THIRTEENTH PARLIAMENT OF SINGAPORE

Second Session

FOURTH REPORT OF THE ESTIMATES COMMITTEE

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ESTIMATES COMMITTEE

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CONTENTS

FOURTH REPORT OF THE ESTIMATES COMMITTEE

The Estimates Committee, appointed in pursuance of Standing Order No 100 (3), had agreed to the following Report:

1 The Estimates Committee considered the Budget for the Financial Year (FY) 2019/2020 (Paper Cmd 19 of 2019) and enquired into certain matters, including special transfers, supplementary estimates for FY2018 and cybersecurity in Government and resources allocated. The Committee also made inquiries on the measures to build Singapore as a Global-Asia node of technology and development, and monitored the implementation of the national SkillsFuture movement.

2 In the course of its enquiry, the Committee received two memoranda from the Ministry of Finance (MOF) on 17 May 2019 and 19 September 2019. The Committee also received a written representation from the Singapore Business Federation (SBF) on 19 September 2019.

MONITORING OF SPECIAL TRANSFERS

3 The Committee noted in Budget 2019, a large sum of $15.3 billion was set aside under Special Transfers, including Top-up to Endowment and Trust Funds. The sum included $6.1 billion for the Merdeka Generation Fund and $5.08 billion for Long Term Care Support Fund. The Committee noted that these Special Transfers were meant to meet the specific current and future needs of Singaporeans and provide assurance to the public that there was sustainable funding to meet these needs.

Purpose of Funds set aside in Special Transfers and Accountability

4 As part of monitoring the usage of funds in Special Transfers, the Committee queried MOF to know more about the funds set aside in the Special Transfers, their purposes and how they were managed.

5 MOF shared that there were two categories of Special Transfers: (a) Special Transfers to businesses and households, and (b) Top-up to Endowment and Trust Funds. MOF clarified that Special Transfers referred to cash flows disbursed from the Consolidated Fund over an FY, and not to the fund balances within Endowment and Trust Funds or to the cash flows from

these funds. Special Transfers might supplement Ministries' expenditure, but were not part of Ministries' operating expenditure. The administrative costs incurred for implementation of Special Transfers were funded within the reported Special Transfers amount.

(a) <u>Special Transfers to businesses and households</u>

Special Transfers to businesses and households had been disbursed over the years to help Singaporeans and businesses cope with various transitional shifts and changes to key policies. An example was the Temporary Employment Credit, which was a three-year measure introduced between 2015 to 2017 to help employers cope with higher wage costs arising from CPF enhancements. In certain years, the Government might also share one-off surpluses with Singaporeans. For example, in 2018, the Government announced a one-off SG Bonus, arising from the exceptional revenue upside, to share the fruits of the country's development with Singaporeans.

(b) <u>Top-ups to Endowment and Trust funds</u>

Endowment and Trust Funds were created by the Government for specific expenditure objectives and were established with an injection of Government monies as principal to help fund specific programmes on an ongoing basis. For Endowment Funds, the principal sum set aside could not be spent, and was used to generate a stream of income to finance programmes on an ongoing basis. These programmes were, in turn, recurring and needed an on-going income. An example was the Community Care Endowment Fund, which provided social assistance to low-income Singaporeans. Trust Funds served similar purposes but the principal sum might be drawn down for spending. These were usually set aside when the Government's commitment was well-defined at the establishment of the fund. An example was the Pioneer Generation Fund to provide the Pioneers with greater assurance on their healthcare costs. The Fund was sized to meet the needs of the Pioneers for life.

6 MOF further informed the Committee that their approach to Special Transfers reflected the Government's commitment to meet Singapore's spending needs in a sustainable manner. Special Transfers to businesses and households might be used to meet temporary needs or share one-off surpluses without adding to the base of long-term recurrent spending, while

Endowment and Trust Funds helped to ensure that certain programmes were not affected by annual or cyclical fluctuations in revenues due to the economic cycle.

7 In a follow-up query, the Committee enquired whether there was any relationship between Special Transfers and budgetary surpluses, and how had variances in economic growth and budgetary surpluses from FY2012 to FY2018 impacted Special Transfers. In addition, the Committee was interested to know the criteria for making top-ups to the Endowment and Trust Funds and how were these criteria determined if any.

8 MOF explained that the timing and amounts of Special Transfers, including Top-ups to Endowment and Trust Funds, were determined based on the Government's longer-term plans, the needs of the economy and society, and the Government's fiscal position. The Government also needed to maintain a balanced budget over each term of Government as required under the Constitution.

9 Elaborating more, MOF shared that Special Transfers were not mechanically determined by the amount of budgetary surpluses at any point in time. In fact, Special Transfers might increase in times of budgetary deficits if the economic situation calls for it. In the event of a significant economic downturn, the Government might supplement the regular annual expenditure through Special Transfers to households and businesses as part of counter-cyclical fiscal measures. For example, during the Global Financial Crisis in 2009, the Government announced a $4.5 billion Jobs Credit Scheme to encourage businesses to preserve jobs in the downturn. The Overall Budget Balance was in deficit of $0.8 billion in that year.

10 On the other hand, in years with unexpected budgetary surpluses, the Government might use Special Transfers to share one-off surpluses with Singaporeans. MOF gave the example of the one-off $700 million SG Bonus announced in Budget 2018, arising from an exceptional one-off revenue upside from higher stamp duty collections and MAS' Contributions. Another example was Budget 2011 which had the one-off Growth Dividends costing $1.5 billion as part of the "Grow and Share Package", to share the fruits of Singapore's exceptional economic growth in 2010.

11 As for top-ups to Endowment and Trust Funds, the Government similarly adopted a long-term view and ensured that there were sufficient funds to meet committed spending needs.

For example, the Government had set aside funds to partially support the development of upcoming major infrastructure projects with lumpy expenditures, such as Changi East Development and major rail lines, through the setting up of the Changi Airport Development Fund and Rail Infrastructure Fund in 2015 and 2018. The Government had also set aside funds based on the estimated lifetime cost of cohort-based packages, namely the Pioneer Generation Package (PGP) in 2014, and the Merdeka Generation Package (MGP) in 2019, to provide the Pioneer and Merdeka generations with greater assurance on their healthcare costs. The cohort package subsidies were on top of significant annual healthcare spending ($11.7 billion estimated in FY2019), which was expected to rise significantly with ageing demographics. In addition, the Government topped up the Medical Endowment Fund by $0.5 billion in 2017, after assessing that the utilisation had increased by an average of 9% a year between FY2013 to FY2015. Topping up such funds when the Government was able to do so was a fiscally prudent approach that provided assurance to the public that there was sustainable funding to meet future needs. MOF re-emphasised that the Government's approach to Special Transfers reflected the commitment to meet spending needs in a sustainable manner.

12 To the Committee's query on the percentage of the Budget for each of the respective years that had been allocated for Special Transfers, MOF provided a breakdown of Special Transfers, as well as Special Transfers as a percentage of Overall Government Expenditure between FY2010 to FY2019 which can be found at Annex A.

13 When it was shared with the Committee that the estimated expenditure from the various funds was expected to amount to $4 billion as juxtaposed against Ministries' spending of $79 billion, the Committee probed further and asked what the $4 billion represented in terms of a percentage of the total amount in the Special Transfers and information on how much of it was drawn down from returns as opposed to capital.

14 MOF reiterated that Special Transfers referred to the Government's expenditure for the year that was spent on (i) transfers to businesses and households within the year, and (ii) top-ups to funds for spending over several years. In FY2018, the Government's revised expenditure on Special Transfers to businesses and households was $1.7 billion, top-ups to funds amounted to $7.3 billion. Expenditure from funds in the same year amounted to $4.1 billion. MOF's reply focused on top-ups to, and expenditures from, funds.

15 Given that funds were classified as (i) Endowment Funds, or (ii) non-Endowment Funds, MOF explained that for Endowment Funds, only investment income could be spent. The principal sum set aside could not be spent, and was used to generate a stream of investment income to finance their respective programmes. These programmes were ongoing and, hence, needed a recurrent source of income. There were five Endowment Funds and examples included the Edusave Endowment Fund and Medical Endowment Fund. As the principal sum could not be spent, the expenditure from Endowment Funds was roughly equal to the rate of investment return. The total estimated expenditure from Endowment Funds in FY2018 was $0.8 billion, representing 3.9% of the Endowment Fund balances. There were no top-ups to Endowment Funds in FY2018.

16 For non-Endowment Funds, the principal sum, together with the investment income, might be drawn down to meet expenditure needs over multiple years. For example, the Pioneer Generation Fund was used to fund the cohort-based PGP, and needed to last till the last Pioneer had passed on. The Changi Airport Development Fund (CADF) would be used for the Changi East Development whose construction was expected to last more than a decade. MOF expected the drawdown to start early next decade. To sum up, in FY2018, the total amount spent from non-Endowment Funds was $3.2 billion, representing 7.7% of the non-Endowment Fund balances. Total top-ups to non-Endowment Funds amounted to $7.3 billion.

Information on the Funds

17 The Committee noted that the balances of Endowment and Trust Funds were reported through (i) financial statements to Parliament (for Government Funds set up by legislation), or (ii) Statutory Board's (SB) financial statements (for a fund where a SB was a custodian, trustee or agent of the fund[1]). The list and purposes of Funds are shown in Annex B. The Government would make top-ups to the funds from time to time to meet the expenditure needs of the respective programmes.

18 To the Committee's suggestion whether MOF would consider consolidating such information on fund balances and KPI reviews in the Revenue and Expenditure Estimates, MOF clarified that the Revenue and Expenditure Estimates was a document that set out the

[1] For example, CPF Board is the trustee for funds such as Special Employment Credit (SEC) Fund and CPF Life Bonus Fund; the financial details of these funds can therefore be found in the CPF Board's financial statements.

Parliament-approved revenue and expenditure estimates of Ministries and Organs of State (that is, the Government of Singapore) for the financial year, prepared in accordance with the requirements of laws governing the financial affairs of the Government of Singapore[2].

19 In this regard, the Revenue and Expenditure Estimates, being a document that sought Parliament's approval for the Government's Budget, only included balances of Government Funds found under the Statement of Assets and Liabilities. Given so, the Revenue and Expenditure Estimates would not be an appropriate document to present the information on non-Government Funds. MOF assured the Committee that the Government would continue to review how best to provide relevant and useful information on Government accounts.

Special Transfers and Future Budgetary Planning

20 The Committee also queried MOF whether the significant amount of funds set aside in Special Transfers over the years for various needs, such as future healthcare and infrastructure, would be sufficient to fund future expenses and the needs of Singaporeans. In addition, the Committee asked whether the funds set aside in Special Transfers were also taken into account for future budgetary planning and alleviate pressure on the Government to increase revenue sources.

21 In response, MOF informed the Committee that the Government had planned for the long term and saved for major expenditures ahead by setting aside Endowment and Trust Funds where appropriate. For instance, in FY2018, the total spending from Government Endowment and Trust Funds was estimated to be $4.1 billion[3]. Most of this expenditure was social in nature, including GST Voucher and Pioneer Generation Fund disbursements. The spending from these funds was over and above baseline Ministry expenditures, which were expected to grow significantly.

