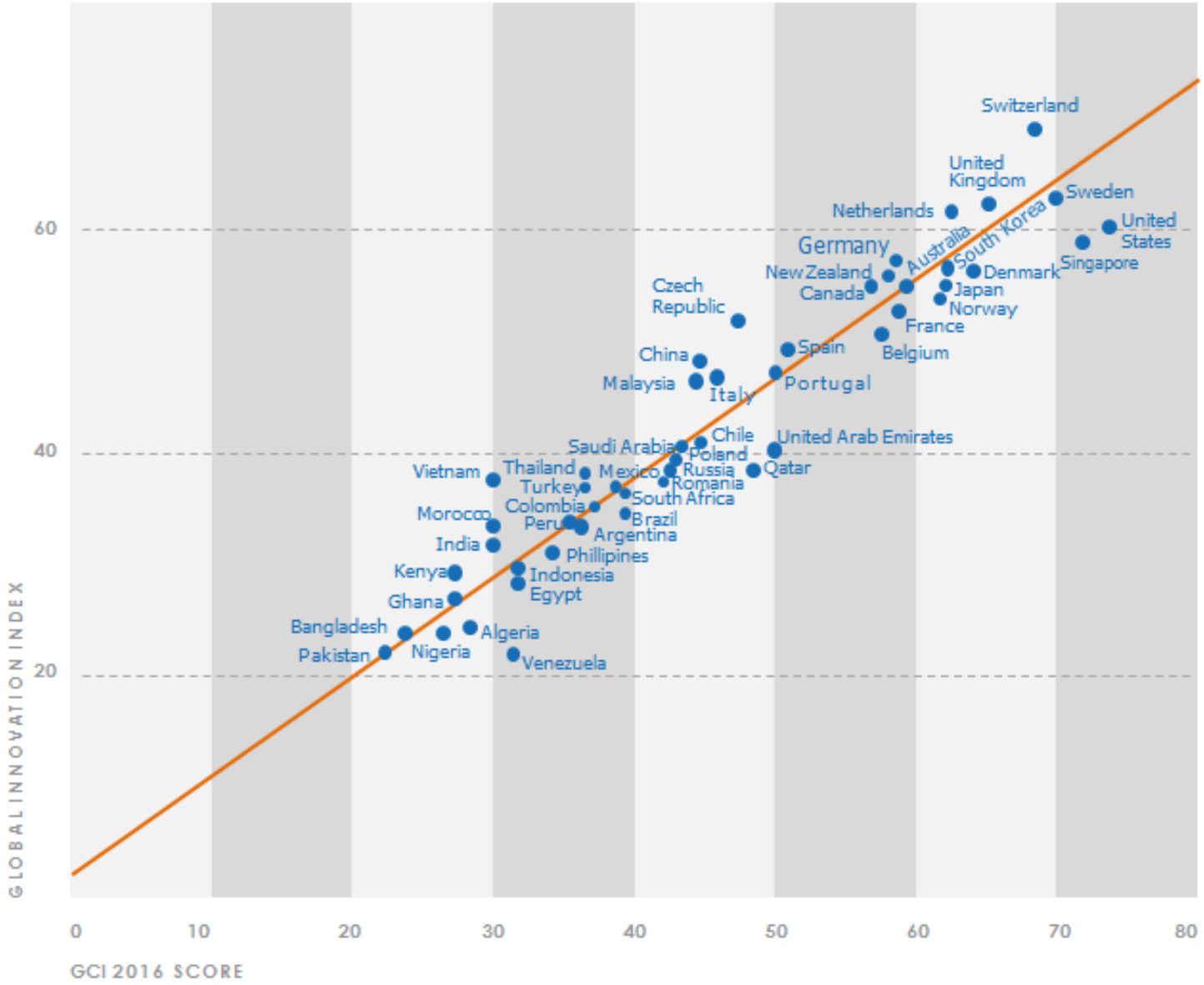
Source:
Huawei 2016, "Connect where it counts: Mapping your transformation into a digital economy."

Figure 3. GCI versus the Global Competitive Index



Source: Huawei 2016, "Connect where it counts: Mapping your transformation into a digital economy."

