

# REPORT OF THE COMMITTEE ON THE FUTURE ECONOMY

PIONEERS OF THE NEXT GENERATION

2017 >>>





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# EXCHANGE OF LETTERS WITH THE PRIME MINISTER

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7 February 2017

Prime Minister

The Committee on the Future Economy (CFE) was convened in January 2016 to review Singapore's economic strategies. You asked the Committee to build on the Economic Strategies Committee's work in 2010, and to take a fresh look to address the new challenges we face.

2. Members of the CFE were drawn from diverse backgrounds, including government, private sector, and the labour movement. The Committee, Subcommittees and working groups benefited from the contributions from employers and workers, academics, professionals, students, private companies, public agencies, unionists, trade associations and chambers, as well as Singaporeans abroad. In total, more than 9,000 people contributed their ideas and energies.

3. The CFE has completed its work and now submits its key recommendations.

4. Since 2010, we have made good progress in nurturing a highly-skilled people, growing an innovative economy, and building a distinctive global city. However, the world today is very different from the start of the decade. It has seen unexpected events, overlaid with longer-term structural changes. First, global growth has been subdued and is expected to be lower than the previous decade. Second, we are in an era of rapid technological change, and global value chains and production patterns are changing rapidly. Third, political uncertainty has risen as political parties respond to the anxiety of some segments of the population to turn inwards and protectionist. All these are significant changes which are still playing out. We have to make plans and be prepared to cope with these changes and uncertainty.

5. The CFE assessed that Singapore is starting from a strong position, and we are confident we can chart a new course. There are many opportunities for us to innovate, deepen our capabilities, remain open and connected, and stay relevant to the world. The US and Europe continue to have innovative companies and people, whom we can work with. We also see strong market potential in many parts of Asia – in particular ASEAN, China, and India – as well as in emerging markets farther afield. Singapore is also well-poised to tap into several growth sectors, driven by factors such as the rise of the middle-class and urbanisation in Asia.

6. Our vision is for us to be pioneers of the next generation. We have identified seven mutually-reinforcing strategies that will maximise the chances of Singapore's success. First, Singapore needs to deepen and diversify our international connections, and continue to support free and open markets. Second, we will build on SkillsFuture, and support the acquisition and utilisation of deep skills. Third, we need to strengthen enterprise capabilities so that our companies are innovative and competitive. Fourth, we need to develop strong digital capabilities and support the pervasive adoption of digital technologies across all sectors of the economy.

7. To support these four strategies, three key enabling strategies will have to be put in place. First, we must invest in Singapore's physical and social infrastructure to support these strategies. Second, we need to ensure the execution of these strategies is done in an integrated way, through the Industry Transformation Maps (ITMs). The ITMs can address the specific needs and possibilities in each industry, and realise synergies across industries. Finally, we need to partner each other to enable growth and innovation. Our ability to work with and trust one another will be our distinct competitive advantage and the key to the successful execution of the strategies we have laid out.

8. We believe our strategies will create an economy that offers ample opportunities, with all Singaporeans enjoying sustainable wage growth and meaningful careers. Together, we will build a Singapore of global relevance; a Singapore that can ceaselessly reinvent herself and grasp new opportunities. We are prepared for tomorrow.

9. We thank you for the privilege of serving on the CFE.



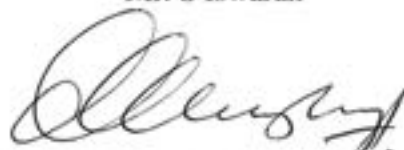
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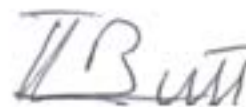
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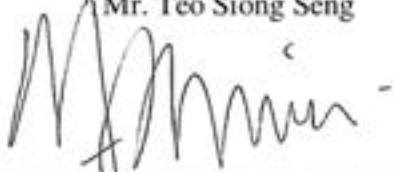
Mr. Tan Chong Meng



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*Prime Minister  
Singapore*

8 February 2017

Mr Heng Swee Keat  
Minister for Finance  
Co-Chairman, Committee on the Future Economy

Mr S Iswaran  
Minister for Trade and Industry (Industry)  
Co-Chairman, Committee on the Future Economy

*Dear Ministers Heng & Iswaran,*

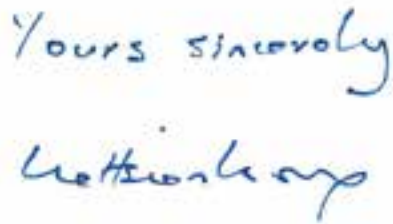
Thank you for your letter dated 7 February 2017, submitting the recommendations of the Committee on the Future Economy (CFE).

The world is going through a period of great uncertainty. Significant structural shifts are taking place in many countries. Industries and jobs are changing rapidly. Amidst the disruption, there will also be opportunities. We cannot be sure which industries will perish and which will flourish. What is certain is that Singapore must stay open to trade, people and ideas, and build deep capabilities so that our people and companies can seize the opportunities in the world.

The CFE has proposed a comprehensive set of recommendations to guide our economic strategy for the next 5 to 10 years. The Government accepts the strategies proposed and will pursue all of them. Ministers will provide a full response during the 2017 Budget Speech and Committee of Supply debates.

Developing the strategies is the first step. The strategies are our guide but what counts is how well we implement them to transform our economy. This will require difficult trade-offs as our resources are limited and we have to take calculated bets. We will take a hard-headed, pragmatic approach. When results are promising, we will vigorously pursue them. When a scheme does not look like it is going anywhere, we must have the courage to cut losses. That is how we progressed for the past 50 years and the only way to continue progressing in future.

On behalf of the Government, I wish to thank the members of the Committee, the Subcommittees and the working groups for all the hard work. This report epitomises how in Singapore, Government, businesses and workers tackle challenges and seize opportunities together. Its publication marks the beginning of another chapter of the Singapore story. Now the hard work begins, and every Singaporean has a role. Let us work together as one united people, to achieve success and prosperity for ourselves and our families.



Yours sincerely  
Lee Hsien Loong

LEE HSIEN LOONG



# EXECUTIVE SUMMARY

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*Our vision is for us to be the pioneers of the next generation. In the future economy, our people should have deep skills and be inspired to learn throughout their lives; our businesses should be innovative and nimble; our city vibrant, connected to the world, and continually renewing itself; our Government coordinated, inclusive and responsive.*

**To this end, we should:**

- 1. Deepen and diversify our international connections**
- 2. Acquire and utilise deep skills**
- 3. Strengthen enterprise capabilities to innovate and scale up**
- 4. Build strong digital capabilities**
- 5. Develop a vibrant and connected city of opportunity**
- 6. Develop and implement Industry Transformation Maps (ITMs)**
- 7. Partner each other to enable innovation and growth**

*Our collective efforts will allow us to grow by 2-3% per year on average, exceeding the performance of most advanced economies. Together, we can build a value-creating economy that is open and connected to the world, offering a multitude of opportunities, with sustainable wage growth and meaningful careers for all Singaporeans.*

## INTRODUCTION

1. Singapore has enjoyed sustained economic growth since independence, weathering many economic crises. Incomes have risen substantially; the economy has become more diversified; and Singaporeans today enjoy a quality of life equal to that found in advanced economies. Together, we have built a nation we can be proud of.

2. We have achieved this by restructuring our economy repeatedly, adapting to evolving global as well as domestic circumstances. The last major restructuring started in 2010, following the recommendations of the Economic Strategies Committee (ESC). We have made good progress since, developing higher skills in our workforce, growing an innovative economy, and building a distinctive global city. Although productivity performance has been weak in the domestically-oriented sectors, overall real productivity grew by 2.5% per annum (p.a.) between 2009 and 2016.<sup>1</sup> Singapore's resident unemployment rate has remained low at around 3% and the real median wage has grown by 2.6% p.a.<sup>2</sup> over the same period.<sup>3</sup>

<sup>1</sup> This is measured as real value-added per actual hour worked. For 2016, based on advance gross domestic product estimates and preliminary estimates on hours worked. (Source: Ministry of Trade and Industry)

<sup>2</sup> This is measured as real growth in gross monthly income from work (including employer Central Provident Fund contributions) of full-time employed residents. (Source: Ministry of Manpower)

<sup>3</sup> For OECD countries, the unemployment rate averaged 7.7% and growth in real wages was 0.4% between 2009 and 2015. Unemployment is measured as harmonised unemployment rate. Wages are measured as average annual wages per full-time and full-time equivalent employee. (Source: OECD)

3. But the world today is very different from the start of the decade. We have seen unexpected changes in the global order, which may portend significant geopolitical and economic discontinuities. Whichever way the world goes, a small, open economy like ours will need to adapt.

4. It is therefore timely that the Committee on the Future Economy (CFE) was convened in January 2016 to develop economic strategies for the next decade. The CFE engaged over 9,000 stakeholders, including Trade Associations and Chambers (TACs), public agencies, unions, companies, executives, workers, academics, educators and students.

### **Global shifts**

5. Since the ESC, we have seen **significant structural shifts** in our external environment. **Global growth has been subdued** and is expected to be lower than in the previous decade. Populations in developed economies and some developing ones are ageing. **Global productivity growth has been sluggish**, though technological changes could yet generate new waves of innovation and breakthroughs. Growth in the United States (US) has recovered since the Global Financial Crisis, but not to pre-crisis levels. Europe continues to face structural problems, including high youth unemployment. Asia remains a bright spot, with some economies growing rapidly. **Global value chains are also changing**. Some countries are moving up the value chain, while major trading nations, including China, are insourcing more.

6. We are in an era of **rapid technological change**. Innovation cycles have shortened. New technologies can supplant entire industries, displacing all their workers, even as they create new opportunities. The recent rise of new businesses like Uber and Grab exemplify this, as do robotics and artificial intelligence programs displacing routine jobs in manufacturing and services alike. In such an environment, workers must continually retrain and upgrade themselves to stay relevant.

7. Most worryingly, the world saw a dark shift in mood away from globalisation in 2016. It no longer seems certain we are on an inexorable course towards greater globalisation, stronger multilateral institutions and a more connected world. Instead, we saw nativist politics and protectionist economics growing in strength and influence in Europe and the US. The anti-globalisation trend will undermine international trade, hurting all economies, but particularly small open ones like Singapore, with two-thirds of our gross domestic product (GDP) generated by external demand.

## Charting our next phase of growth

8. The CFE has studied these global trends and re-examined Singapore's operating assumptions and model, to chart our next phase of growth. What do we need to retain and what must we change to remain competitive and relevant in the world?

9. **This is not the first time we have done such a review.** In every phase of our development, from Third World to First, we have progressed by building on our existing strengths, growing new capabilities, and shifting away from activities that were no longer viable. For example, in the 1960s and 1970s, our strategy of export-led industrialisation succeeded in complementing our historic strength as an entrepôt. A growing manufacturing sector created positive spillovers for the sectors relating to trade, finance, tourism and professional services, and vice versa. Singapore's links to other global financial centres and trading hubs grew. Later, as we developed new manufacturing and services clusters – such as in specialty chemicals, pharmaceuticals, headquarter services and wealth management – and grew our investments overseas, companies and workers in existing sectors also prospered. There may be creative destruction as we create new industries; but there is also creative preservation as the new revitalises the old.

10. The CFE is confident that despite the challenging global environment we face today, there are **many opportunities** for us to innovate, deepen our capabilities, remain connected and stay relevant to the world.

- a. The **US and Europe** continue to have innovative companies and people whom we can work with. We also see strong potential in many Asian markets – in particular **Southeast Asia, China and India** – as well as in **emerging markets** farther afield.
- b. Singapore companies are well-poised to tap into several growth sectors. For example, the rise of the middle-class and urbanisation in Asia will increase demand for **finance, hub services, logistics**, as well as **urban solutions**. Scalable **healthcare** technology solutions can help meet both our own domestic healthcare needs, as well as growing demand abroad. The **digital economy** presents opportunities both within specific sectors like infocomm technology (ICT) and media, and will also transform other sectors like real estate. In **advanced manufacturing**, new technologies and the rise of complementary services can raise productivity. We must retain a globally-competitive manufacturing sector, with further value-added from manufacturing-related services.

11. We cannot know which industries will succeed. What we do know is that Singapore must stay open to trade, talent and ideas, and build deep capabilities. By being innovative, bold and willing to change, and by remaining open to the world, and deepening our knowledge of markets everywhere, our businesses and people can grasp the opportunities that this new environment offers, and Singapore can continue to prosper.

## OUR STRATEGIES

12. We call upon the Singaporeans of today, young and old, to be the **pioneers of the next generation**. We shall progress by embracing new realities and creating new opportunities.

13. In the future economy, our people should have deep skills and be inspired to learn throughout their lives; our businesses should be innovative and nimble; our city connected and vibrant, continually renewing itself; and our Government coordinated, inclusive, and responsive.

14. The CFE has identified **seven mutually-reinforcing strategies** to achieve this vision. The following section lays out broadly each of these strategies, but is not a comprehensive list of all the recommendations of the CFE. The seven strategy chapters that follow provide more details.

### Strategy 1: Deepen and diversify our international connections

15. The strategic imperative for free and open markets remains as important as ever, for Singapore and the global economy. The free movement of goods, services and investments enables efficient specialisation and rising living standards around the world. Given the current sentiments against globalisation, we must not only resist protectionism but forge ahead to deepen linkages with our overseas partners and seek opportunities in new markets. Our public officials, businesses and individual citizens should build strong ties with their overseas counterparts, and strengthen economic cooperation with other countries and regions through specific projects. We should also build deep connections to global innovation and technology networks so as to harness new ideas better.

#### Recommendation 1.1: Press on with trade and investment cooperation

16. Given the centrality of trade to our economy, we must resist the threat of rising protectionism. Singapore must continue to **work with like-minded partners to advance the liberalisation of trade and investment**. These should include partners in less traditional markets seeking to plug themselves into the global economy.

17. We need to **strengthen trade cooperation, and reduce tariff and non-tariff barriers** to trade, such as through the Association of Southeast Asian Nations (ASEAN) Economic Community (AEC) and the Regional Comprehensive Economic Partnership (RCEP). As the ASEAN Chair in 2018, Singapore can help to advance economic integration within ASEAN and with ASEAN's key partners. Singapore should also continue to work strategically with our global partners to pursue trade liberalisation and global economic integration, despite present protectionist sentiments in some of our key trading markets.

18. Singapore's joint projects to develop industrial and business parks in India, Indonesia and Vietnam, as well as township projects in China, have delivered mutual benefits. We should continue to explore similar opportunities beyond our shores, and partner institutions like the World Bank and Asian Development Bank (ADB), and new institutions like the Asian Infrastructure Investment Bank (AIIB), in pursuit of regional development projects.

***Recommendation 1.2: Set up a Global Innovation Alliance (GIA)***

19. Given the fast-changing technological environment and rapid growth in Asia, it is even more critical for us to build new networks to facilitate innovation, especially for our young. To spearhead this, our Institutes of Higher Learning (IHLs) and companies should link up with **overseas partners** in major innovation hubs and in key demand markets to form a GIA. The National University of Singapore (NUS) Overseas Colleges already has links in the US, Europe and China. We should build on these links, involve more IHLs and expand our network in regional countries, so as to better expose our students to opportunities in Asia. In-market partners can come on board the GIA to set up **innovation launchpads**, where Singaporeans and foreign startups can work together to tap on the expertise in our IHLs and their partners. In addition, the GIA can serve as **welcome centres** where Singapore-based enterprises and institutions can collaborate with overseas partners.

***Recommendation 1.3: Deepen knowledge of our markets***

20. In our next phase of internationalisation, our people will need to acquire deeper knowledge of regional markets. They can only do so by spending time in these markets. We should use the **SkillsFuture Leadership Development Initiative (LDI) to expose potential corporate leaders to quality overseas assignments**. We can also do better to **ease the concerns of Singaporean parents over their children's education** when taking on overseas assignments. For instance, online platforms such as the Student Learning Space can be used to help their children stay in touch with the national curriculum. We can also smooth the transition when these children return to Singapore – for example, by facilitating their enrolment in the International Baccalaureate programme – to ensure continuity of learning.

21. Singapore already serves as a base for many companies serving markets in the region, including professional services firms that provide specialised services to companies in these markets. Our universities have a range of area research programmes, while think tanks like the Institute on Asian Consumer Insight and Asia Competitiveness Institute dive deep into specific subjects. Our media coverage of the region is also expanding. We should build on these assets, and encourage **more specialised market research firms and consultancies** to develop wider and deeper market knowledge of the region. **More internationalisation programmes can be developed** for students to acquire Global-Asia market insights and immerse themselves in overseas markets. **Trade associations and economic agencies should undertake more study trips** to help businesses gain insights into the region.

## Strategy 2: Acquire and utilise deep skills

22. With the rapid pace of technological development, our workers will need to develop deep skills to stay relevant. Two key shifts are needed. First, since technologies and jobs are likely to change throughout our lifetimes, we need to go beyond the pursuit of the highest possible academic qualifications early in life to focus on acquiring and using knowledge and skills throughout our lives. Second, as technology replaces routine tasks, our people need to acquire deeper skills to create value, and more importantly ensure that they can utilise their skills effectively on the job.

23. Every advanced economy is wrestling with these difficult shifts. Singapore is no different. The SkillsFuture movement, launched in end-2014, gives Singaporeans a head-start in developing themselves throughout life, regardless of their starting points. Students and fresh graduates now get better Education and Career Guidance, and receive early exposure through the SkillsFuture Earn and Learn Programmes.

24. The CFE recommends that we build on this momentum. We need to help Singaporeans acquire deep skills in a timely, accessible manner through modularised programmes, and strengthen the nexus between skills acquisition and utilisation. Learning throughout life needs to be our way of life, so we can quickly and easily adapt to new job demands, or even switch jobs or industries as the economy transforms.

### Recommendation 2.1: Facilitate acquisition of deeper skills

25. Skills acquisition is not just for those wishing to switch jobs. To stay relevant, our workers need to continuously deepen and refresh their skills. To facilitate this process, our training providers and IHLs should offer more **modularised and technology-enabled training programmes**.<sup>4</sup> The courses can be combined to build up to higher qualifications.

26. To help Singaporeans plan their own education and training over their working life, the Government should consider setting up an **online one-stop education, training, and career guidance portal**.

<sup>4</sup> In support of SkillsFuture, the National University of Singapore (NUS), Nanyang Technological University (NTU), SIM University (UniSIM) and our polytechnics have launched more than 500 skills-based modular courses since 2015.

### Recommendation 2.2: Strengthen nexus between acquisition and utilisation of skills

27. Employers need to promptly utilise the skills their employees acquire. For this to happen, training needs to be closely linked to the requirements of the job. One example is the Infocomm Media Development Authority (IMDA)'s SkillsFuture TechSkills Accelerator (TeSA) programme, where company-led training efforts have resulted in a 100% placement rate among TeSA graduates. Another potential opportunity is in urban solutions, where the Government can support **place-and-train schemes in firms throughout the value chain**, including transaction advisory firms, law firms, engineering consultancies, financial institutions, and multilateral development banks. We should develop more such company-led programmes.

28. This should not be limited to new sectors. Existing companies should give more attention to in-house training. This could be supported by **extending work-learn programmes** beyond fresh graduates to **existing employees in companies**.

29. Information gaps can result in missed matches between employers and employees. To make the labour market more efficient, and match jobseekers and employers better, **we should improve the user experience and functionality of the national Jobs Bank**.

30. The Government should facilitate training and employment of workers via initiatives such as the **Professional Conversion Programme** and **Career Support Programme**. The Government should also evaluate and improve its existing support schemes to ensure that our older workers, persons with disabilities and other at-risk workers can all benefit from growth.

### Strategy 3: Strengthen enterprise capabilities to innovate and scale up

31. Enterprises must be able to organise people, ideas and capital effectively to create value. Over the years, companies based here have enhanced their corporate capabilities. The entry of multinational corporations (MNCs) and the emergence of startups with new ideas and models have also injected vibrancy to the corporate landscape. As competition intensifies, growing and deepening capabilities among all our businesses will be critical. For instance, strong human resource and management capabilities can maximise the efforts of employees. Companies can also tap on the Research Innovation Enterprise 2020 Plan (RIE2020) to develop innovative and viable commercial products. Companies that have strong growth potential can be supported to scale up and internationalise.

### *Recommendation 3.1: Strengthen our innovation ecosystem*

32. The Government has invested significantly in research and development (R&D). The CFE recommends establishing **commercially-oriented entities** that have the technical expertise, business networks, and instincts to better **commercialise the research findings and intellectual property** (IP) of our research institutions. We also recommend developing a **standardised IP protocol** for all public agencies and publicly-funded research performers, to simplify the commercialisation process.

### *Recommendation 3.2: Support enterprises to scale up*

33. Today, our economic agencies have a range of support schemes to help enterprises innovate and raise productivity. In the future, we need a more tailored approach to help enterprises grow and scale up, taking into account their specific needs and growth stage.

34. We should help **high-growth enterprises scale up and internationalise with targeted assistance**, including access to networks, mentors, technology and financing.

35. We should also **encourage partnerships among enterprises, especially between large and small enterprises**. Large enterprises can adopt corporate venture capital (VC) strategies to strengthen their capabilities, while startups can gain access to new sources of funding and networks by linking up with large enterprises. We should separately step up efforts under existing initiatives such as the Partnerships for Capability Transformation (PACT) to encourage partnerships.

### *Recommendation 3.3: Catalyse the private sector to provide more growth capital*

36. For enterprises based in Singapore to scale up, they need more **smart and patient growth capital** — that is, long-term capital that brings along ideas and expertise. To provide enterprises with such capital, we should encourage a variety of private sector funding, including from banks, VC funds, and private equity (PE) funds. The Government should simplify the **regulatory framework for VCs**, in particular the authorisation process for VC managers. We should also encourage more **PE firms** to be based here, so they can develop deeper knowledge of the opportunities in Singapore and the region. Where there are clear gaps in market financing – for example, for project financing in emerging markets – the Government can develop new forms of support for the private financing of Singapore companies, while ensuring that risk decisions remain in the hands of the private sector. We can build on the role of Clifford Capital.



#### **Strategy 4: Build strong digital capabilities**

37. Digitalisation is creating new industries as well as transforming many existing ones, such as finance, advanced manufacturing and healthcare. Digitalisation also offers businesses, small and big, an effective means of reaching global markets. Building on our Smart Nation vision, we can tap on the economic opportunities offered by the digital economy. To do so, we must promote the adoption of digital technologies across all sectors of the economy. In addition, we must build strong capabilities in digital technologies, in particular data analytics and cybersecurity, which can be applied flexibly across sectors. Data will be an increasingly important source of comparative advantage and we need to improve our ability to use it productively in the economy.

##### **Recommendation 4.1: Help small and medium enterprises (SMEs) adopt digital technologies**

38. **SMEs** form the bulk of our enterprises, and we should help them **adopt digital technologies**. We can do so by providing expertise as well as financing support. We can also accelerate the pace of adoption of digital technologies among SMEs through **national initiatives** like the National Trade Platform and a National Payments Council.

##### **Recommendation 4.2: Build deep capabilities in data analytics and cybersecurity**

39. The Government should support the development of digital capabilities such as applied **data analytics** by establishing **joint laboratories** with industry players. Such partnerships can promote innovation and help train data scientists. The Government can also use National Service to develop deep, niche **skills in cybersecurity** among **Full-Time National Servicemen**, given the strategic importance of cybersecurity to the economy as well as national security.

##### **Recommendation 4.3: Harness data as an asset**

40. The Government should establish a **dedicated programme office** to support enterprises in making the most of **data as an asset**. The office can provide industry-specific regulatory guidance and co-develop **flagship data science projects** that will have positive demonstrative effects on other enterprises.

## **Strategy 5: Develop a vibrant and connected city of opportunity**

41. Cities are the economic drivers of the future. Singapore's capacity to flourish in the future global economy is tied to the city-state's ability to attract and create opportunities. The city must be well-connected externally, with sufficient space to grow and rejuvenate internally. We should use our limited size to our advantage by encouraging agglomeration. The co-location of similar firms can attract talent, create critical mass for shared infrastructure, and generate knowledge spillovers among firms and people. In addition, our innovations in creating and sustaining such a connected city will create new expertise that can be exported to rapidly urbanising countries elsewhere.

### **Recommendation 5.1: Invest in our external connectivity**

42. The Government should continually invest in **new international connections**. The development of **Changi Airport's Terminal 5** and the next-generation **seaport in Tuas** will further strengthen Singapore's position as a global air and maritime hub. The **Kuala Lumpur-Singapore High Speed Rail (HSR)** will connect us to the capital of Malaysia, allowing both countries to benefit.

43. In the future economy, Singapore must also be **digitally connected**, for that would allow us to transcend our boundaries. We must maintain our position as one of the world's most digitally connected cities. This will be supported by the strengthening of Singapore's communications infrastructure, e.g. by trialling technologies such as the Heterogeneous Network (HetNet).

### **Recommendation 5.2: Continue to plan boldly for growth and city rejuvenation**

44. Notwithstanding our limited land, we can increase the space we have, provided we plan and execute boldly. Land will be freed up for redevelopment when the Air Base in Paya Lebar moves to Changi and the container terminals in Tanjong Pagar and Pasir Panjang shift to Tuas. We must also develop ways to **create new space**, such as by developing an **underground masterplan to expand underground infrastructure**. We can also **use our existing space better**, for example by creating an **urban logistics system** that will reduce congestion. We will begin with District Logistics Networks in new industrial estates, starting in Jurong Innovation District (JID). Another example is industrial hubs – such as the JTC Chemicals Hub, where multi-level storage and chemical production, as well as shared facilities, will reduce land use by up to 50%, and the JTC Space @ Tampines North, which will allow us to move heavy manufacturing into high-rise spaces.

### *Recommendation 5.3: Build partnerships for a vibrant city*

45. We should create dense **clusters of mutually-reinforcing economic activities** – such as in Punggol and JID – by siting companies of varying sizes with synergistic activities together to encourage partnerships. Moreover, as these areas are next to universities — Singapore Institute of Technology (SIT) in Punggol, and Nanyang Technological University (NTU) in Jurong, respectively — their location can help strengthen the linkages among skills development, research and economic activity.

46. At the same time, we can do more to make existing iconic districts more vibrant. **Orchard Road**, for instance, should be upgraded into a lively shopping and lifestyle destination with a signature street experience. We are building a second Central Business District (CBD) in the **Jurong Lake District**, with a mix of commercial as well as residential areas. We should strive to be a leading city for the development and appreciation of design and the arts.

47. The private sector can partner Government in such projects by taking on the role of a “**master developer**” – developing, place-making, and managing future precincts. To support this, and respond nimbly to new opportunities, the Government should allow **greater flexibility in land use** to enable complementary activities to be adjacent or co-located together.

### *Recommendation 5.4: Develop exportable capabilities*

48. Partnerships between the Government and the private sector will also help Singapore-based enterprises develop **exportable capabilities** in the field of urban solutions. The Land Transport Authority (LTA) allowing the testing of self-driving vehicles at one-north is an example of this. Hyflux is working with PUB and our research institutions to develop and pilot innovative water technologies, which can be adopted in many projects around the world. As we plan the rejuvenation of our city, we can set aside **special test-bedding zones** for firms to develop and refine their products, and at the same time prepare our city for the future and develop new exportable capabilities.

### *Strategy 6: Develop and implement Industry Transformation Maps (ITMs)*

49. To ensure that the five strategies outlined above can come together in a coherent way to meet the needs of our diverse industries, the ITMs should be used as platforms to integrate planning and implementation. Singapore is unique in having created industry-specific platforms that bring together all the stakeholders in that industry. Our approach is not to pick winners, but to build capabilities to give our enterprises and workers the best chance of succeeding in the open market. While some enterprises will succeed, others that are slow to adapt will not, and we should accept this.

50. An idea developed early in the CFE process was the ITMs. This was announced in Budget 2016 and is already being implemented. The ITMs will cover 23 industries and about 80% of the economy by the end of FY2017. They bring together industry partners, TACs, unions, and public agencies, as part of the Council for Skills, Innovation, and Productivity (CSIP). Each ITM integrates and implements holistic strategies in the areas of (a) growth and competitiveness, (b) innovation, (c) internationalisation, (d) productivity, (e) jobs and skills, and (f) government support. The objective is to help each industry achieve its potential, and to create good jobs for Singaporeans. Six ITMs have been launched so far.

51. The CFE recommends that the early learning points from the first batch of ITMs be used to strengthen succeeding ITMs. Each ITM should continue to be customised for that industry, and there should be linkages among related industries to build cluster-level capabilities.

### *Recommendation 6.1: Tailor ITMs for each industry*

52. The ITMs recognise that each industry has its own challenges and opportunities. Some industries need to grow their top line; others need to reduce their costs. Some ITMs focus on helping frontier firms in their industry grow; others focus on helping low-productivity firms catch up. Furthermore, as markets and technologies change, each industry will need to react differently. We should continue to adopt a tailored approach for each industry, so we are focused on where the potential can be best realised in each case.

53. There are industries with **good growth prospects** because they can take advantage of **global opportunities and rapidly-improving technology**. ITMs for these industries will help companies to upgrade their capability so they can seize these opportunities and create good jobs.

54. One such industry is logistics, which is positioned to tap on Asia's rising middle-class and the growth of e-commerce. The logistics ITM will support companies to leverage technology and adopt best-in-class supply chain practices. In addition, the logistics industry skills framework will support Singaporeans to upgrade their skills and take on jobs in this sector.

55. Industries that require large numbers of low-skilled workers will have to **increase their productivity and upgrade their jobs**. They too need customised strategies.