22 For healthcare in particular, MOF shared that the Government expected expenditure to continue rising with a rapidly ageing population and increasing incidence of chronic diseases

[2] The primary laws include the Constitution of the Republic of Singapore and the Financial Procedure Act. Article 147 of the Singapore Constitution provides that the Minister for Finance shall prepare annual estimates of revenue and expenditure, and that estimates of expenditure shall be prepared for the sums respectively required to meet the heads of expenditure proposed to be met from the Consolidated Fund and the Development Fund.

[3] The spending from Endowment and Trust Funds can be found in the Analysis of Revenue and Expenditure, published on the Singapore Budget website.

over the medium term. Monies set aside were based on the estimated lifetime cost of cohort-based packages, namely, the PGP and MGP. Cohort-based packages like the PGP and MGP were provided over and above the growing Ministry expenditure. However, PGP and MGP catered only for the additional subsidies and benefits enjoyed by these cohorts, and not the baseline of healthcare expenditures. MOF took the view that Singapore would need to spend more on the baseline of healthcare expenditures, through providing subsidies to a growing elderly population, building new capacity to meet rising demand, and investing in new medical technologies to improve care quality.

23 MOF informed the Committee that the Government had also set aside funds to support the development of upcoming major infrastructure. These included long-term projects to protect Singapore against climate change, and the Changi East Development. The Government had saved ahead in preparation for these lumpy investments by setting up the Changi Airport Development Fund in 2015 and the Rail Infrastructure Fund in 2018. While these funds would help to reduce the fiscal burden in future through offsetting future expenses, they would not be able to fully fund Singapore’s overall infrastructure needs. It would also be more equitable for future generations to bear part of the costs as these projects would primarily benefit them. Hence, the Government had taken on studying the option of using Government debt as part of the financing mix for long-term infrastructure projects to fund future infrastructure investments.

24 Assuring the Committee, MOF reiterated that the Government would continue to plan ahead and prepare early to meet these varied needs. To ensure a fiscally sustainable and secure future, the Government remained cognisant of the need to be prudent in its spending, to save up where possible, and raise revenues in a fair and progressive manner.

Cohort-based packages PGP and MGP

25 With more cohort-based packages like the PGP and the MGP being provided in recent years, the Committee, in a follow-up query, asked MOF to share the considerations in setting up cohort-based financing packages and whether there were plans for a more long-term solution to finance healthcare expenditures in the future.

26 In reply, MOF informed the Committee that the Government constantly looked at ways to better support the needs of Singaporeans. The Government provided substantial support for

Singaporeans' healthcare needs through permanent schemes (namely, broad-based healthcare and MediShield Life premium subsidies, MediSave top-ups, MediShield Life and CareShield Life premium subsidies, and MediFund) so that healthcare remained affordable for all.

27 Cohort-based financing packages, such as PGP and MGP, were designed for the specific needs and circumstances of its intended target group. In particular, for the PGP and MGP, seniors in these cohorts had fewer educational opportunities and lower wages. For example, while more than nine in 10 Singaporean youths today could expect to go on to have post-Secondary education, the Pioneer and Merdeka generations had fewer opportunities. Before joining the workforce, less than two in 10 of the Merdeka generation received post-Secondary education, while about one in 10 of the Pioneers received post-Secondary education. The PGP and MGP provided additional support to these groups, who had reached or were reaching their retirement years. These benefits were built on top of the substantial base of permanent schemes that the Government had put in place to keep healthcare affordable for all Singaporeans. In 2019 alone, the Government expects to spend $6.1 billion to subsidise patient bills through existing permanent healthcare schemes, equivalent to the lifetime cost of the MGP. This was expected to rise significantly with the ageing demographics.

28 To ensure the long-term sustainability of healthcare expenditure, the Government took the following approach:

(a) <u>Adopt active cost management strategies</u>: Actively transforming the healthcare system through three key shifts.

i. Moving beyond Healthcare to Health, by investing upstream in health promotion, disease prevention and screening to empower Singaporeans to take greater ownership of their health.

ii. Transforming care models to provide cost-effective and holistic care in the community, so that patients do not need to go to more acute and intensive settings, such as acute hospitals, for their treatment and care.

iii. Shifting towards value-driven care to ensure that resources are used carefully to gain the most benefit for the population. For example, focusing on cost-effective treatments that provide the best value for patients, and improving productivity in the healthcare sector through innovation and working in collaboration with industry.

(b) Meet the increase in recurrent expenditure with recurrent revenues: With an ageing population and a growing chronic disease burden, spending on permanent healthcare schemes and other parts of the healthcare systems will continue to increase structurally. To meet the increase in expenditure, the Government plans to raise the GST from 7% to 9% sometime between 2021 and 2025 to increase broad-based recurrent revenues. This will help support recurrent healthcare expenditures, among other important growing needs like pre-school education and domestic security. The Government will ensure that the system of taxes and transfers continues to be progressive.

29 The Government would continue to review the healthcare financing policies, to support Singaporeans' healthcare needs as the population aged and life expectancy increased.

Usage of Government Debt

30 Noting that the Government was further studying the option of using Government debt as part of the financing mix for long-term infrastructure projects, the Committee asked, in a follow-up query, what this entailed and what were the considerations for using such an approach.

31 Elucidating further, MOF highlighted that it was announced at Budget 2019 that the Government was carefully studying the option of borrowing to finance long-term infrastructure. Major, long-term infrastructure projects could have lumpy development expenditures, but their benefits spanned many generations of Singaporeans. Paying for such infrastructure projects through some borrowing was fairer and more efficient, by converting a concentrated lump of spending in a few years into a smoother stream of loan repayment with interest. Done in a responsible and sustainable manner, borrowing would help instil financial discipline and distribute the share of funding more equitably across current and future generations.

32 MOF assured the Committee that the Government would ensure that the usage of Government debt for long-term infrastructure, if found suitable, would be done in a disciplined and prudent manner. Safeguards would be put in place to ensure that the debt and its interest and repayment were sustainable and in line with the Reserves Protection Framework.

Borrowing or not, the Government would continue to ensure that all Government projects were cost-efficient, well-managed and yield economic or social benefits.

Fluctuation in Special Transfers

33 The Committee noted that from 2015 to 2017, the sum allocated to Special Transfers dropped before rising again from 2018. The Committee sought an explanation from MOF on the reasons for the fluctuation in the amount allocated to Special Transfers. The Committee further queried whether there should be an ideal range of the amount of Special Transfers, as a percentage of the Total Budget allocated in each FY, to ensure that future obligations are provided for.

34 MOF explained that the timing and amounts of Special Transfers depended on the Government's policies and positions, which took time to refine and develop. Such policies were then considered against the Government's financial position, before deciding on the best way to fund them, which could include Special Transfers. For example, the PGP was developed following a fundamental review of healthcare financing in 2013 which enhanced the underlying structure of subsidies. The PGP was built on this and was announced in the following year to provide greater healthcare assurance for the Pioneers. In 2019, following a year-long review of the ElderShield Scheme, the Government injected $5.1 billion into a new Long-Term Care Support Fund to strengthen support for long-term care. The timing and amounts of Special Transfers depended on such considerations and were not pre-determined.

35 MOF took the view that rather than specifying a set range of Special Transfers every FY, it was more critical to put in place well-designed schemes and to adopt a suite of measures to ensure fiscal sustainability. The setting up of funds for specific anticipated needs in the future, when Singapore would be able to afford it, was fiscally prudent. The Government also monitored fund balances and reviewed its KPIs, and might inject further monies into funds and special transfers if the fiscal position allowed for it.

Observations and Recommendations

36 The Committee expressed its appreciation to MOF for sharing and elaborating on the various queries on Special Transfers which had been insightful. Acknowledging the efforts by the Government to plan and anticipate Singapore's future needs, the Committee took the view that such proactive actions and plans were taken with the interests of the current cohort and

future generations of Singaporeans in mind, and urged the Government to continue with such efforts.

37 The Committee acknowledged that there was no “one size fits all” financing solution for every policy, and was thus assured to note that the Government had a range of financing options according to the specific needs of its individual programmes. The Committee also supported the approach of being financially prudent to ensure a fiscally sustainable and secure future for Singapore by having Special Transfers to either share one-off surpluses or setting up of funds to meet certain anticipated needs in the future. The Committee was heartened to note that the Government took into consideration the impact of spending on various policies on long-term recurrent spending, as well as the effect of unpredictable economic environments and cyclical fluctuations on certain programmes to ensure that neither the budget nor policy objectives were compromised. The Committee urged the Government to continue exploring and experimenting various ways, including the usage of Government debts, to balance the competing needs of Singaporeans across generations.

38 As for cohort-based financing packages such as the PGP and MGP, the Committee noted that the relevant Funds were sized to meet the needs of the cohorts for life. Nevertheless, the Committee urged the Government to continually monitor expenditures, by taking medical inflation and longevity trends into account, to ensure that there were sufficient funds and that the subsidies and benefits under the packages would provide meaningful support and give peace of mind to the relevant cohorts on their healthcare costs.

39 In view of a greying population, the Committee was assured that the Government would continue to review the healthcare financing policies to support Singaporeans’ healthcare needs as the population aged and life expectancy increased. The Committee also urged the Government to keep a close eye on the healthcare needs of new cohorts that might need the support of similar cohort-based financing packages in the future, or look into new models of supporting rising healthcare spending.

40 The Committee also urged the Government to examine how to present the information, such as fund balances and KPI reviews for Endowment and Trust Funds, including non-Government Funds, in a more consolidated or meaningful way.

41 The Committee was assured that the Government was cognisant of the need to continue planning ahead and to be prudent in its spending, to save up where possible, and raise revenues in a fair and progressive manner.

SUPPLEMENTARY ESTIMATES FOR FY2018

42 The Committee noted that the Supplementary Estimates for FY2018 (that is, the financial year 1 April 2018 to 31 March 2019) requested the amounts of $1.33 billion for the Supplementary Main Estimates and $295 million for the Supplementary Development Estimates. The Committee also noted that a total of 11 Ministries/Heads requested extra funds in the Supplementary Main Estimates. As such, the Committee asked MOF how the Supplementary Estimates for FY2018 compared with previous Supplementary Estimates, and what was/were the underlying reason(s) for the large amount of funds requested in the Supplementary Estimates.

43 MOF stated that the Supplementary Estimates for FY2018 came in at 4.1% of the Revised Estimates of Ministries and Organs of State that requested for Supplementary Estimates. This was within the historical norm of between 2.2% and 11.3% from FY2010 to FY2017. As a comparison, the total Supplementary Estimates for FY2018 increased by $1.2 billion from the previous year, with Supplementary Main Estimates increasing by $1.0 billion. The underlying reasons for the amount needed in the Supplementary Main Estimates for FY2018 were:

(a) <u>Higher spending on existing subsidy schemes</u> (MOM, MND, MOH, MCCY), such as higher-than-expected payments for Workfare Training Support Scheme (WTS) with more WTS-eligible individuals taking more courses on average, and higher-than-expected HDB flat sales resulting in higher gross loss on sale of flats; and

(b) <u>Higher spending on matching grants</u> (MOE, MND). This includes higher-than-expected endowment matching grants to Autonomous Universities due to higher-than-expected donations to these institutions, and higher-than-expected co-matching contributions from the Government for Town Council's Lift Replacement Fund Scheme due to higher-than-expected contributions by Town Councils; and

(c) Additional expenditure on manpower (Judicature, Presidential Councils, MOE, MHA) partially due to higher Annual Variable Component salary payments arising from higher-than-expected economic growth.