Figure 4. GCI versus the Global Innovation Index



Source: Huawei 2016, "Connect where it counts: Mapping your transformation into a digital economy."

CHINA

The smart city concept quickly gained momentum among Chinese academics and thought leaders. Smart city development in China caught the attention of the central and regional governments as early as 2010. They understood that with the rapid pace of urbanisation China needed radical solutions for urban management and city operations. They have been bold about adopting smart solutions. Transportation, energy, water and healthcare were and are key areas which the authorities must deliver on if they were to avoid an urban mess. In 2012, the Ministry of Housing, and Urban and Rural Development launched an urban nationwide testbed effort for smart city innovations which now covers 300 cities and partnered with the China Development Bank to provide funding of 80 bill Chinese yuan for the first 3 years.

More recently in 2015, the China State Council launched the "Internet Plus" action plan first presented by Premier Li Keqiang when he delivered his government work report earlier the same year. The government aims to integrate mobile internet, cloud computing, big data and IoT with traditional manufacturing and agriculture, and stimulate the growth of China's domestic tech industry, e-commerce, industrial networks and internet banking. China wants to help internet companies increase their international presence. Internet plus is spoken of as a new engine for growth. The Plan says by 2025 Internet Plus will become the new economic model and an important driving force for economic and social innovation. Internet Plus is seen to help Chinese internet companies go global with the 1 Belt 1 Road Initiative.

China has had some success in implementing smart government though Chinese IT entrepreneurs say it is uneven, but there are some big bright spots. China has the most Internet and mobile users in the world. In 2014 there were 649 mill internet users and 557 mill used mobile phones. (China Internet Network Information Center.) In 2015, 30% of rural China has broadband and 60% in the cities. China has pushed for smart government in the cities using open data platform to share data resources, new media (online social media) to communicate with the public to gather better information for better decision making. Smart apps mushroom for transportation needs. In governance, China started using police drones across the country to help to break up drug rings, stamp out terrorism and fight corruption. There are 300 drones used in 25 provinces at the moment. Smart healthcare has helped to make more efficient and effective the interactions of patients with doctors, nurses, hospitals, pharmacies and insurers. For instance it has

streamlined patient visits from reservation and registration to insurance claim and payment using Alipay's Future Hospital, introduced telemedicine to reduce patients clinical visits with Ali Health, and there is an online pharmacy which delivers the pharmacy to the doorstep.

There are still issues of regulation which are considered problematic. Chinese researchers or entrepreneurs are of the view that China has progressed a lot, but it is still not there yet because the ecosystem of technological innovation is a work in progress. China is game to try PPP approaches in developing smart cities and the verdict is something is moving and should be watched. The thing to remember about China is that accompanying the top down initiatives of the government, the enormous market potential of China has attracted many Chinese to become tech entrepreneurs. There is a lot of energy in the country, a lot of skills and a lot of ideas.

SOUTH KOREA

South Korea's economic development success since the 1950s is considered an economic miracle. It was one of the 4 tiger economies of Asia. Today it is the 11th largest economy in the world with a strong manufacturing sector exporting semiconductors, wireless telecommunications equipment, computers, motor vehicles, steel, ships and petrochemicals. Its development of the ICT industry since the Asian Financial Crisis in 1997 is impressive and South Korea is ranked No 1 in the ICT Development Index.

With a growing population moving into cities, South Korea realized they would have to solve the problems of congestion, environmental degradation and poor building standards. South Korea naturally turned to smart technologies. In 2007 the city of Seoul rolled out a Smart Seoul plan to be achieved by 2015. It's ambition was to become one of the 5 most competitive cities in the world! In fact Seoul is regarded by many as a go - to place to get a blueprint for smart city development. If you think of smart city technology probably Seoul did it first. Today they have added the dimension of 'green city' and they want to stimulate green technologies.

Seoul set out first to build infrastructure, then secondly to provide smart services and thirdly to advance smart services.