56. For example, the retail industry is facing disruption by e-commerce players. The retail ITM will encourage productivity growth through the use of innovative business formats and technology – for example, storefront self-checkout and cash management, as well as backend shared logistics services like self-collection lockers. Retail jobs can be redesigned to make them more attractive to Singaporeans. Retail enterprises can also acquire new capabilities, like search engine optimisation for omni-channel retail, so they can broaden their customer base.

### *Recommendation 6.2: Adopt a cluster approach to maximise synergies across industries*

57. We should enhance our ITMs by **adopting a cluster approach, to foster synergies across industries**, not just within industries. We can take advantage of **skills adjacencies** between industries to support the provision of skilled manpower in both. For example, the food services and hospitality industries both need similar skills. There is also scope to strengthen linkages across industries – for example, upgrading the capabilities of precision engineering enterprises so they become core suppliers to MNCs in other industries.

58. At the same time, we should be alert to changing industry configurations. New industries that do not fit into existing classifications will emerge. When they do, we should facilitate, not impede, such developments.

### *Strategy 7: Partner each other to enable innovation and growth*

59. The path ahead is uncharted. To succeed, we need to pull together. This will allow us to better understand future challenges and harness the opportunities that emerge. The Government must strive to create an environment where TACs, unions, enterprises and individuals can come together and trust one another. This is what we have done in the past; this is what we must continue to do.

### *Recommendation 7.1: A greater role for TACs and unions*

60. Our TACs are valuable multipliers, leading industry-level initiatives and supporting enterprises to scale up and make inroads in overseas markets. One example is how the Singapore Manufacturing Federation (SMF) collaborated with the Enterprise Europe Network (EEN) to launch an EEN Singapore Centre, which facilitates Singapore companies' access to technological know-how, IP and partnership opportunities within Europe. **More TACs should step forward** to lead similar initiatives. They can tap on the Local Enterprise and Association Development (LEAD) programme to do so. It was enhanced in 2016 with LEAD+ to help TACs enhance their capabilities.

61. Our unions too must continue to do their part to nurture a sense of ownership among workers and **help them prepare for jobs of the future**. Unions must continue to work in concert with enterprises and the Government, move SkillsFuture forward and care for the well-being of all Singaporeans – **especially those who may be more vulnerable** in a rapidly-changing economy.

### *Recommendation 7.2: Create a regulatory environment to support innovation and risk-taking*

62. Our processes and regulations have provided a safe and predictable environment for our people and enterprises, but have grown established and less flexible over time. The Government will need to be nimbler given the rapid pace of innovation and increasing global competition. We must take risks and be willing to make fundamental changes to support the emergence of potentially-disruptive business activities.

63. The Government should therefore design a **regulatory environment** that **supports innovation and risk-taking**, even as it balances this against risk. The Government should also **test regulatory innovations**, such as regulatory sandboxes, to enable trials of new products and services in a real-world environment with appropriate safeguards. For example, in building a Smart Financial Centre in Singapore, the Monetary Authority of Singapore (MAS) is supporting FinTech experiments so that promising innovations can be tested in the market.

64. The Government should **streamline its support schemes** for enterprises, and review and **rationalise the roles and functions of Government agencies** that support enterprises in various ways. Government agencies should focus on developing globally competitive enterprises in Singapore.

***Recommendation 7.3: Use Government lead demand to support the development of promising industries***

65. The Government should consider using **lead demand** more systematically to support the **development of promising industries**, especially where this coincides with our own strategic national needs. New but promising enterprises with short track records will benefit from citing the Government as a reference customer. We have seen this work well for our water and defence technology industries. A recent example is the Healthcare Innovation Challenge co-organised by IMDA and the National Healthcare Group.

***Recommendation 7.4: Review and reshape Singapore's tax system***

66. Rising domestic expenditures due to ageing and global changes in tax rules will necessitate a review of Singapore's tax system. The Government should maintain a **tax regime** that upholds two principles: One, our tax system should remain **broad-based, progressive, and fair**, even as we raise revenues over time to meet rising domestic needs. Two, Singapore's tax regime should remain **competitive and pro-growth**, for this is vital if we are to sustain innovation and promote a dynamic economy.

***Recommendation 7.5: Create a sustainable environment***

67. The Government should ensure that even as the economy grows, we pay attention to the quality of the environment. Our efforts to build a City in a Garden have been well received both at home and abroad. Given the threat of climate change, Singapore should play its part in **contributing to global efforts** to improve environmental sustainability. In that way, we can maintain a high-quality living environment in Singapore for generations to come.

## CONCLUSION

68. The CFE sets out the broad strategy. What matters is to **put these strategies to work**. We are confident we can execute our plans, for we are resourceful as a nation and determined as a people. During implementation, we will take an **adaptive approach**, continuing strategies which are successful, discontinuing those which are not, and making major changes where necessary.

69. The strategies we set out are **mutually-reinforcing**. For example, by becoming a startup and innovation capital, and supporting our enterprises to scale up and ride the digital wave, we will allow enterprises to create value and take advantage of our diverse global connections to compete internationally. Similarly, our enterprises will be supported by a globally-oriented people with deep and relevant skills, in a smart city that encourages vibrancy, sustainability and connectivity. These efforts will be integrated by ITMs, and multiplied by all parties working together. The purposeful implementation of these mutually-reinforcing strategies will give us a competitive edge against larger and better-resourced countries.

70. Singapore is entering a new phase of development. The journey ahead is not without challenges. **Our people and enterprises will be the key agents of change and the drivers of value-creation**. Our people must have that curiosity to seek out challenges to address and problems to solve. And our enterprises must have the ambition and drive to create fresh concepts and bring them to market, striving always to stay ahead.

71. Over the next decade, our collective efforts should enable us to **grow by 2-3% per year** on average, exceeding the performance of most advanced economies. This will be a good outcome for our present stage of development, with our incomes already higher than in many advanced economies and our workforce growing slower than before. Crucially, these GDP outcomes, measuring only economic activity within our borders, do not reflect the full extent of our success. A Singapore which is deeply connected to the region and the rest of the world will also provide a wide range of opportunities for our people and enterprises to thrive in markets abroad.

72. At the same time, our approach is an **inclusive** one, for we want the fruits of our growth to be enjoyed by all Singaporeans. We want an economy that offers **ample opportunities, with all Singaporeans enjoying sustainable wage growth and meaningful careers**.

73. We want to be the **pioneers of the next generation**. Together, we will build a Singapore of global relevance; a Singapore that can ceaselessly reinvent herself and grasp new opportunities. We are prepared for tomorrow.

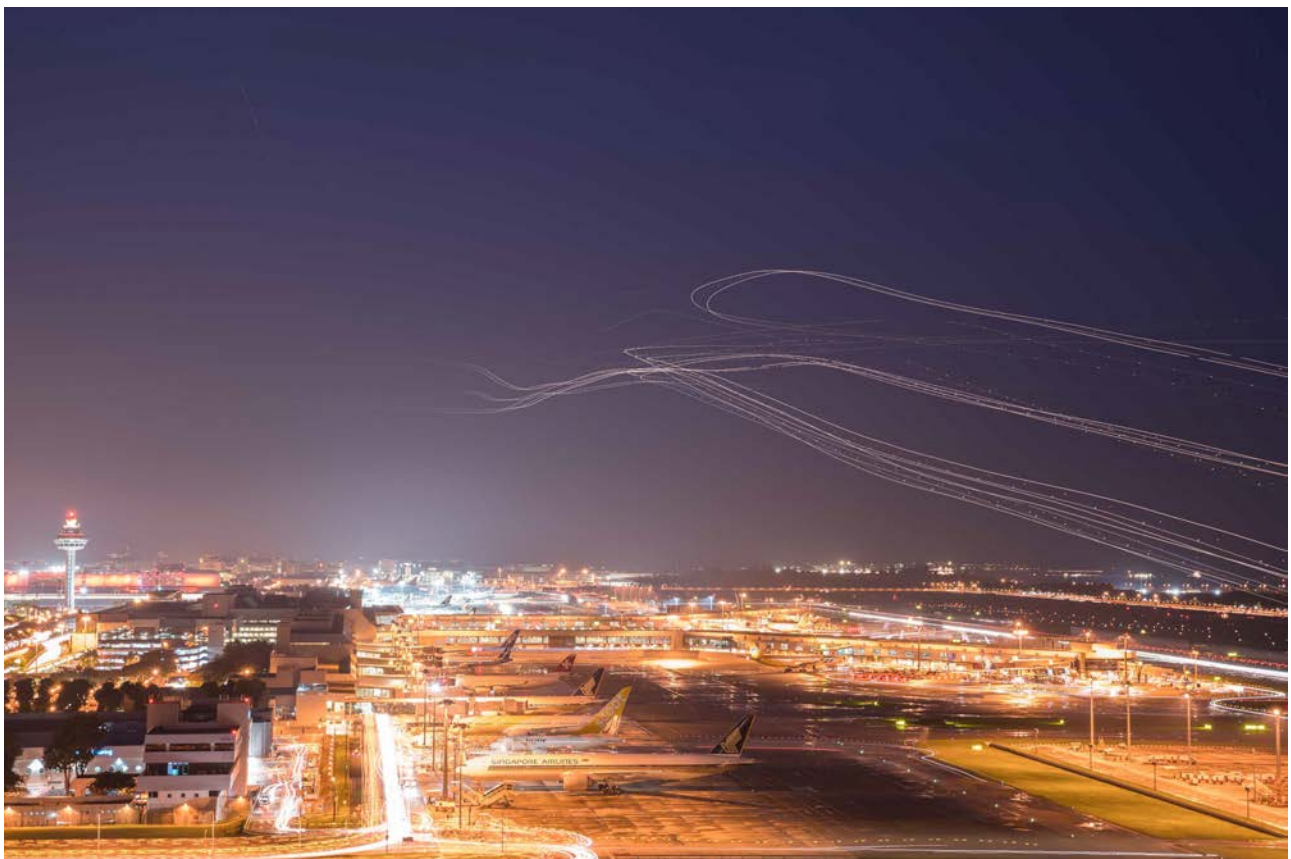
## STRATEGY 1: DEEPEN AND DIVERSIFY OUR INTERNATIONAL CONNECTIONS

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74. The imperative for free and open markets remains as important as ever. The free movement of goods, services and investment enables efficient specialisations, and has led to a rise in living standards around the world. Two-thirds of Singapore's GDP is derived from external demand. Access to a wider pool of resources and technology gives our externally-oriented sectors a productivity edge over domestically-oriented sectors. The emergence of anti-globalisation sentiments in several parts of the world may undermine open global trade, with negative consequences for the world, including Singapore.

75. We must resist the threat of rising protectionism. The benefit of open trade as a tide that lifts all boats remains true, and many parts of the world continue to engage vigorously in and grow robustly from open trade. We need to lean against trends that threaten to make our world more inward-looking and protectionist. Singapore must remain open to trade, investment and talent.

76. Asia offers many opportunities for both companies and individuals who are prepared to learn its intricacies, and to serve its varied range of needs. Rising consumption and demand for infrastructure in Asia offer significant export and investment opportunities for Singapore-based companies. We need to help our enterprises accelerate their pace of internationalisation, especially in the region, and groom talent with deep regional market expertise.



*Changi Airport. Photo credit: The Civil Aviation Authority of Singapore*



77. We should deepen our economic partnerships with other countries to find more opportunities for growth. This can be done by expanding our linkages with our partners and strengthening our capabilities, especially our in-market networks and expertise, to access markets more effectively. At the official, business and individual levels, we should build strong ties with our overseas counterparts, in bilateral and multilateral contexts. As we deepen our knowledge and links with key markets, we also need to build connections to global innovation and technology networks, to harness new ideas for growth.

### **Recommendation 1.1: Press on with trade and investment cooperation**

78. Given the importance of trade to Singapore, **we should continue to work with like-minded partners to pursue the liberalisation of trade and investment.** Despite the rise of protectionism in some parts of the world, there remain many economic players who are committed to open trade, as well as potential new partners in diverse and emerging markets seeking to plug into the global economy. The CFE recommends the following:

- a. **Remain committed to a rules-based trading system** to ensure certainty and consistency to trade relations. As a member of the World Trade Organisation (WTO), we should continue to do our part to strengthen the multilateral trading system. We should also strengthen trade cooperation and reduce tariff and non-tariff barriers to trade through plurilateral initiatives and platforms such as the RCEP, Asia-Pacific Economic Cooperation (APEC) as well as the Free Trade Area of the Asia-Pacific (FTAAP).
- b. **Strengthen regional integration**, of which trade architecture and connectivity are vital. The AEC will make ASEAN a more compelling market and competitive production base, and enable our companies to expand into the region at lower costs. As ASEAN Chair in 2018, Singapore could help to advance economic integration within ASEAN and with its key partners. We also need to enhance our regional trade architecture to support digital businesses and data flows, such as developing mutual recognition of data protection standards.
- c. **Press on with developing specific bilateral initiatives with key trading partners.** We should draw on our experience in developing joint projects that create significant mutual benefit for us and our partners. These include industrial and business parks in India, Indonesia and Vietnam, and township projects in China. For instance, the Chongqing Connectivity Initiative in China and the Andhra Pradesh Capital City (Amaravati) Project in India, have opened up new opportunities in sectors such as logistics and urban solutions. Concurrently, we should continue to diversify our international connections by building inroads to emerging markets such as key cities in Africa, Latin America and Central Asia.

- d. **Strengthen our collaboration with multilateral institutions** like the World Bank and ADB, and new institutions like the AIIB. We worked closely with the World Bank to establish the Infrastructure and Urban Development Hub, and to base a team from the Global Infrastructure Facility in Singapore. Similarly, we cooperated with the ADB to set up the Asia Infrastructure Centre of Excellence here. Singapore is also a founding member of the AIIB. We should work on more of such initiatives that foster collaboration on infrastructure projects and promote regional development.
- e. **Work with our TACs as key multipliers** to share insights and help galvanise industry in support of the above efforts. In addition, TACs can take the lead to help businesses better understand and avail themselves of the benefits from our existing network of 21 Free Trade Agreements (FTAs) and Economic Partnership Agreements (EPAs) with key trading partners.

### **Recommendation 1.2: Set up a Global Innovation Alliance (GIA)**

79. By drawing international connections, and bringing together a wide range of perspectives and experiences, we can **spark new innovation activity**. The practice of connecting and working with global partners, across geographical and cultural boundaries, also inculcates mindsets and instincts that are more alert and ready to tap into opportunities everywhere. To facilitate this, the CFE recommends that our IHLs and companies link up with overseas partners in major innovation hubs and key demand markets, to form a GIA. The GIA should:

- a. **Expand existing efforts to strengthen our links with regional countries and involve more IHLs**, to better expose our students to opportunities in Asia. Currently, the NUS Overseas Colleges programme exposes our students to innovation and entrepreneurship in places such as Silicon Valley, Munich, Tel Aviv and Beijing. This has helped to groom fresh entrepreneurial talent and promising startups in Singapore, and the efforts should be expanded.
- b. **Invite in-market partners to come on board the GIA to set up innovation launchpads**, for Singaporeans and startups from both countries to work together and tap on the expertise in our IHLs and their partners. This will provide a platform for our startups to access opportunities and ideas overseas.
- c. **Serve as welcome centres where Singapore-based enterprises and institutions can collaborate with partners in these cities** on innovation and technology projects. These will form gateways for overseas talent and enterprises to seek out partners from Singapore to access regional and global opportunities.

### **Recommendation 1.3: Deepen knowledge of our markets**

80. In our next phase of internationalisation, there will be an increased need for our people and enterprises to operate in overseas markets. Our extensive market networks and expertise already give us a strong competitive advantage. Going forward, we should continue to improve our understanding of and connections with our key markets. We need to develop a stronger appreciation of different market conditions to form effective strategies that speak to the unique needs of each market. This will require a better understanding of **variations within and across cities or provinces**, as well as **across different sectors** in a particular market.

81. For Singaporeans to build more international connections, the CFE recommends the following:

- a. **Have the Government work with companies to support the deployment of Singaporeans on quality overseas assignments through the SkillsFuture Leadership Development Initiative (LDI).** International experiences, such as cross-functional rotations to different markets, will help potential leaders groom their global instincts. The LDI also seeks to develop these corporate leaders by giving them access to sector-specific leadership and management programmes.
- b. **Facilitate more overseas internships of a substantive duration for students in post-secondary education institutions (PSEIs).** We should encourage more companies to offer overseas internships to students through programmes such as the SkillsFuture's Young Talent Programme and Maritime and Port Authority of Singapore's (MPA) Global Internship Award. We should also consider reciprocal arrangements for internships, between MNCs in high growth potential sectors and Singapore-based companies with overseas presence. We should **expand cross-cultural learning programmes and community service programmes** in our PSEIs to give international exposure to young Singaporeans.
- c. **Help Singaporean parents ease their concerns over their children's education when taking on overseas assignments.** The Government should do more to reduce parents' concerns over their children's re-entry to local schools after an overseas assignment.
  - i. **Help overseas Singaporean students maintain familiarity with the national curriculum.** MOE is currently developing the new **Student Learning Space** as an online platform for Singapore-based students to access learning resources aligned with the school curriculum. MOE should consider making this available to overseas Singaporean students to facilitate a smoother re-entry into Singapore schools.

- ii. **Provide a one-stop portal** containing useful information and contact points of the relevant public agencies, to help families preparing to return.
- iii. **Facilitate enrolment into the International Baccalaureate (IB) Diploma Programme** offered in our mainstream schools for returning Singaporean children. This can provide greater assurance to parents, and build on MOE's current efforts to facilitate the re-entry of returning Singaporean children who do not have a place in a local school.

82. Singapore is already a base for many companies serving markets in Asia. Our universities have a range of area research programmes, while think tanks like the Institute on Asian Consumer Insight and the Asia Competitiveness Institute are focused on specific subjects. The CFE recommends that we build on these strengths through the following:

- a. **Deepen our knowledge of Asia.** A more nuanced understanding of Asia's different cultures and consumer preferences will strengthen the ability of Singapore-based companies to access regional opportunities.
  - i. **Encourage more specialised market research firms and consultancies to develop wider and deeper market knowledge of the region.** This will enrich our knowledge repository, which can help companies to refine their marketing strategies and better position themselves to access opportunities in Asia.
  - ii. **Develop more internationalisation programmes,** to deepen Global-Asia market insights and encourage students to immerse themselves in overseas markets.
  - iii. **Encourage TACs and economic agencies to facilitate more business study trips** to help companies gain in-market insights and pursue opportunities.
- b. **Develop multiple modes of internationalisation.** With the growth of the digital economy, our overseas market presence may be physical, digital or both. To better tap into rising consumer demand in Asia, we need to develop online and offline strategies to accelerate companies' internationalisation efforts.
  - i. **Encourage enterprises to deepen their understanding of e-commerce** and transform traditional businesses to better access overseas demand, using available Government support.
  - ii. **Strengthen in-market facilitation and assistance** for companies in key overseas markets, to build market networks and develop market-specific strategies. This could range from direct Government support to collaboration with third-party multipliers, such as local and foreign TACs.

- iii. **Support the expansion of Singapore's professional services firms' regional networks**, especially in Southeast Asia. Professional services providers can build expertise to participate in the region's growth, as well as facilitate the expansion of Singapore-based companies into the region.

## **Conclusion**

83. We must remain open and connected to the world. International connections expose us to innovative ideas arising from different talent and diverse cultures. We should find ways to deepen our market knowledge, and tap into the expertise and innovations of our partners overseas. This will create mutually-beneficial outcomes with our key trading partners, help improve productivity and create more opportunities for growth. Ultimately, we will have a more robust and resilient economy that will provide good, internationally-valued jobs for Singaporeans.

## STRATEGY 2: ACQUIRE AND UTILISE DEEP SKILLS

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84. Rapid technological advancement will change the type, nature and location of future industries and jobs globally. Every economy is wrestling with the changing nature of jobs, and Singapore is no different.

85. To enable Singaporeans to adapt and thrive in a continually changing job market, two shifts are needed. First, we must go beyond the pursuit of the highest possible academic qualifications early in life, to seek knowledge, experience and skills throughout life instead. Second, beyond acquiring deeper skills, our people need the opportunities to utilise their skills effectively on the job.

86. The SkillsFuture movement, launched in end-2014, seeks to enable all Singaporeans to acquire relevant skills throughout life, regardless of their starting points. Many initiatives have been rolled out in the last two years, to facilitate skills acquisition. A chart summarising the progress of the SkillsFuture initiatives is at [Figure 2.1](#).

87. The CFE recommends that we build on this momentum. We should enhance the way SkillsFuture can serve the twin shifts of skills acquisition and utilisation, and lifelong learning. If learning throughout life becomes our creed, and we are able to put learning into practice, Singaporeans will be able to adapt and succeed along with transformations in the economy and job market, with ease and confidence.



*Aerospace students at Institute of Technical Education (ITE) College Central. Photo credit: Ministry of Education (MOE) Communications and Engagement Group*

## **Recommendation 2.1: Facilitate acquisition of deeper skills**

88. **Our workers will need to continuously deepen and refresh their skills in order to stay relevant.** We have to move away from the mindset that education ends once we enter the workforce.

89. We acknowledge that personal development has to be balanced with other priorities such as family and career demands. It may also not be practical or necessary for individuals to take extended periods of time off from their careers to pursue a degree or post-graduate qualification. To help individuals attain deeper skills while pursuing a career, the CFE recommends that:

- a. **The Government should work with training providers and the IHLs to offer more modularised training programmes**, which are short-duration learning courses endorsed by industry and approved by MOE. For instance, UniSIM offers a range of modular courses in various fields such as Financial Accounting and Visual Effects Design, which are designed to be highly flexible and scalable, to support continuing education. Such courses provide Singaporeans with more opportunities to acquire work-related competencies, without needing to disrupt their career or personal commitments, in the way that a full-time course might. More than 500 skills-based modular courses have been launched since 2015, and we can ramp this up so that more Singaporeans can benefit from a wider range of courses.
- b. **These modularised training programmes should also be technology-enabled**, so that learning can take place outside of the classroom, on mobile devices. Course materials can be digitised and videos of lectures put online so that students can download these and catch up on lessons at their own time. This will help individuals pursue learning at their own pace.
- c. **Skills training across different qualification frameworks should also be more broadly recognised.** The Government, education and training providers, and industry should work together to cross-recognise **skills and knowledge acquired under different frameworks**. For example, the Government could consider facilitating progression into applied degrees for graduates of SkillsFuture Earn and Learn Programmes, with relevant module exemptions.
- d. **Singaporeans should also be better equipped** to make sound career choices, based on their interests, education, and training. The SkillsFuture **Individual Learning Portfolio** (ILP), for example, should serve as an online one-stop education, training, and career guidance portal, to provide every Singaporean with the information they need to plan their acquisition and utilisation of skills.

## **Recommendation 2.2: Strengthen nexus between acquisition and utilisation of skills**

90. To strengthen the nexus between skills acquisition and utilisation, we need **to expand the role and ownership of employers for skills utilisation**. The SkillsFuture TechSkills Accelerator (TeSA) programme is a good example of what can be achieved when employers are actively involved. With the strong involvement of companies, TeSA enables existing and aspiring ICT professionals to acquire industry-relevant digital skillsets, thereby increasing their chances of employment upon completing their courses. The involvement of employers also allows skills acquisition to be done through a variety of modes, including on-the-job training, secondments and overseas training. TeSA also supports science, technology, engineering and mathematics (STEM) professionals to re-skill in emerging industry areas such as data science, cybersecurity, software development and network engineering. Building upon the positive outcomes of initiatives like TeSA, the CFE recommends the following:

- a. **Replicate parts of the TeSA model in other sectors.** One example is to have industry help groom local talent for the urban solutions growth cluster by giving Singaporeans **place-and-train opportunities** in project development roles in firms ranging from transaction advisory firms to law firms, engineering consultancies, financial institutions (FIs) and multilateral development banks (MDBs). This will enable them to be fielded in project structuring roles in advisory firms and MDBs.
- b. **Expand the range of education and training offerings, to include more work-learn programmes at the post-secondary education institutions (PSEIs).** Work-learn programmes emphasise deeper collaboration between education institutions and industry. For example, SIT already offers the Integrated Work Study Programme in their degree programmes, providing students the opportunity to undertake real work, integrate theory and practice, and develop specialist skills in their chosen field. The Government should also consider **extending work-learn programmes to employees** of Singapore-based enterprises, for them to deepen their skills and advance their careers.
- c. **Get companies to take a bigger role in developing workers.** The Government should help build up companies' leadership and human resource (HR) management capabilities so that more companies will recognise the importance and have the know-how to develop their employees. For a start, companies can use the SkillsFuture Mentors Programme<sup>5</sup>, or the HR Capability Toolkit<sup>6</sup> to do so.

<sup>5</sup> The SkillsFuture Mentors Programme aims to enhance SMEs' capabilities in learning and development to build up their value proposition as employers of choice offering good career development and growth opportunities.

<sup>6</sup> The HR Capability Toolkit aims to promote good HR practices in key areas such as learning and development, career management and talent management and succession planning.



- d. **Encourage and enable the hiring and advancement of workers based on skills and competencies**, beyond academic grades or qualifications. This can be done by granting firms preferential treatment for select Government schemes if they adopt skills- and competency-based HR systems. The Government should also study other incentives for these firms, such as the Ministry of Manpower's (MOM) Human Capital Partnership (HCP) programme and other Government schemes tied to skills training or industry development. The public sector's recent move to merge graduate and non-graduate schemes and remove divisional classifications are a good signal of advancing workers based on skills and competencies. Tripartite partners should continue to work together to endorse and showcase best hiring and promotion practices.

91. Jobseekers with the right skills set may not always be matched to employers due to information gaps. To minimise such "missed" matches between jobseekers and employers and to better facilitate job matching, **the Government should enhance the user experience of the national Jobs Bank**, as well as improve its functionality through integration with the ILP platform to bring together information on jobs, skills and competency requirements.

92. New technologies and business models, such as digital platforms, bring about new opportunities for individuals, including **gig workers and freelancers**, to market their skills, provide their services and earn an income. It also allows companies to tap on workers who desire more flexible working arrangements. We should **embrace such developments** as part of an innovative and entrepreneurial economy. At the same time, while individuals can take advantage of this flexible form of working arrangements, we should ensure that such workers are supported, for example, with respect to retirement adequacy.

93. The CFE believes that everyone has a role to play, but we should pay special attention to workers who may face more challenges in this environment. These include workers made redundant or who have been unemployed for some time, as well as older workers and persons with disabilities. The CFE recommends that we:

- a. **Facilitate employment** via more Professional Conversion Programmes, which help mature jobseekers re-skill to take on new jobs in new sectors.
- b. **Appoint more institutional agents to enhance the matching of harder-to-place job seekers with potential employers**, including the National Trades Union Congress's (NTUC) Employment and Employability Institute (e2i) and other private sector intermediaries.

- c. **Continually evaluate and improve existing Government support schemes** such as Adapt and Grow<sup>7</sup>, Workfare Income Supplement<sup>8</sup>, Workfare Training Support<sup>9</sup>, and the Progressive Wage Model<sup>10</sup> to ensure their relevance and adequacy. For instance, the Government can enhance the Adapt and Grow schemes to reach out to more vulnerable workers. The Government can also deliver or facilitate more programmes via the Train-and-Place model, where workers receive a stipend while undergoing training before being placed, where appropriate.

## **Conclusion**

94. With these measures, the CFE hopes to encourage learning throughout life, to nurture Singaporeans who can quickly and easily adapt to new job demands and switch jobs or industries as the economy transforms. Employees and employers alike must play their part to ensure effective skills acquisition and utilisation, so that Singaporeans across the board can enjoy meaningful careers.