44 Noting the explanation from MOF, the Committee asked whether this pointed to under-budgeting earlier in 2018 and what assurances were there for the Committee in ensuring that these expenditures were necessary. The Committee also asked about the guidelines and safeguards in place for Ministries to approve unbudgeted expenditures and to ensure that Ministries' spending of any unexpended budget towards the end of the financial year is for the intended programmes for which the monies had been appropriated.

45 The Committee was informed by MOF that every October, Ministries would put together their best estimates of expected spending over the next financial year beginning 1 April. However, a few Ministries and Organs of State might exceed the voted budget due to unexpected needs that emerged during the financial year. These Ministries and Organs of State would then need to seek supplementary estimates. For example, MND's increased sales transactions for HDB flats resulted in higher gross loss on sales in FY2018.

46 MOF assured the Committee that while the existing budgeting policies provided Ministries with the flexibility to manage their budget subject to the expenditure caps, Ministries were required to go through a rigorous approval process for their projects and programmes. Requests for funding had to be approved by the Internal Approving Authority (IAA). The Permanent Secretaries, in their role as Accounting Officers of the respective Ministries, had the responsibility to ensure that the IAA was properly constituted.

47 Elaborating on safeguards for Ministries' spending, MOF shared with the Committee that Ministries were allowed to transfer budget allocations across different areas of expenditures, but such transfers, also known as virements, had to be approved by the Permanent Secretary of the Ministry as its Accounting Officer, or a sufficiently senior officer authorised by the Permanent Secretary. The areas of expenditure which required an increase in spending (and, hence, budget allocation) would also have to be approved by the Ministry's IAA. There

were also various restrictions[4] which applied to virements to ensure that Ministries' spending was for intended programmes for which the monies had been appropriated. There were also complementary mechanisms in place to encourage financial prudence and savings. For example, at the end of the FY, Ministries were allowed to rollover part of the savings from the operating budget voted to them for use in the next FY.

Observations and Recommendations

48 The Committee was satisfied with the explanation on the need for the amount requested in the Supplementary Estimates for FY2018. The Committee acknowledged the robust checks and measures in place, as explained by MOF, to manage unbudgeted expenditures which required the need to seek supplementary estimates.

49 While the Committee noted that the existing budgeting policies did provide Ministries with the flexibility to manage their budget, subject to the expenditure caps, and agreed with such an approach, the Committee took the view that Ministries had to balance such flexibility with the need to forecast expenditures accurately and adopt prudence in spending.

MONITORING EFFORTS TO BUILD SINGAPORE AS A GLOBAL-ASIA NODE OF TECHNOLOGY AND DEVELOPMENT

50 In his Budget 2019 speech, Deputy Prime Minister Heng Swee Keat touched on efforts to build Singapore as a Global-Asia node of technology, innovation and enterprise which included continued investments in research and development (R&D) with $19 billion set aside as part of the five-year Research, Innovation and Enterprise 2020 (RIE2020) plan.

51 The Committee had looked at the RIE2020 plan in 2017. In the Second Report of the Estimates Committee [*Parl. 9 of 2017*], the Committee acknowledged the Government’s efforts and achievements in stimulating R&D in Singapore and explained that its inquiry into this topic was with the aim of helping the public understand that the funds injected into R&D were fuelling an important element to elevate and position Singapore for the future. The

[4] These include virements that are subject to MOF’s prior approval, and virements that are not allowed legislatively (e.g. virements from Main Estimates to Development Estimates).

Committee also encouraged the Government to aim to build distinct cutting-edge research expertise in certain areas, such as water technologies, to spur more research demands.

52 With more efforts galvanised to build Singapore as a Global-Asia node of technology, innovation and enterprise, the Committee asked MOF for an update on the progress and achievements of the RIE2020 plan.

Updates on the Achievements of the RIE2020 plan

53 In reply, MOF informed the Committee that there was no single indicator that could fully reflect the value from R&D and a basket of indicators that, when taken together, proxy Singapore's progress in making innovation pervasive and deriving value from R&D. MOF took the view that there were multiple pathways through which value from R&D and the RIE investments could be realised.

54 A total of 3,342 industry projects as of 31 March 2018, and 294 successful start-ups as of 31 March 2019 were achieved under the RIE2020 plan. At this rate, RIE2020 would be on track to meeting the target of 4,100 industry projects and had exceeded the target of 250 successful start-ups. As for the number of licences and licensing revenue generated by the AUs and A*STAR, the achievements in the first three years of RIE2020, as set out in Table 1 showed that Singapore was on track to exceeding the achievements in RIE2015.

Table 1 - Number of licences and licensing revenue by the AUs and A*STAR

	RIE2015 achievement	**RIE2020 interim achievement as of Dec 2018**
Licences	1,432	1,092
Licensing Revenue ($ mil)	27.3	28.2

55 MOF reiterated that these indicators should not be the sole metrics used to measure the impact of R&D translation and commercialisation. This was because the value of licences, as well as the scale and impact of the industry-science collaborations varied. It was also explained to the Committee that R&D commercialisation could take many forms, eg, public

collaborations with companies that led to multiple intellectual properties (IPs) being commercialised, or starts-ups spun out from IPs developed by publicly-funded research.

56 The Committee noted that investments in R&D also encouraged the growing of innovative capacities in the private sector. Business Expenditure in R&D (BERD) in Singapore had grown steadily from the start of RIE2015 (see Table 2). The steady upward trend of Singapore's BERD indicated that the RIE investments had catalysed greater innovation activities in the private sector, and encouraged businesses to leverage R&D to innovate and come up with new products, processes and solutions. In absolute terms, corporates had invested more in R&D over the past years. A comparison of Singapore's BERD against UK and other similar-sized advanced economies for the year 2017 is detailed in Table 3.

Table 2 - Singapore's Business Expenditure on R&D (2011-2017)

	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
BERD ($ mil)	4,456	4,249	4,333	5,007	5,512	5,342	5,423

Note: Data from 2011 to 2015 have been revised to reflect updates from private and public sector entities.

*Source: A*STAR National Survey of R&D in Singapore, 2011-2017*

Table 3 – Comparison of BERD as % of GDP in 2015 and 2017

Country	**BERD as % of GDP 2015**	**BERD as % of GDP 2017**
New Zealand	0.63	*data for 2017 is not available*
Netherlands	1.11	1.17
United Kingdom	1.12	1.12
Singapore	***1.45***	***1.21***
Denmark	1.89	1.97
Finland	1.93	1.80
Switzerland	2.39	*data for 2017 is not available*
Israel	3.63	3.91

*Source: OECD and A*STAR National Survey of R&D in Singapore, 2017*

57 MOF shared with the Committee the impact of RIE on good jobs and enabling industry as follows:

(a) Good jobs. Through the RIE investments, Singapore had grown a strong core of research manpower, with the number of Research Scientists and Engineers (RSEs) increasing by about 20% from around 29,500 in 2011 to around 35,300 in 2017, of whom about 70% were Singapore Citizens or Permanent Residents. Beyond the immediate impact on RSEs, RIE investments had also indirectly contributed to good jobs in the rest of the economy, by keeping industries and businesses competitive globally.

(b) Enabling industry growth. Participation by local enterprises in R&D had kept pace with that of MNCs, with R&D expenditure by local Small and Medium Enterprises (SMEs) and Large Local Enterprises (LLEs) accounting for about a quarter of total private sector expenditure on R&D over the same period. Sales revenue from commercialisation of R&D performed in Singapore had almost doubled from S$13.5 billion in 2011 at the start of RIE2015, to S$26.3 billion in 2017.

58 The Committee was informed by MOF that the RIE investments contributed to the competitiveness of economic sectors. For example, the sustained investments in the Advanced Manufacturing and Engineering (AME) domain had kept Singapore's manufacturing sector competitive and vibrant, with a S$80.4 billion (18% of GDP) output in 2017, a Compound Annual Growth Rate (CAGR) of 2.4% over the past 10 years, and many backward and forward linkages to other economic sectors.

59 When asked by the Committee how much of the $19 billion earmarked for RIE 2020 had been committed to date and whether the remaining funds were sufficient to see the plan through to its completion, MOF shared that as of the end of FY2018, about $9.8 billion had been committed and that the remaining funds should be sufficient to see through the completion of RIE2020. This included S$1.25 billion of White Space funding, which the National Research Foundation (NRF) was considering proposals for, that would allow Singapore to respond nimbly to new areas of economic opportunities and national needs over the remainder of the RIE2020 tranche.

60 Noticing that Singapore's BERD from 2011 to 2017 in Table 2 seemed to rise and fall in tandem with the introduction of the Government's RIE plans, the Committee asked whether there was any influence of the Government's RIE plan on BERD and what were the factors contributing to the unevenness in R&D expenditures across the years. Additionally, the Committee observed that Singapore's BERD was 1.21% of GDP in 2017, as indicated in Table 3, which was some distance away from other small advanced economies, such as Finland, Denmark and Israel. The Committee would like to know whether there was a target for Singapore's BERD, and whether there were plans to catch up with these other small advanced economies.

61 It was explained to the Committee that the RIE plan sought to strengthen the research intensity of the Singapore economy, anchor deep research capabilities, build up the innovation capacity of local companies, and contribute to increased BERD over time. This included initiatives, such as (i) the Industry Alignment Fund – Industry Collaboration Projects (IAF-ICP) scheme, which supported strategic collaborations between public research performers and industry and required upfront commitment of R&D spending from industry partners; (ii) the Research Incentive Scheme for Companies (RISC), which supported the establishment and expansion of private sector research laboratories in Singapore through a co-funding mechanism; and (iii) technology consortia, which bring companies and public researchers together around particular focus areas. These consortia gave participating companies first-hand exposure to upstream technologies, allowing them to pre-position themselves for the future by investing in these technologies.

62 In addition, events, such as A*ccelerate NOW!, helped to showcase the technologies and solutions co-developed through publicly-funded research, encouraging companies to collaborate with local research entities and accelerate commercialisation of technologies. The Committee was assured by MOF that the Government would continue to review and improve initiatives to create a vibrant innovation and enterprise ecosystem. For example, Enterprise Singapore (ESG)'s Startup SG initiative provided startups with access to funding, mentorship, talent, local and global networks, co-innovation platforms and infrastructure, in order to build up their capabilities and grow them.

63 Turning to Singapore's BERD (as a percentage of GDP) being lower as compared to some small advanced economies, MOF took the view that BERD is a useful but not

comprehensive or sole indicator of the economic impact from RIE investments. For example, as corporates expanded their portfolio of innovation activities beyond in-house R&D into activities, such as corporate ventures where they invested in deep-tech start-ups offering innovative technologies, they also developed their technological edge as a company, which BERD would not be able to capture. BERD also did not capture other positive economic spill-over effects that arose from developing domestic R&D capabilities, such as attracting MNCs to Singapore and creating good jobs for Singaporeans.

64 MOF also shared that Singapore's BERD was primarily influenced by macro-economic conditions, which tended to be higher when economic conditions were favourable. For example, significant one-time increases in BERD were observed in 2014 and 2015, due to major R&D investments of a few large existing companies and the commencement of R&D at a few companies in 2014.