Smart devices are everywhere and they are empowering residents to be connected, helping low-income families. For instance in 2012, Seoul started distributing second hand devices to low income families and others in need. Citizens are encouraged to donate their old devices when buying new ones incentivised by tax deduction**.** They have electric buses and cars on the road. Its ambition is by 2020, to have 120, 000 electric cars and 110,000 charging stations. **T**hey want to be among the top three in the world to use green cars.

There are many smart cities and smart zones in the country, eg the Incheon Free Economic Zone which includes the Songdo Industrial Business City, the Cheongna Leisure City, and the Yeongjong Global Logistics City.

Songdo is the most well- known dubbed "the world's first smart city" or "the city of the future" built from scratch on 1500 acres of reclaimed land costing US$35 billion. It was built by the Korean Government partnering CISCO to be near Incheon international airport, an "aerotropolis", to lure business there. It was to be a lab to demonstrate Korea's technological advances. 40%of the city has been designated 'green public space" and the city is home to 20 million sq ft of LEED, Leaderhip in Energy and Environmental design. Songdo is a green city, bicycles are everywhere, waste management is state of the art, sucked into an underground pipe. Students in classrooms have a 'telepresence' with sister schools in the US.

A writer from the journal The Atlantic, described the city's futurism as incremental, co-existing with the familiar and mundane, not a city of future scfi, but there were many subtle differences. It is not a utopia, nor a vision of the future but a "testbed". Apparently you can encounter deers and birds and listen to piped classical music in the park.

SOUTHEAST ASIA

Let me now make a few comments about the development towards smart cities in Southeast Asia. An Economic Intelligence Unit Report released in June 2016, commissioned by Microsoft suggest that the 5 major Southeast Asian countries, Indonesia, Malaysia, Philippines, Singapore, and Thailand have high ambitions to harness technologies to help them provide a better and more efficient e-government. They are motivated by the benefits, but constrained by four significant barriers: 1) budgets, 2) quality of their infrastructure, 3) legal framework and 4) skills.

Only Singapore and Malaysia have been more successful and Singapore is way ahead, recognised among the world leaders in digitising government. I will speak on this in a moment.

The Table below gives a picture of the uneven development of the infrastructure and the actual e government usage among the countries.

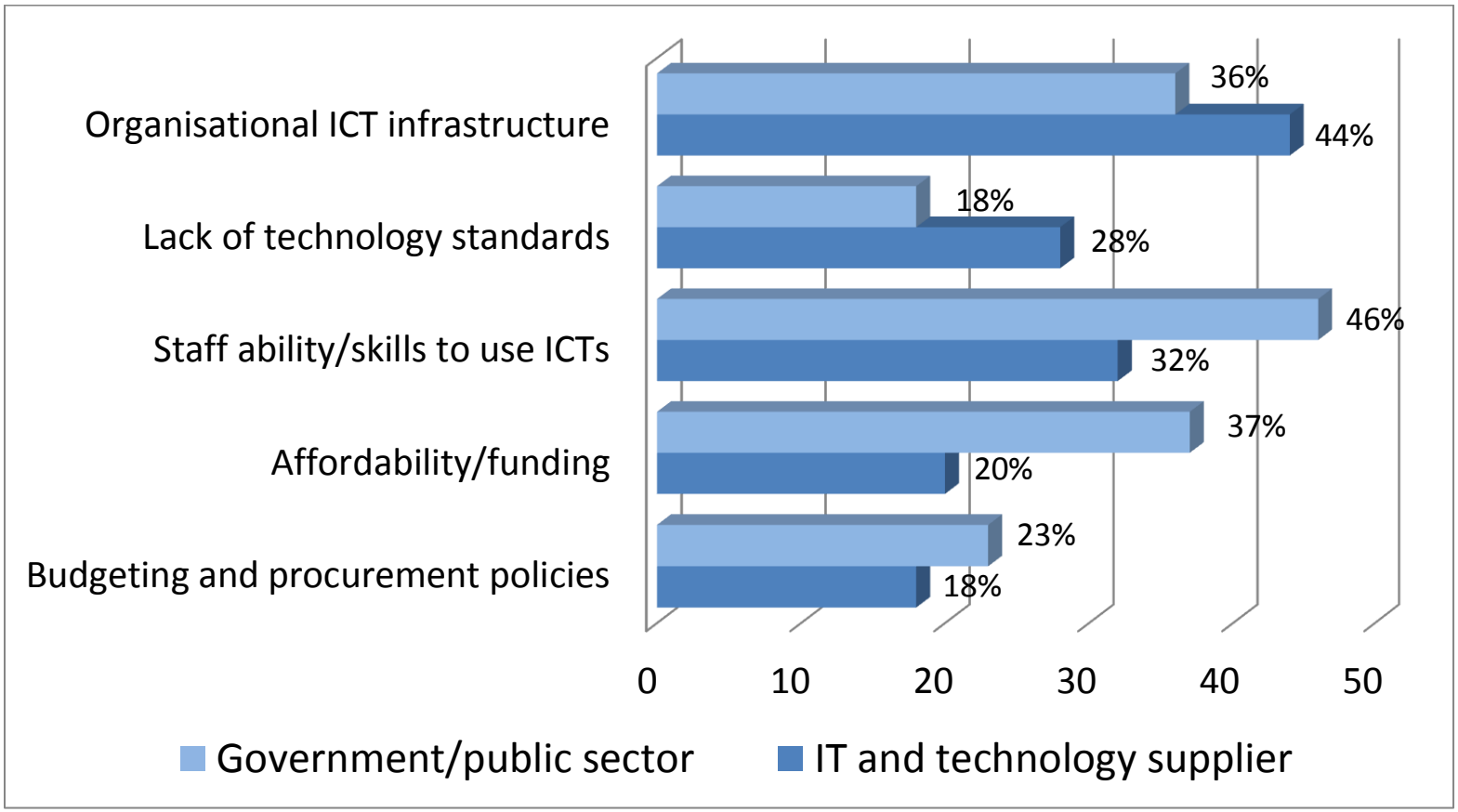
Figure 5. South-east Asia by the numbers