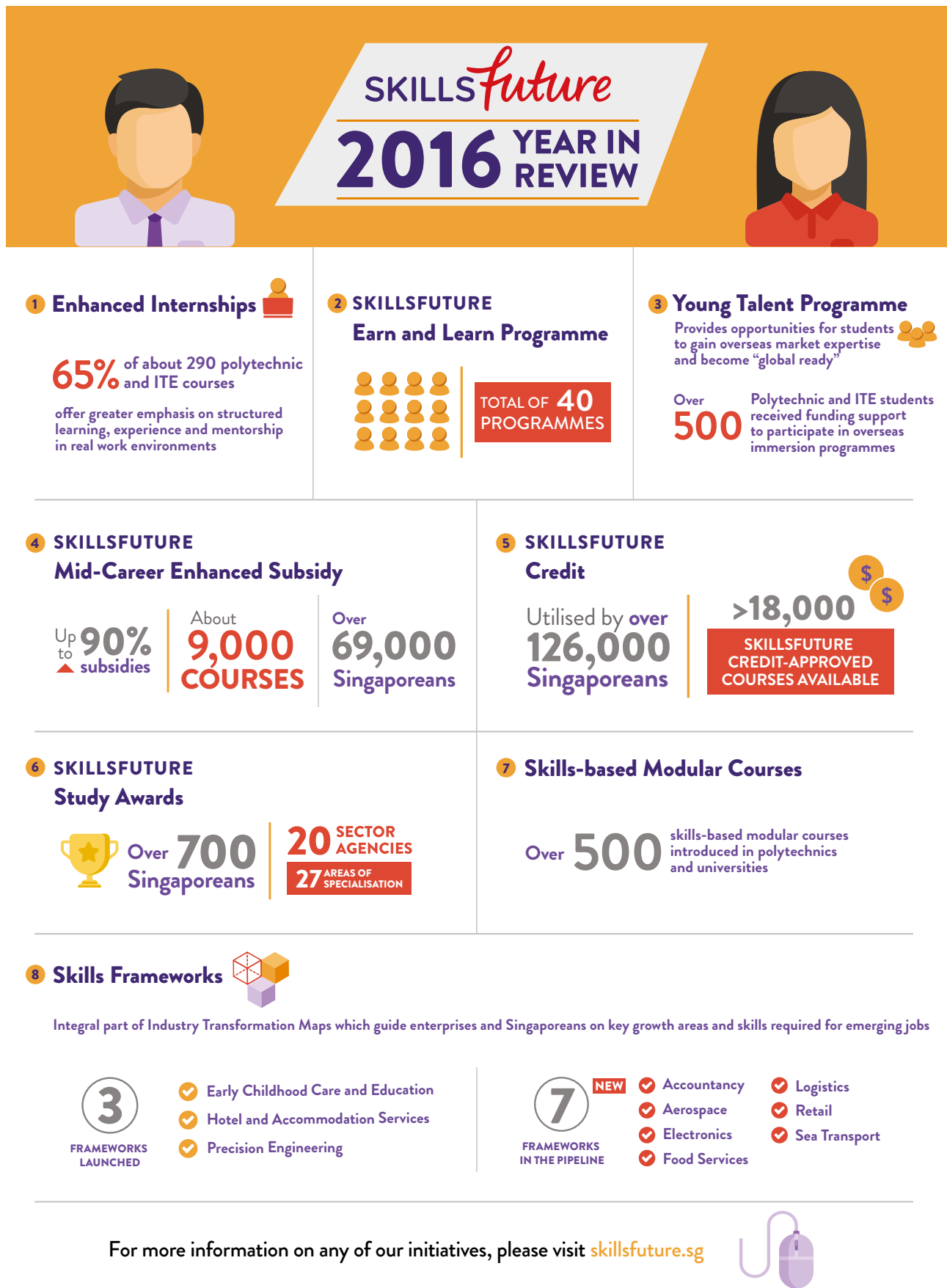
<sup>7</sup> The Adapt and Grow initiative is a set of programmes and services that provides employment and employability support for job seekers to take on new jobs or new careers.

<sup>8</sup> The Workfare Income Supplement scheme encourages eligible workers to continue working and build up their Central Provident Fund (CPF) savings, by supplementing their income and retirement savings through cash payment and CPF contributions.

<sup>9</sup> The Workfare Training Support (WTS) scheme complements the Workfare Income Supplement scheme by encouraging Singaporean workers to attend training to improve their skills. WTS also supports employers to send their workers for training.

<sup>10</sup> The Progressive Wage Model is a productivity-based wage progression pathway that aims to increase the salaries of workers through skills upgrading and productivity improvements. It applies to workers in the cleaning, security and landscape sectors.

Figure 2.1: SkillsFuture Year-in-Review 2016



Statistics as of 31 December 2016

## STRATEGY 3: STRENGTHEN ENTERPRISE CAPABILITIES TO INNOVATE AND SCALE UP

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95. Our economy is only as strong and resilient as each of our enterprises can be competitive. We want a strong core of competitive Singapore-based enterprises as they create good jobs, attract investments and expand networks.

96. Our enterprises now compete in a league where advantage comes from a heightened capacity for new value creation. We therefore need to make a stronger push to deepen their capabilities to innovate and scale up. This effort requires Government agencies, industry and other stakeholders to work together to build an ecosystem for innovation and enterprise growth.

97. The CFE's recommendations build on plans that the Government has already rolled out to make Singapore an innovation-driven economy, such as the Research Innovation Enterprise 2020 Plan (RIE2020), our Smart Nation vision and the Design 2025 Masterplan. Taken together, they can help to develop an innovative society, where our enterprises and people create value and are adept at creativity and risk-taking.



*Artist's impression of Jurong Innovation District. Photo Credit: JTC Corporation*

### **Recommendation 3.1: Strengthen our innovation ecosystem**

98. **Our IP ecosystem should be strengthened to better support innovation and technology adoption.** This will help enterprises to better commercialise the research findings and IP of our research institutions. We are starting from a position of strength. We already have a critical mass of high-tech sectors in Singapore, a vibrant startup and financing ecosystem, world-renowned universities and research institutions, and a strong global pool of research scientists and engineers. The CFE recommends that we should:

- a. **Strengthen our national capabilities to commercialise IP.** We should consider establishing or bringing in dedicated **commercially-oriented entities** that are focused on the commercialisation of IP generated by our IHLs and other research performers based in Singapore. These entities can complement the current Innovation and Enterprise Offices.
- b. **Significantly grow the community of IP and commercialisation experts** (lawyers, patent attorneys, valuers, managers, strategists) to support the commercialisation of innovation. We should also develop IP management capabilities in the public and private sectors to help manage and translate innovation and R&D efforts into commercial outcomes.
- c. **Develop a standardised IP protocol to be adopted by all public agencies and publicly-funded research performers.** This includes the Agency for Science, Technology and Research (A\*STAR) research institutes, autonomous universities and hospitals. This will simplify, standardise and shorten IP negotiations between the industry and public agencies or publicly-funded research performers, and speed up collaborations.
- d. **Update the IP Hub Master Plan, released in 2013, to support innovation and entrepreneurship.** The focus of the IP Hub Master Plan has been on attracting IP-related work and activities to Singapore. Having achieved fair success in this area, it should be updated to also focus on assisting innovators and enterprises to extract value from their IP. This could entail, for example, developing new initiatives in the area of IP transactions and management.
- e. **Review Singapore's copyright regime to take into account new ways of creating, distributing, accessing and using content.** To support the healthy growth of the creative industries, we need a copyright regime that balances between providing exclusive rights as an incentive to create and disseminate new creative works, and providing access to those works for the benefit of other creators and society at large.

99. Our startup ecosystem has made good progress. We can support its growth by enhancing mentorship, helping to raise the profile of our startups, and expanding the entrepreneurial pipeline. The CFE recommends that we should:

- a. **Facilitate personal networking amongst stakeholders of the startup community.** This will strengthen the sense of community and mutual support among startups. Experienced or successful individuals should be encouraged to groom, mentor and inspire the younger generation.
- b. **Strengthen the national branding efforts** for our startup ecosystem, and raise the profile of Singapore's innovative startups.
- c. **Expand our pipeline of entrepreneurial talent.** We must **remain open** to entrepreneurial talent from around the world, especially entrepreneurs who are prepared to collaborate with, or whose skillsets complement the capabilities of, Singaporeans and Singapore-based companies.

### **Recommendation 3.2: Support enterprises to scale up**

100. Our enterprises are diverse in nature and scale, and thus face different needs in their scale-up efforts. We should also **encourage partnerships** among enterprises so they can benefit from each other's capabilities.

101. The CFE recommends that we should:

- a. **Provide high-growth enterprises with more dedicated and customised support,** to help willing and able enterprises scale up overseas quickly and become global leaders in their respective fields. For example, lead Government agencies could be assigned to coordinate all Government assistance rendered to enterprises that have the potential to rapidly scale up. Such enterprises would be identified based on a range of criteria which could include their size, potential for growth, the industry segment that they are in, and market demand.
- b. **Promote tighter collaboration in our corporate ecosystem, especially between large and small enterprises.** Our large Singapore-based enterprises should adopt corporate venture strategies that can help them access relevant new technologies and capabilities. Promising startups identified by such corporate venture strategies can not only gain funding, but be able to tap into scaled-up corporate capabilities and networks. We should also promote greater take-up of existing initiatives such as the Partnerships for Capability Transformation (PACT), which matches SMEs to large organisations on collaborative projects, where they offer complementary value propositions. SMEs in particular tend to improve their potential to scale up through such collaborations.

### **Recommendation 3.3: Catalyse the private sector to provide more growth capital**

102. For enterprises based here to scale up, more **smart and patient growth capital** — long-term capital which brings along ideas and expertise — is needed. We should encourage a variety of private sector funding sources, including banks, VC funds and PE funds. Where appropriate, the Government can partner these funds to invest for growth. We should:

- a. **Enhance the financing ecosystem for the next generation of startups.** The VC ecosystem should be further strengthened through a **simpler regulatory framework** for VC firms. Crowd funding should be facilitated as an alternative source of financing. We should widen the network of angel investors in Singapore to offer startups a more diverse support structure, and the possibility of syndicated deals.
- b. **Increase supply of financing for Singapore-based firms.** The Government should consider how to encourage **PE players to invest more** growth capital into Singapore-based firms looking to regionalise. Loans remain a key financing channel for SMEs. We should review the regulatory framework for finance companies to enhance their role as SME lenders.
- c. **Enhance the financial market infrastructure to facilitate sourcing of deals between Asian enterprises and investors.** For unlisted companies, the Government should facilitate the creation of a private market platform to enable Asian enterprises to access financing from a wider network of investors. For listed companies, the Government should permit dual class share (DCS) structures while instituting appropriate safeguards to promote market transparency and mitigate governance risks. DCS listings are increasingly being considered, for example, in industries such as information technology and life sciences. DCS should be permitted for companies seeking a listing on the Singapore Exchange (SGX) while instituting appropriate safeguards to promote market transparency and mitigate governance risks.
- d. **Strengthen access to cross-border project financing for Singapore-based enterprises that are expanding overseas.** The Government should build on the ESC's efforts, such as Clifford Capital, to address long-standing challenges in cross-border project financing for infrastructure projects while ensuring that risk decisions remain in the hands of the private sector. This is for areas where there are clear gaps in market financing, such as project financing in emerging markets, and for Singapore-based small and medium infrastructure enterprises. We should also deepen our capabilities in the provision of critical supporting services, to strengthen Singapore's competitive advantage as a regional hub for the infrastructure cluster.

## **Conclusion**

103. These three recommendations complement each other to help Singapore-based enterprises innovate and scale up. By enhancing our innovation ecosystem, supporting our enterprises, and increasing the supply of growth capital, we can help our Singapore-based enterprises to remain competitive. This strong base of globally competitive enterprises will in turn support our economy to grow and create good jobs.

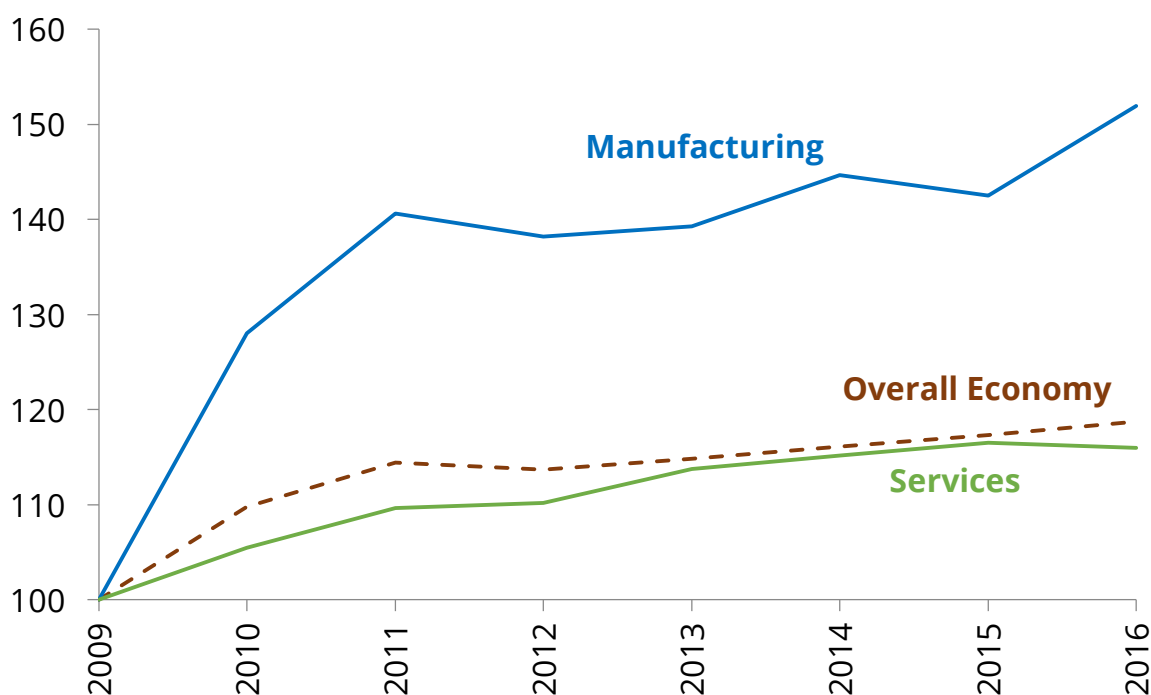


## APPENDIX 3.1: THE ROLE OF MANUFACTURING IN SINGAPORE'S ECONOMY

1. Manufacturing and services are the twin pillars supporting Singapore's diversified economy. Like other advanced economies, services will remain an important source of growth for Singapore.<sup>11</sup> At the same time, manufacturing will continue to play an important role in Singapore's economy.

2. In 2016, the manufacturing sector accounted for around 20% of GDP and 14% of total employment in Singapore.<sup>12</sup> Over the years, it has also enjoyed strong productivity growth. Between 2009 and 2016, real productivity (as measured by real value added (VA) per actual hour worked) in the manufacturing sector grew by 6.2% p.a., higher than the growth in the overall economy (2.5% p.a.) and the services sector (2.1% p.a.) (See Figure 3.1).<sup>13</sup> In addition, the manufacturing sector is a source of good jobs for resident workers in Singapore. Between 2009 and 2016, the real median income of resident workers in the sector rose by 2.9% p.a., surpassing the 2.6% p.a. real growth in the overall economy.<sup>14</sup>

**Figure 3.1: Real VA per actual hour worked (2009 = 100)**



Source: Ministry of Trade and Industry estimates

<sup>11</sup> In recent years, strong growth in services, particularly in finance & insurance and business services, has led to a decline in the share of manufacturing in Singapore's economy.

<sup>12</sup> This is based on advance estimates for the GDP share and the Ministry of Manpower's preliminary estimates for the employment share.

<sup>13</sup> This is based on advance GDP estimates and preliminary estimates on hours worked for 2016.

<sup>14</sup> This is based on real growth in gross monthly income from work (including employer Central Provident Fund contributions) of full-time employed residents. (Source: Ministry of Manpower)

3. Moreover, the manufacturing sector generates strong spillovers to the rest of the economy. In 2005, every S\$1 of manufacturing VA created S\$0.25 of spillovers in the rest of the economy. By 2012, this rose to S\$0.34 as the sector strengthened its linkages with other sectors, particularly business services and wholesale trade. This could in part be due to the trend of manufacturers contracting out services activities that used to be integrated within the firm, such as accounting.

4. Apart from being a source of growth and good jobs, the manufacturing sector also buffers Singapore against the vagaries of the global economy by diversifying our production base and export markets. Such a strategy of diversification is important to ensure that Singapore's economy remains broad-based and resilient over the long term.

5. The manufacturing sector also anchors high-value and complex activities in Singapore which provide skilled jobs for Singaporeans. It preserves and grows competitive capabilities in the economy, including technical and engineering skills that will support future innovations. With the growth in capabilities, the manufacturing sector will also improve its labour and land productivity, allowing us to optimise our precious resources.

6. In view of these factors, the CFE recommends building a globally competitive manufacturing sector, at around 20% of GDP, over the medium term.

7. While we continue to target advanced manufacturing activities in Singapore, we recognise that the complexion of manufacturing is changing. Manufacturing increasingly encapsulates a value chain of activities including services such as design, R&D, logistics, marketing and after-sales services. In particular, the servicisation of manufacturing has encouraged manufacturers to incorporate services elements into their businesses in order to differentiate their products and enhance their competitiveness.<sup>15</sup> At the same time, manufacturers are likely to continue to outsource activities to services sectors such as business services, thereby strengthening their linkages with these sectors and benefiting the wider manufacturing ecosystem.<sup>16</sup>

8. Our manufacturing sector has always been a strong anchor for our economy and a key source of our competitiveness and linkages to the rest of the world. We have built on this strength over the years to transform the sector by seizing opportunities offered by technology and changing market demands and value-chains. Today, our base of high-value manufacturing and services activities provides a strong value proposition for servicised manufacturers that operate across the value-chain, from knowledge-intensive R&D and design to high-tech manufacturing production and post-production services. We will continue to actively encourage the growth of areas that sit at the confluence of high-tech manufacturing and high-end services, such as advanced manufacturing and the Industrial Internet of Things (IIoT).

<sup>15</sup> Singapore's manufacturing sector is recognised to have one of the highest shares of servicised manufacturers in the world (49%). (See Neely, 2008, "Exploring the Financial Consequences of the Servitization of Manufacturing")

<sup>16</sup> In 2012, when the manufacturing sector contributed about 20% of GDP in Singapore, the manufacturing ecosystem — which takes into account the manufacturing-services linkages — contributed about 27% of GDP.

9. Through these efforts, we will be able to retain a globally competitive, high-VA and vibrant manufacturing sector in Singapore — one which will support the growth of the wider ecosystem and continue to create good jobs for Singaporeans.

## STRATEGY 4: BUILD STRONG DIGITAL CAPABILITIES

104. Digitalisation<sup>17</sup> has and will become even more pervasive. It will transform the nature of work and jobs, which will require that we stay ahead of the curve and adapt to potential changes. As an area with high growth potential, Singapore can potentially excel in key segments because of our trusted reputation, technical skills, and advanced infrastructure. Digitalisation will not only support the growth of the ICT and media industries, but also transform and catalyse growth in many other industries. Beyond these effects on specific industries, the digital economy offers new ways for our industries to reach into global markets.

105. The opportunities arising from the digital economy are significant. The Internet of Things will enable Industry 4.0<sup>18</sup>, and also allow more value-added services to be performed by manufacturing companies. Pervasive connectivity and autonomous technologies will enable new urban mobility solutions. The use of healthcare data and wearable technologies will predict and prevent disease, and hopefully add to our years of healthy life. Electronic payments, crowd-funding platforms, and distributed ledgers will transform the financial services landscape, while the digitalisation of business processes and information will transform all industries.



*Photo credit: Shutterstock.com*

<sup>17</sup> In this report, digitalisation refers to the integration of digital or computer technology into business activity, for instance using digital technologies to change business models. This is distinct from digitisation, which refers to the conversion of analogue source material into digital format.

<sup>18</sup> Industry 4.0 refers to the use of digital technologies to support automation in the manufacturing sector.

106. It is important that we take steps to adapt to the changes the digital economy will bring, to ensure that we remain relevant and can seize future opportunities. We have a solid foundation in terms of good infocomm connectivity, a tech-savvy population, and a well-educated workforce. The Government has committed strong support through national-level initiatives such as the Smart Nation platform and the Infocomm Media 2025 Plan. The digital solutions we develop can be exported to rapidly urbanising cities in Asia.

#### **Recommendation 4.1: Help SMEs adopt digital technologies**

107. **SMEs in particular stand to benefit from the adoption of digital technologies.** This can help them to increase productivity, manage business costs, create new revenue opportunities, and scale up their operations. To support SMEs in adopting digital technologies, the CFE recommends that:

- a. More **dedicated support** be provided **to help SMEs better understand and adopt digital technologies.** This would help SMEs reap productivity and other gains from the adoption of digital technologies. At the same time, **encourage the ICT industry to better cater to SMEs' requirements** for digital solutions. This can be done industry by industry through the ITMs.
- b. **Impactful pilot projects** be supported to encourage adoption of emerging digital solutions that have the potential to scale. These pilot projects should test new technologies that can help SMEs increase sales or reduce their reliance on manpower. Government support could come in useful at two levels — first, to defray initial investment costs in new digital solutions to be piloted by SMEs, and second, to deploy tested solutions to the wider SME community.
- c. **Influential intermediaries** play a role in encouraging large-scale adoption of digital technologies. Large clients or suppliers can influence the SMEs they work with to adopt technology solutions. These solutions can also provide wider benefits beyond the SME to its partners, through digitalisation of the supply chain.

108. **National-level digital platforms and infrastructure** can increase the pace of digital adoption by private sector players. These will help connect different players and encourage greater collaboration and innovation. These platforms and infrastructure should have the potential to scale and work across borders. This can change the way business is done in Singapore and the way others do business with us. The CFE recommends the following:

- a. **Use the National Trade Platform (NTP) to catalyse the creation of innovative digital services.**<sup>19</sup> The NTP will digitalise the transactions of trading companies, thereby increasing productivity and reducing their business costs. The NTP will generate data streams for its users, which can be analysed for insights on how to further improve their business processes. Logistics and trade finance companies in particular stand to make the most productivity gains from the NTP. To facilitate this, the NTP should be:
  - i. An **open platform** that can catalyse the creation of innovative value-added services by the private sector; and
  - ii. **Interoperable with overseas platforms** to create stronger linkages to global trade and supply chains and connect trading activities across the region.
- b. **Make Singapore an electronic payments society and facilitate cross-border transactions.** This can be done by building a payments infrastructure that is interoperable and works within and between borders. A National Payments Council should be established to promote collaboration between users and providers of payment solutions. Innovation in payments technology and the integration of payments with digitalised business processes can help our companies reap greater benefits from digitalisation.

#### **Recommendation 4.2: Build deep capabilities in data analytics and cybersecurity**

109. We find that certain digital economy activities hold particularly bright promise for growth. Specifically, the CFE recommends that we build and root advanced data analytics and cybersecurity capabilities in Singapore. These are high-potential growth industries in their own right, which are also core capabilities that support the digitalisation in other industries. We have the right infrastructure to support the development of these capabilities in Singapore. To do so:

- a. **Key industry players and the Government can work together** to develop innovative solutions that serve the needs of industry. This can be done through the use of data analytics and the **training of data scientists** with the analytic capabilities to solve specific problems within various industries.

<sup>19</sup> The NTP was announced at Budget 2016 as a one-stop trade information management platform. It is a successor to the existing TradeNet and TradeExchange platforms.

- b. **The Government can use National Service** to develop deep, niche skills in **cybersecurity**, given its strategic importance to both national security and the economy.
- c. **Singapore should attract and anchor vanguard technology firms** in niche cybersecurity segments where we can develop global leadership, and facilitate partnerships with users as well as local solution providers to create best-in-class solutions.

110. The CFE also recommends that the Government catalyse the creation of **innovative digital services** in specific industries that possess high growth potential or meet national needs. The Government should:

- a. **Identify emerging demand problems and establish public-private partnerships** to conduct research in areas of interest. There can be more initiatives like the Cyber Risk Management (CyRiM) Project, supported by MAS and Cyber Security Agency of Singapore (CSA), which brings together potential market participants to investigate challenges and discover opportunities in the nascent cyber-insurance marketplace.
- b. **Develop appropriate and flexible regulatory frameworks which support innovation and enable the adoption of technology**, such as through regulatory sandboxes. For example, in building a Smart Financial Centre in Singapore, MAS is supporting FinTech experiments so that promising innovations can be tested in the market and have a chance for wider and quicker adoption.

#### **Recommendation 4.3: Harness data as an asset**

111. Data is increasingly ubiquitous as the world becomes digitalised. We should recognise, treat and develop data in ways similar to how we would treat more conventional assets such as property and human capital. We should also develop our own abilities to make the best use of data. Nonetheless, given that this is a new area of development, a collaborative approach will be helpful for us to make the most of data as an asset. There is potential for greater collaboration between industry and the Government to catalyse data-driven innovation. The CFE recommends that the Government establish a **dedicated programme office** to:

- a. **Catalyse the use of data in the economy**. This office should work with industry lead agencies to encourage adoption of data assets as part of the ITMs, provide regulatory guidance, e.g. on personal data protection, and enable regulatory innovation.
- b. **Encourage adoption through flagship data science projects in key industries**. This could take two forms, as a partnership between the Government and high-profile end-user companies in industries where we are in a natural position to aggregate and use data, or as an industry-driven project led by TACs or a consortium of companies.

112. The Government collects data that can be used to create value, for instance to better understand consumer needs and improve efficiencies. Increased digitalisation has also expanded the possibilities in data collection. The CFE recommends that the Government:

- a. **Enhance the collection and supply of data**, particularly data with economic value, by compiling additional statistics, and using new sources of data for better analytics. Some of this is already being done through the use of publicly-available datasets from public agencies, and using technology to facilitate data submission by the general public.
- b. **Systematically share more data with the private sector** so that more innovations and value can be created, for Singaporeans and more. We will need to balance this carefully with privacy and security concerns. Within the Government, structures already exist to encourage data sharing. For instance, data.gov.sg is a one-stop portal that provides access to open data from 70 public agencies. Data could be shared through more **real-time Application Programming Interfaces (APIs)**.

## Conclusion

113. With strong digital capabilities, our people and enterprises will be well-placed to capture the opportunities that come together with the rise of the digital economy. Our ambition is to catalyse the development of the digital economy in Singapore, so that Singapore can be a strong base from which to create and commercialise digital solutions and businesses for the region and the world.



## STRATEGY 5: DEVELOP A VIBRANT AND CONNECTED CITY OF OPPORTUNITY

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114. Singapore's capacity to flourish in today's highly connected world is tied to our ability to attract and create opportunities. Our city must therefore be planned in a way that connects us globally, and provides us with options to grow. We should pursue new and creative ways of organising our city for vibrancy and connectivity, and invest in the right infrastructure ahead of time.

115. One of Asia's most liveable cities today, Singapore should also build on our strong position to create a city distinguished by the dynamism of our environment and uniqueness of our culture. Singapore should be a great place not only for work, but also to live, learn and play. This will also allow us to attract and retain talented individuals — both local and global — to contribute to Singapore's economy and society.

116. We should view Singapore's small size not as a limitation but as an opportunity to pioneer integrated and well-coordinated urban solutions. There is great potential for Singapore to share our lessons and solutions with rapidly urbanising cities elsewhere, as our enterprises build up our expertise in urban solutions.



*Artist's impression of Jurong Innovation District. Photo Credit: JTC Corporation*

## **Recommendation 5.1: Invest in our external connectivity**

117. Singapore has served well as a gateway for global players seeking to tap on opportunities in Asia, and for Asian enterprises looking to internationalise beyond their domestic markets. To stay relevant, we must continually invest in new connections. The CFE recommends the following:

- a. **Strengthen our status as a global air hub by investing in new international connections.** The Changi Airport Terminal 5 project will grow our capacity for more passenger travel and air linkages, and in turn support growth in other parts of our economy. We should also progressively upgrade our existing Terminals to maintain quality passenger experiences. With the re-planning of the larger Changi East area, we can promote the growth of related industries, for example, in aerospace and logistics.
- b. **Enhance Singapore's position as a global transshipment hub and leading International Maritime Centre (IMC).** The next generation sea port in Tuas will allow Singapore to handle up to 65 million twenty-foot equivalent units (TEUs) annually when completed, more than double what Singapore handled in 2016. The Tuas Terminal will also keep Singapore anchored as a leading IMC. We should adopt land intensification strategies and raise productivity through technology, including automated guided vehicles in port operations, to reap greater efficiencies. The Government should also explore siting complementary activities such as logistics at the port.
- c. **Leverage the Kuala Lumpur-Singapore HSR project to facilitate seamless cross-border connectivity** between both capitals and spur more economic activities in this region. The HSR will create jobs, enhance business linkages, and promote tourism opportunities, on both sides of the link. It will also catalyse the growth of Singapore's second CBD in the Jurong Lake District, the terminus of the HSR.
- d. **Enhance national ICT infrastructure to make Singapore a key node for the digital world.** Singapore should continue to make infrastructure investments that grow our digital connectivity, both domestically and to the rest of the world. For example, Singapore should continue to promote Singapore as a Digital Harbour and trial technologies such as the Heterogeneous Network (HetNet)<sup>20</sup> that could strengthen Singapore's communications infrastructure. Singapore can also create a "plug-and-play environment" to facilitate the deployment of Internet of Things applications, and foster the conditions to be an attractive test-bed for companies based here.

<sup>20</sup> HetNet refers to modern mobile communications networks, where multiple types of access nodes in a wireless network may be used.

## **Recommendation 5.2: Continue to plan boldly for growth and city rejuvenation**

118. Notwithstanding our limited land, we can increase the space we have if we plan and execute boldly. We should continue to plan and create space for growth and city rejuvenation. The CFE recommends the following:

- a. **Develop innovative ways to create new spaces.** We should expand our use of underground space, and expedite the development of a comprehensive **underground master plan** to identify potential underground uses. For example, large infrastructure — like bus interchanges and electrical substations — could be placed underground where economically viable. We should also explore other innovative ways to create space, such as developments in the air space over existing buildings and roads, and multi-purpose floating platforms.
- b. **Introduce more specialised spaces that improve land productivity** and support growth. We can push towards greater land productivity by moving to multi-level, specialised infrastructure with shared facilities. For example, the JTC Chemicals Hub — which features a multi-level design and shared facilities — allows chemical companies to carry out manufacturing, blending, and distribution activities all in one place, while reducing land take by up to 50%. Introducing more industrial facilities with higher technical specifications and flexible designs can also allow us to move heavy manufacturing to high-rise spaces, and facilitate the adoption of newer technologies.
- c. **Create an urban logistics system** for Singapore that optimises use of land, infrastructure, and goods vehicles movement. We should push for mass adoption of in-mall and off-site consolidation of deliveries, to optimise the loading and unloading of trucks, reduce congestion around the delivery bays of malls, and minimise freight traffic. We should also accelerate plans for the roll-out of a nation-wide locker system, to support the rapidly growing e-commerce market. In addition, we should develop a District Logistics Network in new industrial estates, e.g. in Jurong Innovation District (JID) (See [Figure 5.1](#) for more details).