65 The Committee noted that SMEs and LLEs accounted for a quarter of total private sector expenditure on R&D in 2017. In a follow-up query, the Committee enquired whether there was an optimal percentage of R&D or target for R&D expenditures by local SMEs and LLEs. The Committee was also interested to know how Singapore compared with other economies, such as Finland, Denmark, Switzerland and Israel in terms of R&D participation by local enterprises. As for the $26.3 billion sales revenue in 2017, the Committee asked for the proportion attributed to commercialisation of R&D accruing to the SMEs and LLEs.

66 In reply, MOF informed the Committee that the Government did not set a specific target for R&D expenditures by SMEs and LLEs. In many of the small advanced economies, a significant proportion of BERD was contributed by a few large locally-headquartered multinational companies (MNCs). In Sweden, 20 of the largest Swedish MNCs invested in R&D to make up around 40% of BERD in 2015. In the Netherlands, the top 30 Dutch companies contributed 48% of BERD in 2017. In contrast, about 50 of the top Singapore LLEs contributed about 15% of BERD in 2017. MOF also shared that in 2017, SMEs and LLEs accounted for about 10% of the $26.3 billion sales revenue from commercialisation of R&D. This proportion has fluctuated between 10% to 20% over the last five years (2013-2017).

67 Observing that Singapore had grown a strong core of research manpower, with about 35,300 RSEs in 2017, the Committee queried further to ask for the percentage of Singapore

citizens and PRs driving R&D in leadership positions. The Committee also asked how were the plans to ensure that there was skills transfer from talented foreigners to Singapore citizens and PRs, and on retaining foreign talent and naturalising them as Singapore citizens.

68 In reply, MOF stated that in the A*STAR Research Institutes and Centres, Singapore citizens and PRs (SCPRs) made up about 77% of RSEs who are Principal Investigators or equivalent. These were individuals leading research studies and, hence, leaders responsible for driving R&D in Singapore.

69 MOF highlighted that all research-performing entities, including companies, AUs and research institutes, were required to abide by the Fair Consideration Framework in hiring RSEs. If they received research funding from the Government, they were required to seek approval from the grantors should they wish to hire foreigners. This ensured a sustainable and healthy mix of foreigners and locals in R&D. Foreign entrepreneurs who hold the EntrePass, which allowed them to start and operate new businesses in Singapore, were also required to hire a minimum number of Singaporeans in their companies to qualify for EntrePass renewal.

70 MOF further shared that the number of RSEs that are SCPRs has increased from 20,439 in 2007 to 24,773 in 2017. This increase could be attributed to:

(a) Foreign RSEs in leadership positions subsequently naturalising as SCs; and

(b) The Government's efforts to build up a pool of local RSEs, eg, new RSEs through A*STAR's Scholarships and MOE's Singapore Teaching and Academic Research Talent (START) scheme. Over time, they had risen to leadership positions. The Returning Singaporean Scientists Scheme also sought to attract outstanding overseas-based RSEs back to Singapore to take up leadership positions in the AUs and publicly-funded research institutes.

71 With regard to foreign talent retention in Singapore, an average of 56% of international PhD students remained in Singapore one year after graduation. Between 2015 to 2017, within their first year of graduation, about 25% of PhDs who were foreigners became Singapore permanent residents.

Observations and Recommendations

72 The Committee welcomed the updates from MOF on the progress and achievements of the RIE2020 plan. The Committee acknowledged MOF's view that there were multiple pathways through which value from R&D and the RIE investments could be realised. The Committee noted MOF's explanation on the inherent difficulties in analysing the impact of R&D and attributing to wider outcomes that might only be apparent from some time-lag. Nevertheless, the Committee urged the Government to remain committed to make the relevant evaluation(s) and set KPIs, to inculcate strong discipline in extracting value from R&D and RIE investments, and develop the necessary insights to inform future funding allocations. The Committee took the view that the Government should develop a comprehensive set of analytics, taking into account short- and long-term factors, to set KPIs and inform value and outcomes of R&D and RIE investments, a priority necessary to meet Singapore's aspiration as a Global-Asia node of technology and development.

73 The Committee observed that the Government was doing what it could in terms of providing finances, mobilising research institutes and tertiary institutes to help local enterprises move along in terms of R&D. Noting that while in many of the small advanced economies, a significant proportion of BERD was contributed by a few large locally-headquartered MNCs, in contrast, about 50 of Singapore's top LLEs contributed to about 15% of BERD in 2017, it appeared to the Committee that leading Singapore's enterprises might not be adopting R&D as aggressively as their foreign counterparts and R&D efforts seemed more fragmented in Singapore. The Committee urged the Government to understand the significant difference in concentration of BERD amongst small competitive economies as compared to Singapore, and whether this was a pre-requisite necessary for emergence of national unicorns to become globally competitive. Additionally, in comparison with other small advanced economies like Sweden and the Netherlands, the Committee observed that Singapore appeared to be behind in terms of R&D adoption by local enterprises. While the Committee acknowledged that BERD was neither an apple-to-apple comparison due to the different contexts and mix of industries across countries nor the only measurement of whether investments into R&D were delivering value, the Committee agreed that more could be done to push for greater uptake of technology and R&D by local enterprises. The Committee also considered whether there was a lack of impetus among local enterprises to innovate and suggested that the Government could look into other ways of encouraging innovation, such as creating viable role models of innovation in every industry sector to spur competition and encourage other companies to adopt

technology to keep up. The Committee took the view that the Government could encourage local enterprises to incorporate R&D into their DNA as part of their strategy to compete locally or on a global platform.

74 Noting that Singapore had grown a strong core of research manpower, the Committee recommended monitoring developments in the research manpower sector to ensure that the R&D manpower scene remained viable and robust to support Singapore's R&D ecosystem. In addition, the Committee urged the Government to ensure opportunities for skills-transfer to current and future cohorts of research manpower, such as through active tie-ups with our local educational institutions.

75 Besides nurturing an ecosystem to drive more multidisciplinary collaborations, the Committee urged the Government to continue encouraging research institutes and AUs to explore research collaboration with overseas research institutes and universities to provide more opportunities for local researchers to tap on knowledge or expertise not easily available.

Centres of Innovation (COIs) to support SMEs with technology innovation

76 Turning to the COIs, the Committee had taken note of the Government's continued investments in COIs as announced in Budget 2019 which included the setting up of two new COIs for aquaculture and energy in Temasek Polytechnic and Nanyang Technological University respectively. The COIs are to support SMEs with technology innovation by providing assistance to enterprises, especially local SMEs and start-ups, in developing and testing technology products, through access to laboratory facilities, consultancy services and training courses. Noting that there are already eight COIs in Institutes of Higher Learning (IHLs) and public research institutes (RIs) and two new COIs to be set up, the Committee asked about the achievements of the COIs thus far and the number of SMEs which had benefited from collaboration with the COIs.

77 The Committee learnt from MOF that since the launch of the COI programme in 2006, the COIs had reached out to more than 7,400 companies, and embarked on more than 3,500 projects. It was also shared with the Committee that local SMEs benefited from COIs in the following ways:

(a) Product and Process Innovation – COIs helped with the translation of IP into commercial products and engaged in co-development projects with SMEs, enabling SMEs to create differentiated products which could capture new markets or increase their competitiveness.

(b) Technical Resources and Assistance – COIs provided SMEs with access to technical consultancy and specialty equipment that enabled product development by SMEs.

(c) Increased awareness of the latest tech developments – COIs hold outreach events for SMEs to increase awareness of new technologies available, assist SMEs in developing technology roadmaps that facilitate planning for R&D and innovation.

(d) Foster partnerships with lead demand drivers for development of innovation solutions – COIs link SMEs with lead demand drivers through innovation challenges, and aggregation of testbed partners, etc.

78 Recognising the benefits that COIs bring to local SMEs, the Committee inquired about the targets of the COIs and whether there were any monitoring systems in place to measure the effectiveness of the COIs.

79 MOF informed the Committee that the COIs aimed to bring research institutions and industry closer together to collaborate on applied R&D and technology commercialisation projects, and help SMEs develop new or improved products and services, including the translation of IP. Hence, the performance of COIs was tracked by the number of enterprise projects. The RIE2020 target was 200 enterprise projects over five years. Enterprise projects were defined as projects that involved either IP commercialisation, deployment of technologies, or improvement to the absorptive capacity of enterprises to take on technology. To ensure that companies had their skin-in-the-game and that the projects embarked on were relevant and of value to the companies involved, companies had to bear part of the cost of services provided by the COIs. In addition, the performance of COIs was reported and monitored by the Innovation & Enterprise (I&E) Exco, which was co-chaired by the Permanent Secretary of National Research and Development (NRD) and Chairman of the Economic Development Board (EDB). Every COI was account-managed and monitored closely by ESG through regular interactions and reporting of KPIs.

80 The Committee was interested in the targeted 200 enterprise projects for RIE 2020 that have been undertaken by the COIs and asked MOF to provide further information, such as the breakdown of these projects in terms of industry and how have these projects been translated to benefits for Singapore and Singaporeans in terms of jobs, IP commercialisation and industry growth.

81 MOF elaborated that the COIs had undertaken 198 enterprise projects as of March 2019. Of these, 90 projects were for the environment and water-related sectors, 60 projects were for the food manufacturing sector, and 48 were for the broader engineering and manufacturing sector. These projects have led to enterprises improving their business processes or products through developing and/or testing new technology. For example, the Food Innovation Resource Center (FIRC) used the latest packaging technologies to assist food manufacturer Cocoba Private Limited, to extend the shelf life of its salted egg fish skin and potato chips. This had enabled Cocoba to export its products to the Philippines, Hong Kong, and Thailand. To measure the impact of COIs, ESG, then known as SPRING Singapore, commissioned a COI Impact Study in 2016[5]. The quantitative impact findings showed that SMEs that undertook projects with COIs generated an estimated $13 of value-add for every dollar of grant funding provided to the COIs[6]. The study also found through interviews and market research that 61% of beneficiary companies had reported acquiring technical knowledge for current and future projects.

Feedback from Singapore Business Federation (SBF)

82 Noting the responses from MOF, the Committee agreed and supported the Government's policy behind the COI programme. To gather more feedback on how SMEs had benefited from the COI programme and how the programme could be further improved to serve SMEs better, the Committee reached out to SBF for their comments and views.

83 SBF informed the Committee, in a written representation dated 19 September 2019, that it found that SMEs had benefited from the COI programme, despite the programme being still in the process of gaining traction and numbers were still limited. SBF took the view that

[5] The impact study covered 7 COIs: (i) electronics, (ii) environment and water technology, (iii) food innovation, (iv) marine and offshore technology, (v) materials, (vi) precision engineering, and (vii) supply chain management.
[6] The value-add calculation was estimated based on: (i) the nominal 3-year cumulative value-add for all projects involving the 7 COIs covered by the impact study from Jan 2010 to Dec 2015 and (ii) the cumulative grant funding for the COIs from FY2007 to FY2015.

the COIs had an important role in assisting SMEs in their R&D needs as many local SMEs were unaware of new technologies, lack the capabilities or resources to absorb and deploy them, or to further commercialise upstream intellectual property into downstream products and services. SBF recounted to the Committee that local SMEs often depended on external research and laboratory facilities to meet these technology needs. To help SMEs access and develop such capabilities, the COIs set up in polytechnics and research institutes for innovative enterprises allowed the SMEs to leverage on their technical facilities and talent.