	Indonesia	Malaysia	Philippines	Singapore	Thailand
UN E-Government Development Index ranking, 2014	106	52	95	3	102
Internet users (per 100 people), 2014	17.1	67.5	39.7	82	34.9
Fixed-broadband subscriptions (per 100 inhabitants), 2014	1.2	10.1	23.2	27.8	8.2
Mobile-broadband subscriptions (per 100 inhabitants), 2014	34.7	58.3	28	156.1	79.9
Fixed-line broadband affordability (as a % of GNI per capita), 2013	6.9	2.4	8.6	0.4	5
Total population, 2014	254.5	29.9	99.1	5.5	67.7
GDP per capita, current USD, 2014	3,492	10,934	2,871	56,287	5,519

Source: Economist Intelligence Unit 2016, "High aspirations, stark realties: Digitising government in South-east Asia."

Figure 6. Having it, and knowing how to use it

Top 5 barriers to greater use of ICT in the public sector (% of respondents)



Source: Economist Intelligence Unit 2016, "High aspirations, stark realties: Digitising government in South-east Asia.

Governments understand the importance of adopting cloud computing, data, analytics and that they must be combined with the Internet of things (IoT), but some are further into becoming a smart city or society than others. There have been notable attempts to develop smart cities in Malaysia. There was the Multimedia Super Corridor and Cyberjaya, but the projects did not take off. There are attempts to bring in smart solutions in a piecemeal way in some cities.