### **Recommendation 5.3: Build partnerships for a vibrant city**

119. We should create multiple economic clusters of innovation, refresh our lifestyle and leisure options, and foster a deeper appreciation for design and the arts. The CFE recommends the following:

- a. **Develop Jurong Lake District**, to showcase what the future of live-work-learn-play environments could look like. Jurong Lake District has the potential to be a livelier second CBD. We can achieve this if we adopt innovative designs, and plan the district for synergies with the nearby JID, NTU, and the upcoming Tuas Terminal. The district should provide easy access to leisure spaces, including the upcoming Jurong Lake Gardens. A high level of connectivity should also be created through the link-up of various transport nodes, including the eventual Kuala Lumpur-Singapore HSR terminus. We should also aim for a more radical approach towards people-centric urban planning in the design of streets, and push for car-lite concepts within the district.
- b. **Cluster mutually-reinforcing economic activities** for emerging industries in new mixed-use districts, for synergistic growth. The CFE supports the developments in Jurong Lake District, JID and Punggol which will allow us to not only focus on growing these nascent industries, but also create dense clusters of related economic activities. This will yield economies of scale and enhance network effects for businesses. For example, JID could be the centre for advanced manufacturing, urban solutions, CleanTech and smart logistics, while Punggol becomes the place for businesses in the digital, ICT, and cybersecurity fields. With NTU at JID and SIT at Punggol, there can be a strong flow of research, innovation and talent between the education and business campuses. We will need to enhance exchanges and collaborative programmes between industry, academia and other partners. Such partnerships could support industry-relevant skills development, rapid prototyping and commercialising of new ideas.
- c. **Enhance Singapore's physical landscape and cultural and lifestyle offerings to strengthen Singapore's identity and distinctiveness.** As we develop new districts and rejuvenate existing areas, we should be sensitive to our built heritage. We can strive to be a leading city for the development and appreciation of design and the arts, and encourage arts and cultural institutions to undertake more active programming. To boost our lifestyle and entertainment offerings, the CFE recommends that the **private sector partners with the Government to upgrade Orchard Road**. We should leverage Singapore's unique proposition as a City in a Garden and employ both physical transformation and experiential programming to curate a signature street experience. These will make Orchard Road a lively shopping and lifestyle destination, and one of the iconic streets of the world.

- d. **Create spaces that cater to the changing needs of businesses and workers.** Workspaces that double up as community and networking platforms, and facilitate the exchange of ideas, are gaining popularity as the nature of work evolves. **More innovation spaces** should be developed, especially in new districts, to support our startup ecosystem and changing work preferences. **Greater flexibility of uses should also be allowed in industrial areas**, in view of the blurring lines between services and manufacturing. This will allow businesses across sectors and different functional divisions to co-locate, find synergies, and catalyse innovation.
- e. Allow more scope for **Government partnerships with private firms** to co-develop and meet the needs of the city. The CFE recommends:
- i. **Local place-making efforts in existing precincts.** Several precinct associations, such as Singapore River One and Chinatown Business Association, have already undertaken place management initiatives to increase vibrancy and footfall. The Government could study legislation for a formal **place management framework**, to empower businesses to take ownership of their precinct. When doing so, it could consider the Business Improvement District model, which has been successful in other countries.
  - ii. **The development, place-making and management of future precincts.** To respond flexibly to business needs, the Government could partner the private sector as a **“master developer”** to develop, place-make and manage future precincts, so long as the master developer is able to deliver on the desired outcomes for the district. We could also allow greater flexibility in land use to integrate value chains and industries, and enable synergies across the various developments within a precinct. This flexibility creates “white space” where unplanned land use ideas can flourish.

## **Recommendation 5.4: Develop exportable capabilities**

120. **Making Singapore a living lab for innovative urban solutions** will help our Singapore-based enterprises develop exportable capabilities and seize regional growth opportunities. We should help more Singapore-based enterprises in this area by setting aside special test-bedding zones for firms to develop and refine their products. The CFE recommends the following:

- a. **Experiment with new urban mobility solutions.** Singapore should monitor trends — for example, electric vehicles, hydrogen vehicles, and self-driving vehicles (SDV) — and be prepared to embrace them should they become technically and commercially viable. LTA already allows for the testing of self-driving vehicles at one-north. Singapore could also plan ahead, in new districts, by implanting supporting infrastructure such as charging stations, or designing our road networks to cater for precinct-level SDV transit systems.
- b. **Be a model city in sustainability,** by more aggressively investing in R&D, test-beds and commercialisation of new energy solutions. On the supply side, we should ramp up the deployment of solar photovoltaics (PVs) where economically viable and sustainable, and invest in R&D for energy storage solutions and solar forecasting. These could support cost-effective deployment, and enhance energy grid resilience. On the demand side, we should continue to push for greater efficiency in energy usage, through more energy “smart meters” to encourage energy-saving behaviour through real-time feedback. Real-time information will also facilitate the easier implementation of Demand-Side Management (DSM) initiatives and allow for the development of new business models.
- c. **Strengthen water and food resilience.** We should do more to achieve higher water efficiency in the industrial sector, by requiring large industrial water users to report on their water efficiency management plans and encouraging them to adopt technologies that make their processes more water-efficient. We should also improve self-sufficiency in selected strategic agricultural produce, such as eggs and vegetables, by developing new farming technologies and solutions. This can be done via farming models that use less land, such as multi-tiered vegetable farms.

## **Conclusion**

121. We have the opportunity to re-shape and transform Singapore’s cityscape for the long term. We must continue to develop Singapore sustainably and ensure that Singapore will still have plenty of optionality for years to come. We should apply our minds creatively to imagine new spaces, implement bold urban plans and designs, and be good stewards of our precious physical resources. Singapore can be a vibrant and connected city for generations to come.

Figure 5.1: District Logistics Network



## STRATEGY 6: DEVELOP AND IMPLEMENT INDUSTRY TRANSFORMATION MAPS (ITMs)

122. To implement all the CFE strategies coherently, and to address the specific needs of our different industries, the CFE recommends that we champion the ITMs as the **platform for integrative planning and implementation**.

123. Early on in the CFE process, the idea was raised to **create industry-specific platforms to bring together all relevant stakeholders to comprehensively transform each industry**. Recognising the potentially wide-reaching impact of the ITMs, and in the spirit of rapid prototyping and iterative implementation, the Government introduced the Industry Transformation Programme in Budget 2016. The goal was to launch 23 ITMs, covering around 80% of the economy, by the end of FY2017. (See [Appendix 6.1](#) for a list of the ITMs.) Implementation of the ITMs is led by the tripartite Council for Skills, Innovation and Productivity (CSIP), which taps on industry expertise from a wide range of sectors, to create maximum synergies across our skills, innovation and productivity efforts. To date, six ITMs have been launched.<sup>21</sup>



*Joint lab for semiconductor R&D by Applied Materials and Agency for Science, Technology and Research (A\*STAR) Institute of Microelectronics (IME). Photo Credit: A\*STAR*

<sup>21</sup> These are Retail, Food Services, Hotels, Precision Engineering, Logistics and Food Manufacturing.



124. The objective of the ITMs is to keep our industries competitive and generate growth for Singapore. Rather than picking winners, we should build capabilities at the industry level to give our enterprises and workers the best chance of succeeding in the open market. Each ITM will be tailored to the specific needs of the industry and coordinated by a single Government agency, taking into account how it is affected by changes in the global economy and technology. Each ITM puts forward a growth and competitiveness plan, which is developed based on the input from Government agencies, unions, industry partners and TACs. Each plan features four pillars:

- a. **Productivity.** These are strategies to support companies, especially SMEs, to move to higher value-added activities and raise operational efficiency. For instance, the plan could highlight specific operational changes that individual companies can make to increase efficiency, or establish shared platforms that will generate economies of scale for the wider industry. This pillar rides on and sustains the momentum of the work of the National Productivity Council.
- b. **Jobs and Skills.** These are strategies to invest in our people, so that they will not only have the ability to acquire deep skills to support the shift to greater value creation, but also have the opportunities to use them as their industries transform. For instance, the plan could highlight ways in which jobs can be redesigned, or promote initiatives to help workers develop deep skills in preparation for the future. Industry-level SkillsFuture strategies are a key feature in this pillar.
- c. **Innovation and Technology.** These are strategies to leverage R&D and promote the adoption of technology for the benefit of the industry. For instance, R&D could lead to new products or services which our companies can commercialise. New technologies can also introduce new business models, given the rise of digitalisation. If our companies are able to adopt these technologies quickly, it will help them capture a first-mover advantage.
- d. **Trade and Internationalisation.** These are strategies to support companies in expanding to overseas markets and deepening international connections. For instance, this could entail opening new channels for our companies via e-marketplaces or establishing presence overseas, building their capabilities to scale, or strengthening the branding of the entire industry internationally.

125. Besides involving the private sector and unions, the ITMs will also require the **Government to increasingly perform the role of facilitator and enabler of industry transformation.** For example, the Government can create a regulatory environment that is conducive for innovative business models, or set national standards to promote technology adoption.

126. The ITMs will also look for opportunities to **tap on stakeholders such as TACs to act as multipliers**. For example, the Singapore Tourism Board (STB) has entered into a three year partnership with the Singapore Hotels Association (SHA). Both organisations will work together to drive innovation within the industry, support the Hotels ITM through manpower and training initiatives, as well as organise outreach and share best practices. The SHA has also been supporting STB in piloting industry-wide initiatives that leverage economies of scale, such as consolidating procurement requirements for food preparation, and researching best practices in design, operation and technology.

127. We recognise that industries often have linkages to each other, e.g. precision engineering companies often have a supplier relationship with firms in other segments of manufacturing. As we launch more ITMs, we can begin to **organise related ITMs on a cluster basis, where the transformation of one industry can have positive spillover effects on the other**. These should be reviewed regularly to ensure that the industries and clusters remain relevant.

### **Recommendation 6.1: Tailor ITMs for each industry**

128. The CFE recommends that the ITMs take a differentiated approach. The **ITMs should customise their strategies to suit the needs of each industry**, rather than take a one-size-fits-all approach.

129. Industry by industry, the ITMs should drill deep for a full understanding of the challenges and prospects specific to that industry, and home in on the appropriate actions to position it for sustained relevance and competitiveness. Where an industry has good growth prospects, the ITM's task would be to **map out the opportunities, invest in capabilities, and help Singaporeans take up good jobs** in these industries. Such ITMs should also include strategies to strengthen the nexus between R&D investments and industry plans. The logistics sector is an example (See [Appendix 6.2](#)).

130. In contrast, some industries are facing challenges in restructuring, for instance if they are domestically-focused and require large numbers of low-skilled workers. ITMs for such industries will have to focus on strategies to **increase their productivity and upgrade their jobs**. In these industries, ITMs have to identify the key headwinds, and support companies to transform their operations (See [Box Article 6.1](#)). At the same time, we will need to redesign jobs in these industries to keep them attractive and meaningful, while training up new capabilities for the future. One such example is the retail sector (See [Appendix 6.3](#)).

### **Box Article 6.1: Ci Yuan Hawker Centre — An industry upgrading project**

Ci Yuan Hawker Centre is an example where a pilot project seeks to upgrade productivity across multiple players at the same time. Self-payment kiosks and outsourced dishwashing functions reduce manpower reliance, while central kitchen support for hawkers reduces food preparation time by up to four hours a day. Bulk purchasing of ingredients also brings about additional cost savings for the hawkers on the project. Overall, such industry-level upgrading projects reduce the business risk and set-up costs for companies looking to invest in productivity.

### **Recommendation 6.2: Take a cluster approach to maximise synergies across industries**

131. As part of the iterative Industry Transformation process, even as we roll out the remaining ITMs, we can make process and organisational improvements. The CFE recommends **taking a cluster approach** in the next phase of ITMs, to foster synergies across industries.

132. The first six ITMs are demonstrating that there are benefits to coordinating across related industries. For example, one of the strategies in the Precision Engineering ITM is to groom precision engineering SMEs to become core suppliers to MNCs. One of the takeaways from rolling out this strategy is that precision engineering SMEs could in fact compete better with support from the companies within other manufacturing sectors, e.g. aerospace.

133. Similarly, there may be significant adjacencies between jobs within a related cluster of industries. We will need to strengthen our ability to identify these skill adjacencies, and **put in place initiatives where we can take advantage of the skill adjacencies between industries** to support the provision of skilled manpower on both sides, and to help Singaporeans access these opportunities.

134. The CSIP has identified six broad clusters of industries (See [Appendix 6.1](#)), and formed tripartite cluster subcommittees to seek the cross-ITM synergies within each cluster. For example, the subcommittees could identify skill adjacencies within the broad Manufacturing cluster to ensure that we have a ready pool of skilled workers who can access different pathways to good jobs in the various industries within each cluster. They can also consider potential collaboration across the food and hotels sectors in the Lifestyle cluster, for instance. The CFE strongly supports this cluster approach, and suggests that the CSIP do this in a systematic, iterative manner.

135. At the same time, we should be **alert to changing industry configurations**. New industries that do not fit into existing classifications will emerge, and create new links between existing industries. For example, wearable technologies are an industry in itself, and at the same time brings together the fashion and healthcare industry. We shall move in step with such developments, and adjust our ITM and cluster definition and organisation to match the market.

## **Conclusion**

136. The ITMs are the pioneering instrument by which the CFE recommendations will be implemented. The launched ITMs are already applying the CFE strategies and generating benefits for workers and enterprises. The Government should press on with its differentiated approach tailored to each industry. In the next phase of ITMs, a cluster-based approach can boost the transformation of clusters of industries.

## APPENDIX 6.1: LIST OF ITM CLUSTERS AND INDUSTRIES

S/N	Cluster	Sector	Coordinating Agency
1	Manufacturing	Energy & Chemicals and Process Construction & Maintenance	EDB <sup>22</sup>
2		Precision Engineering	EDB
3		Marine & Offshore	EDB
4		Aerospace	EDB
5		Electronics	EDB
6	Built Environment	Construction (including Architecture and Engineering Services)	BCA <sup>23</sup>
7		Real Estate	CEA <sup>24</sup>
8		Environmental Services	NEA <sup>25</sup>
9		Security	MHA <sup>26</sup>
10	Trade and Connectivity	Logistics	EDB
11		Air Transport	CAAS <sup>27</sup>
12		Sea Transport	MPA <sup>28</sup>
13		Land Transport (including Public Transport)	LTA <sup>29</sup>
14		Wholesale Trade	IES <sup>30</sup>
15	Essential	Healthcare	MOH <sup>31</sup>
16	Domestic Services	Education (Early Childhood, and Training & Adult Education)	MOE <sup>32</sup>
17	Modern Services	Professional Services	EDB
18		ICT and Media	MCI <sup>33</sup>
19		Financial Services	MAS <sup>34</sup>
20	Lifestyle	Food Services	SPRING <sup>35</sup>
21		Retail	SPRING
22		Hotels	STB <sup>36</sup>
23		Food Manufacturing	SPRING

<sup>22</sup> Singapore Economic Development Board

<sup>23</sup> Building and Construction Authority

<sup>24</sup> Council for Estate Agencies

<sup>25</sup> National Environment Agency

<sup>26</sup> Ministry of Home Affairs

<sup>27</sup> Civil Aviation Authority of Singapore

<sup>28</sup> Maritime and Port Authority of Singapore

<sup>29</sup> Land Transport Authority

<sup>30</sup> International Enterprise Singapore

<sup>31</sup> Ministry of Health

<sup>32</sup> Ministry of Education

<sup>33</sup> Ministry of Communications and Information

<sup>34</sup> Monetary Authority of Singapore

<sup>35</sup> SPRING Singapore

<sup>36</sup> Singapore Tourism Board

## APPENDIX 6.2: LOGISTICS ITM

1. Logistics is a critical enabler of Singapore's economy. In 2016, the Transportation and Storage sector, which includes logistics, contributed about 8% to Singapore's GDP and about 7% of total employment. The Logistics ITM integrates the efforts of various Government agencies and associations and maps out strategies that will reinforce Singapore's position as a globally leading logistics hub through operations excellence, innovation and a strong Singaporean core. Transformation of the industry is expected to achieve a value-add of S\$8.3 billion and introduce 2,000 new Professional, Managerial, Executive and Technical (PMET) jobs by 2020.
2. The Logistics ITM identifies the opportunities that the industry can tap on as a result of global trends such as the rise of Asia, emerging business and manufacturing developments such as additive manufacturing and omni-channel retail, as well as the advent of new technologies. It takes into consideration the challenges that the industry will face in securing sufficient land and labour, as well as competition from the region and globally.
3. The Logistics ITM puts in place strategies to take advantage of these opportunities.
  - a. First, the ITM will help companies to build differentiating capabilities through the establishment of Centres of Innovation and Centres of Excellence in Singapore. To bolster the logistics innovation eco-system in Singapore, the Government will work with research institutions and universities to develop world-class capabilities in the logistics and supply chain management domains. The Government will also continue to promote Singapore as a choice location for leading manufacturers and brand owners to base their supply chain management activities and decision making.
  - b. Second, it will uplift the operations excellence of the industry by directly supporting companies to tap on suitable process methodologies and technologies. For SMEs, the Government will invest in next-generation facilities with high specifications units that encourage co-location of companies. This will drive the deployment of advanced technologies by operators and improve overall collaboration of the industry to derive productivity savings.
  - c. Third, it will help to support the workforce in acquiring the skills for the jobs in the sector. The logistics industry is expected to create 2,000 PMET jobs by 2020, and see changes to its workforce — rank-and-file jobs will become less laborious and more skilled, while new professional roles will be created. Through the Adapt and Grow initiative, the Government aims to help mid-careerists from other sectors transit smoothly into the industry. Workforce Singapore (WSG) will also support the current logistics workforce to acquire niche and emerging skills through the Industry Catalyst Programme. A Logistics Skills Framework that provides comprehensive information on career pathways in the logistics industry led by SkillsFuture Singapore (SSG) will also be developed. These initiatives will complement each other and further strengthen the Singaporean core within the Logistics industry.

- d. Fourth, to enable enterprise growth, the ITM will support the adoption of technology and the development of specialised logistics handling capabilities. Enterprises will also be supported in their market expansion efforts to secure trade flows and increase international presence. With these efforts, the ITM hopes to scale up more Singapore-based companies.
- e. Finally, the Logistics ITM will improve our domestic urban logistics to deliver resource optimisation for enterprises and the public.

4. In executing these strategies, the Logistics ITM will involve the TACs, for example, through projects to optimise resource utilisation across industry players. The active participation of TACs such as the Singapore Logistics Association in the Logistics ITM will also ensure that more companies can come to know of and tap the benefits of its initiatives. It will also tap on the support of our unions to help workers, especially the most vulnerable, to reskill and take on jobs in this sector.

## APPENDIX 6.3: RETAIL ITM

1. Retail is an important industry in Singapore, made up of about 22,000 retail establishments, contributing almost 1.4% to GDP and about 4% of total employment.<sup>37</sup>
2. The industry faces several near term challenges, including fewer business travelers, as well as structural challenges such as consumer shifts from brick-and-mortar to e-commerce.
3. The 2020 vision of the Retail ITM is for Singapore to have a vibrant retail industry, comprising a mix of highly productive omni-channel retailers and local brand owners with global footprints, supported by a professional and skilled workforce.
4. Strategies have been identified in four key areas:
  - a. First, the ITM aims to drive growth through innovation. SPRING Singapore (SPRING) and IMDA will work together to support retailers to adopt an omni-channel strategy. This will help retailers to better reach out to and support targeted end-to-end consumer needs across both online and offline channels. The aim is to grow the e-commerce share of total retail receipts from the current 3% to 10% by 2020. The ITM also aims to help retailers to develop new retail concepts and brands. This includes working with companies to support R&D and prototyping for in-house product development, as well as holding masterclasses to help retailers adopt innovative and differentiated concepts.
  - b. Second, the ITM aims to improve productivity through technology. The goal is for the retail industry to achieve an average annual productivity growth rate of 1% from now till 2020 without increasing the sector's overall reliance on manpower. This will call for aggressive deployment of manpower-saving technologies at the store-front and back-end, as well as piloting new technologies. Examples include Radio Frequency Identification (RFID) for inventory management, automated retail services and cashier-less stores.
  - c. Third, the ITM will help build a future-ready and productive retail workforce. This will include redesigning jobs, enhancing career progression pathways and investing more in skills training. The Adapt and Grow initiative will help Singaporeans adapt to changing job demands and grow their skills. The Retail Professional Conversion Programme, P-Max and Career Support Programme will provide workers with greater access to good jobs with better career progression pathways. SPRING is also working with SSG to develop a Skills Framework for Retail to upskill the workforce to move into emerging jobs in retail, e.g. digital marketing and data analytics.

<sup>37</sup> The retail industry is defined as retail trade excluding sales of motor vehicles, petrol stations, and hawkers and stall-holders.

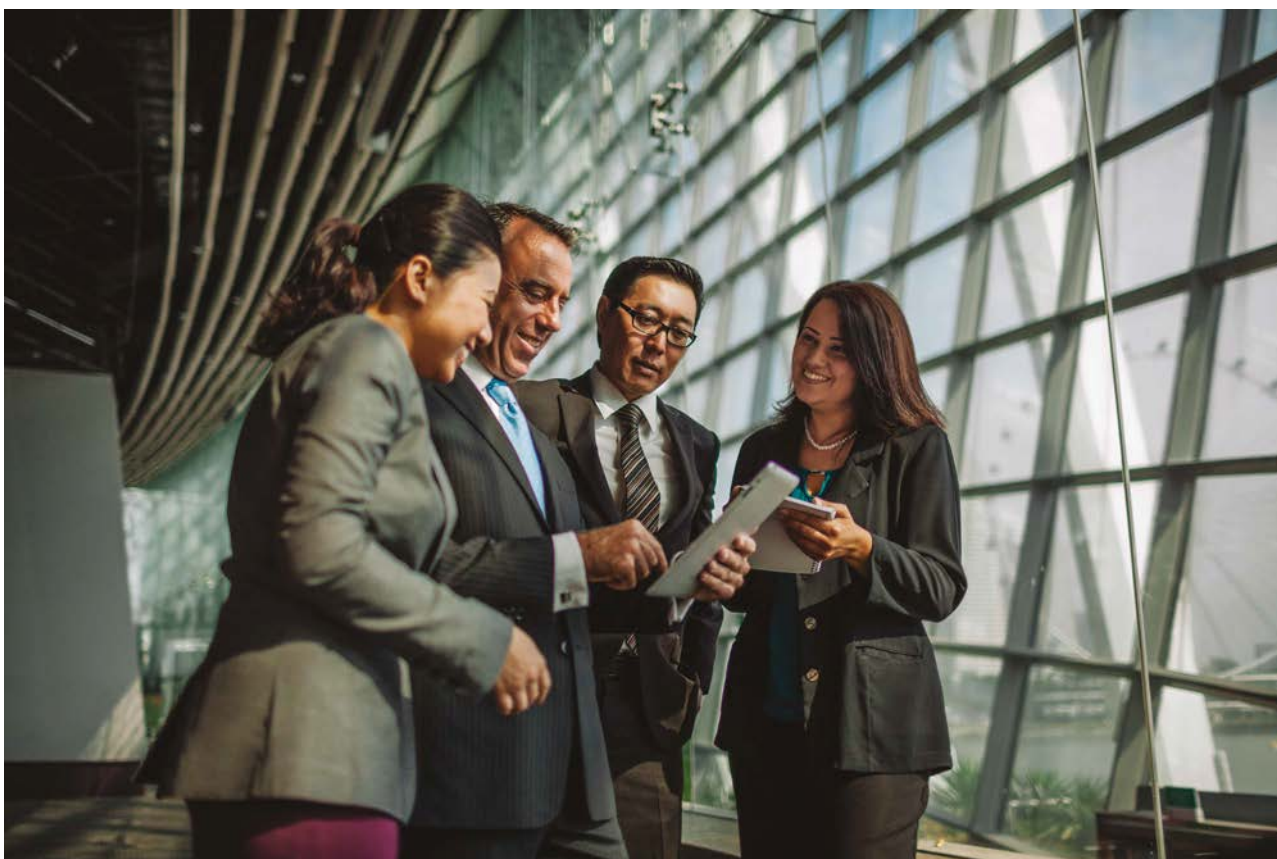


d. Finally, the ITM aims to help our retail companies to internationalise for growth. This includes continuing efforts to help companies create regional and global brands, and facilitating internationalisation through digital channels. TACs such as the Singapore Retailers' Association and Singapore Furniture Industry Council play an important role in supporting companies in this transformation journey, e.g. by providing networking support in international markets. Our labour movement can also encourage our workers to pick up skills which will be important in the retail sector in the future, such as in search engine optimisation and omni-channel marketing.

## STRATEGY 7: PARTNER EACH OTHER TO ENABLE INNOVATION AND GROWTH

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137. Our path ahead is uncharted. Unpredictable economic, technological and geopolitical changes are affecting life and business in every country, and will require each of us to rediscover our place in and value to the world. In Singapore, the pioneering spirit that brought us from Third World to First remains strong. In our next phase of growth, we must follow our pioneering instincts, pull together and partner one another to secure a bright future for Singapore.



*Partnerships for success. Photo Credit: Singapore Tourism Board*

138. Everyone has a part to play in this journey:

- a. Our people must take ownership for acquiring, developing and using their skills and capabilities;
- b. Our enterprises must seize opportunities and build capabilities, including by forming partnerships in our dense and diverse corporate ecosystem;
- c. TACs are valuable multipliers in the overall ecosystem, seeking shared solutions for their industry members, and leading sector-level initiatives;
- d. Unions too can play an important role in supporting their members' evolving needs, by expanding services and growing networks;
- e. Our RIs, IHLs, as well as our training providers, are critical in helping our industries and workers prepare for the future economy and tap on the best talent and ideas from around the world; and
- f. The Government can also help the economy thrive through its regulatory and policy levers as well as its own spending.

### **Recommendation 7.1: A greater role for TACs and unions**

**139. Our TACs and unions, as valuable multipliers, are leading actors in the industry transformation mission.** TACs can assume a wide range of proactive roles to lead industry-level initiatives, and support enterprises to scale up and make inroads into overseas markets (See [Box Article 7.1](#)). They can also support the development of skills frameworks, help our RIs and IHLs obtain a better understanding of the needs of each industry<sup>38</sup>, and provide valuable feedback in the development of our ITMs.

#### **Box Article 7.1: How a TAC supported internationalisation**

The Singapore Manufacturing Federation (SMF) is an active trade association formed in 1932 to champion the Singapore manufacturing sector and drive its competitiveness and sustainable growth. As an example, to support internationalisation, the SMF has collaborated with the Enterprise Europe Network (EEN), IE Singapore and Intellectual Property Intermediary (IPI) to form an EEN Singapore Centre. Launched in April 2016, the Centre facilitates Singapore companies' access to technological know-how, IP and partnership opportunities within Europe. To date, there are over 500 Singapore companies registered with the Centre, which has facilitated over 200 business-to-business meetings and expressions of interest. Eight partnership agreements have also been signed.

<sup>38</sup> For example, the Technology Adoption Programme supports collaboration amongst TACs, RIs, IHLs and industry partners to identify and translate new technologies into Ready-to-Go (RTG) solutions to address productivity challenges in SMEs.

140. **More TACs should step forward to lead more industry initiatives.** To do so, they can tap on the Local Enterprise and Association Development (LEAD) programme. This provides grant support to TACs to lead efforts in industry upgrading, internationalisation and secretariat upgrading. LEAD+ was introduced in 2016 to provide support for TACs to deepen their capabilities further.

141. Other types of associations, such as merchant associations, can also play an important role by driving locality-based upgrading and helping businesses, especially the micro and small enterprises, strengthen their capabilities. For example, Singapore River One and the Chinatown Business Association have run various initiatives to add to the vibrancy and footfall in their precincts, thereby improving prospects for the enterprises located in their precincts.

142. **Tripartism** in Singapore has been a key competitive advantage for us. Our good industrial relations remain an enduring strength. Going forward, **our unions must continue to encourage and help Singaporeans prepare for the jobs of the future.** Unions can work with Government in the following ways:

- a. **Placement of workers in new jobs**, particularly the most vulnerable. This could include working closely with MOM's Adapt and Grow initiative, and continuing to enhance the programmes under the e2i;
- b. **Preparing workers for the jobs of tomorrow**, working closely with employers, WSG and SSG to sense market needs and develop skills;
- c. **Increasing productivity.** Our unions should support our productivity and innovation efforts, and work closely with the Government to operationalise the ITMs, including playing a valuable role in reaching out to workers; and
- d. **Improving working conditions**, such as through the Progressive Wage Model for selected industries with low wage workers, and working closely with the Government on issues such as workplace safety.

## **Recommendation 7.2: Create a regulatory environment to support innovation and risk-taking**

143. Over the past 50 years, the Government had invested in education, infrastructure and created a business-friendly environment. Our processes and regulations have provided a safe and predictable environment for our people and enterprises, but have grown established and less flexible over time. The Government will need to be nimbler given the rapid pace of innovation and increasing global competition. We must take risks and be willing to make fundamental changes to support the emergence of potentially-disruptive business activities. The CFE recommends that the Government should:

- a. **Regulate in a forward-looking manner** to proactively address technological and industry innovations. This will require regulatory agencies to balance risk concerns with industry development needs.
  - i. Focus on high potential areas. The Government should identify and **focus on areas with high potential for technological and industry innovation**, and where regulation needs to keep pace. Providing clear and updated regulations will be particularly important for the development of these emerging industries, such as MedTech, FinTech, and food and nutrition. The regulatory agencies should then systematically collaborate to review existing regulations.
  - ii. Take a ground-up perspective when reviewing regulations. Regulatory agencies should consider end-to-end business requirements and work to harmonise the various standards and compliance requirements to **enhance the ease of doing business**.
- b. **Develop a greater capacity in the public service to encourage innovations.** Some Government agencies already have a track record of facilitating innovation, such as MAS for FinTech and LTA for autonomous vehicles. Other Government agencies that regulate new sub-sectors should adopt a similar approach.
  - i. The Government and industry should work together to proactively identify other areas to **test regulatory innovations**, such as sandboxes, to enable trials of new innovations in a real-world environment with appropriate safeguards. This will then inform the drafting of new regulations or the revision of existing regulations, to facilitate the implementation and roll-out of new innovations.