84 SBF shared with the Committee that as of May 2019, more than 1,000 unique SMEs had engaged the 10 COIs in projects, with more than one-third of them engaging the COIs on repeated projects. COIs helped SMEs innovate through these three broad functions: (i) engaged in product and process innovation through IP translation and co-development of products; (ii) provided technical consultancy and access to specialty equipment that would otherwise be too costly for the SMEs and; (iii) enhanced sectoral knowledge transfer through feasibility studies, roadmaps and outreach events.

85 On the Committee's query whether SMEs faced any difficulties in accessing and benefiting from the COI programme, SBF informed the Committee that some difficulties cited were in areas pertaining to technology language, licensing frameworks, foreground/background intellectual property issues, exclusive/non-exclusive licensing issues, gaps between the research scene and the full application translation prototypes. There was a lot of R&D knowledge that would be required to be imparted to SMEs first before these enterprises were able to know how best to participate and partner for R&D.

86 On how the Government could encourage more SMEs to participate and benefit from the COI programme, SBF suggested organising more outreach to inform local companies how they could access and benefit from the COI programme. The outreach could be in various forms, such as seminars, workshops, and breakfast talks. SBF could work closely with ESG and the COIs to assist in this area. These outreach activities could encourage the proliferation of a culture of having SMEs access and engage the COIs on technology issues or problems. Such a culture would also sow the seeds for SMEs to adopt a "constantly searching and innovating" mode.

87 To the Committee's broad query for suggestions to better facilitate SMEs in developing new and improved products and services and for implementation of programmes to benefit more SMES, SBF provided the feedback to the following three broad areas:

(a) Targeting of industry clusters to deliver cluster solutions. Such an arrangement essentially enhanced the efficiency in administering viable and tested solutions for enterprises encountering issues of a similar nature within the same industry. Over time, there would be an accumulation of industry-specific institutional knowledge and these could be applied effectively and quickly to better facilitate the delivery of solutions within industry clusters.

(b) Sieving out individual companies more aggressively and providing the push for the R&D ecosystem to deliver what the company required. At present, while there might be a great amount of business matching, SBF shared that SMEs' feedback suggested that the R&D ecosystem nonetheless did not seem to provide sufficient "ballast" in its push to satisfy the needs of the companies. The COIs tended to only deliver standard schemes and solutions that did not seem to be useful at the firm-level. There was, therefore, a need for the COIs to administer their R&D through an iterative feedback loop that addressed the needs of companies more meaningfully.

(c) Amount of bureaucracy as a limitation factor that might hamper the "speed to market" to some extent. Notwithstanding the necessity in programme gatekeeping, the view was that a more "pro-enterprise" spirit was needed to facilitate business growth and the unlocking of value for enterprises. The progress in fintech driven by the MAS was mentioned as an example to emulate, where market trends and customers' needs were promptly identified and, thereafter, the relevant sandboxes and licensing structures quickly put in place.

88 Additionally, SBF shared that on the issue of assisting SMEs to make the "technology leap", the wish is for instituting some form of subsidisation that comes with tenable instalment plans that enable enterprises to "pay back" the subsidies that went towards technology development with these COIs over the course of one to two years. This would go some way in relieving SMEs' liquidity constraints while facilitating the development of viable technologies.

Observations and Recommendations

89 The Committee expressed its appreciation to SBF for providing valuable feedback on the COI programme. As SBF had noted, the COI programme was still gaining traction and numbers were limited. Local SMEs were unaware of new technologies, lacked the capabilities or resources to absorb and deploy them or to further commercialise upstream intellectual property into downstream products and services. Hence, the Committee urged the Government to focus efforts to help local SMEs shorten the learning curve to embrace technology language, licensing frameworks and translation prototypes to equip them to fully participate in R&D.

90 Notwithstanding, the Committee observed that 1,000 unique SMEs had engaged 10 COIs in projects, with more than one-third of them engaging the COIs on repeated projects. The Committee noted from the COI Impact Study in 2016, SMEs that undertook projects with COIs generated an estimated $13 of value-add for every dollar of grant funding provided to the COIs, with 615 of beneficiary companies reporting acquiring technical knowledge. The Committee urged the Government to continue building up the COIs and conduct more outreach to SMEs to accelerate local companies' capabilities to innovate. The Committee was of the view the COIs played an important role in harnessing local SMEs in the push towards technology innovation which included translating R&D into practical business solutions for the SMEs.

91 The Committee also recommended that the Government consider SBF's feedback favourably, especially in the area of doing more outreach activities to engage SMEs to tap on the COIs and inculcate a "constantly searching and innovating" culture among the local SMEs which would then result in them reaching out to access and engage the COIs on technology issues or problems. The Committee recognised that such a culture would also enable local companies to self-initiate by reaching out to tap on the various Government programmes in place. In addition, the Government could also look into reducing the amount of bureaucracy, as cited by SBF, and encourage a more "pro-enterprise" spirit among the different Government agencies to facilitate business growth and the unlocking of value for enterprises. Separately, the Committee urged the Government to consider positively SBF's feedback on the need for the COIs to administer their R&D through an iterative feedback loop that addressed the needs of companies more meaningfully.

NATIONAL SKILLSFUTURE MOVEMENT AND BUDGET ALLOCATED

92 Following up on the Committee's Report [*Parl. 4 of 2017*] released in January 2017 which examined SkillsFuture as part of its work, the Committee sought updates from MOF on the SkillsFuture movement. The Committee noted that then-Deputy Prime Minister Tharman Shanmugaratnam informed Parliament in 2015 that the estimated Government spending on continuing education and training would increase from about $600 million per year to an average of over $1 billion per year in 2020. Given so, the Committee asked MOF to provide information on the annual spending by the Government on continuing education and training for Singaporeans since 2015 and the estimated spending needed beyond 2020.

93 To this, MOF explained that the projected expenditure for "Continuing Education and Training (CET)"[7] cited in the 2015 Budget Statement consisted of MOM's and MOE's projected expenditure for CET, including new programmes launched under the SkillsFuture umbrella, and job placement. This excluded spending on training grants by sector agencies as part of their industry development efforts. MOF went on to share that in FY2017, $800 million (excluding spending on training grants by sector agencies) went to programmes for CET, including SkillsFuture spending and job placement (eg, Adapt and Grow programmes). The Committee also learnt that the Government was prepared to make provisions of up to $3.6 billion for programmes to support lifelong learning and job placement efforts over the next three years, from FY2019 to FY2021.

94 When asked how the funding deployed thus far had been helping Singaporeans in seizing opportunities to adapt to new jobs and prepare for the future, MOF informed the Committee that funding was deployed to a range of programmes supporting different groups of Singaporeans. MOF emphasised that all Singaporeans are eligible for training support, especially in industry-relevant courses where subsidies are provided for courses at the Institutes of Higher Learning (IHLs) and approved training providers. Higher subsidies were provided for courses which were more industry-relevant. To guide course selection, there was the SkillsFuture Series, which was a curated list of short, industry-relevant courses that focused on

[7] Since 2015, MOF had refined the definition of "CET" to exclude job placement programmes without training components.

priority and emerging skills areas[8]. Since the launch of the SkillsFuture Series from October 2017 to December 2018, over 30,000 Singaporeans have participated in the programme. MOF also shared that support was also provided to Singaporeans to acquire foundational digital knowledge and skills, through SkillsFuture for Digital Workplace, a two-day training programme. Digital knowledge was important for success in the future economy. From October 2017 to December 2018, over 25,000 Singaporeans had participated in the programme.

95 Moreover, students in IHLs benefited from Work-Learn Programmes, which integrated structured on-the-job-training with institutional learning. These programmes included the ITE Work-Learn Technical Diploma (WLTD), the SkillsFuture Earn and Learn Programme (ELP), the SkillsFuture Work-Learn Bootcamp (WLB), and the SkillsFuture Work-Study Degree Programme (WSDP). As at 31 December 2018, there were over 120 work-learn programmes on offer. Over 3,500 individuals had benefited from these programmes.

96 Additional support was also given to jobseekers through the Adapt and Grow (A&G) initiative. It provided employment facilitation services, such as career coaching, employability workshops, job fairs and job matching. It also provided wage and training support for employers to re-train workers to take up new jobs, through Professional Conversion Programmes (PCPs) and Place-and-Train programmes. Another A&G programme, the Career Support Programme (CSP), provided wage support to employers to encourage them to give opportunities to retrenched or long-term unemployed PMETs. In 2018, more than 30,000 individuals were placed into new jobs through the A&G initiative.

97 In a follow-up query, the Committee wanted to know, out of the 30,000 individuals who were placed into new jobs through the A&G initiative in 2018, how many continued to stay in the jobs into which they were placed beyond six months. The Committee was also interested to know whether the Government tracked retention rates at jobs taken up through employment schemes such as Adapt and Grow, Place-and-Train and Professional Conversion Programmes (PCPs) and, if so, what had been the retention rates since each scheme's inception.

[8] Namely, data analytics, finance, tech-enabled services, digital media, cybersecurity, entrepreneurship, advanced manufacturing and urban solutions.

98 In reply, MOF informed the Committee that in the first half of 2018, about 17,000 jobseekers found new jobs through the A&G initiative. More than 80% continued to stay in employment six months after being placed. Among this group, about two in three remained with the same employer, and the remaining found jobs with new employers. The estimated six-month retention rates for about 13,000 jobseekers placed through A&G in the second half of 2018 were still being processed and would be ready in the fourth quarter of 2019. Table 4 shows the estimated 6-month retention rate of jobseekers placed through various A&G programmes in the first half of 2018.

Table 4 – Estimated 6-month retention rate of local jobseekers placed through A&G programmes in first half of 2018 by programme

Programme	**Estimated 6-month retention rate (Remain in employment)**	**Estimated 6-month retention rate (Remain in employment with same employer)**
Professional Conversion Programmes	~90%	~80%
Career Support Programme	>80%	>70%
Place-and-Train Programmes	~90%	~70%
P-Max	~90%	>70%
Work Trial/Career Trial	~80%	~60%

Source: Workforce Singapore

99 In general, while the Government tracked the retention rates of those placed through A&G programmes, comprehensive data on retention rates since inception was not available for some of these programmes.

SkillsFuture – an inclusive national movement

100 Noting that SkillsFuture was an inclusive national movement, the Committee asked MOF how the Government ensured that no citizens were left behind in the SkillsFuture movement.

101 MOF reiterated that SkillsFuture is a national movement to provide all Singaporeans with opportunities to develop to their fullest potential through life, regardless of their individual starting points. There were broad-based schemes aimed at increasing affordability and awareness of upgrading opportunities available, while other schemes were more targeted at developing industry-relevant skillsets of the workforce and at supporting vulnerable groups.

102 In terms of broad-based support, MOF shared that SkillsFuture Singapore (SSG) works with IHLs, private training providers and employers to ensure that training opportunities were available for all Singaporeans to support them in their skills development, taking into account the workforce's diverse training needs. Subsidies were provided to ensure that training costs were affordable. For instance, SSG provides base fee subsidies of up to 90% for SSG-approved CET courses. Singaporeans might also use the SkillsFuture Credit to offset the remaining out-of-pocket costs. To increase awareness of available resources for career planning and skills upgrading needs, SSG worked with partners, such as Community Development Council, People's Association, Workforce Singapore and Employment and Employability Institute (e2i), to provide related information through SkillsFuture Advice workshops. The MySkillsFuture portal also provided access to industry information and tools to search for education and training programmes.