SINGAPORE and the SMART Nation

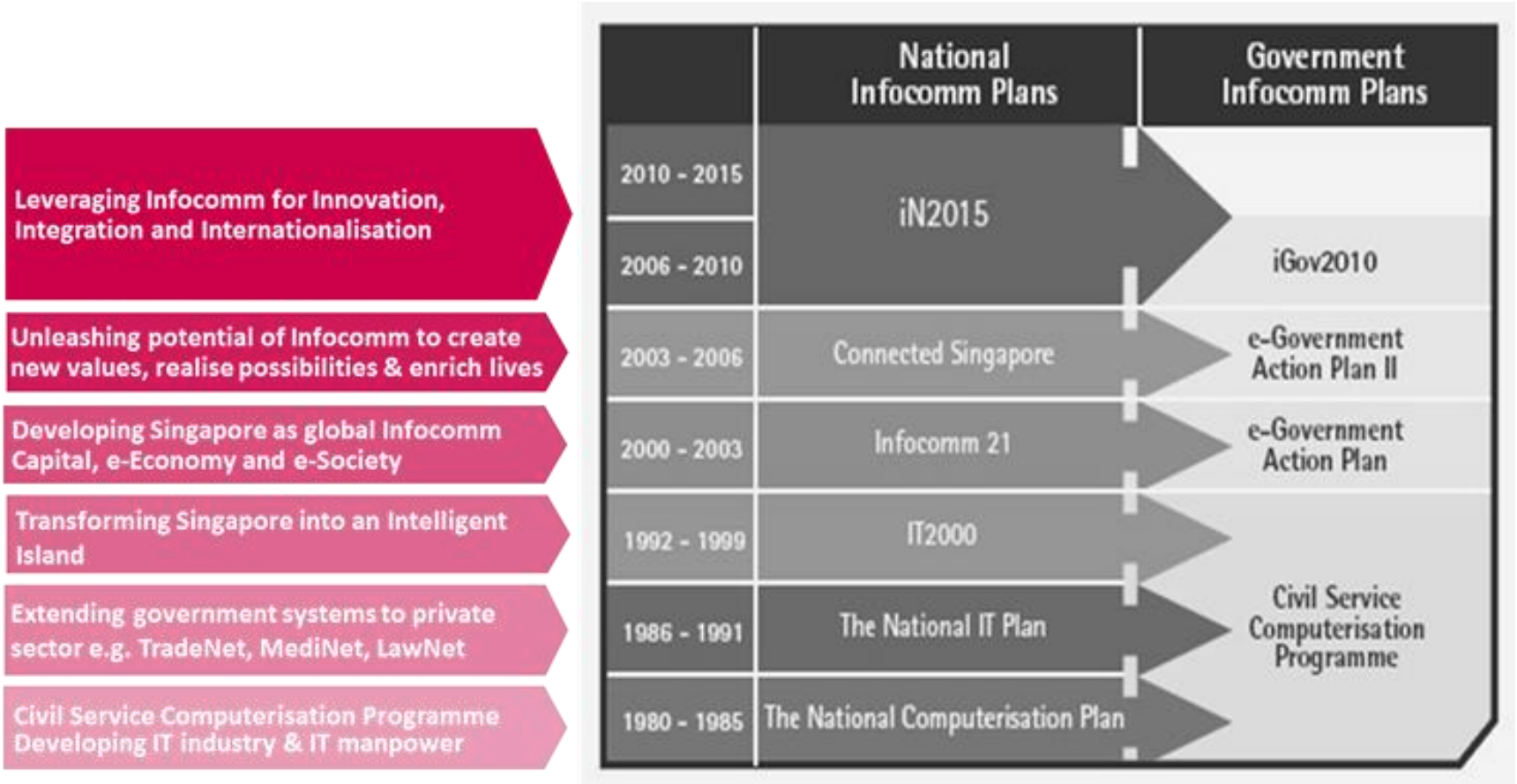
Singapore has emerged in the top ranks of various smart cities indexes outranking South Korea. I have asked myself why that is so because South Korean cities are really smart.

What steps did we take to be smart and why are we successful as smart? I am a policy person, not a techie, so you will hear a great deal about the policy angle from me.

There are two basic facts about Singapore that one must know. It is a country without natural resources, consequently there is great value placed on developing people—on human resources. Nurturing human capital and social capital have always been at the center of the country's plans. Education is a high priority and so is social cohesion, creating a cohesive society out of diversity. Singapore's population is well-educated and students do very well in math and science. The international Trends in International Maths and Science Study (TIMSS) 2016 just ranked our students top in the world for math and science. Secondly, Singapore is a city /country or city- state. We have only one layer of government which makes it easier for us to act and move agilely and nimbly. When one thinks of American cities, there is the city, state and the federal governments each of which has its rules and regulations. Navigating that can be discouraging.