144. The Government should also **streamline existing support schemes across the whole of Government to make support more accessible to firms**, especially SMEs. Acknowledging that SMEs often have to prioritise day-to-day operational issues over longer-term capability-upgrading projects, we could make the grant landscape even more accessible, to nudge their behaviour and encourage more capability development. An example of this is the Business Grants Portal (See [Box Article 7.2](#)).

#### **Box Article 7.2: Business Grants Portal (BGP)**

The BGP ([www.businessgrants.gov.sg](http://www.businessgrants.gov.sg)) aims to make grants even more accessible to businesses. Through the BGP, businesses can now easily find the relevant grants to support their business needs, without the need to approach multiple agencies. The application process and required data fields in application forms have also been simplified to help enterprises apply for grants more easily.

This change moves us from a “scheme-centric” system to one that is “firm-centric”, increasing the efficiency and effectiveness of grant administration for both the Government and users alike.

145. The Government should also **review the roles and functions of Government agencies which support enterprises to start, grow and internationalise**. For example, lead public sector agencies can be assigned to coordinate the assistance rendered to enterprises that are interested in and have the potential to rapidly scale up.

#### **Recommendation 7.3: Use Government lead demand to support the development of promising industries**

146. Government procurement has the potential to support the development of industries. The Government should consider **using lead demand more systematically to support the development of promising industries**, especially where this coincides with our own strategic national needs. Government procurement can be an avenue to test and validate new solutions. Newer firms especially, with shorter track records, can benefit from citing the Government as a reference customer.

147. The Government can use lead demand to drive innovation and build capabilities in a few ways:

- a. **Issue public sector challenges** to encourage companies to explore, pilot and co-develop innovative solutions to specific problems. An example is the Healthcare Innovation Challenge co-organised by IMDA and the National Healthcare Group.

- b. **Set aside resources**, e.g. manpower and funding, to **spur innovation procurement**.
- c. **Expand accreditation schemes to support promising and innovative startups and SMEs** to overcome the lack of track record in some cases, and build trust in our enterprises, for example through IMDA's Accreditation@IMDA programme.

#### **Recommendation 7.4: Review and reshape Singapore's tax system**

148. Over the years, the Government has shaped the tax system in Singapore to be pro-growth and progressive by keeping tax rates internationally competitive and building a broad base of direct and indirect taxes. This has allowed us to encourage effort and enterprise, and create good jobs.

149. Going forward, domestic and global changes will require us to review and refine our tax policies. These include rising social expenditure needs due to ageing, and growing momentum for international tax developments such as the OECD Base Erosion and Profit Shifting (BEPS) project.

150. The CFE calls on the Government to maintain a **tax regime** that upholds two principles. First, Singapore's tax system should remain **broad-based, progressive and fair**, even as revenues are raised over time to meet rising domestic needs. Second, Singapore's tax system must remain **competitive and pro-growth**.

#### **Recommendation 7.5: Create a sustainable environment**

151. As Singapore's economy grows, the **Government should not overlook the quality of the environment**. Our reputation as a City in a Garden has placed Singapore on the tourism map, and has enhanced the liveability for all who call Singapore home. As concerns rise internationally on climate change and environmental sustainability, the CFE recommends that **Singapore should continue to contribute to global efforts to maintain a high standard of environmental sustainability**. We need to be good stewards of our precious physical resources, so that we can maintain a high quality living environment in Singapore for generations to come.

#### **Conclusion**

152. By working in partnership, we will be able to multiply our efforts to increase the chances of Singapore's success in our next phase of economic growth. It is not the sole purview of the Government to transform the economy — our many stakeholders must contribute to the collective outcome by taking action. Our stakeholders all have to play their part to give our economy the competitive edge, so that Singapore may pioneer an innovative and inclusive path into the future economy.

## ANNEX 1: CFE SUBCOMMITTEE REPORTS

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1. The CFE was organised into 5 subcommittees, to review and make recommendations in the following areas:

- a. Future corporate capabilities and innovation
- b. Future growth industries and markets
- c. Future of connectivity
- d. Future city
- e. Future jobs and skills

2. The discussions from these subcommittees were distilled in the main committee report and its seven strategies. However, to reflect the work of the subcommittees and the diversity of views obtained by the CFE, each of the subcommittees has also summarised its recommendations in this annex.



# SUBCOMMITTEE ON FUTURE CORPORATE CAPABILITIES AND INNOVATION

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## Introduction

1. The Subcommittee for Future Corporate Capabilities and Innovation sought to:
  - a. Recommend strategies to enable enterprises and industry clusters to develop innovative capacities, and use technology as well as new business models and partnerships to create value.
  - b. Examine these strategies in relation to multinational corporations (MNCs), large Singapore-based enterprises, small and medium enterprises (SMEs) and startups, and the interaction among them within and across industries.
2. Our recommendations are in two themes: building enterprise-level capabilities, for enterprises at each of the different stages of growth; and building systems-level capabilities, to drive innovation, enterprise and a more risk-tolerant culture.

## Theme SC1.1: Building enterprise-level capabilities

3. All enterprises, large and small, are subject to global competition and technological change. But enterprises at different stages of their life cycle respond to these challenges differently, and require different forms of support.

### *Recommendation SC1.1: Enhance support for startups in mentoring, market access and financing*

4. Young and well-educated entrepreneurs can now leverage the borderless digital world and technological advancement to create a regional or global company within a short span of time. Many are driven by the prospect of disrupting existing industries and improving lives.

5. Singapore has done well in encouraging startups. We teach entrepreneurial skills in our Institutes of Higher Learning (IHLs), and have developed distinctive infrastructure such as Launchpad, in Singapore and overseas. We now rank top 10 among startup nations. The number of startups in high-technology<sup>39</sup> sectors has increased by 70% from 2,800 in 2003 to 4,800 in 2015. More venture capital (VC) funds have set up in Singapore.

6. We propose to strengthen the current startup ecosystem further by enhancing support in mentoring, market access, and financing.

<sup>39</sup>This is based on SPRING Singapore's definition of high technology sectors, which include pharmaceuticals, biomedical manufacturing and hardware manufacturing.

- a. Encourage large enterprises to collaborate with startups, giving startups access to funding and the large enterprises' corporate capabilities and networks;
- b. Review regulatory compliance requirements for VCs to make Singapore more attractive to larger VCs;
- c. Encourage more angel investors and private equity firms to be based in Singapore, and facilitate syndicated investments, through appropriate incentives; and
- d. Facilitate denser personal networking amongst stakeholders of the startup industry through entities such as SGInnovate.

**Recommendation SC1.2: Strengthen Trade Associations and Chambers (TACs) and empower strong TACs as partners to support SME transformation**

7. SMEs are the bedrock of any economy, including Singapore. They account for about half of our GDP and two-thirds of employment, and are an integral part of the rich ecosystem of our industries. Dynamic and innovative SMEs have the potential to scale up into global enterprises anchored in Singapore.

8. Currently, some 70,000 SMEs in Singapore are engaged each year by TACs and the Government through conferences, workshops and business advisory services. TACs are important partners in upgrading our SMEs to be ready for the future. Stronger TACs can work closely with the Government to conduct mass outreach, to actively spur SMEs in their respective sectors to upgrade their capabilities, raise productivity, embrace innovation and transform their businesses. Stronger TACs can also be empowered to lead in promoting platform technologies, new business models or more productive operational processes.

**Recommendation SC1.3: Streamline existing schemes to be easier to use**

9. Government schemes should also be streamlined as much as possible. SMEs need not know all the schemes and their detailed operating mechanics. Instead, they should approach TACs or SME Centres who can help them tap on a small handful of schemes to assist in the SME's specific needs in automation and technology, organisation capabilities, internationalisation and human capital development.

10. This also means that the administration of schemes will be different – instead of having different agencies processing grant applications based on their own fixed set of criteria and areas of support, all agencies will be able to support all deserving SMEs using streamlined, consolidated grants which can be packaged in ways that cater to different business needs, using criteria with room for customisation. Administrators should be empowered, within bounds, to design packages that best assist SMEs based on their circumstances.

**Recommendation SC1.4: Focus help for high-growth enterprises to seize global opportunities from their home base in Singapore**

11. Attracting MNCs to Singapore continues to be important. In addition, we need to groom and scale up more Singapore-based enterprises. Singapore can be a place where we develop solutions, market and sell them to the region, and scale up businesses. As a platform for growth, we will have access to growth capital and regional markets, and local and regional manpower and talent — backed by Singapore’s trusted brand.

12. To better support promising enterprises to scale up, there must be focused help for high growth and promising Singapore-based enterprises to grow the next generation of champions. This should be a dynamic list that can change depending on their performance and prospects. The Government’s support can be in easing the enterprises’ access to growth capital, facilitating their entry into overseas markets, deepening their technology edge, growing and developing their talent pool, and connecting them to mentors and experienced entrepreneurs.

13. Having a deep and liquid capital market, and having more enterprises anchoring in Singapore to access growth capital, are mutually reinforcing. We should establish a more structured approach for enterprises that had raised capital in the private space to move into the public market, coupled with efforts to increase the vibrancy and attractiveness of our public market.

**Theme SC1.2: Building systems-level capabilities**

14. Beyond enterprise-specific recommendations, the subcommittee also recommends key shifts to improve the system/environment in which our enterprises operate.

**Recommendation SC1.5: Accelerate the adoption of data-driven innovation**

15. Building on Singapore’s advantages of good global digital connectivity, reputation for good governance, trusted institutions and frameworks, and our Smart Nation vision — Singapore could seize a first-mover advantage in developing a strong data architecture where information flows seamlessly and safely and useful data is accessible to business to spur innovation and new business models, which in turn buttress Singapore’s reputation as a centre for high-value data analytics. The subcommittee proposes to:

- a. Have a party that maintains oversight of the national effort across agencies to provide regulatory guidance on personal data and to accelerate adoption of data-driven innovation in the private sector — through flagship “lead adoption” data science projects with large enterprises, and mass adoption of data science among SMEs;
- b. Grow demand for data, by driving large-scale data analytics projects in key sectors, such as in healthcare, retail and finance, involving both key enterprises and Government agencies. New approaches could then be integrated into our Industry Transformation Maps;
- c. To enhance the supply of Government data with economic value through real-time Application Programming Interfaces (APIs), that could result in new business services; and
- d. To continue to develop and expand the talent pool for data analytics for both the infocomm technology (ICT) and non-ICT sectors, and facilitate the linkages and exchange of such talent between the public and private sectors.

**Recommendation SC1.6: Regulatory innovations (such as “no action letter” and sandboxes) to enable innovative and new business models**

16. Various industries have faced the challenge of disruptive competition — unconventional in oil and gas, Uber and Grab in the taxi industry, Spotify in music. The disruptive businesses may not even be lucrative or employing a superior technology. But they force existing players to adapt or perish.

17. This presents a dilemma for regulators who will come under pressure from existing players to keep out disruptive competitors. Disruptive businesses made possible by innovation and technology present unfamiliar regulatory territory, where existing rules may not apply or are not able to apply, but they reflect a long-term trend and the new reality. They also present more choices to consumers. We need to embrace disruptive businesses and keep abreast of technological advancement. We should have an innovation-friendly and agile regulatory environment to allow new growth sectors driven by new technologies to emerge. Singapore’s urban environment, with a sophisticated consumer base and forward-looking regulatory regimes will position us as an attractive location to develop, pilot, and scale up new business models and technologies.

18. Regulatory agencies should adopt a ‘never say no’ approach when dealing with a new business model, and be prepared to allow it to be piloted under conditions, even tight ones. This could mean setting up regulatory sandboxes, such that within certain parameters, new business models can make forays into the Singapore market. This can be complemented with ‘no action letters’ issued by regulatory agencies, to assure disruptive players that they are within the law so long as they operate within prescribed parameters. To ensure a fair playing field, such measures should be time-limited, after which a new set of regulations that take into account these new business models would be formulated accordingly.

### **Recommendation SC1.7: Government lead demand to spur innovation**

19. Experience in other countries, such as the European Union's (EU) Public Procurement for Innovative Solutions Programme, Korea's New Technology Purchasing Assurance Scheme, Finland's TEKES Smart Procurement Programme, shows that government lead demand can be an effective tool to improve public service delivery and also stimulate innovation.

20. Industries value Government lead demand as it encourages them to co-create and develop new innovative products, and provides an opportunity to test-bed and validate new solutions in a real operating environment with contained risks. It also helps build a track record and facilitates export, by citing the Government as a reference customer.

21. Singapore could build stronger expertise in structuring procurement processes and contracts, especially in sectors such as urban solutions, healthcare, and Smart Nation. To support this, the Government could:

- a. Issue public sector challenges, so as to work with enterprises to explore, pilot and co-develop innovative solutions;
- b. Identify and resource lead agencies to drive lead demand, including setting aside a use-it-or-lose-it budget in public sector organisations to spur lead demand; and
- c. Expand accreditation schemes to support promising and innovative startups and SMEs, to overcome the lack of a track record.

### **Recommendation SC1.8: Deepening the role of universities as a driver of innovation and enterprise**

22. Under the Research, Innovation and Enterprise (RIE) 2020 plan, universities are key players in the discovery, use and dissemination of knowledge. Research in universities covers a spectrum, from pure research to applied research that draws in large enterprises, spawns startups and adds buzz to university incubators. Through teaching, universities disseminate knowledge and grow Singapore's human capital. Through collaborations, they transfer knowledge and raise the technological and innovation capabilities of our enterprises and public sector service providers.

23. That is why major global innovation hubs — Boston, Israel, Silicon Valley — are anchored by top universities. Singapore could deepen the role of our universities to serve as brain trusts and drivers of innovation and enterprise, by:

- a. Increasing opportunities for industry experts to teach and perform applied research whether on a full or part-time basis;
- b. Involving university faculty and PhD students in planning major Government projects and proposing better technological solutions; and
- c. Expanding overseas enterprise and innovation launchpads to provide students with experiential learning in overseas startups, expose them to a foreign business environment, and plug them into networks, especially in Asia.

**Recommendation SC1.9: Better translate research and development (R&D) into economic outcomes**

24. Intellectual property (IP) provides economic incentives for businesses and researchers to invest in R&D and a legal and commercial framework to facilitate collaboration across the Government, academia and industries. Economies that create, preserve and disseminate IP well will be innovative and competitive.

25. Driving growth and prosperity for Singapore is a key motivation behind the Government's heavy investment through RIE2015 and RIE2020 — involving public agencies, Agency for Science, Technology and Research (A\*STAR) research institutes, universities, polytechnics and enterprises. Looking ahead, a key focus is on commercialising the knowledge, generating employment, improving lives and creating tangible economic value.

26. IP policies of our publicly-funded research performers play an important role in facilitating commercialisation of R&D outcomes. We must enable IP developed through public investment to be taken up by private enterprises who can best exploit it to create economic activities and jobs. This can be by non-exclusive licensing, exclusive licensing or full assignment of ownership rights. We need a clear and ambitious IP strategy and a standardised IP protocol, which translates into speed, clarity and consistency in our approach to commercialising IP and creating enterprises.

27. We should establish commercially-oriented entities with the technical expertise, business networks, and instincts to better commercialise the research findings and IP of our R&D outcomes. We must also grow our pool of IP management professionals, facilitate bundling of IPs across publicly-funded research performers and improve their outreach to industries, to encourage more commercialisation of IP in Singapore.

### *Recommendation SC1.10: Expand pipeline of technical and entrepreneurial talent*

28. With Singapore's limited domestic market, our people and enterprises must have a global mindset from the onset even if they start local. Startups and SMEs need capable entrepreneurs with a global outlook, and professionals with investment, business development, and legal and regulatory skills from different countries. Large Singapore-based enterprises and MNCs need capable executives with an entrepreneurial mindset, international experience and global networks.

29. There has however been feedback that Singaporeans are often reluctant to take overseas postings, especially in emerging markets. Their concerns include not seeing such postings as a key part of career development, and relocation of their family. We must have a structured approach for Singaporeans to acquire overseas experience, and let Singaporeans see the value of such exposure.

- a. Expand overseas entrepreneurial opportunities to students from all post-secondary education institutions;
- b. Review current work pass schemes to facilitate entry of more startup founders and key executives who are prepared to anchor their growing businesses in Singapore;
- c. Organise the best students in mathematics and science to compete to be posted, into technology-based vocations during Full-Time National Service. This can help develop a generation of expertise steeped in military technologies such as data analytics, robotics and cybersecurity. After they leave the military, they can form a strong deep-tech human network. The subcommittee recommends that the Ministry of Defence consider setting up such technology vocations and give this initiative sufficient priority in terms of competing for the best talent; and
- d. Set up structured development programs with MNCs and large Singapore-based enterprises to provide early-career overseas exposure to Singaporeans.

### **Conclusion**

30. Building up the innovation capacity of Singapore is not just about public spending, policies and regulations, but also the culture and mind sets of our people. This will take time to shift, and perseverance to see through.

31. The subcommittee hopes that these ten recommendations will collectively change our mindsets and culture over time, so that Singaporeans and our enterprises will become more innovative, enterprising and risk-taking, and forge strong partnerships — the Government, our enterprises, and Singaporeans — to seize global opportunities together from our home in Singapore.

# SUBCOMMITTEE ON FUTURE GROWTH INDUSTRIES AND MARKETS

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## Introduction

1. The Subcommittee on Future Growth Industries and Markets has identified (i) key industry clusters and internationalisation opportunities, given global trends and Singapore's comparative advantages; and (ii) strategies to develop these clusters and address these growth opportunities. Its recommendations are driven by global forces that could pose both challenges and opportunities for Singapore's relevance as a key node in the global economy. These forces include the rapid digitalisation of economic activity, industrialisation and urbanisation of emerging economies, aging populations in economically advanced countries, and the changing configuration of economic relations in Asia.

## How Singapore must position itself

2. The subcommittee proposes three broad strategies to help Singapore develop new capabilities, transform existing industries and thrive in the face of such changes. These build on and deepen **strategies 1, 3 and 4** of the main report:

- a. **Develop deep digital capabilities.** With cross-border flows increasingly digitalised, Singapore must establish leadership in key digital segments and be embedded in the digital economy.
- b. **Build strong capabilities in innovation.** Growing consumption power of rising urban populations will create more pressure on companies and governments to constantly better standards. To thrive, Singapore needs to build on existing strengths and lead by innovating new solutions and businesses for the world.
- c. **Tap opportunities in a changing Asia.** Singapore needs to deepen its strategic engagement with the region, help its enterprises internationalise more quickly, and groom talent with global mind-sets and deep regional market expertise.

3. Through the subcommittee's consultations, six growth clusters emerged that marry high projected growth rates with Singapore's comparative advantages: (i) the digital cluster, (ii) advanced manufacturing, (iii) hub services, (iv) logistics<sup>40</sup> (v) urban solutions and infrastructure and (vi) healthcare. These build on Singapore's capabilities and provide good opportunities to achieve sustained growth. At the same time, we will continue to transform the rest of our economy, which include many areas of strength. Similarly, the growth markets with which Singapore should focus on developing stronger ties are Southeast Asia (SEA), China and India. Finally, three horizontals (scaling up, internationalisation, and empowering our workforce) that will enable Singapore to succeed in these growth clusters and markets. The rest of this report elaborates on how Singapore can develop these growth clusters and tap into export and internationalisation opportunities in the identified growth markets.

<sup>40</sup> For more details on this, please see the report of the Subcommittee on the Future of Connectivity.



## **Theme SC2.1: Positioning Singapore as a digital centre in Asia**

4. Singapore must carve out a role as a digital centre in Asia, where innovative digital solutions, services, and businesses are created, monetised, and exported. Global indices have identified Singapore as a leader in digital maturity<sup>41</sup> and network readiness<sup>42</sup>, and Singapore hosts over 200 of the world's top digital companies and the world's densest startup ecosystem.<sup>43</sup> Singapore must build on its strengths in digital infrastructure and capabilities while creating an enabling environment for industries, companies and workers.

### **Recommendation SC2.1: Establish regional and global leadership in key digital segments**

5. Singapore should establish leadership in key digital segments, by building an enabling environment with core capabilities and infrastructure while catalysing the creation of innovative digital services. The three proposed initiatives are to build advanced analytics and cybersecurity capabilities; build critical communications, e-payments and last mile logistics infrastructure to support regional digital businesses and e-commerce; and enable innovative digital services through partnerships and new regulatory frameworks.

### **Recommendation SC2.2: Boost adoption of data science and data-driven innovation**

6. In the digital economy, data will be a key resource. The Government should establish a dedicated programme office to encourage the adoption of data science and data exchange in the private sector. The proposed initiatives are to promote adoption of data science across focus industries; and supply more economically valuable Government data.

### **Recommendation SC2.3: Accelerate digitalisation in the Government, industries and companies**

7. In line with the Smart Nation vision, the Government should invest in national digital platforms to transform transactions with companies and citizens. These platforms could be scaled globally through value-added private sector services. To accelerate the digitalisation of industries and companies, the Government should incorporate digital technologies within the plans for key sectors and provide access to capabilities and capital.

<sup>41</sup> This is based on the Digital Evolution Index 2014 by MasterCard and the Fletcher School at Tufts University, in which Singapore ranked #1. The study ranks each country's digital readiness based on 1) supply (how technology and infrastructure affects growth), 2) demand (consumer demographics and income), 3) institutions (governmental policies), and 4) innovation (have startups and outside companies found the environment conducive to new business).

<sup>42</sup> This is based on the Networked Readiness Index 2016 by World Economic Forum, in which Singapore ranked #1. The study ranks how well countries use information technology to drive social and economic transformation, and uses indicators such as education quality and a government's use of information and communications technologies (ICT).

<sup>43</sup> This is based on the Startup Ecosystem Ranking 2015 Report by Compass, in which Singapore ranked #10. The study ranks ecosystems by 1) performance, 2) funding, 3) talent, 4) market reach, and 5) startup experience.

**Recommendation SC2.4: Build a strong pipeline of digital talent and accelerate reskilling efforts**

8. The Government should build a strong pipeline of digital talent while deepening and reskilling talent at scale. In particular, it should focus on high-demand areas, such as data analytics and cybersecurity. The two proposed initiatives are for the Government to act as a training partner to build a strong pipeline of industry-ready digital talent; and to build a TechSkills Accelerator (TeSA) to deepen and reskill infocomm technology (ICT) and science, technology, engineering and mathematics (STEM) professionals.

**Theme SC2.2: Building on Singapore's industrial strengths to succeed as a lead hub for advanced manufacturing (AM)**

9. Manufacturing has been and will continue to be a key pillar of Singapore's economy (See [Appendix 3.1](#) of this report). AM technologies will transform the way that factories and supply chains are organised and products created. This will alleviate resource constraints and enhance productivity, creating opportunities to attract manufacturing activities and develop adjacent products, services and business models. It will strengthen our leadership in the aerospace, semiconductors, machinery and systems, biopharmaceuticals and chemicals sectors. To serve as a globally competitive, lead manufacturing hub, Singapore should augment its current base of complex manufacturing capabilities, and prepare its workforce to take on the jobs created by the integration and adoption of AM technologies.

**Recommendation SC2.5: Attract high-value manufacturing investments**

10. The Government should encourage companies to (i) undertake more complex, high-value manufacturing activities in Singapore and (ii) anchor strategic manufacturing investments in key sectors. Singapore should stay attractive for manufacturing, by ensuring regulations remain conducive for technology innovation and adoption, and improving infrastructure.

**Recommendation SC2.6: Transform our manufacturing base to become more resource efficient**

11. Companies should use AM techniques to reduce resource reliance. The Government should introduce initiatives to boost mass adoption, lead adoption and innovation of AM technologies to raise productivity of manufacturing firms. The four proposed initiatives are to build public-private showcases of AM facilities; provide access to research equipment and AM technologies; anchor "Factories of the Future"; and invest in R&D of AM technologies.

*Recommendation SC2.7: Foster the creation of manufacturing products, services and business models in Singapore*

12. Singapore should boost the creation, manufacture and export of locally-developed products and technologies. It should help key manufacturers evolve into solution providers by strengthening their capabilities in adjacent services (e.g. predictive maintenance). The two proposed initiatives are to build pilot facilities in public research institutions to test and scale product and process technologies; and facilitate business model innovation.

*Recommendation SC2.8: Train workers for jobs created by the integration and adoption of AM*

13. While the adoption of AM technologies may displace some menial jobs, it will create high value-adding jobs (e.g. industrial data scientists). Singapore should train its workforce for these roles, and ease the transition of displaced employees. The proposed initiatives are to tailor educational offerings in vocational schools and universities; re-train and accredit the workforce to take on new AM roles; and promote career opportunities created by AM.

**Theme SC2.3: Building a vibrant hub services ecosystem**

14. Hub services are vital business functions that direct the cross-border flows of goods, services, capital and people. To harness opportunities arising from Asia's growing share of global goods, services and capital flows, Singapore should anchor and expand its roles as the nerve centre facilitating Asia-centric trade and capital flows, as well as a global exchange for origination, brokering, structuring and financing of key global deals.

*Recommendation SC2.9: Strengthen competitiveness in key hub services verticals*

15. Singapore should continue to strengthen its existing base of activities in finance, trading, HQ and professional services.

16. **Finance.** Singapore should strive to become a global leader in fostering innovation and the pervasive use of FinTech. The two proposed initiatives are to develop Singapore as a Smart Financial Centre and create opportunities for efficiency in electronic payments; and strengthen Singapore's ability to finance Asian startups and small and medium enterprises (SMEs).

17. **Trading.** Singapore is a successful regional trading hub for agricommodities, metal and minerals, and energy-related commodities. It should diversify trade flows and deepen its ecosystem of supporting services and financing. The two proposed initiatives are to grow a liquid commodity derivatives marketplace; and strengthen commodity trade financing.

18. **Business HQs & Professional Services.** Singapore should differentiate itself from competitors by deepening its cross-industry ecosystem so companies can anchor more strategic functions and build teams with deep capabilities. This will benefit other parts of the economy, especially professional services. [Appendix SC2.1](#) sets out recommendations on the legal and accounting sectors. The subcommittee proposes to anchor business HQs of Singapore-based companies; tighten links between core hub services (e.g. finance) and professional services (e.g. legal); and foster industry collaboration in high-growth segments.

**[Recommendation SC2.10: Capitalise on new flows through digital platforms in trade and capital](#)**

19. Digital platforms hold the potential to broaden access to markets, enhance transparency and enable new modes of exchange, unlocking a new wave of trade and capital flows. The proposed initiative is to develop global-scale platforms that build on Singapore's hub status in trade and finance to attract and grow new trade and capital flows.

**[Recommendation SC2.11: Train future-ready professionals](#)**

20. As basic tasks make way for more sophisticated work, Institutes of Higher Learning (IHLs) must continually update their curriculum to develop professionals with multi-disciplinary skillsets. The two proposed initiatives are to enhance the relevance of IHL curriculum to address key areas of job demand; and strengthen specialist expertise in high-growth areas.

**[Theme SC2.4: Becoming a leading provider of urban solutions and infrastructure to the world](#)**

21. Demand for urban infrastructure and services is expected to grow strongly, with infrastructure investments in developing Asia projected to be US\$20 trillion (S\$28.5 trillion) from 2016 to 2030. With strong regional connectivity and a track record of successful urbanisation, Singapore is well-positioned to ride the wave of urbanisation in developing Asia.

**[Recommendation SC2.12: Develop new systems-level test-beds](#)**

22. Singapore should enhance its position as a "Living Lab", where companies can develop, test and commercialise innovative urban solutions, before scaling up for the region and beyond. The two proposed initiatives are to extend scope of test-bedding to district-level and multi-domain projects; and apply regulatory sandbox treatment to Living Labs.

***Recommendation SC2.13: Aggregate demand for sustainable technologies to help enterprises build track record***

23. Lead demand has resulted in the development and adoption of smart, sustainable technologies. The Government should use lead demand to build enterprises' expertise and track records in areas such as energy management and industrial water solutions.

***Recommendation SC2.14: Raise national ambitions in adoption of sustainable urban solutions***

24. To raise Singapore's renewable energy and urban mobility ambitions, the Government should leverage Green Mark standards to encourage solar photovoltaics (PV) adoption; explore large-scale floating PV deployment; develop national standards to track renewable energy production/consumption; and craft urban mobility adoption plans.

***Recommendation SC2.15: Enable access to infrastructure opportunities in overseas markets***

25. Today, Singapore-based companies can access overseas infrastructure opportunities by participating in government-to-government platforms. The Government should assist Singapore-based companies to develop their capacity and expertise to bring these projects to reality. The two proposed initiatives are to encourage the private sector to set-up a facility to support the development of project preparation capabilities; and groom local infrastructure talent through Government-supported manpower programmes.

***Recommendation SC2.16: Bridge the gap in political and credit risk coverage in markets with infrastructure demand***

26. Many infrastructure projects of interest to Singapore-based companies are in emerging markets with low credit ratings. Insurance for such projects is not readily available. The Government should facilitate collaboration between private sector players, credible export credit agencies (ECAs) and financial institutions to provide insurance for risk coverage for these projects, so Singapore firms can access such opportunities.