103 For vulnerable groups, such as low-wage and older workers, the Committee learnt that enhanced training subsidies were available to support their skills training. Singaporeans who were 35 years old and above (or 13 years and above for Persons with Disabilities) and earning an average gross monthly income of not more than $2,000 for the months worked could enjoy a higher subsidy of up to 95% of course fees under the Workfare Training Support scheme. Under the SkillsFuture Mid-Career Subsidy, Singaporeans aged 40 and above received up to 90% course fee subsidies.

104 MOF commented that Singapore had seen good labour market outcomes in recent years. According to MOM's Labour Force Survey, the annual average resident unemployment rate had remained stable around 3% in the last three years, with long-term unemployment below 1% in the same period. Local retrenchments fell to around 7,000 in 2018, the lowest since 2012. At the same time, the employment outcomes of graduates from Singapore's IHL had remained strong over the years, with nine in 10 of those who were economically active being employed within six months of completing their final examinations. Stressing that good labour market

outcomes could not be achieved solely through the Government's efforts, MOF called on firms and Singapore workers to continue working alongside the Government to make full use of the available opportunities to learn and re-learn, upskill and reskill.

Support for SMEs under SkillsFuture

105 Noting the response from MOF, the Committee ventured to ask further about the support for companies and organisations especially SMEs who are implementing SkillsFuture initiatives such as the Place-and-Train Scheme.

106 The Committee learnt that since the start of SkillsFuture in 2015, the Government had been progressively engaging enterprises to play a bigger role in this national movement. This included encouraging enterprises to actively invest in their workers' training, adopting more progressive Human Resource practices, creating structures to improve on-the-job-training (OJT) opportunities and to be more proactive in building up their talent pipeline. Some of this support was provided through programmes which supported SME transformation. For example, human capital development was one of the areas supported under the Enterprise Development Grant (EDG). EDG also supported the costs of training staff involved in the deployment of automation projects. To provide extra support for firms, the MOE had during its Committee of Supply debate in March 2019, announced enhancements to the Productivity Solutions Grant (SkillsFuture Training Subsidy) which provided additional funding above existing training subsidies.

107 MOF further shared that the Place-and-Train Programmes under the Adapt and Grow (A&G)[9] initiative supported companies that were prepared to hire jobseekers who might not have the full set of skills for the job, but could be trained. These programmes included the Professional Conversion Programmes (PCPs) and Rank-and-File Place-and-Train (RnF PnT) programmes, which provided training and salary support for employers to re-skill jobseekers for new occupations or sectors that had good prospects and opportunities for progression. In 2018, about 1,500 companies tapped on PCPs and RnF PnT programmes, benefitting about 6,500 individuals with more than $100 million committed to fund their training and salary support. About 80% of these companies were SMEs.

[9] Comprises a suite of service and programmes to facilitate job matching, and help jobseekers overcome skills, wage or job expectation mismatches. Includes career matching services, Career Support Programme, Jobs Bank, RnF Place-and-Train Programmes, PCPs, P-Max and Career Trial.

108 Recognising that worker upskilling and firm transformation went hand-in-hand, MOF informed the Committee that the Government had programmes that supported Singapore firms, including SMEs, in building up their human capital development capabilities, and the training of workers in tandem with firm transformation. Ultimately, the Government's efforts to help Singapore firms transform, particularly SMEs, went hand-in-hand with the SkillsFuture programmes. As firms transformed, the jobs they provided got upgraded, hence, giving Singaporeans a clear impetus to upskill. As Singaporeans upskilled and re-skilled, firms that employed them would also gain the know-how to transform.

Monitoring outcomes of SkillsFuture

109 Encouraged by the support for local SMEs, the Committee asked about the targets or indicators that had been established for the SkillsFuture movement and how the outcomes were monitored.

110 It was shared with the Committee that the outcomes and the take-up rates of skills upgrading initiatives were tracked by MOE/SSG. Firstly, MOE/SSG tracked the outcomes of training for individuals and employers, to gauge the impact of the training supported. Out of about 3,500 surveyed learners who attended work-related training in 2018, more than 80% of them reported that six months after the training, they were able to perform better at work. MOE/SSG also tracked outcomes through longitudinal studies every few years. The latest longitudinal study by MTI on Singapore Workforce Skills Qualifications (WSQ) training found that non-employed individuals who underwent WSQ training were more likely to find employment. The same study showed that employed individuals who attended WSQ training received positive real wage returns. Secondly, since the inception of SkillsFuture, MOF had seen significantly higher training participation rates for the resident labour force. According to MOM's Labour Force Survey, the training participation rate had increased from 35% in 2015 to 48% in 2018.

111 MOF noted that there had been a healthy demand for the various SkillsFuture programmes. In 2018, about 465,000 Singaporeans and about 12,000 enterprises benefited from training subsidies. Ultimately, the key outcomes of SkillsFuture were for Singaporeans to be able to continually upskill and re-skill, to take up good job opportunities and thrive amidst changes in the society and the global economy. MOF reiterated and assured the Committee that there had been good progress thus far for the SkillsFuture movement.

Observations and Recommendations

112 The Committee was appreciative of the updates provided by the Government on the national SkillsFuture movement and commended the Government's commitment to continual learning. The Committee agreed with the Government's approach of engaging enterprises to play a bigger role in this national movement since having workers who were continually upskilled and re-skilled would provide the needed workers for enterprises to transform and adapt to changes.

113 The Committee was satisfied that the SkillsFuture movement had been making good progress and was benefiting Singaporeans. The Committee observed that efforts at re-training workers were also proving to be effective, with high employment retention rates and good labour market outcomes. Noting that the retention rates for those placed through A&G programmes were tracked, the Committee urged the Government to consider tracking comprehensive data on retention rates for other employment schemes.

114 The Committee urged the Government to continue engaging Singaporeans and employees in Singapore to partake in the SkillsFuture movement. For instance, SSG could reach out to Singaporeans who had yet to utilise their SkillsFuture Credit. In addition, the Committee urged the Government to take pro-active measures in the dissemination to relevant stakeholders on the availability of such programmes and to revamp programmes and initiatives should participation rates wane. The Committee would also like to encourage SSG and WSG to consider having a guided way of encouraging Singaporeans to upgrade themselves, such as having guided continuous development pathways in the training and upgrading programmes tailored to trades and professions to deepen mastery of skills.

Budget provision for SSG in 2019

115 Noticing that a budget provision of $220 million had been made for SSG in 2018 but which increased to $413.99 million in 2019, the Committee asked for reasons leading to the increased budget provision in 2019.

116 MOF explained that SSG draws from the Lifelong Learning Endowment Fund (LLEF), Skills Development Fund (SDF) and the National Productivity Fund (NPF), as well as receives funding from MOE's Block Budget, to drive and coordinate the implementation of SkillsFuture. In 2018, MOF and other agencies reviewed and streamlined the sources of

funding for jobs and skills programmes and, in the process, reclassified programmes that should be supported by the Funds vis-à-vis MOE's Block Budget. This included subsuming CET funding for the Autonomous Universities (amounting to $160 million) under SSG. This one-off exercise contributed to most of the increase in expenditure reflected in SSG's programmes.

Measures to prevent abuse of SkillsFuture

117 The Committee also asked what the SSG had been doing in detecting and preventing individuals, training providers or organisations from abusing the SkillsFuture funding scheme(s).

118 To this query, MOF informed the Committee that SSG had improved its ability to detect and act against suspected fraudulent claims, while ensuring that genuine grant applications continued to benefit from good service standards. SSG had published a media release on 29 November 2018 on the recommendations by an Inter-Agency Process Review Task Force which was set up in November 2017 to conduct a thorough review of SSG's grant administration and fraud mitigation capabilities. The Inter-Agency Process Review Task Force comprised members from SSG management, the Accountant-General's Department, the Commercial Affairs Department and MOE. The work of the Task Force was overseen by the SSG Board. SSG had, in the media release, reported on several recommendations made by the Task Force, and changes to systems and processes were implemented through organisational restructuring, enhanced data analytics and new enforcement strategies.

119 First, SSG had set up a dedicated Fraud and Enforcement Division to manage fraud risk and enforcement. This allowed for greater focus on the monitoring and detecting of suspicious claims, investigating the parties involved in such claims and taking the necessary enforcement actions. This also allowed for a more focused and concerted development of system and staff capabilities to support SSG's fraud mitigation efforts.

120 Second, SSG had partnered GovTech and other private sector consultants to incorporate data analytics capabilities in its fraud detection system. Data was also being verified with other Government agencies, such as the Accounting and Corporate Regulatory Authority, to ensure its integrity. This strengthened SSG's investigation of suspected fraudulent activities and expedited enforcement actions.

121 In addition, SSG had a range of existing enforcement measures, such as inquiries or site visits, withholding of disbursement while investigations were taking place, termination of funding as soon as a case of suspected fraud or abuse was established, and maintaining a public whistle-blowing channel.

122 Lastly, MOF shared that MOE/SSG took a serious view of any individual, training provider or organisation that abused SkillsFuture funding schemes and would not hesitate to act against any who contravened its funding rules or terms of use, including referring potential fraud cases to the Commercial Affairs Department of the Singapore Police Force.

Observations and Recommendations

123 The Committee was satisfied with the explanation on the increase of budget provision for SSG in 2019.

124 The Committee also noted the measures implemented to prevent abuse of SkillsFuture. The Committee urged the Government to consider regular reviews of SSG's grant administration and fraud mitigation capabilities to ensure that such measures were sufficient.

CYBERSECURITY AND RESOURCES

125 In the Third Report of the Estimates Committee [*Parl. 16 of 2018*], MOF informed the Committee that "cybersecurity was critical to support developments towards a Smart Nation" and that "it had targeted to set aside approximately 8% of total annual Government Information and Communication Technologies (ICT) expenditure for cybersecurity spending". The Committee observed that following a series of data and security breaches in the public sector, a Public Sector Data Security Review Committee (PSDSRC) was convened by Prime Minister Lee Hsien Loong. As such, the Committee asked MOF about resources set aside for cybersecurity, such as the total annual Government ICT expenditure, and what was the annual percentage spent on cybersecurity.

Government's ICT expenditure

126 MOF reported that annual Government ICT expenditure increased from $3.6 billion in FY2016 to $4.0 billion in FY2017. Based on the larger ICT projects approved in FY2016 to

FY2018, an average of about 9% of ICT expenditure[10] on larger projects was on cybersecurity. The cybersecurity spending was mainly for security technology solutions and operations to secure Government ICT systems. In addition, the Government spent about $3 million a year on cybersecurity education and training of public officers. MOF assured the Committee that the Government would continue to invest in cybersecurity, in line with Singapore's Cybersecurity Strategy published in 2016.

127 On the Committee's further query on the Government's expenditure on cybersecurity as compared with other countries' spending, MOF informed the Committee that other advanced digital Governments, such as Israel and South Korea, have stated that they would allocate 8% and 10% of their total Government IT budget to cybersecurity respectively. This was comparable to Singapore's expenditure on cybersecurity, as a percentage of ICT spending.

Cyber and Data Security in Public Sector

128 Recognising that public officers had an important role to play in cyber and data security, the Committee sought an update on (i) improvements made in cybersecurity awareness amongst public officers and (ii) the resource and investment commitments to ensure robust data security practices in the public sector.