What are the precise steps we took on our journey to be a smart city and now a smart nation? You may decide which are triggering moves that set change in motion. What is the pattern of investment that yields results?

Figure 7. E-Government Journey



Source: IDA 2014, "Overview of IT: Vision for Smart Nation."

It cannot be emphasised enough that Singapore is a country without natural resources. To enhance our competitiveness, we understood the need to be early adopters of the IT revolution. In 1980 the National Computer Board was established with a 5 year plan to computerise the civil service, develop the local IT industry, expand software engineering and services, and grow IT professionals for industry. The whole civil service was put on notice to start transaction processing, data modelling and database management.

In 1986 there was another 5 year plan, benchmarks really, this time bringing the National Computer Board, Singapore Telecommunications and the National University of Singapore together. Now we focused on developing the professional skills, software engineering, expert systems and the electronic data exchange. We improved ICT infrastructure, developed a strong exported- oriented ICT industry and alliances with global software firms and invested to build skills.

What is significant is that in the 1990s we set up electronic services such as TradeNet for traders, Portnet for shippers and forwarding companies, Medinet for healthcare, Lawnet and the Integrated Land Use System (ILUS), GIS information based system that helps in urban planning and road planning. TradeNet commenced in 1989. It is an electronic data interexchange system that links traders, hauliers, shipping lines, freight forwarders, airlines and handling agents with government agencies and the air and port authorities.

Figure 8. Linking the Trading Community

Source: Jeffrey B. H. Tan & James S.L. Yong, "Many Agencies, One Government – Singapore's Approach to Public Services Delivery."

TradeNet is said to save Singapore traders over $1bill a year. Today in 2016 Singapore is revamping Trade Net by building a National Trade Platform combining Tradenet, TradeXchange and Customs systems into one system and taking into account fintech.

Then came the IT 2000 Integration Master Plan (1992-2000), focusing on rolling out the infrastructure and setting technical standards. This connected everyone, homes, school, libraries, and offices in the intelligent island and we laid the broadband network, multimedia, telecommunications and technical standards.

We called this Singapore One and we were said to be the world's first nation-wide broadband network. In truth this was a city –wide project so perhaps it was not so difficult. By 2002, 2 out of 5 were internet users in Singapore.

In 1999 a significant step was taken when the National Computer Board and the Telecommunications Authority of Singapore was merged to form the Infocomm Development Authority (IDA). IDA became the single agency in charge of planning, policy formulation and industry development of the IT and telecoms sectors.

T 2000 was seen to be a very successful roadmap.

The key is Singapore is always upgrading itself periodically. It takes stock of what it has done and plans the next moves. In the 1990s we noted the changing global economic landscape and technologies had evolved massively, so we made the next massive investment. In 1997, the Asian Financial Crisis hit the region. Southeast Asia looked weak and South Korea was affected too. We noticed that the US was moving fast and so was China whose economy was not affected. We decided we should invest during this time.

In 1999, we launched a Technopreneurship Investment Fund to encourage start-ups in the ICT industry. US $1 billion was set aside for investment in Singapore and overseas in promising start-ups. It was a major PPP project and caught the imagination of young engineers. This high profile investment was a strong signal the government sent to its people and to the world that it was serious about ICT innovation.

What followed was the Infocom 21 (2000-2003). Its vision was “to turn Singapore into an Info Comm capital with thriving e-commerce and e society.

We were more industry- focused and wanted industry led growth. The government would be the facilitator, promoter, educator and anchor tenant for testing and for pilot deployments of new applications.

E-government was introduced in 2000. The e-citizen portal now has 1600 public services enabled for online delivery. Singaporeans need one password to interact with all the government services. You can do government procurement business online through GeBIZ.