***Recommendation SC2.17: Facilitate access to competitive long-term financing***

27. Notwithstanding Singapore's strengths, companies face stiff global competition from foreign firms due to financing gaps. The subcommittee recommends that the Government catalyse non-recourse project financing market to support small and medium players.

## **Theme SC2.5: Becoming a health innovation hub for patient-centric solutions**

28. The healthcare sector is positioned for growth, especially in the Asia-Pacific, where healthcare expenditure is expected to hit US\$2.2 trillion (S\$3 trillion) by 2018, and grow at 10.5% per annum. This growth is driven by population growth, ageing populations, increasing affluence and the rise in chronic diseases. The nature of demand for healthcare is changing as a result, necessitating new delivery and business models. Successfully capturing these opportunities could reduce the cost of healthcare, increase the efficiency of healthcare delivery and resource use, increase economic value capture from research investments, and create better jobs for Singaporeans that require multi-disciplinary skills. These will require a healthcare ecosystem conducive for collaborative innovation and rapid testing and scaling.

### **Recommendation SC2.18: Harness innovation solutions to meet national health needs**

29. Singapore's national health needs are key demand drivers for innovation, which could lead to the creation and adoption of leading-edge solutions. Successful solutions can be commercialised for export. The three proposed initiatives are to work with industry to develop innovative solutions in public healthcare; build industry capability to develop functional foods<sup>44</sup>; and leverage industry to develop solutions for an ageing population.

### **Recommendation SC2.19: Enable data sharing**

30. Data is a key enabler to facilitate patient-centric healthcare solutions. Access to aggregated data can guide healthcare providers and industry players to better assess needs and market demand, with implications for development of policies, products and services. The two proposed initiatives are to support market studies by publishing and visualising aggregated healthcare data; and support R&D via integrated research databases.

### **Recommendation SC2.20: Enhance regulatory efficiency & support for health products & solutions**

31. To enable greater commercialisation by local SMEs and multinational corporation (MNCs) of health products and solutions with high growth potential, the Government should enhance its regulatory framework to accelerate the domestic speed-to-market. The proposed initiatives are to engage industry earlier and more closely; ensure that regulation is responsive to technological advances and growth areas; and develop a priority review track to evaluate innovative health products and solutions that address the national disease burden. Relevant regulatory agencies, including HSA and AVA, should be appropriately resourced.

<sup>44</sup> Functional foods deliver enhanced benefits over and above their basic nutritional value.

## **Theme SC2.6: Growing enterprises through innovation, scaling up and internationalisation**

32. Grooming a strong base of competitive, Singapore-based companies is critical to Singapore's development and to create good jobs for Singaporeans. In 2010, the ESC aimed to groom 1,000 local companies with annual revenues exceeding \$100 million by 2020. Today, we have around 800 such companies, up from 560 in 2009. Singapore should build on this progress.

### **Recommendation SC2.21: Create new enterprises and businesses in strategic, innovative clusters**

33. Singapore needs innovative and highly-networked clusters of enterprises that can survive in a rapidly evolving and digitalising economy. The two proposed initiatives are to foster cross-industry partnerships; and develop new services and solutions in the professional services industry to assist product, service and business innovation.

### **Recommendation SC2.22: Focus on innovative high-growth companies with strong capabilities**

34. Internationalisation is critical for Singapore-based companies' long-term growth. Focused, dedicated and customised Government support based on criteria such as companies' corporate and innovative capabilities, can help high-growth enterprises compete with best-in-class global rivals and scale up quickly into global leaders.

## **Theme SC2.7: Accelerating internationalisation to tap into opportunities in Asia**

35. Internationalisation is critical for companies to grow. Growing consumption and demand for infrastructure in Asia offers significant opportunities for Singapore-based companies. These companies must move quickly especially in regional growth markets.

### **Recommendation SC2.23: Enlarge the pool of companies plugged into regional demand**

36. The Government should foster collaboration between larger corporations and Singapore-based SMEs, to enhance the collective's value proposition to overseas clients. The Government should provide in-market assistance for key overseas markets with strong growth prospects, and which attract high levels of interest from Singapore SMEs; and link up Singapore IHLs and companies with overseas partners in innovation hubs and key demand markets, which would lead to co-creation and commercialisation of innovation solutions.

37. Singapore should continue to deepen its engagement with SEA, where its nearest trading partners are. In particular, the Government should engage the Association of Southeast Asian Nations (ASEAN) to develop a regional digital policy; and expand Singapore's professional services firms' networks in SEA.

***Recommendation SC2.24: Help companies plug into the digital economy and ride on Asia's growth***

38. Brick-and-mortar companies can leverage e-commerce to ride on SEA, China and India's growth. The Government should develop strategies for Singapore-based companies to connect with these markets using e-commerce.

**Theme SC2.8: Empowering our workforce with skills for the future**

39. To grow key nascent industries where there are fewer Singaporeans with existing expertise, Singapore must augment local talent with foreign talent possessing specialised skillsets. Concurrently, Singapore must develop global-minded local talent who can acquire specialised skills and assume leadership roles in large enterprises.

***Recommendation SC2.25: Increase overseas exposure***

40. Deep expertise in SEA is key. The Government should increase support for Singaporeans working overseas; partner Asian corporations and Singapore IHLs to promote hands-on overseas opportunities for students; and work with employers to give Singaporeans overseas exposure.

**Conclusion**

41. Singapore should focus on developing capabilities in key clusters, help businesses internationalise and provide Singaporeans with skills for the new economy. This will position Singapore and Singaporeans to benefit from the next wave of global economic growth.



## Appendix SC2.1: Legal and Accounting Services

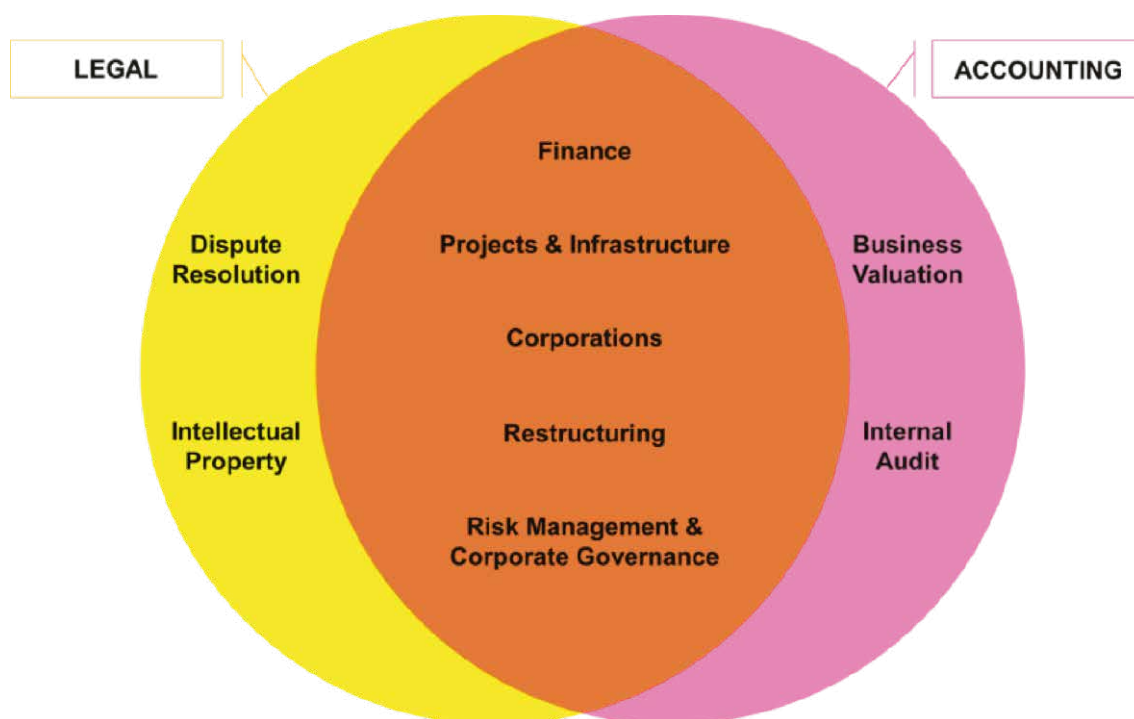
### **Becoming a global exchange for financing, brokering, structuring and dispute resolution for international commercial transactions**

1. Singapore is in a strong position to become a trusted global exchange for financing, brokering, structuring and dispute resolution for international commercial transactions.

#### Recommendation SC2.1.1: Strengthen Singapore's global market position in legal and accounting services

2. The Working Group on Legal and Accounting Services has identified nine high growth practice areas which can help drive demand for Singapore's legal and accounting services.

**Figure SC2.1.1: High-growth practice areas**



3. There is potential to **capture international demand for legal and accounting services** by pursuing activities within these practice areas where there is high growth potential in Singapore, generating opportunities for Singapore-based law and accounting firms. Singapore should **catalyse and support the internationalisation of Singapore's law and accounting firms**, thus allowing Singapore to capture a greater share of international demand for legal and accounting services.

*Recommendation SC2.1.2: Transform the legal and accounting sectors through enhancing productivity, collaboration and innovation*

4. The increasing pace of technological developments, growing sophistication of client demand, and rising competition from non-traditional service providers are reshaping Singapore's legal and accounting sectors. Firms of all sizes should develop strategies to transform and move up the value chain. This can be done by **spurring growth and productivity of the professions as a whole, with particular attention to small and medium-sized firms, and fostering a culture of pervasive and collaborative innovation.**

*Recommendation SC2.1.3: Build thought leadership through driving standards and research*

5. **Singapore can be a thought leader in standards and research in legal and accounting services.** To support the growth of the legal and accounting sectors, Singapore needs to ensure that its standards and frameworks remain industry-relevant. It should pioneer and set international standards and frameworks for the region and the world.

*Recommendation SC2.1.4: Equip legal and accounting professionals to be future-ready through deepening skillsets and industry expertise*

6. The continued growth and competitiveness of the legal and accounting sectors will rest on its professionals. Singapore's lawyers and accountants are already recognised for their strong technical skills and knowledge. They should build on their core strengths and strive to become holistic business advisers to their clients. In this regard, Singapore's professionals can be future-ready through **developing multi-disciplinary skillsets and business orientation; familiarity with technology; and specialist expertise in identified high growth areas and sector-specific knowledge.**

# SUBCOMMITTEE ON THE FUTURE OF CONNECTIVITY

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## Introduction

### *Importance of connectivity to the economy of Singapore*

1. As a small country with an open economy, connectivity is core to Singapore's survival and prosperity. Over the years, we have built up the depth and breadth of our international linkages to become one of the most connected countries globally.<sup>45</sup> Today, our excellent connectivity and international networks make Singapore a preferred business and logistics hub, and create global opportunities for Singaporeans both here and overseas.

2. The previous year saw a worrying uptick in anti-globalisation politics and protectionist policies, especially among developed economies in Europe and the United States (US). Despite this, Singapore must remain committed not only to keeping our economy open but to further developing the depth and breadth of our trade, finance, information and people flows, and seizing the new growth opportunities afforded by the rise of the digital economy. We must be strategic in how we expand the reach and density of our global networks, taking into account the needs of businesses and other stakeholders identified by the CFE. We should also integrate physical, digital and financial connectivity to create new platforms that transform our competitive edge and boost our value proposition to the world.

3. The Subcommittee on the Future of Connectivity was tasked with identifying the forms of connectivity that will be vital in the future economy as well as to make recommendations to strengthen these linkages. We did so with the aim of strengthening Singapore's position as a key global node that remains economically competitive and geopolitically relevant, and that creates good jobs and fulfils the aspirations of Singaporeans.

4. To this end, we envision Singapore as a gateway to the fast-growing Asia-Pacific region: a well-connected, trusted and efficient economic centre of activity that links the established economies of today with the high-potential markets of the future.

### **Theme SC3.1: Entrench Singapore's aviation and maritime hub position**

5. Singapore has built one of the world's busiest container ports. Changi Airport is a vibrant air hub because of its excellent connectivity and service, and sees one of the world's highest passenger and cargo volumes. Our air and sea ports are significant value and job creators in themselves, and also enable the growth of other sectors such as tourism, trade and investment, logistics, and manufacturing.

<sup>45</sup>The 2016 DHL Global Connectedness Index ranked Singapore as the first among "globalisation hotspots," which are cities with the most intense international flows of trade, capital, people and information compared to their internal activity, and the second most connected country in the world.

6. We cannot take our achievements for granted. As the global economic centre of gravity shifts eastward, there will be significant new opportunities for us, but also more intense competition. We must continue to secure Singapore's position as an aviation and maritime hub.

***Recommendation SC3.1: Invest in air and sea port infrastructure and capacity***

7. Building capacity ahead of demand should remain a top priority, primarily through the expansion of Changi Airport (including the three-runway system, Terminal 5, and Changi East Industrial Zone), and consolidation of container operations at the new Tuas Terminal. We need also to continue to aggressively invest in productivity, innovation and research and development (R&D) to increase land and labour productivity. All this will allow us to better capture a good share of the growing aviation and maritime traffic in the Asia-Pacific, and strengthen Singapore's connectivity in the process. Over the course of developing these large infrastructure projects, we will develop deep technical knowledge and expertise that can be packaged into solutions for export.

***Recommendation SC3.2: Enhance Singapore's competitiveness and attractiveness as an International Maritime Centre (IMC)***

8. We should continue to build capabilities in shipping and maritime services to enhance Singapore's attractiveness as an IMC. To position for future growth, it is also important that we remain nimble and adapt to emerging trends in the sector such as smart ships and ports, data analytics, and digital platforms that are disrupting traditional business models and creating new value chains. An advisory committee comprising industry experts has been formed to help chart development directions for Singapore's IMC for 2030 and beyond.

***Recommendation SC3.3: Strengthen Changi Airport's position as a leading global air hub***

9. To continue to be a leading global air hub to support our future economy, Changi Airport has to grow its connectivity, maintain its attractiveness as a transfer point for international passengers, and remain a competitive gateway for air carriers. This will require us to (i) continue to pursue air services liberalisation to secure more traffic rights for our carriers, (ii) anchor a diverse group of carriers at Changi, (iii) enhance cost competitiveness, and (iv) boost Singapore's attractiveness as a tourist and business destination. The Government should also facilitate the adoption of technology and optimisation of intra-airport connectivity to enhance the efficiency of passenger and cargo processing and improve the quality of industry jobs. We should also explore ways to improve the flow of goods between the airport and other nodes of industrial and logistics activity in Singapore.

## **Theme SC3.2: Strengthen Singapore's position as an innovative leader in international trade and logistics**

10. Connectivity has gained importance as a backbone to wholesale trade, a vital growth engine. Building on our leadership position in trade and logistics and our reputation as a trusted, neutral and reliable partner, Singapore should further differentiate our capabilities to attract related high-value activities. We need to invest in more innovation capabilities and promote diverse business models and services to enhance value creation.

### **Recommendation SC3.4: Strengthen regulatory coherence and connectivity in key sectors**

11. Regulatory connectivity enables Singapore-based companies to better participate in global trade. In the pharmaceuticals and medical devices sector, Singapore should further differentiate itself as a trusted, global regulatory leader. This can be done by ensuring that our local regulatory standards are aligned to internationally-developed ones by working closely with other like-minded regulatory agencies, and enhancing participation in regional and global regulatory platforms. Similarly, with increasing perishable food flows in Asia, our regulatory authorities can support the growth of food trade flows in this region by taking on a developmental function to assist the food industry in expanding its market, including helping Singapore-based food traders navigate other markets' regulatory environments.

### **Recommendation SC3.5: Enhance research and innovation ecosystem to promote development of world-class supply chain innovations**

12. Building on our strengths as a leading logistics hub, Singapore can grow its thought and practice leadership in supply chain management (SCM). We should build on our strengths in key manufacturing and services sectors, and harness emerging business and technology trends. This will help guide the development of differentiated research and innovation capabilities in SCM. For example, businesses will also be able to leverage the National Trade Platform to develop innovative solutions for the logistics sector. Through more deliberate coordination of innovation activities among Government, industry and academia, we can create new, disruptive business models and solutions for the global market.

### **Recommendation SC3.6: Develop Singapore as a global commodity derivatives and forward freight agreements (FFAs) hub**

13. As a global financial hub with over 500 global and local financial institutions, Singapore provides for 25-35% of trade finance for commodities trading in Asia, and is the third largest global foreign exchange market. Singapore needs to continue to be the global exchange where businesses and service providers converge to originate, broker, structure and finance worldwide deals. In particular, Singapore should tap on the growing opportunity to be the trading hub for commodity derivatives and FFAs.

### **Recommendation SC3.7: Enhance regional trade architecture for e-commerce**

14. To realise freer movement of e-commerce goods across Southeast Asia and support the regional expansion of Singapore-based companies, we should develop trade facilitation capabilities to support speedy small volume and small value transactions. The Government should assess and update trade disciplines to encourage the anchoring of key businesses and capabilities in Singapore as well as support the internationalisation of Singapore-based companies in key digital segments.

### **Theme SC3.3: Strengthen capital market linkages to Singapore's economy**

15. The next generation of Asian startups and small and medium enterprises (SMEs) will drive growth. In 2015, startups in Southeast Asia raised US\$1.61 billion, 43% higher than in 2014. We should seize the opportunity to strengthen Singapore's ability to meet the financing needs of Asian enterprises from the startup phase through their growth stages, and eventual public listings. For distressed companies, there is also scope to enhance restructuring advisory services, to help these companies re-achieve growth.

### **Recommendation SC3.8: Strengthen private financing for startups and SMEs in Asia**

16. In recent years, there has been strong growth in private markets as international investors seek additional investment opportunities outside of public markets, while more enterprises are remaining private for longer. Singapore should strengthen its ability to capture private financing flows to these companies, including VC funding for startups. We recommend rationalising the VC manager regulatory framework and creating a private placement platform to better connect Asian SMEs to investors.

### **Recommendation SC3.9: Expand public financing channels for next-generation Asian companies**

17. A well-functioning capital market requires a strong public equities market to properly value companies, and support and incentivise early investors and employees to grow with the company. A public equities market can also act as a source of fresh capital for companies to gain critical mass and reap the benefit of network externalities. To widen the range of public financing options, and to support the Singapore Exchange (SGX) as a listing venue for companies in high-technology, bio-pharmaceutical and life sciences industries, we recommend allowing dual-class share structures with appropriate safeguards to mitigate governance risks.

### **Recommendation SC3.10: Strengthen debt restructuring ecosystem for distressed companies to re-achieve growth**

18. While we are likely to see more new and promising Asian companies being created in the coming years, we can also expect some companies to experience weak or no growth given the uncertain macroeconomic environment, or as their business models become uncompetitive. There is an opportunity for specialist firms to provide restructuring advice that will help distressed companies to restructure their businesses, and re-achieve growth and profitability, and for Singapore to strengthen its position as a corporate restructuring hub. Such restructuring activity will in turn contribute to increased capital market activities. We recommend facilitating more service providers to set up restructuring advisory teams, as well as anchoring more debt restructuring funds in Singapore.

### **Theme SC3.4: Enhance Singapore's capabilities in electronic payments**

19. While Singapore has a payments ecosystem that is safe, sound and secure, consumers and businesses still rely substantially on cash and cheques. A recent study estimated that in 2015, almost 61% of consumer payments, and 44% of business payments, were made using cash and cheque. Despite the ongoing reliance on cash and cheque, Singapore was also found to have the requisite components to be a best-in-class jurisdiction in the area of payments. These components include the FAST payment system, which allows 24x7 real-time interbank payments, and one of the highest mobile phone penetration rates in the world.

### **Recommendation SC3.11: Create an electronic payments society in Singapore**

20. A comprehensive strategy is needed to increase the use of electronic payments in Singapore, so as to enhance consumer convenience and business productivity. This strategy should encompass: (i) streamlining and strengthening the regulatory framework, (ii) establishing a National Payments Council to enhance coordination and co-creation in payments, (iii) developing interoperable payments infrastructure, and (iv) accelerating SME digitalisation and adoption of electronic payments.

### **Recommendation SC3.12: Capture economic value through regional electronic payment systems**

21. An established local electronic payments society puts Singapore in an advantageous position as the epicentre for regional electronics payments. As businesses digitalise and expand regionally, a robust regional electronics payments network is critical for future economic growth. Given the strategic importance of electronic payments as an enabler for the future economy, it is imperative that we build our regional connectivity to catalyse changing trade flows and galvanise Singapore's position as Asia's leading financial and trade hub. This should include building cross-border networks in the form of electronic marketplaces and other value-added services, as well as building a vibrant FinTech ecosystem.

## **Theme SC3.5: Grow Singapore from a telecommunications hub to a digital harbour**

22. Singapore's standing as a regional telecommunications hub draws multinational corporations (MNCs) in sectors such as advanced manufacturing, finance, digital advertising, and content and internet platforms to aggregate their data and invest in activities clustered around their digital assets in Singapore. This creates demand and catalyses partnership opportunities for Singapore-based companies.<sup>46</sup> High-speed and high-bandwidth connectivity also gives Singapore-based businesses an edge in developing digital business models that are easily scalable to regional markets.<sup>47</sup> Some estimates suggest that the direct value-add of data connectivity in trade is up to 38% of Singapore's gross domestic product (GDP).<sup>48</sup>

23. To ensure that Singapore continues to attract high value-added jobs and activities in an increasingly digitalised global economy, we must constantly enhance our digital infrastructure by growing Singapore from a regional telecommunications hub into a Digital Harbour: a modern hub for data, content, applications and services.

### **Recommendation SC3.13: Promote Singapore as a compelling data centre hub**

24. To realise the vision of a Digital Harbour, we must, among other things, enhance the attractiveness of Singapore as a data centre hub. Data centres are critical infrastructure – the new “ports” for the future – that are necessary for digital companies<sup>49</sup> to effectively process, store and distribute their content. With more than half of Southeast Asia's data centre capacity based in Singapore, we have a strategic edge in promoting Singapore as a compelling data centre hub. We need to ensure a sustainable supply of data centre capacity, including exploring novel approaches in view of our land scarcity, and develop robust domestic connectivity infrastructures to link key nodes.

<sup>46</sup> ArcStone and EverComm are two examples of local data analytics startups that are helping MNCs in the industrial manufacturing sector leverage insights from data to increase productivity and maximise efficiency in their manufacturing plants.

<sup>47</sup> Notable examples include local e-commerce startups such as Lazada, Zalora and Reebonz which have scaled their e-commerce platforms to regional markets and are aiming to build the next billion-dollar e-commerce business out of Singapore.

<sup>48</sup> Economic Impact of Submarine Cable Disruptions, APEC Policy Support Unit, 2012.

<sup>49</sup> This includes businesses in digital innovation, cloud computing, analytics, and new business models in the social and mobile spaces.



### **Recommendation SC3.14: Develop complementary data capabilities**

25. In addition to infrastructure enhancement, it is crucial that the Government also drives industry and talent development efforts to attract critical data and premium content companies as “queen bees”, and address security, data and privacy concerns. A vibrant research and industry ecosystem is also needed to keep abreast of the latest developments and disruptive technologies, and identify how such advancements can be tapped to enhance Singapore’s connectivity infrastructure. In attracting quality investments, we should build on Singapore’s strengths in IP legislative and enforcement frameworks, supported by a strong rule of law. To this end, we note that the Subcommittees on Future Corporate Capabilities and Innovation, and on Future Growth Industries and Markets have recommended to accelerate the adoption of data-driven innovation to enable Singapore to seize a first-mover advantage in using data science to strengthen competitiveness and innovation.

### **Theme SC3.6: Establish Singapore as a platform where talent and ideas create opportunities**

26. Harnessing human capital has always been the bedrock of our development strategy and success. Singapore has earned a reputation as an open economy that welcomes the contributions of global players to the dynamism of our local business ecosystem. The cities that will enjoy high-quality growth and way of life will be the ones that welcome new ideas and embrace diversity. At the same time, advances in technology and an increasingly interconnected world economy have vastly intensified the war for talent.

### **Recommendation SC3.15: Expand Singapore’s schemes to attract talent and incubate ideas that support our key growth clusters**

27. To catalyse our future economy, Singapore must distinguish itself as a place where the entrepreneurs and innovators of tomorrow want to bring their ideas to fruition. In addition to strengthening our local talent pool, our manpower policies and talent attraction schemes must strategically target the right people and businesses to support the future key growth clusters such as the digital economy, advanced manufacturing, urban solutions, healthcare, hub services, and logistics. We would benefit from strengthening the coordination and marketing of initiatives, programmes and funding for international startups and tech companies and workers, for instance via a centralised agency. Facilitating the flow of global talent into Singapore will create value for our economy, build up our local capabilities, and create new jobs and opportunities.

### *Recommendation SC3.16: Strengthen and grow the ecosystem that supports networks of talent*

28. Our diaspora is a global network of ideas, experiences and enterprises that can add a new dimension to Singapore's economy. Overseas Singaporeans build Singapore's strong reputation as well as goodwill towards our country. Similarly, non-Singaporeans, who have contributed to the vibrancy of our city and community, help promote Singapore internationally when they leave. Thus, we should seek to nurture stronger networks of overseas Singaporeans and non-Singaporeans, strengthen their connections and encourage their active links back to Singapore.

29. In this age of globally-mobile talent, it is equally important to also build an environment that supports the mobility of Singaporeans by ensuring that policies and administrative processes do not unintentionally become barriers to their return. This includes minimising the inconveniences of the relocation process, sustaining engagement with Singaporeans overseas, and providing assistance when they and their families are ready to return to Singapore. This will also help encourage Singaporeans to move abroad, even for a while, to gain invaluable experience before returning to Singapore.

### **Conclusion**

30. Strengthening Singapore's connectivity to the rest of the world remains central to our future economic strategy, allowing us to transcend our geographical limits and create high-value economic activities and jobs for Singapore and Singaporeans. Amid an evolving global landscape where traditional hub models that centralise economic activity at national levels are being challenged, we must secure our city-state's position as a key node in the global networks of tomorrow and continue to punch above our weight in international arenas.

31. Singapore is well-positioned to harness opportunities in the future to achieve this. We should leverage on our existing strengths, including continuing to improve traditional areas of connectivity like the port and airport, and embrace an increasingly digitalised world that is creating new interdependencies and complexities in areas such as trade, logistics, finance, and information. Most importantly, Singapore must not neglect the critical role a strong network of global citizens will have in supporting the economy and creating a vibrant, connected city.

## SUBCOMMITTEE ON THE FUTURE CITY

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### Introduction

1. Singapore's growth over the last 50 years was underpinned by a long-term, holistic approach to urban planning and development. We built a vibrant Central Business District (CBD), an ecosystem of commercial centres and industrial clusters across the island, and a high-quality living environment with affordable housing for all. We put in place a robust infrastructure network for energy, water, transportation and infocommunications to power the economy, as well as to meet the needs of our people. We developed a City in a Garden and embraced liveability and sustainability in our developments.
2. The challenges of the future will be different, many of which we may not be able to anticipate fully now.
  - a. In a borderless digital world, digital connectivity and networks will be just as, if not more, important than physical connectivity and networks.
  - b. Rapid urbanisation will lead to greater competition over basic resources like food, water and energy; and the effects of climate change will be felt over the coming decades.
  - c. With more diverse and mobile populations, cities which can best attract talent and embrace creative destruction will lead the pack.
3. Our urban development has to keep pace with or even stay ahead of these changes. We must build on our strengths and continue to aspire to be a vibrant and resilient city with solid infrastructure, strong businesses, great connectivity and a highly liveable environment.
4. In this context, the Subcommittee on the Future City was tasked with recommending strategies to reinforce our economic advantages and create an outstanding living environment for our people. In the course of its work, the subcommittee recognised that there are already several major plans for Singapore's urban transformation. These include the new developments at Marina Bay and Jurong Lake District; as well as the expansion of our air and sea ports in Changi and Tuas, both of which will enable the freeing up of space in the existing Paya Lebar Air Base and Tanjong Pagar/Pasir Panjang seaports. All these mean that we have not reached our physical limits, and there remains space on our island for future growth.

5. To complement these plans, the subcommittee has put forward recommendations that can be summarised under five key themes for our future city:

- a. Build a global city for the digital revolution;
- b. Nurture a distinctively Singaporean and inclusive home;
- c. Pursue new public-private partnerships;
- d. Enhance local connectivity and mobility networks; and
- e. Strengthen sustainability, adaptability and resilience.

#### **Theme SC4.1: Build a global city for the digital revolution**

6. Today Singapore is ranked in the league of top global cities. But we must continue to work hard to stay at this level against intense competition from other emerging cities. To achieve this, we must develop Singapore as a key node for the digital revolution, broaden our development beyond the city centre, and continue to expand our infrastructure with more space options for the future.

#### **Recommendation SC4.1: Develop Singapore as a global Digital Harbour**

7. Digital technologies are changing the ways we work and redefining business processes and models. Just as we have succeeded as a container trading hub and an air hub, Singapore now needs to position itself as a Digital Harbour. In this regard, we must **strengthen our digital network infrastructure and create a “plug-and-play” environment**, which allow devices to communicate with the Internet more easily and facilitate the ready deployment of Internet of Things applications and services. Beyond infrastructure, Singapore needs to build up its digital capabilities, such as data analytics, to create value in order to capitalise on the benefits of the digital economy. In positioning Singapore to become a digital harbour, we hope to create an ecosystem that facilitates data harnessing, aggregation, analytics and the development of creative and practical digital applications. This will in turn reinforce our value proposition and growth as a key Asia-Pacific business and financial hub.