129 The Committee was updated on several improvements and measures made within the public service to instil good cybersecurity practices. For example, the Smart Nation and Digital Government Group (SNDGG) introduced an IT security awareness programme in July 2018 to instil a stronger cybersecurity culture across the public service. It was mandatory for all public officers to complete the course, to educate all public officers on emerging cyber threats and the cybersecurity measures to take. In addition, as phishing had been an increasingly common vector for cybersecurity attacks, the Government agencies had been educating their officers, and conducting periodic phishing tests to ensure public officers remain vigilant. To complement this and equip public officers with more cybersecurity tools, SNDGG had made available an email plug-in to allow all public officers to easily report suspicious emails for further investigation. It assured the Committee that the Government would continue to educate

[10] This did not include other forms of cybersecurity expenditures which may be embedded in ICT spending, such as the built-in security components of endpoint devices (eg, laptop computers).

public officers on cybersecurity threats and the adoption of good cybersecurity practices, through initiatives, such as roadshows, electronic direct mails, workshops and conferences.

130 The Committee was also informed that to safeguard the confidentiality and integrity of data within the public sector, the Government had put in place technical measures, such as Internet Surfing Separation, as well as internal rules and processes, to ensure that only authorised personnel had the permission for system administration. Policies for data protection which governed, amongst other things, proper procedures for access, care, and retention of citizens' information, were also in place. These were also complemented by internal IT audits of agencies' data access and data protection measures. Additionally, the Public Sector Governance Act formalised the data-sharing arrangements between all public sector agencies, and introduced three criminal offences for the misuse of data to ensure that individual officers were responsible and accountable for safeguarding information.

131 The Committee noted that the Government would study and implement the relevant recommendations of the PSDSRC to further strengthen data security, including the roles of vendors and other authorised third parties.

Protecting Singapore's Critical Information Infrastructure

132 Concerned with possible cyberattacks on critical components of the Government's IT infrastructure and obtaining sensitive information, to the detrimental of Singapore's security, the Committee asked whether the Government had any plans to prioritise spending/resources to protect critical and sensitive data for certain sectors, such as defence, finance and healthcare.

133 Assuring the Committee that the Government had and would continue to prioritise resources on protecting critical and sensitive data, it was shared that a key priority was to protect Singapore's Critical Information Infrastructure (CII), as a cyberattack on these CII could result in widespread disruption and have a destructive impact on Singapore's society and economy. The Cyber Security Agency of Singapore (CSA) had thus far identified CIIs in the following 11 sectors: Energy; Water; Banking and Finance; Healthcare; Transport (which included Land, Maritime and Aviation); Infocomm; Media; Security and Emergency Services; and Government.

134 For each sector, CSA worked closely with the relevant sector regulator to identify essential services within the sector, as well as the computers and systems that were critical to the delivery of these services. CII owners were required, under the Cybersecurity Act, to comply with statutory obligations to safeguard the cybersecurity of their CII. In addition, the PSDSRC would also review and improve how the Government was securing and protecting citizens' data.

135 Elaborating further on measures taken for the national defence sector, MINDEF shared that it was investing resources, from its block budget, to protect their networks, systems and data against cyberattacks, including establishing a defence cyber security centre to coordinate daily operations against cyber threats, as well as incident-response teams to handle cyber incidents. Recognising that the cyber threat landscape was constantly evolving, MINDEF was proactively testing its own systems for vulnerabilities. This included crowdsourcing global cyber talent to do so through the MINDEF Bug Bounty Programme in 2018, where 264 white hat hackers from around the world helped identify 35 previously unidentified vulnerabilities in MINDEF's systems.

136 As for the banking and finance sector, the Monetary Authority of Singapore (MAS) adopted a four-pronged strategy to enhance cyber resilience. This included the following:

(a) <u>Regulation and Guidance</u>. MAS regulates and provides guidance to financial institutions in managing cyber risk. The legally-binding requirements are set out in the MAS' Notice on Technology Risk Management. In this regard, financial institutions are required to implement IT controls to protect customer information from unauthorised access or disclosure;

(b) <u>Supervision</u>. MAS conducts supervision of financial institutions through on-site inspections and off-site reviews to assess their cybersecurity posture and IT risk management, as well as their adherence to MAS' regulations and guidelines. Where there are gaps or areas for improvement observed, financial institutions are required to remediate the gaps and address the risks;

(c) <u>Surveillance and Information Sharing</u>. MAS conducts sectoral cyber surveillance and collaborates with CSA and CII owners to exchange cyber threat information and collectively maintain cyber situational awareness; and

(d) Competency and capability development. MAS has been partnering the industry to bolster cybersecurity competencies and capabilities within the financial sector through various avenues, such as the industry Standing Committees on Cybersecurity and the cybersecurity grant under the Financial Sector Technology and Innovation scheme.

137 Following the cyberattack on SingHealth's system, MOH, the Integrated Healthcare Information Systems (IHiS) and the public healthcare family have been implementing a suite of people, process, technology and partnership measures to strengthen cybersecurity across public healthcare institutions, with particular focus on the Committee of Inquiry's recommendations and CII requirements. MOH had also established a Chief Information Security Officer (CISO) office to provide independent cybersecurity oversight, strengthened the management of cybersecurity risks, and built cybersecurity capabilities in the healthcare sector. The Committee was informed that MOH was also reviewing and reinforcing data governance and data security frameworks across the healthcare system to facilitate digital health transformation efforts whilst safeguarding sensitive health and personal data.

Manpower and expertise in cybersecurity

138 Noting the Government's efforts in protecting Singapore's CII, the Committee took the view that having the required skilled manpower and technological expertise would be important. Therefore, the Committee proceeded to ask about the percentage of staff in GovTech/Government who specialised in cybersecurity and whether manpower resources were sufficient.

139 The Committee learnt that currently, about 6% of the staff in GovTech specialised in cybersecurity. Across CSA, GovTech and the Sector Leads[11] of the 11 CII Sectors, there were more than 500 headcounts allocated for officers who specialised in cybersecurity.

140 MOF confirmed that the Government was cognisant that there was a global shortage of cybersecurity talent. As cybersecurity threats continued to increase, so would the demand for cybersecurity manpower. While the Government continued to hire and train cybersecurity

[11] The Sector Leads are LTA, MPA, CAAS, PUB, EMA, MAS, IMDA, MHA, GovTech, and MOH (MOH is taking over the Sector Lead function from IHiS).

professionals, the Committee was informed that the Government would also leverage on new technologies to make cybersecurity more manpower-efficient, and tap on partnerships with the private sector to augment the Government's cybersecurity capabilities.

141 When the Committee requested for an elaboration on the existing expertise in Government to lead cybersecurity initiatives, it was shared with the Committee that the Government had developed capabilities in three key areas – technical expertise, ecosystem development and in expanding Singapore's international space:

(a) Technical Expertise. The Government had developed technical expertise mainly in the areas of Operations/Intelligence[12]; Governance, Risk, and Compliance[13]; and Security Architecture and Development[14].

(b) Ecosystem Development. To ensure a sustainable manpower pipeline for the cybersecurity ecosystem, the Government had stepped up its outreach to Secondary school students to attract them to a cybersecurity career, and developed the Cyber Security Associates and Technologists (CSAT) programme which helped to convert young and mid-career professionals in adjacent technical fields into cybersecurity specialists through on-the-job training with participating companies. On the industry front, the Government had also been working with the private sector to encourage product and solution development to address immediate cybersecurity challenges.

(c) Expanding Singapore's International Space. The Government was actively tracking and monitoring international and regional cyber policy and technology developments which might have an impact on Singapore's interests and capabilities. In the efforts to strengthen international partnerships, the Government had been forging bilateral cooperation with key countries of interest and had been participating in – and where possible, shaping – international and regional cybersecurity policy discussions at the UN and other key international platforms.

[12] Operations/Intelligence refers to expertise in cyber monitoring and threat detection, including advance information fusion, as well as incident response.
[13] Governance, Risk, and Compliance refer to expertise required to set cybersecurity technical standards, conduct risk assessment or security audit, and provide technical consultancy services to CIIs.
[14] Security Architecture and Development refer to expertise in areas such as cybersecurity architecting and security design.

142 On the Committee's further query about the longer term plans for Singapore to stay ahead of the game as far as cybersecurity was concerned, the Government shared that it intended to build on existing capabilities as follows:

(a) Technical Expertise. The Government would build the technical expertise needed to deal with new or emerging technologies. For example, with the advent and proliferation of the Internet of Things (IoT), the Government would build specific expertise in architecting the IoT ecosystem and developing IoT security solutions. The Government also intended to develop solutions to better secure the Internet infrastructure, as there had been more threats, such as Domain Name Server (DNS) exploitations, that targeted the Internet infrastructure and tap on the usage of emerging technology to boost cybersecurity operations, such as Artificial Intelligence to identify and understand cyber threats and the mitigating measures. Lastly, the Government would also enhance existing capabilities in Vulnerability Assessment and Penetration Testing (VAPT) – including system-level attack simulation – to provide an independent, professional and in-depth assessment of Singapore's systems and networks, many of which entail components and technology from foreign countries.

(b) Ecosystem Development. The Government recognised the need to encourage companies to invest in longer term solutions that would strengthen defence against increasingly advanced cyber-attacks. This required not only the commitment of the senior management of companies to take a long-term perspective, but also deliberate investments in new and innovative solutions that could enhance an organisation's cybersecurity capabilities. CSA had embarked on initiatives which included working with CIIs and cluster leads to identify their longer-term needs and matching them with the development community[15].

(c) Expanding Singapore's International Space. To ensure Singapore stays ahead of the game, the Government would continue to (i) pursue strong partnerships with key international and regional players both for bilateral operational

[15] As an example, CSA launched the pilot Cybersecurity Call for Innovation in September 2018, which invited the development community to submit proposals for innovative solutions that can help address cybersecurity challenges set forth by end-users. Successful applicants who were selected by the end-users gained the opportunity to do a proof of concept (POC) with a ready customer, and also received funding support from CSA's Co-innovation and Development POC Scheme.

exchanges and technical cooperation; (ii) drive regional cybersecurity policy and capacity-building initiatives to attract strong cooperation from countries of interest and top industry players; and (iii) actively participate and shape international cybersecurity discussions – especially at the United Nations – concerning the establishment of rules, norms and principles for cyberspace.

Handling vendors handling outsourced IT functions

143 Being aware that the Government outsourced certain IT functions, such as data management, the Committee was interested to know the criteria put in place to ensure the competency and suitability of outsourced parties and the safeguards and monitoring measures in place to ensure that outsourced parties performed according to agreed standards.

144 It was explained to the Committee that Government agencies did not routinely outsource data management. Agencies might choose to outsource certain data management activities after taking into consideration the competency and suitability of vendors. The agency would have to ensure that the outsourced parties were in compliance with the relevant whole-of-Government (WOG) policies and standards, including those on data management and ICT security. The Government had put in place policies for outsourced parties to comply with, including security safeguards when disclosing data to a third party, and rights to audit the external parties' services. The ability to comply with these mandatory requirements, together with the vendor's track record, competency, and performance in delivering Government contracts of similar nature, were substantial factors in the evaluation of prospective vendors.