But we did not stop at that. In Nov 2014, a year before the 50th anniversary of Singapore’s independence, PM Lee Hsien Loong shared his vision of a Smart Nation with the country. Singapore was a leading city, but the world was changing fast and other countries were catching up. San Francisco, New York, London, Sydney and Shanghai were pulling ahead of the rest. Singapore would move ahead. Singapore would take full advantage of technology, make it part of our lives and in our work. Smart Nation is a special emphasis on the scale and scope of transformation, but also on being inclusive to bring those not yet IT literate into the digital world. The new emphasis is the people- focus and people- friendly applications. Everyone should be brought into the digital revolution. We wanted to avoid the inequality that would arise from those who are IT literate and those not. IDA runs boot camps for senior citizens to become IT literate. Older people help other older people.

Figure 9. Digital Inclusion

The Digital Inclusion programme consists of four key areas, namely the **Silver Infocomm Initiative**, **NEU PC Plus Programme**, **Home Access Programme** and **Enable IT Programme**, which target four key groups: seniors, needy students, low-income households and people with disabilities.

Source: Infocomm media development authority (imda), "Preparing our People and Businesses for the Digital Future."

In fact what I've described is the smart nation journey we've taken steadily and purposefully for a while. It was in steps—Vision. Policy. Resources. Technology. Resources. Advance Technology. We are wired up and well connected. 9 out of 10 Singaporeans have broadband and we aim to have fibre in every home. Our smart phone penetration is one of the highest in the world --- 85% of our population have smart phones. We are doing a lot in e-government. 98% of Singaporeans who pay tax pay it online. The public hospitals have integrated their patients records, regardless of where he goes, the data is accessed. We have introduced systems in the homes for the elderly population who live alone or whose family are out at work in the day. Our housing authority HDB is piloting the Smart Elderly Monitoring System and Alert System which uses a combination of sensors to detect if there is movement in the flat where the senior lives or if something out of the ordinary happens or the routine changes. The family member will be alerted if signals are not sent.

What are the lessons we draw from Singapore? Why do we succeed as smart and what are the challenges still before us?

SUCCESS

1) I have alluded to our size. It is a challenge and strength. Our compact size gives us comparative advantage in moving fast as there is only one layer of government.

2) Singapore makes long term investments in R &D and we continue to do so even in times of crisis. In fact we speed ahead during a crisis to invest. Although the global economy is slowing and the Singapore is affected, Singapore committed to investing S$19 bill over 5 years. We spend about 2% of GDP on R&D.

3) Our political system because of its continuity allows us to make long term investments. We can afford to be strategic. There is stability of government and we have an intelligent leadership. Our Prime Minister can write code.

4) We are open to ideas and open to receiving people into our country. Although there are reports of a political backlash from the many foreigners coming to work, we are fundamentally open but we are letting in numbers at an absorbable pace.

5) Singapore has built up networks of connectivity as a trading nation and because of its geostrategic location.

6) We enjoy trust because of a history of good governance. The population trusts the government which helps with cohesion and stability and others trust us because of our adherence to the rule of law, transparency, respect for intellectual property rights, and corruption is not tolerated.

I have enumerated our strengths. Let me share with you our challenges.

Challenges

1) Singapore has laid down a strong infrastructure for a smart nation. But the road to innovation and the innovative industries is steep. The challenge is to scale up to produce our own Google and Alibaba. Our market is small unlike China's or India's. Our start-ups are small and have scale up challenges. We are not producing for the Western market yet in a major way. But we will keep trying.

2) Our population generally seems to be less interested in entrepreneurship. There is a lack of ambition to make it big in start-ups and business companies. We have made our name in the world as a well-run country and our DNA seems to be largely that of a nation of civil servants, executives and managers. But some of this is beginning to change. There is strong interest in cybersecurity and it is a growth industry in Singapore attracting many young people.

3) Finally the leadership for the smart city or smart nation has come from the government primarily. The government must now democratise the initiatives and take in more ideas from the ground and get more buy in from the man and woman in the street.

I would like to end my remarks with a message for business and industry in the audience. Although Singapore is small, we innovate and we are a lead adopter in the region and a pace-setter. We co-develop with industry ideas that have promise. We overcome our size constraint with the FTAs we negotiated and signed. We have an extensive network of 20 implemented FTAs with 31 trading partners including the US, China, Japan, Korea, and India. A few more are still under negotiation. So our reach is wide.

We hope to see you in Singapore to explore things together.