#### **Recommendation SC4.2: Develop new innovative growth centres outside the downtown area**

8. We should **grow more economic centres outside of the city centre to broaden our development, and provide more choices for businesses and individuals**. This is a tested strategy and is in line with our decentralisation strategy. Today we have one-north for biomedical sciences, infocomm technology and media, physical sciences and engineering; Jurong Island for petrochemicals; and Seletar Aerospace Park for aviation industries. These economic centres have allowed businesses to benefit through the creation of synergies and networking effects.

9. Going forward, we will have new centres at Jurong Innovation District, which is envisioned as the next-generation industrial park, serving advanced manufacturing, urban solutions, CleanTech and smart logistics; and at Punggol for firms in the cyber-security, infocomm technology (ICT) and digital fields. These ought to be developed as mixed-used centres integrating industrial with complementary research and development (R&D), educational, commercial, entertainment and residential uses. Leveraging on the proximity to educational institutions such as Nanyang Technological University and Singapore Institute of Technology, Jurong Innovation District and Punggol respectively will help spearhead academia-industry collaboration to facilitate knowledge sharing and generate solutions that can be rapidly prototyped, tested, commercialised and manufactured.

10. In addition, the development of Jurong Lake District presents us with opportunities to create a new urban centre to test ideas presented in this report. We should develop Jurong Lake District differently from most CBDs, which are typically quiet during the after-work hours and on weekends. We should create a **live-work-play-learn environment that encourages vibrant ecosystems, creates synergies between academia and businesses, and creates a sense of community.**

11. The Kuala Lumpur-Singapore High Speed Rail (HSR) will connect Jurong Lake District to the Malaysian terminus at Bandar Malaysia in Kuala Lumpur, and to Iskandar Puteri in Johor through a shuttle service. The HSR terminus at Jurong Lake District will also be within walking distance of two existing and two new Mass Rapid Transit (MRT) lines, which will connect Jurong Lake District to Singapore's city centre. We recommend that the Government also look into providing convenient transport connections to link this second CBD to Changi Airport. With the air-rail connection, this could further spur business connectivity across the region.

12. The Changi Air Hub in the east and Tuas Terminal in the west are also potential economic centres. Through re-planning the Changi East area and reconfiguring existing land uses, we can create a new belt of aerospace and air logistics industry spaces west and north of Changi Airport to complement the civil aviation industry. Through upfront planning and design, we can utilise land more efficiently through the creation of above-ground space and underground space at Tuas Terminal. This additional space will enable us to cluster complementary industries and economic activities in the same region, for example, by providing commercial space near the Tuas Terminal for port-related services.

#### *Recommendation SC4.3: Provide more flexibility for mixed-use and new innovative work arrangements*

13. The increasing ‘servicisation’ of industrial activities, where companies integrate service-type headquarter functions with production facilities, is blurring the lines between services and manufacturing. We should provide **more flexibility to integrate industrial with other uses to allow businesses to better tap on horizontal and vertical synergies across the different sectors and catalyse new innovations**. For example, this can be achieved by having complementary uses like medical technology firms and hospitals close to each other, or siting different functions like R&D, production, office and retail together. Such district-level flexibility would also allow developers to change uses within the district to meet the needs of ever-evolving business models.

14. Entrepreneurs and independent professionals are increasingly seeking out spaces which serve not just as an office, but also a community and networking platform. We should **develop more innovation spaces in our mixed-use districts to strengthen the supporting ecosystem for entrepreneurs and businesses, and harness synergies with economic activities in their vicinity**. To strengthen the integration between industry and academia within such districts and to create a vibrant exchange of ideas, besides co-working spaces, we need to inject public spaces, programming and software to facilitate interaction of talent living, working and studying in these areas.

#### *Recommendation SC4.4: Expand underground infrastructure and develop innovative ways to create new spaces*

15. In expanding our space options, we should **fully tap the potential of our underground space by developing an underground masterplan** that allows us to plan and coordinate the use of such spaces. To optimise our limited land, we should identify opportunities to place large infrastructure underground, such as bus interchanges, bus/train depots, utilities, storage facilities and underground reservoirs, where economically viable. We should also **encourage further innovations in space creation by making use of air space over existing buildings and roads**. We can also seek ways to **optimise the use of sea space and water bodies** through multi-purpose floating platforms.

#### *Theme SC4.2: Nurture a distinctively Singaporean and inclusive home*

16. Even as we strive to build a global city, we remain mindful that Singapore is more than just a base for economic activities; it is foremost a home for our people. We have developed a uniquely Singapore identity in our first 50 years. As we build our future city, we should strengthen our cultural and lifestyle offerings, and adopt an inclusive approach to development that resonates with all Singaporeans.

#### *Recommendation SC4.5: Embark on developments that strengthen our identity*

17. To continue to strengthen our Singapore City in a Garden vision, **we should integrate more greenery** into our public infrastructure and built environment, enhance our biodiversity efforts by building more Nature Ways to counter fragmentation of our areas of biodiversity, and **do more soft-scaping of our waterways and implement more Active, Beautiful, Clean (ABC) Waters projects along waterways in the heartlands.**

18. We should continue to **preserve and rejuvenate our city in a sensitive manner which strengthens our built heritage at the same time.** We have conserved over 7,000 heritage buildings and structures, restored them to their former glory and rejuvenated them to have continued relevance and use in today's context. This approach should continue in individual as well as precinct-level developments. We should also review our policies to facilitate more private sector participation in preserving our built heritage, as well as pay more attention to the programming of the heritage buildings that are adapted for new uses so that they are accessible to Singaporeans but also relevant to the history of the buildings.

#### *Recommendation SC4.6: Enhance our cultural and lifestyle offerings, and rejuvenate Orchard Road*

19. We should continue to develop a vibrant cultural and arts scene. Today, Singapore hosts a series of international cultural and arts performances and events throughout the year, but we can do more. We should **enhance the offerings in our various cultural nodes, including the heartlands, to showcase the distinctive Singapore culture,** through regular programming and active curation of events.

20. Orchard Road is both the core commercial precinct in Singapore and a vital tourism district. However, increased regional competition and the rise of e-commerce, as well as increased offerings in suburban malls, have affected the retail scene in Orchard Road. There is a need to reposition and rejuvenate Orchard Road to ensure that it remains a vibrant precinct that Singaporeans can enjoy, maintain Singapore's competitiveness as the regional launchpad for retail brands, and enhance our appeal as a global and liveable city.

21. We recommend that the **private sector partner the Government to embark on bold moves to transform Orchard Road into a vibrant shopping and lifestyle destination with a signature street experience in a city garden.** This could involve a more intensive street transformation programme which provides multi-purpose space for experiential concepts and programming, wider walkways, enhanced street crossings and more sheltered connections. The identity of Orchard Road could be strengthened with more distinct offerings and experiences, setting it apart from malls in other parts of Singapore.

#### *Recommendation SC4.7: Provide more inclusive infrastructure*

22. With an ageing population, **we should make our transport system even more senior-friendly**, such as through the installation of more lifts at transport nodes and having more at-grade crossings instead of overhead bridges. **Key facilities and amenities can also be distributed nearer homes to make it more convenient for elderly residents to access them. Our future city should provide barrier-free access to facilitate the travel of people with special needs.**

#### *Theme SC4.3: Pursue new public-private partnerships*

23. Building our future city is not just the role of the Government, but also that of our businesses and citizens. The private and people sectors should have a bigger stake in developing and curating our future city. Going forward, we should create more opportunities for private firms to be master developers of our urban landscape and support local place-making efforts through a formalised place management framework.

#### *Recommendation SC4.8: Allow more scope for private firms to be master developers*

24. Today, our urban masterplans parcel out individual land parcels to be developed for specific uses, and opportunities for synergies across adjacent land parcels with different uses are often left untapped. As the private sector is most attuned to changes in business models and can connect to a wider global network, we could afford greater flexibility of land use across various land parcels as we masterplan our new economic centres. **The Government could partner the private sector as a “master developer” to develop, place-make and manage our future economic centres.**

25. Under such partnership models, the vision for these growth centres could be jointly developed, and subsequently implemented by a private firm or firms committed to the success of the centre over the long term. Beyond planning and development, the master developer would also be responsible for the marketing, place-making and programming of the centre. Such a public-private development model could inject greater dynamism and responsiveness in our future economic centres.

#### *Recommendation SC4.9: Support local place-making efforts through Business Improvement Districts (BID)*

26. There are several precinct associations in Singapore that have place management work like Singapore River One, One Kampong Gelam, Orchard Road Business Association and Little India Shopkeepers and Heritage Association. But these are ad-hoc and limited in scope, due to limited and uncertain funding. In addition, participation in precinct associations is currently voluntary and hence not every stakeholder (either property or business owner) contributes to the common pool of funds which is used to improve the area, leading to concern over the problem of “free-riders” and the lack of certainty in funding over the long term. Place management efforts and other initiatives such as marketing plans and improvement works cannot be sustained in the long run under such a model.



27. We recommend that the **Government study and implement a formal place management framework that would empower stakeholders to take more ownership of the betterment of their precinct.** One option is the introduction of a “Business Improvement District” or BID – a stakeholder-led and stakeholder-funded body formed to improve a defined commercial area. BIDs were first established in Canada and the United States in the 1960s and now exist around the world, including in Germany, Japan, Australia, New Zealand and the United Kingdom. Under such a formalised place management model, property owners and/or business operators are represented and have a say in what they want for their precinct. They contribute funds which would be ring-fenced for use within the BID area and can come up with their own solutions to make the BID area more attractive and increase footfall.

#### **Theme SC4.4: Enhance local connectivity and mobility networks**

28. Singapore has built up a strong network of international connections as an air and sea hub. Within Singapore, the movement of goods and people must take place with a similarly high degree of efficiency to power the economy. In our future city, we should implement a nation-wide urban logistics system, experiment with and adopt new urban mobility solutions, and make active mobility options more attractive.

#### **Recommendation SC4.10: Implement a nation-wide urban logistics system to enhance our hub status**

29. At the core of a productive economy is an efficient freight system where an island-wide distribution network with regional distribution centres connects to the airport and sea port. Hence, we should **implement a nation-wide urban logistics system to enhance our hub status.** In the near term, we should work towards implementing integrated District Logistics Networks within our new industrial estates. In the longer term, we could explore inter-district logistics networks that connect the seaport and airport in order to move freight more efficiently across Singapore.

30. To enhance business-to-business (B2B) distribution, we should **facilitate more in-mall distribution operations, as well as the use of off-site consolidation centres.** To enhance business-to-consumer (B2C) distribution, we should implement a **network of federated parcel lockers throughout Singapore,** which would allow for convenient pick-up of goods by consumers at a time and location of their choosing.

#### *Recommendation SC4.11: Experiment with and adopt new urban mobility solutions*

31. The Government should **experiment with and adopt new urban mobility solutions for our future city**. We should promote more R&D in Self-Driving Vehicles (SDVs) with test-bed zones which integrate SDV mobility solutions with existing cycling, bus and train transport options. The Government should also plan for and develop the supporting infrastructure, such as charging stations for Electric Vehicles and designing the roads to better cater for SDV transit systems, so that we can more easily mainstream these solutions once the technology is sufficiently mature and is economically viable. Finally, we should exploit the potential in using big data and real-time/predictive analytics to support multi-modal transport management (e.g. Mobility-as-a-Service concepts).

#### *Recommendation SC4.12: Make active mobility options more attractive*

32. Active mobility should also be the choice mode of first- and last-mile connection to the train station or bus interchange. We should **expand our network of intra-town cycling paths, and provide supporting infrastructure** such as bicycle parking, to encourage and facilitate the adoption of such modes of transport. We should also **adopt a people-centric urban planning approach to improve the walking experience**. More physical links between buildings, such as elevated linkages and underpasses, which provide connections that are sheltered from weather elements, could be built. We should consider legislation to mandate such links. We should also make these linkways aesthetically attractive, for example, by injecting interesting streetscapes, greenery, art and architectural design to enhance the walking experience for pedestrians.

#### *Theme SC4.5: Strengthen sustainability, adaptability and resilience*

33. Economic growth should be anchored on sustainability and resilience principles. Going ahead, we need to develop and invest in innovative energy solutions, continue to push ahead with initiatives for water resilience, and strengthen our food security by transforming our local agriculture sector to become highly innovative and productive.

*Recommendation SC4.13: Develop and invest in innovative energy solutions on both the demand and supply side*

34. **Singapore can lead the way as a model city in sustainability, through more aggressive investment and deployment of new solutions in the energy sector.**

From the energy supply side, there is scope to ramp up the deployment of solar photovoltaics (PVs) across Singapore, where economically viable and sustainable. More efforts should be devoted to the R&D of energy storage solutions to enable cost-effective and safe deployment in Singapore's tropical climate and urbanised environment. We should also develop solar forecasting capabilities adapted for the local context, to enhance power system operations and grid resilience. On the energy demand side, we should continue to push for greater efficiency in energy usage, for example through the use of more district cooling systems and energy "smart meters" which offer the potential to change behaviour through real-time feedback. With real-time information, Demand-Side Management (DSM) initiatives such as incentive schemes and dynamic pricing schemes can be implemented more easily. Potentially, new business models for sharing savings between DSM providers and consumers will arise.

*Recommendation SC4.14: Continue to push ahead with initiatives for water resilience*

35. We can also **do more to achieve higher water efficiency in the industrial sector**, for example, by requiring large industrial water users to report on their water efficiency management plans and encouraging them to adopt technologies that will make their processes more water-efficient. Water demand can also be managed by encouraging alternative water sources, such as seawater for cooling. We should also plan early and invest in major infrastructure, such as coastal protection structures or stormwater detention tanks, ahead of time to protect Singapore from climate change risks.

*Recommendation SC4.15: Strengthen our food security with a highly productive and innovative agriculture sector*

36. Singapore can **carve a niche in urban solutions by becoming a living lab for food production technologies**, just like what we have done for water recycling and desalination. We should improve productivity by leveraging on technologies to develop new farming solutions. We need to invest in more R&D in urban food production, in domains such as inputs optimisation (e.g. through genomic selection) to improve yield and nutritional properties of crops, as well as automation and systems integration of farming processes. We can overcome our land constraints by implementing new farming models which use less land, such as vertically stacked fish farms and multi-tiered vegetable farms. There are also overseas examples of deep sea, semi-submerged farms which we can potentially adopt. These farms operate on minimal manpower and are more productive than traditional farms.

## Conclusion

37. Our future city will play the important role of providing the necessary space and infrastructure for the economy to grow and evolve. At the same time, our future city must be one that provides a high-quality living environment for our people.

38. Underpinning the foundation of our future city are concepts of adaptability, sustainability and resilience. Being adaptable and flexible means that we will be able to innovate and seize new economic opportunities; being sustainable means that we conserve the city's capacity to support long-term, continuous economic growth; being resilient means that our city will be more capable of buffering against and recovering from external shocks and risks.

39. We should be bold enough to do things differently from other cities. With the recommendations by our subcommittee, as illustrated in [Figure SC4.1](#), we are confident that our future city will be known to the world as a city that promises the physical pre-requisites as well as the ecosystems for new growth sectors to take root and flourish; a city that is a 'live' model of sustainability, showcasing cutting-edge urban solutions that are developed here and exported overseas; and a city that is constantly rejuvenating itself to offer a range of exciting offerings to its residents and stays liveable and endearing to all who wish to call this place their "home".

Figure SC4.1: Our future city

# SINGAPORE: FUTURE CITY

Our future city will play the important role of providing the necessary space and infrastructure for our economy to grow and evolve, and in creating an endearing home for Singaporeans. Our urban development plans must respond to the future challenges.

Several major plans for Singapore's urban transformation are already in place, but there is still much to be done. There is still more space in our island for future developments and we can all play a part in building a better Singapore for the future.



# SUBCOMMITTEE ON FUTURE JOBS AND SKILLS

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## Introduction

1. The Subcommittee on Future Jobs and Skills focusses on how Singaporeans can be prepared and equipped with the skills needed for jobs today and in the future.
2. Jobs and skills are related but distinct. Jobs are demand-driven and are responsive to global macroeconomic trends. The acquisition of skills, in contrast, is an individual-driven endeavour, a personal enterprise and learning journey. Collectively, choices made by individuals determine our capability and competitiveness as a workforce and as an economy. Thus, individual aspirational pursuits and wider economic policies have to be in sync, with our people preparing themselves based on opportunities and industry needs. At the same time, the collective skillsets of people add depth and strength to our economy and create new jobs.
3. Singapore starts from a position of strength. We have built the capability of our workforce on a solid foundation of quality education and training with good supporting infrastructure, affording Singapore nimbleness and flexibility.

## Opportunities and challenges

4. Four global trends and macro factors, which present both opportunities and challenges for Singaporeans, will drive the outlook for future jobs and skills:
  - a. **The changing economic landscape.** To drive Singapore's next phase of economic growth and job creation, our companies need an expansionary mindset and to seize opportunities to tap into global and regional markets. Singaporeans need a greater sense of adventure and enterprise and an international outlook to venture overseas.
  - b. **Disruptive technology.** The type, nature, and location of future industries and jobs will change. Routine and simple cognitive tasks will likely be automated. However, new jobs will also be created, not unlike when the Internet and computer were invented and resulted in a new way of work and life.
  - c. **Greater emphasis on soft skills.** Beyond technical skills, employers will look increasingly to essential generic skills, such as social and collaborative skills. Essential generic skills are more transferrable and future-proof, and help Singaporeans adapt to new roles and expectations in our changing economic landscape.
  - d. **Demographic trends.** In the years leading to 2020 and beyond, the local workforce growth will slow, largely due to demographic realities such as an ageing population and low birth rates. More than ever, we have to make every person count. Productivity, skills and innovation will be key drivers of growth.

## **Theme SC5.1: Focus on skills in recruitment, advancement and recognition**

### **Recommendation SC5.1: Increase emphasis on skills-based performance and potential in recruitment and advancement**

5. The subcommittee recommends encouraging and enabling the recruitment and advancement of workers based on skills and competencies, beyond just academic grades or qualifications.

6. To encourage the use of skills and competencies as the key yardstick in the recruitment, development and recognition of workers, the subcommittee recommends that (i) human resource executives be trained and certified in skills- and competency-based recruitment methods, including interviews, assessment centres, aptitude tests and other forms of holistic evaluation, and go beyond recruiting based on academic qualifications; (ii) employers remove job eligibility criteria that are defined solely by academic qualifications; and (iii) employers implement internal on-the-job training systems to impart essential job-related skills to all workers, including mid-career entrants. To strongly incentivise organisations to adopt the skills- and competency-based human resource system, the subcommittee proposes granting firms which adopt skills- and competency-based human resource systems preferential treatment for select Government schemes. The Government should study possible incentive frameworks, such as eligibility for the Ministry of Manpower's (MOM) Human Capital Partnership programme and other Government incentives tied to skills training or industry development programmes.

### **Recommendation SC5.2: Government can lead the way in skills- and competency-based recruitment and recognition of public officers**

7. The majority of public officers are already on schemes which do not distinguish between degree and diploma holders. Ministries and Statutory Boards (SBs) should consider merging the remaining graduate (degree) and non-graduate (non-degree) schemes, especially where academic qualification is not a clear proxy for skill proficiency in specific roles.

8. To facilitate individuals' continuous honing of their skills, the deployment of Full-Time National Servicemen (NSFs) with skills relevant to National Service (NS) vocations could be expanded. The Singapore Armed Forces (SAF) will start to allow NS enlistees to indicate their preferred vocations. This initiative will enable more NSFs to maintain their skills during NS, thereby deepening expertise in sectors of both military and economic strategic importance. This could include areas such as cybersecurity. SAF can further examine how NS vocations can make better use of niche skills among NSFs that will contribute to areas of strategic importance to the defence and security of Singapore.

9. Tripartite partners should work together to endorse and showcase best hiring and promotion practices, and demonstrate to companies that it is in their interest to make this shift.

### **Recommendation SC5.3: Develop a more differentiated foreign workforce policy**

10. To meet the needs of the future economy, Singapore must continue to remain open to talent from around the world. The Government's approach, when processing Employment Pass (EP) applications, has been to assess criteria related to the individual's salary, education qualifications and experience. Going forward, the Government should consider greater differentiation when granting EPs, to also take into account the firm's commitment to fair consideration, as well as the economic spin-offs from and growth potential of the firm's activity.

11. The subcommittee notes that the MOM has started taking steps in this direction by more closely scrutinising the work pass applications of firms which have not put in sufficient efforts at being fair in employment practices.

12. The Government can consider expanding the Fair Consideration Framework to also take into account efforts by companies to hire based on competencies and skills, active participation in taking interns from post-secondary education institutions (PSEIs) or in cooperative programmes, participation in SkillsFuture initiatives such as the Earn and Learn Programme (ELP), and participation in Adapt and Grow initiatives such as Professional Conversion Programmes and Career Support Programme. This will ensure that our workforce remains globally competitive, our local workers are considered fairly for jobs, and our local workforce is complemented by skilled foreign workers with the right expertise. It will also encourage firms to participate in programmes designed to improve workforce capabilities.

### **Theme SC5.2: Strengthen the inclusive approach in upgrading our workforce**

#### **Recommendation SC5.4: Support sectors with good growth potential and sectors that meet domestic needs**

13. Singapore needs to ensure a steady pipeline of talent that will augment the sectors with good growth potential, as well as domestic sectors that present new job opportunities. While some job functions may be automated, new jobs will be created in emerging sectors. There are also existing jobs that will remain in demand, e.g. high-touch jobs such as nursing which typically require skills and a personal touch that cannot be supplanted by technology.

14. These new jobs as well as existing high-touch jobs present new opportunities for workers who have been displaced or are at risk of displacement. The Government should ensure the availability of industry-recognised training programmes, including short modular training modules or courses, to help these workers pick up the necessary skills and experiences for career conversions into such new sectors, as job prospects grow in these sectors.



**Recommendation SC5.5: Strong support and opportunities for older workers, persons with disabilities and workers made redundant**

15. Economic restructuring may increase redundancies and frictional unemployment as workers transit between jobs. We must continue to help older workers, low-wage workers, workers with disabilities, workers made redundant and other at-risk workers adapt by ensuring that our economic development is inclusive so that all Singaporeans can reap its rewards.

16. The subcommittee recommends that the Government continue to step up its efforts to strengthen support schemes such as Adapt and Grow, Workfare Income Supplement, Workfare Training Support, and the Progressive Wage Model. The Government should continually evaluate these schemes and ensure that they remain relevant in providing adequate support for these workers. It can appoint more agents, including the National Trades Union Congress's (NTUC) Employment and Employability Institute, and other private sector intermediaries, to help source for potential employers and job-seekers.

**Theme SC5.3: Enhance education and training pathways to further strengthen the link between skills demand and supply**

17. The subcommittee notes that the Government recognises that the acquisition of deep technical and essential generic skills is not a sequential process. Often, they are simultaneously and better acquired through hands-on experience, internships, attachments and integrated work-learn approaches. Different modes of instruction already exist in the post-secondary space and will become increasingly important. Our modes of education must continue to evolve to create a continuum of learning opportunities for Singaporeans in school and at the workplace.

**Recommendation SC5.6: Introduce new modalities of education and training at the post-secondary education institutions**

18. The subcommittee recommends introducing new modalities of education and training at PSEIs, i.e. universities, polytechnics and the Institute of Technical Education (ITE), to enhance learning effectiveness and to better meet the contemporary skills demands of the economy. Industry partners should play a more active role in shaping the curriculum and participating in the selection of students/trainees.

19. These new modalities could include variants of work-learn models, where the students toggle between school and the work place, either by alternating semesters or parts of the week between their respective education institutions and employers. This goes beyond internships, as industries and PSEIs work more closely together to co-create the curricula to maximise on-the-job and off-the-job learning opportunities and effectiveness for the students.

20. The Government should also consider introducing more of such work-learn programmes at the degree level, not to fuel a chase for academic qualifications but to create more avenues for skills deepening through concurrent on- and off-the-job training.

21. The synergistic training arising from concurrent on- and off-the-job training is particularly useful in helping learners develop focus, specialisation and mastery. While the SkillsFuture ELPs were deliberately targeted at fresh polytechnic and ITE graduates when they were initially launched, the Government should consider extending such work-learn programmes to individuals who are existing employees of companies, i.e. mid-career individuals seeking to deepen their skills for skills mastery and career advancement.

***Recommendation SC5.7: Increase the range of articulation pathways of education at the tertiary level***

22. The subcommittee recommends enhancing the range of articulation pathways of education at the tertiary level that will benefit all students at ITE, polytechnics, and the publicly-funded universities. To this end, Government could introduce new articulation pathways and ease the transition across different pathways.

23. For example, as we move towards increased emphasis on skills, the Government and industries should engender greater recognition of prior learning. The Government and industries could work together to identify and enable suitable means of assessing relevant skills and knowledge attained in one framework for the purposes of satisfying prerequisites for further training or education that come under other qualification frameworks. This will be part of the effort to ensure inter-operability between qualifications systems and porosity across the different education pathways.

24. In addition, at the Committee of Supply sitting in 2016, it was announced that a new SkillsFuture ELP pathway for ITE graduates leading to a part-time polytechnic diploma would be introduced. Similar SkillsFuture ELPs in the infocomm technology (ICT) sector should also be considered to level up on-the-job training and experience for students. There is scope for the Government to explore expanding the range of courses and number of places for the ITE Technical Diploma, especially to target in-service workers.

#### **Theme SC5.4: Develop Singaporeans' global outlook and facilitate access to meaningful overseas experiences and international exposure**

25. To seize the growth opportunities offered by the region, Singaporeans must broaden their worldview and actively venture out of Singapore. Meaningful overseas experiences will help Singaporeans develop resilience and foster an enterprising spirit, as well as acquire the skills to adapt and thrive in an evolving economic context, so that Singaporeans remain relevant and employable both at home and abroad. This process begins at school and continues through to the workplace, and key competencies to be developed include essential generic skills, entrepreneurial acumen and risk-taking, as well as the ability to work across cultures.

#### **Recommendation SC5.8: Facilitate the deployment of Singaporeans to overseas postings**

26. The Government has announced plans to launch a SkillsFuture Leadership Development Initiative (LDI), which will incentivise companies to deploy Singaporean managers and executives overseas to gain work experience and enhance their employability. The LDI could be leveraged as a significant enabler for the deployment of Singaporeans on overseas assignments, so as to build up the pipeline of executives with overseas exposure that will benefit both the companies and the Singapore workforce. To broaden the international perspectives of Singaporeans, other development schemes championed by Government or by industry that would achieve similar objectives should also be encouraged and supported.

#### **Recommendation SC5.9: Facilitate more overseas internships and increase international exposure for our students**

27. There is already a wide range of overseas programmes for students in our PSEIs. Many are short cross-cultural learning or community service programmes, and these should be expanded wherever possible to give our students international exposure to other cultures and to increase their awareness of the global context. Students could also seek out short-term overseas work attachments to broaden their global perspectives.

28. The subcommittee also recommends facilitating more overseas internships of a more substantive duration for students in our PSEIs. More schemes like the Young Talent Programme under the SkillsFuture movement and the Maritime and Port Authority of Singapore's (MPA) Global Internship Award to facilitate overseas internships for our students could be encouraged, in addition to the opportunities available under the Global Innovation Alliance. At the institution level, the universities, polytechnics and ITE should work with industries to enable more students to pursue overseas internships. There is scope to consider reciprocal arrangements with multinational corporations (MNCs) in targeted sectors and Singapore companies with global/regional presence to help create more quality overseas internship places for our students.

### *Recommendation SC5.10: Strengthen support for and facilitate reintegration of returning Singaporean students*

29. The ease of reintegration of their children into the education system in Singapore is an important consideration for parents who are offered the opportunity to work overseas. There is already extensive support in place for returning Singaporean students, but it is critical that even before they begin their overseas stints, parents have clarity on the support available to prepare Singaporean children for the local education system upon return.

30. Currently, the information on such support is available on various online platforms. The subcommittee recommends consolidating the Ministry of Education's (MOE) resources for returning Singaporean students into a stand-alone site, a 'One-Stop-Virtual Service Centre'. This will give parents and students clarity on the full suite of measures that MOE provides to assist in their children's reintegration into the Singapore education system, as well as the range of choices available.

31. To ease the reintegration into the local school system, the subcommittee recommends providing overseas Singaporean students access to learning resources aligned to the Singapore school curriculum on MOE-supported platforms. One such platform is the Student Learning Space (SLS). While such platforms are not meant to be a complete replacement for the classroom experience, the online resources can support self-paced student learning on subjects and topics aligned to the Singapore school curriculum, using computing or mobile devices.

32. When they are overseas, some students undergo education that is closer to the International Baccalaureate system. The subcommittee recommends that MOE facilitate these students' enrolment, subject to their School Placement Exercise for Returning Singaporeans (SPERS)<sup>50</sup> scores, into the three existing national schools offering the International Baccalaureate Diploma Programme upon their return.

33. For better continuity in their children's education, some parents may choose to let their children remain in Singapore, or to return to Singapore earlier to avoid disrupting their studies. Currently, these parents have the option of enrolling their children in selected hostels run by different schools. The Government could explore the possibility of enhancing its current Boarding Awards Scheme to provide more support for students whose parents work overseas.

### **Conclusion**

34. The outlook for jobs in Singapore is not something that can be predicted with certainty. What is certain is that in order to sustain Singapore's economic progress, our key competitive advantage will continue to lie in having a skilled workforce able to meet the industry needs of today as well as tomorrow.

<sup>50</sup> SPERS is a centralised posting exercise that takes place in the last quarter of the academic year for returning Singaporeans who wish to join the local education system at the beginning of the following academic year. SPERS is conducted by MOE and facilitates entry into Secondary 1, 2 and 3, as well as Pre-University 1.

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<b>Ben Leong (Associate Prof)</b>	Associate Professor, School of Computing, National University of Singapore
<b>Candice Ong (Ms)</b>	Chief Commercial Officer, ShopBack
<b>Costas Courcoubetis (Prof)</b>	Professor, Engineering Systems and Design, Singapore University of Technology and Design
<b>Michael Meyer</b>	Partner and Managing Director, The Boston Consulting Group
<b>Nicholas A Nash</b>	Group President, Garena Online
<b>Ong Peng Tsin</b>	Managing Director, Monk's Hill Ventures
<b>Peter Ho</b>	CEO, HOPE Technik
<b>Ravi Lambah</b>	Head (Telecom, Media & Technology), Joint Head (India), Temasek Holdings Pte Ltd
<b>Samuel Lim</b>	Founder and CEO, Reebonz
<b>Teo Lay Lim (Ms)</b>	Senior Managing Director (ASEAN), Accenture
<b>Ying Shao Wei</b>	Chief Operating Officer, DataSpark
<b>Zaqy Mohamad</b>	Director, ASEAN Accounts and Business Development, Ernst & Young

#### ***Resource Panel***

Emily Ong (Ms)  
Goh Lih Shiun  
Kuok Meng Ru

Lim Chee Kean  
Saleh M Haji Munshi  
Sopnendu Mohanty

Tan Chee Hau  
Tan Li San (Ms)

## Subcommittee on Future Growth Industries and Markets

<b>S Iswaran (Co-Chair)</b>	<b>Minister for Trade and Industry (Industry)</b>
<b>Jean-Luc Butel (Co-Chair)</b>	<b>President, K8 Global, and Global Senior Advisor, McKinsey &amp; Company</b>
<b>Indranee Rajah (Ms)</b>	Senior Minister of State for Law and Finance
<b>Azmoon Ahmad</b>	Senior Vice President, Desay SV Automotive
<b>Chaly Mah</b>	Chairman, Singapore Accountancy Commission
<b>Fabian Wong</b>	CEO, Philips ASEAN and Pacific
<b>Forrest Li</b>	Founder, Chairman and Group CEO, Garena
<b>Han Kwee Juan</b>	CEO, Citibank Singapore Limited
<b>Hany Fam</b>	President, MasterCard Enterprise Partnerships
<b>Ichiro Iino</b>	Chief Executive for Asia-Pacific, Hitachi Ltd and Chairman, Hitachi Asia
<b>James Rowan</b>	Chief Operating Officer and Board Member, Dyson
<b>Johan de Villiers</b>	Managing Director, ABB Singapore
<b>Jonathan Asherson</b>	Regional Director, ASEAN & Pacific, Rolls Royce
<b>Michael Gryseels</b>	Director (Senior Partner), McKinsey & Company
<b>Miguel Ko</b>	Executive Director and Group CEO, Ascendas-Singbridge
<b>Peter Tan</b>	President and CEO, Fischer Tech
<b>Sunny Verghese</b>	Co-Founder and Group CEO, Olam International Limited
<b>Susan Chong (Ms)</b>	Founder and CEO, Greenpac
<b>Vesmond Wong</b>	Chairman and Group CEO, DeClout
<b>Vincent Chong</b>	President and CEO, Singapore Technologies Engineering Ltd
<b>Wolfgang Baier</b>	CEO, Luxasia
<b>Yeoh Keat Chuan</b>	Managing Director, Singapore Economic Development Board

**Subcommittee on Future Growth Industries and Markets (Working Group on Legal and Accounting Services)**

<b>Indraneel Rajah (Ms)</b> (Co-Chair)	<b>Senior Minister of State for Law and Finance</b>
<b>Chaly Mah (Co-Chair)</b>	<b>Chairman, Singapore Accountancy Commission</b>
<b>Chang Zi Qian</b>	Co-Founder, Intelllex Holdings Pte Ltd
<b>Chia Yong Yong (Ms)</b>	Consultant, Foo Kwok LLC
<b>Chng Lay Chew</b>	Chief Financial Officer, Singapore Exchange Limited
<b>Daren Shiau</b>	Partner, Co-Head of Corporate & Commercial Department, Allen & Gledhill LLP
<b>Eric Teo</b>	Adjunct Associate Professor, Division of Accounting, Nanyang Business School
<b>Evan Law</b>	Chief Executive, Singapore Accountancy Commission
<b>Han Kok Juan</b>	Deputy Secretary, Ministry of Law
<b>Irving Low</b>	Head of Risk Consulting / Head of Markets, KPMG Services Pte Ltd
<b>Kelvin Wong</b>	Assistant Managing Director (Cluster Group Enterprise), Singapore Economic Development Board
<b>Lee Wai Fai</b>	Group Chief Financial Officer, United Overseas Bank
<b>Mohamad Saiful Saroni</b>	Partner, PricewaterhouseCoopers LLP
<b>Paul Seah</b>	Partner, Tan Kok Quan Partnership
<b>Pek Siok Lan (Ms)</b>	Senior Managing Director, General Counsel, Temasek International
<b>Peter Hoad</b>	Singapore Office Leader, Arup Singapore Pte Ltd
<b>Rachel Eng (Ms)</b>	Deputy Chairman, WongPartnership LLP
<b>Sarjit Singh</b>	Executive Chairman, Ardent Associates LLP
<b>Serene Wee (Ms)</b>	Chief Executive, Singapore Academy of Law
<b>Thio Shen Yi</b>	President, Law Society of Singapore
<b>Uantchern Loh</b>	Chief Executive, Singapore Accountancy Commission
<b>Vanita Jegathesan (Ms)</b>	Corporate Counsel, Chevron International Pte Ltd
<b>Yee Ping Yi</b>	Deputy Secretary (Policy), Ministry of Finance

### *Deep Dive on Advanced Manufacturing*

Alvin Ng	Lee Kam Sung	Ralph Foong
Baudouin Halsberghe	Lee Keng Guan	Ruddy Sterckx
Chang Thai Nam	Lee Teng Huar	Ruiichi Ikeda
CT Chua	Lim Kok Kiang	Shermine Gotfredsen (Ms)
David So	Lim Tau Fuie	Steve Conner
Eddie Tay	Mark Chua	Theo Kneepkens
Haryanto Tan	Mihari Cataras	Wilson Deng
Ho Ee Kid	Ng Khoon Lye	Wong Fook Seng
John Machulski	Ong Ken Yip	Zhou Simin (Ms)
Juergen Seitz	Peter Ho	
Kenneth Tan	Raimund Klein	

### *Deep Dive on China*

Adrian Tan	Frankie Lee	Million So
Alice Chan (Ms)	Isaac Ho	Ng Soon Leng
Ang Sok Hong	Jessie Lim (Ms)	Oliver Yip
Charles Wong	Jimmy Soh	Richard Yen (Dr)
Chong Yong Thiam	Liane Ong (Ms)	Ronnie Seng
Clement Wong	Lim Ai Leng (Ms)	Ryan San
Dawn Yip (Ms)	Lim Lee Meng	Sun Tongyu
Eric Goh	Lincoln Lim	Tan Cheng Guan
Fong Chi Chung	Loh Sin Yong	Yim Jeng Yuh

### *Deep Dive on Cybersecurity*

Benjamin Mah	Goh Eng Choon	Sophia Ng (Ms)
Boye Vanell	Leonard Ong	Tan Yeow Seng
Colin Low	Ng Lup Houh	Tony Chew
Donald L. Pressley	Richard Moore	Vincent Loy
Eugene Teo	Sabrina Ho (Ms)	Winston Chew

### *Deep Dive on E-Commerce*

Anupam Pahuja	Florian Hoppe	Lee Yee Fung
Arne Jeroschewski (Dr)	Hyunwook Cho	Noam Berda
Cheong Lai Peng (Ms)	Jeff Cheong	Paul Soon
Clara Nguyen (Ms)	Kelvin Tay	Pierre Poignant
Damien Haas	Kiren Kumar	

### *Deep Dive on Healthcare*

Andrew Hamilton  
Bruce Liang  
Chang Yew Kong  
Chen Weiwen  
Claus Zieler  
Diederik Zeven  
Fiona Tan (Ms)  
Grace Ng (Ms)  
James Lim

Jeremy Lim  
John Lim  
Johnny Teo  
Ken Lee (Dr)  
Lal Sundeep  
Lee Chien Earn  
Lim Tock Han  
Nawal Roy  
Ng Choon Peng

Noonan Kenneth Daniel  
Peter Cheng  
Poon Thong Yuen  
Roger Radke  
Shane Pang Lu Thing  
Tan Say Beng  
Venugopal Joshi  
Weng Si Ho (Ms)  
Zenton Goh

### *Deep Dive on Hub Services*

Aaron Yeo  
Alison Kennedy (Ms)  
Alvin Cai  
Alpesh Patel  
Cavan Tan  
Cordelia Chung (Ms)  
Damien Glendinning  
David Wijeratne  
Derek Kidley  
Dilip Mistry  
Eleana Tan (Ms)  
Fraser Thompson  
Gary Ong  
Hilary Chan (Ms)  
Jackie Chew

Jacky Ang  
Jitesh Avlani  
Jo Le Couilliard (Ms)  
Kent Chaplin  
Kevin Lu  
Kiyohiko Yoshii  
Kuok Meng Wei  
Lam Kun Kin  
Lester Lim  
Li Li Kuan (Ms)  
Luke Lim  
Mahesh Asrani  
Mark Vessey  
Matt Godfrey  
Mohit Mehrotra

Nick Waters  
Paul Ng  
Phua Jia Le  
Prakash J.  
Sandhia Nair  
Satish Shankar  
Satya Ramamurthy  
Stephen Ly  
Susan Hwee (Ms)  
Tan Chin Hwee  
Tan Wah Yeow  
Thomas Mouritzen  
William Ng  
Zhen Junjie

### *Deep Dive on India*

Aloysius Arlando  
Angeline Chan (Ms)  
Benjamin Yap  
Bernard Tan  
Edmund Cheah  
Elizabeth Tan (Ms)  
Foong Kah Keong

Grace Chiew (Ms)  
Jonathan Yap  
Kow Juan Tiang  
Lee Yee Fung  
Magdalene Loh (Ms)  
Margaret Toh (Ms)  
Omar Shahzad

Piyush Gupta  
Tan Soon Kim  
Tang Tat Kwong  
Tony Yap  
Vivian Singh  
Yeong Wee Tan

### *Deep Dive on Infrastructure*

Audra Low (Ms)  
Christina Tan (Ms)  
Clive Kerner  
Gan Chee Yen  
Jeanette Wong (Ms)  
Jonathan Yap  
Kai Nargolwala

Kok Chee Wai  
Lee Ark Boon  
Lee Hoi Leong  
Lee Seng Chee  
Lee Sze Liang  
Lim Pek Suat (Ms)  
Lim Wee Seng

Lynn Tho (Ms)  
Ng Kai Scene (Ms)  
S Nasim (Dr)  
Stephen McWilliams  
Tan Ee Loo (Ms)  
Wong Heang Fine

### *Deep Dive on Southeast Asia*

Ashwin Chari  
Charles Tan  
Chia Kim Huat  
Eddie Seow  
Edward Chiu  
Ivan Tan

Jan-Paul Jeffrey  
Kelvin Teo  
Kenneth Lim  
Lai Shu Ying (Ms)  
Leong Chi Meng  
Liew Yew Fah

Lim Ho Kee  
Lim Kay Kheng  
Tan Ee Loo (Ms)  
Tan Soon Kim  
Vincent Tan

### *Deep Dive on Urban Solutions*

Alex Taylor  
Alexandre Parilusyan  
Alfred Huan (Prof)  
Alfred Lum  
Allan Pang  
Andrew Chow  
Anisah Ahmad  
Armin Aberle (Prof)  
Arnold Lee  
Bert Jan Armand Deprest  
Brandon Chia Seng Poon  
Chinn Lim  
Chris Whitney  
Christophe Inglin  
Dan Chia  
Edwin Khew  
Etienne Drouet  
Eugene Toh  
Fong Pin Fen (Ms)  
Franck Vitte  
Frank Phuan  
Fumio Hatori  
Gao Chun Ping  
Goh Chee Kiong

Hari Gunasingham (Dr)  
Hari Ramachandran  
John Warren  
Jonathan Ng  
Jong Tong Foo  
Joseph Tay  
Karen Yu (Ms)  
Kenneth Sim  
Kenny Sng  
Kevin Chow  
Ko Yamamoto  
Kok Yixiong  
Laura Wynters (Dr)  
Lee Boon Woei  
Lim Horng Leong  
Lim Tow Fok  
Lim Yew Meng  
Looi Teik Soon  
Luca Fontana  
Mahesh Tanwani  
Mann Young  
Omar Shahzad  
Pablo Viejo  
Patricia Yim (Ms)

Quoc-Cuong Vuong  
Seah Chee Huang  
Shintani Yasuyuki  
Siew Chen Ann  
Steve Lee  
Subodh Mhaisalkar (Prof)  
Takagi Kaosu  
Tan Kong Hwee  
Tan Seng Chuan  
Tan Sze Tiong  
Tan Tian Chong  
Terence Siew  
Thomas Jakob  
Thomas Reindl (Dr)  
Tom Lokenvitz  
Tommy Leong  
Wei Nan Yew  
Wolfgang Huppenbauer  
Yap Zhi Jia  
Yeo Sheow Wei (Ms)  
Yeoh Lean Weng  
Yeow Shinwe

### *Aerospace Roundtable*

Chua Wei Chuen  
Dev Rudra  
Jeffrey Lam  
Jimmy Tan  
Joel Tee  
Kevin Kirkpatrick

Lee Chee Weng  
Lindy Heng (Ms)  
Mark Loh  
Mark Stevens  
Ng Kim Keng  
Paul Inman

Soh Chee Siong  
Tan Kong Hwee  
Wong Yue Jeen  
Yogesh Farswani

### *Healthcare Roundtable*

Audrey Tan (Ms)  
Christine Giam (Ms)  
Keith Carpenter (Dr)  
Liam Tully (Dr)

Lee Tiong Soon  
Lee Boon Kiat  
Maureen O'Shea (Ms)  
Paul Sharratt (Prof)

Pericles Lagonikos  
Rajnish Narula



### *Precision Engineering Roundtable*

Ahmad Magad	Haryanto Tan	Loh Wai Mun
Amos Leong	Iris Tiong	Ong Eng Yian
Ashley Yap	Jack Goh	Ralph Foong
Barry Sim	Joachim Ihrcke	Simeon Tan
Chan Kheng Meng	Jonathan Chou	Tan Sock Cheng
Chang Chin Nam	Kelvin Zin	Terrence Oh
Chang Thai Nam	Kenneth Tang	Tommy Ng
Derrick Yap	Koh Boo Hor	Vanessa Chan
Goh Hin Tiang	Lim Boon Huat	

### *Specialty Chemicals Roundtable*

Baudouin Halsberghe	Lee Teng Huar	Valdirene Licht
Cindy Koh (Ms)	LRS Mani	Xin Yi Tan (Ms)
Jacques Cazin	Martin Willis	
Kin Yung	Nich Challoner	

### *Focus Group on Banking, Finance & Insurance and Private Wealth*

Andrew Mak	Lam Chee Kin	Pamela Yeo (Ms)
Angela Lim (Ms)	Louis Chan	Stacy Choong (Ms)
David Tung	Mah Kah Loon	Tan Su Shan (Ms)
Darius Tay	Mark Billington	
Dawn Ho (Ms)	Michael Pfaar	

### *Focus Group on Compliance (Governance and Investigations), Risk Management and Internal Audit*

Abdul Jabbar Bin Karam Din	Dan Shea	Ng Siew Quan
Annabelle Yip (Ms)	Holger Linder	Satyanarayan Ramamurthy
Chan Shui Har (Ms)	Jimmy Ng	Siraj Omar
Cheung Pui Yuen	Lam Chee Kin	Tan Boon Yen (Ms)
Chew Mei Lee (Ms)	Leon Yee	Vincent Choo
Choo Chek Siew	Mee F Moh (Ms)	Wilson Ang
Daisy Khoo (Ms)	Melvin Yong	

### *Focus Group on High Growth Practice Areas, Evolving Client Needs, and Potential Disruptors*

Christopher Chuah	Lin Diaan-Yi (Ms)	Sachi Kayal (Ms)
Kohe Hasan (Ms)	Max Loh	Sim Guan Seng
Lee Eng Beng	Quek Suan Kiat	Tan Ting Ting (Ms)

### *Focus Group on Intellectual Property*

Abhijit Ghosh	Daniel Poh	Rachel Tey (Ms)
Adam Bogsch	David Chiem	Sivagnanaratnam,
Andy Chaw	Ho Cheng Huat	Sivananthan (Anan)
Angela Toh (Ms)	Jessica Tang (Ms)	Tan Pheng Hock
Carol Goh (Ms)	Joyce Tee (Ms)	Winston Chan
Chiew Yu Sarn	Keoy Soo Earn	
Clarence Tan	Lam Chung Nian	

**Focus Group on Small and Medium Sized Accounting Firms — Innovation and Internationalisation**

Amos Ng	Kon Yin Ton	Tan Ai Ching Eleana (Ms)
Elaine Lim (Ms)	Lee Fook Chiew	Tan Kuang Hui
Fang Lee Wei (Ms)	Lynette Seah (Ms)	Valencia Teo (Ms)
Frankie Chia	Ravi Arumugam	Vincent Tang
Ho Lon Gee	Sidney Lim	
Kelvin Tay	Sim Guan Seng	

**Focus Group on Technology, New Business Models and Other Disruptors**

Alex Toh	Foong Sew Bun	Mark Wong
Alexis Chun (Ms)	Hans Zhong	Ong Ba Sou
Chan Yuk Lun	Jeff Bullwinkel	Quek Jee Ngee
Cherilyn Tan (Ms)	Jonathan Yuen	Reuter Chua
Daniel Leong	June Lim (Ms)	Suvir Varma
Eddie Ng	Lam Chee Kin	Terence Tan
Ellery Sutanto	Lim Seng Siew	Yee Cheok Hong
Foo Nian Chou	Malik Yajnish	

**Subcommittee on the Future of Connectivity**

<b>Chan Chun Sing (Co-Chair)</b>	<b>Secretary-General, National Trades Union Congress; Minister for Prime Minister's Office</b>
<b>Mariam Jaafar (Ms) (Co-Chair)</b>	<b>Partner and Managing Director (Singapore), The Boston Consulting Group</b>
<b>Chee Hong Tat</b>	Minister of State for Communication and Information and Health
<b>Christian Bischoff</b>	Founder and Executive Chairman, Pan Asia Logistics
<b>Daniel Koh</b>	Managing Director and Global Head, Asset & Liability Management, Standard Chartered Bank
<b>Donald Tay</b>	CEO, DPEX Worldwide Express
<b>Gareth Evans</b>	CEO, Qantas International and Freight
<b>Goh Choon Phong</b>	CEO, Singapore Airlines
<b>Julian Persaud</b>	Regional Director (APAC), Airbnb
<b>Lee Seow Hiang</b>	CEO, Changi Airport Group
<b>Lim Chee Kean</b>	CEO, Ascent Solutions
<b>Loh Boon Chye</b>	CEO, Singapore Exchange Limited
<b>Loi Pok Yen</b>	Group CEO, CWT Group
<b>Maximilian Bittner</b>	CEO, Lazada Group
<b>Ong Ai Hua (Ms)</b>	President, One Johnson & Johnson Southeast Asia
<b>Ooi Huey Tyng (Ms)</b>	Country Manager (Singapore and Brunei), VISA
<b>Oscar de Bok</b>	CEO (Mainland Europe, Middle East and Africa), DHL
<b>Parag Khanna (Dr)</b>	Senior Research Fellow, Centre on Asia and Globalisation, Lee Kuan Yew School of Public Policy
<b>Poh Choon Lay</b>	Deputy CEO, SCF Global Pte Ltd

<b>Rene Pedersen</b>	Managing Director, A.P. Moller Singapore Group Representative (Asia Pacific), Maersk Group
<b>Robert Yap (Dr)</b>	President, Singapore National Employers Federation
<b>Rohan Mahadevan</b>	Senior Vice President (APAC), Paypal
<b>Saw Ken Wye</b>	CEO, CrimsonLogic
<b>Tan Puay Hin</b>	Senior Advisor (Group Port Design & Connectivity), PSA International
<b>Tan Tong Hai</b>	CEO, StarHub
<b>Vinod Kumar</b>	Managing Director and Group CEO, Tata Communications

### Resource Panel

Bernard Wee  
Chua Taik Him

Kelvin Wong  
Leong Sing Chiong

Ng Siew Kiang (Ms)  
Tan Kong Yam (Prof)

### Consultation on Air Transport

Alicia Low (Ms)  
Angus Robson  
Barathan Pasupathi  
Benjamin Tan  
Bob Lange  
Brendan Sobie  
Charmain Kwok (Ms)  
Conrad Clifford  
Desiree Bandal (Ms)  
Donald Tan

Doreen Koh (Ms)  
Foo Chai Woo  
Gerry Oh  
Gwee Xin Lin (Ms)  
Ili Hazwani (Ms)  
Jaisey Yip (Ms)  
Jeffrey Ng  
Laurence Chin  
Liew Zhong Yao  
Lim Ching Kiat

Loganathan Velaitham  
Mui Chee Wai  
Pearly Ue (Ms)  
Roger Look  
Sean Ng  
Sum Kar Leong  
Victor Sim  
Xin Jing Jing (Ms)

### Consultation on Finance Connectivity

Amos Tan  
Chan Hon Fai  
Jinesh Patel

Steven Fang (Dr)  
Sylvia Wong (Ms)  
Tan Siok Hong (Ms)

Wico Yeo  
Zia Zaman

### Consultation on Food Regulatory Connectivity

Astrid Yeo (Dr)  
Chua Lay Har

Chua Tze Hoong (Dr)  
Yap Him Hoo (Dr)

### *Consultation on Healthcare Regulatory Connectivity*

Chan Cheng Leng (Ms)  
Chua Siew Wei (Ms)

Ling Boon Lee (Ms)  
Raymond Chua (Dr)

Wong Woei Jiuang (Ms)

### *Consultation on Physical Connectivity*

Bennett Neo  
Chan Hsien Hung  
Chin Yau Seng  
Goh Hung Song  
Jeffrey Chua  
Jeffrey Ng  
Jordan Z. Schwartz  
Kelvin Lim  
Kevin Cheong  
Ku Young Bae  
Leong Choong Cheng  
Leow Yeouyi  
Lucas Tan

Michael Koh  
Michael Tyler  
Mike Lee  
Navin Chandra Salian  
Ooi Boon Hoe  
Preston Chow  
Raine Ng Yoke Foong (Ms)  
Richard Lim  
Rodney Ee  
Roxane Desmicht (Ms)  
Ruffier Philippe  
Sahril Bin Mahmood  
Sascha Hower (Dr)

Tan Boon Hao  
Tan Juan Fook  
Travis Wong  
TS Teo  
Vaibhav Dabhade  
Vincent Phang  
Wan Chee Foong  
Wong Chian Voeng  
Wong Shih Jon  
Yacoob Piperdi  
Zarina Piperdi (Ms)

### *Consultation on Trade Finance / Derivatives*

Amitabh Jha  
Anthony Key  
Calvin Lee  
Celine Teiseddre (Ms)  
Cheam Hing Lee  
Christina Ng (Ms)  
Dickson Jiang  
Evan Lim

Fuzu Zeng  
Guy Thurston  
Iain Lawson  
John Ho  
Jonathan Tan  
Linda Neo (Ms)  
Michael Lum  
Ng Chuey Peng (Ms)

Philip Choi  
Tan Kah Chye  
Tan Yuet Yee (Ms)  
Theresa Pixler Zapiecki (Ms)  
William Chin  
Xiao Qin

### *Deep Dive on Capital Markets*

Amit Anand  
Amy Ang (Ms)  
Benjamin Tan  
Eng-Kwok Seat Moey (Ms)  
Gail Ong (Ms)  
Gan Seow Ann

James Khoo  
Jason Green  
John Yohan Kim  
Keith Magnus  
Rajeev De Mello  
Rohit Sipahimalani

Saikat Mukherjee  
Sam Vilo  
Sumit Behl  
Tan Tze Gay (Ms)  
Willard McLane

### *Deep Dive on Payments*

Anita Loh (Ms)  
Anupam Pahuja  
Calvin Tan  
Chris Feng  
Darrell Chan  
Denis Bugrov

Gan Siok Hoon (Ms)  
Gillian Lee (Ms)  
Greg Trotter  
John Laurens  
Ku Young Bae  
Lawrence Chan

Lynn Gaspar (Ms)  
Menno Dellisse  
Norma Sit (Ms)  
Shonali Krishnaswamy (Dr)  
Yeong Mun Ling (Ms)  
Zhang Dayong

## Subcommittee on the Future City

<b>Lawrence Wong (Co-Chair)</b>	<b>Minister for National Development</b>
<b>Tan Chong Meng (Co-Chair)</b>	<b>Group CEO, PSA International</b>
<b>Desmond Lee</b>	Senior Minister of State for National Development
<b>Charles Quek</b>	CEO, HSL Constructor Pte Ltd
<b>Cheng Hsing Yao</b>	Group Managing Director, Guocoland Singapore
<b>Chong Siak Ching (Ms)</b>	CEO, National Gallery Singapore
<b>Goh Swee Chen (Ms)</b>	Chairperson, Shell Companies in Singapore
<b>Janet Ang (Ms)</b>	Vice President, Industry Solutions, Systems of Engagement and Smarter Cities, IBM Asia Pacific
<b>Loh Chin Hua</b>	CEO, Keppel Corporation
<b>Malone-Lee Lai Choo (Dr)</b>	Director of Center for Sustainable Asian Cities, National University of Singapore
<b>Manohar Khiatani</b>	Deputy Group CEO, Ascendas-Singbridge
<b>Muhammad Shamir</b>	Founder and CEO, VersaFleet Pte Ltd
<b>Ng Lang</b>	CEO, Urban Redevelopment Authority
<b>Png Cheong Boon</b>	CEO, JTC Corporation
<b>Sanjeev Sanyal</b>	Visiting Fellow, IDFC Institute, Mumbai
<b>Scott Dunn</b>	Vice President, AECOM
<b>Siew Man Kok</b>	Chairman and Director, MKPL Architects Pte Ltd
<b>Thomas Chu</b>	Managing Director, Boustead Projects Limited
<b>Wan Kwong Weng</b>	Head of Group Corporate Services & Group General Counsel, Mapletree Investments
<b>Wong Kim Yin</b>	Group CEO, Singapore Power
<b>Yam Kum Weng</b>	Executive Vice President (Air Hub and Development), Changi Airport Group

### Focus Group on Flexible Land Use and Mixed-use Districts

Benedict Soh  
Bicky Bhangu (Ms)  
Cheang Kok Kheong  
Grace Choo (Ms)  
Lynette Leong (Ms)

Ng Wai Yee (Ms)  
Pua Seck Guan  
Richard Hong  
Richard Lee  
Richard Paine

Stephanie Groen (Ms)  
Tan Swee Yiow  
Tan Yok Joo (Ms)  
Thio Gim Hock

## Subcommittee on Future Jobs and Skills

<b>Ong Ye Kung (Co-Chair)</b>	<b>Minister for Education (Higher Education and Skills); Second Minister for Defence</b>
<b>Bill Chang (Co-Chair)</b>	<b>CEO, Group Enterprise and Country Chief Officer, Singapore, Singtel</b>
<b>Janil Puthuchery (Dr)</b>	Minister of State for Communications and Information and Education
<b>Low Yen Ling (Ms)</b>	Parliamentary Secretary for Education and Trade and Industry; Mayor, South West Community Development Council
<b>Andrew Chong</b>	Regional President & Managing Director, Infineon Technologies Asia Pacific Pte Ltd
<b>Anthony Tan</b>	Group CEO and Co-Founder, Grab
<b>Cham Hui Fong (Ms)</b>	Assistant Secretary-General, National Trades Union Congress
<b>Chong Ee Rong (Ms)</b>	Group Managing Director, Ogilvy & Mather Singapore
<b>Clarence Ti</b>	Principal, Ngee Ann Polytechnic
<b>Elaine Yew (Ms)</b>	Global Executive Committee Member and Managing Partner (Singapore), Egon Zehnder
<b>Izzat Mohd Ismail</b>	Managing Director, EDN Learning Discoveries
<b>Joshua Soh</b>	CEO, HealthSTATS International Pte Ltd
<b>Joshua VM Kuma (Dr)</b>	Director, Baring Private Equity Asia
<b>Judy Hsu (Ms)</b>	CEO, Standard Chartered Bank Singapore
<b>Lee Chee Koon</b>	CEO, The Ascott Limited
<b>Suhaimi Zainul-Abidin</b>	Director, Quantedge Capital
<b>Tan Thiam Soon (Prof)</b>	President, Singapore Institute of Technology

## Focus Group with Unions and Older Workers

Ahmad Morshid Bin Mustapha	Helen Goh Meng Chee (Ms) Lynn Wong Yuqing (Ms)	Rose Tan (Ms) Seah Keng Tia
Ang Kok Yong	Mohammad Hasrul	Shawn Ng Youyi
Burhan	Passarebu Daud	Siska Oktaviani (Ms)
Daniel Loh	Ng Si Kin	Sokdev Singh
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