145 To ensure that outsourced parties performed according to agreed standards, contracts required preventive measures such as security requirements, supplier management, and monitoring of compliance. There were also clauses that allowed the Government to take rectification measures and other remedies including liquidated damages and indemnity for breaches, as well as provisions for services to be terminated. In addition, agencies would carry out audits of their vendors' compliance to ICT security policies, Service-Level Agreements, and performance. The Government assured the Committee that SNDGG also regularly audited agencies to check that the necessary controls were in place. SNDGG engaged the agencies after each audit on the actions they should take to further strengthen IT governance.

Observations and Recommendations

146 The Committee recognised the various efforts and measures put in by the Government to protect Singapore's CII. The Committee urged the Government to have regular reviews of the various measures taken to protect Singapore's CII to ensure they remained relevant and adequate in preventing serious cyberattacks.

147 The instilling of good cybersecurity practices and measures to safeguard the confidentiality and integrity of data within the public sector was supported by the Committee. The manner in which the Government treated cybersecurity and data management with seriousness within the public service would not be lost on Singaporeans and businesses and, thus, provide the leadership and example for them to follow.

148 Given the fast-changing technology world, the Committee was of the view that it would be a challenge to keep up with evolving cyber threats. Hence, the Committee urged the Government to nurture a culture of learning among the public service where lessons learnt would be shared among the various Government agencies to ensure a whole-of-Government effort in the defence of our cybersecurity landscape.

Cybersecurity in the private sector

149 Given the wide-reaching effects of digitisation permeating all aspects of the society and businesses, the Committee asked whether there were any resource and investment commitments to ensure robust data security practices in the private sector, especially for SMEs.

150 The Government took the view that cybersecurity was the collective responsibility of the Government, businesses, individuals and the wider community. It was vital that SMEs and business owners did their part to actively consider cyber risks as part of their business risks, and factored in cybersecurity as part of the cost of doing business digitally.

151 The Committee took note that the Government recognised that cyber-threats posed risks to SMEs, and that SMEs might face resource constraints when improving their cybersecurity. In addition to the various initiatives to raise cybersecurity awareness, the SMEs Go Digital programme provided additional support to SMEs as follows:

(a) Under the Start Digital Pack that was announced in January 2019, newly-registered SMEs would be supported with affordable, modular and easy-to-use basic cybersecurity solutions during the nascent stages of their businesses.

(b) The Productivity Solutions Grant (PSG) would provide funding support for SMEs to implement a more comprehensive set of cybersecurity solutions, such as (i) end-point solutions, (ii) network protection solutions, (iii) data security solutions, and (v) detection and response solutions. Details of the scheme were being finalised.

152 Noting the various initiatives to raise cybersecurity awareness among SMEs, the Committee asked in a follow-up query, the number of SMEs that had tapped on the SMEs Go Digital programme since the inception of the programme and whether feedback was collected from the SMEs on the usefulness of the programme.

153 It was shared with the Committee that since the SMEs Go Digital programme was launched in 2017, more than 10,000 SMEs had benefited. Basic cybersecurity elements were included in the programme. Among these, 6,450 SMEs had taken up the Start Digital Pack since its launch in 2019. Of these, more than 1,800 had adopted the dedicated cybersecurity module.

154 The Government would conduct regular surveys to understand SME satisfaction with the programme, including those on the solution providers and/or programme partners. The regular survey cycle would commence in the fourth quarter of 2019. Based on qualitative feedback so far, SMEs were seeing tangible outcomes from digitalising their businesses through the SMEs Go Digital programme. For example, Acies Security Networks, a security services company, had overcome challenges in managing staff and operations by adopting a pre-approved solution (ie, mobile reporting solution) under the SMEs Go Digital programme. Another example was Kopi Roti, a food and beverage establishment. By adopting a pre-approved solution for digital ordering and payment, customers could order and pay from mobile devices, allowing the company to better serve its clientele through pick-up and delivery. Kopi Roti saw a 15% to 20% sales increase as a result of adopting this solution.

155 On the query when the cybersecurity solutions scheme under the PSG would be launched, the Committee was informed that the cybersecurity solutions, which formed part of

a larger solution suite supported by the PSG, would be rolled out progressively from the fourth quarter of 2019 onwards.

Raising awareness to instil cybersecurity culture in the community

156 The Committee agreed with the Government's view that cybersecurity is the collective responsibility of the Government, businesses, individuals and the wider community. Hence, the Committee asked in a follow-up query about the awareness programmes to instil a stronger cybersecurity culture across the businesses, individuals and the wider community.

157 Given that the Government could not secure Singapore's cyberspace alone and the businesses, individuals and the wider community needed to stay informed, improve their understanding of cybersecurity issues, and take the relevant preventive measures, CSA had been conducting various engagement and outreach efforts to promote cybersecurity awareness and the adoption of good cybersecurity practices.

<u>Individuals and Wider Community</u>

158 Every year, CSA runs a nationwide cybersecurity awareness campaign to highlight the importance of cybersecurity, and provide cyber hygiene tips. The 2018 cybersecurity awareness campaign focused on four cyber hygiene practices: (1) use antivirus software; (2) use a strong password and two-factor authentication; (3) spot signs of phishing; and (4) update software as soon as possible. As part of the campaign, CSA conducted a roadshow at Bedok Mall, and talks in schools and community centres. Participants had found these useful. For example, 96% of survey respondents at the roadshow at Bedok Mall stated that the event was informative and useful in teaching them how to create a strong password. The 2019 cybersecurity awareness campaign was launched in September this year with a roadshow at Ang Mo Kio Central Stage and reinforced the four cyber hygiene practices. The campaign would run for about six months and end in March 2020. Venues for upcoming roadshows include Our Tampines Hub, ITE West and NTU.

159 Since November 2018, Cyber Savvy Machine Pop-Ups had been set up at a different public library every month. Library-goers learnt about good cybersecurity practices and won a small gift by attempting a quiz. More than 70,000 quiz attempts had been recorded so far. CSA intended to deploy more machines to increase the outreach in community and school settings.

160 To raise awareness of cyber threats among the public and private sectors, industry, academia and providers of essential services, CSA also published a "Singapore Cyber Landscape" report annually. The publication provided an overview and analysis of Singapore's cyber health, so that the relevant stakeholders could take appropriate action to defend themselves against such threats. The Singapore Computer Emergency Response Team (SingCERT) also issued advisories to alert the public and enterprises on cyber threats, and provided advice on remediation and preventive measures. Since 2018, SingCERT had issued more than 100 advisories.

161 Digital Defence was also officially launched in February this year, as a new pillar of Total Defence. This is a whole-of-nation effort to protect and defend Singapore online. A recent initiative was the inclusion of Digital Defence into the SkillsFuture for Digital Workplace programme, where participants learnt about cybersecurity and other digital literacy skills, such as how to identify and guard against fake news. The programme was supported by NEXUS, CSA and NLB.

Students

162 Recognising that young students were an important target group, the Government took the view that it was important to establish good cyber hygiene practices from an early age. CSA had collaborated with the Personal Data Protection Commission to produce a series of Cyber Safety activity books, which had benefited five cohorts of Primary 5 students, with a total of 210,000 copies distributed. The activity books were made available online. Also, CSA had developed a Cybersecurity Awareness Skit for Secondary school students. The skit provided an engaging and interesting avenue for students to pick up good cyber hygiene tips, and reached about 30,000 students from close to 50 schools this year.

Businesses

163 For businesses, CSA had developed cybersecurity resources, such as the Be Safe Online Handbook, which highlighted six essential cybersecurity measures that enterprises should take to strengthen their cyber defences and enhance digital risk management.

164 CSA had also partnered the Association of Information Security Professionals (AiSP), a key professional body for cybersecurity professionals in Singapore, to run the Cybersecurity Awareness and Advisory Programme. The programme brought on board other associations and

institutes, to raise cybersecurity awareness and the adoption of good cyber hygiene through regular talks, seminars and workshops. Since the start of the programme in October 2018, AiSP has partnered associations, such as the Singapore Chinese Chamber of Commerce and Industry, and organised more than 10 events which reached out to about 300 SMEs on the importance of cybersecurity.

Observations and Recommendations

165 Concurring with the Government's view that cybersecurity was the collective responsibility of the Government, businesses, individuals and the wider community, the Committee recognised the progress that had been made in the engagement and outreach efforts to promote cybersecurity awareness and the adoption of good cybersecurity practices among businesses, individuals and the wider community. The Committee encouraged the Government to keep up with such efforts, especially in engaging our youth so as to inculcate good cyber hygiene practices from an early age.

ANNEX A

SPECIAL TRANSFERS, FY2010 – FY2019

Table A1: Breakdown of the Special Transfers from FY2010-19

	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018 (Revised)	FY2019 (Budgeted)
Special Transfers ($m)	7,095	8,427	8,860	8,584	12,356	10,369	6,372	6,122	9,000	15,297
Special Transfers Excluding Top-ups to Endowment and Trust Funds ($m)	1,505	2,909	1,458	2,990	3,856	4,369	2,772	2,112	1,700	1,737
Top-ups to Endowment and Trust Funds ($m)	5,590	5,517	7,402	5,594	8,500	6,000	3,600	4,010	7,300	13,560

Table A2: Special Transfers as a Percentage of Overall Government Expenditure

	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018 (Revised)	FY2019 (Budgeted)
Special Transfers	13.5%	15.3%	15.3%	14.2%	17.9%	13.3%	8.2%	7.7%	10.2%	16.0%
Special Transfers Excluding Top-ups to Endowment and Trust Funds	2.9%	5.3%	2.5%	5.0%	5.6%	5.6%	3.6%	2.7%	1.9%	1.8%
Top-ups to Endowment and Trust Funds	10.7%	10.0%	12.8%	9.3%	12.3%	7.7%	4.7%	5.0%	8.3%	14.2%

ANNEX B

LIST OF FUNDS AND PURPOSES

	Fund Name	Purpose
1	Edusave Endowment Fund	- Provide grants to educational institutions to enable them to enhance their quality of teaching - Provide for scholarships, bursaries and awards, and contribute to Edusave Pupils Fund
2	Lifelong Learning Endowment Fund	Provide grants to: - Encourage or assist persons to acquire, develop or upgrade skills and expertise to enhance their employability - Research/develop learning methods and technology to enhance the acquisition, development or upgrading of such skills and expertise - Establish, expand or maintain facilities for promoting the acquisition, development or upgrading of such skills and expertise
3	Medical Endowment Fund	Provide grants for defraying hospital charges, fees and other expenses incurred by patients with financial difficulties
4	ElderCare Fund	Provide subventions for defraying recurrent costs in providing step-down care
5	Community Care Endowment Fund	Provide assistance to enable citizens and permanent residents of Singapore with financial difficulties to attain sufficient income for basic needs, address children developmental issues and integrate into society
6	Goods and Services Tax Voucher Fund	Provide financial assistance to persons who are in need of relief from goods and services tax as prescribed under the GSTV Fund Act
7	National Research Fund	Provide funding for research and development activities
8	Pioneer Generation Fund	Provide assistance in the form of financial benefits or other support to Singapore's Pioneers to meet their healthcare costs, and other costs of living in Singapore
9	Public Transport Fund	Provide financial assistance to passengers using bus services or train services
10	Long-Term Care Support Fund	Strengthen financial protection for long-term care - Fund CareShield Life subsidies and long-term care support measures, such as Elderfund
11	Merdeka Generation Fund	Provide assistance in the form of financial benefits or other support to Singapore's Merdeka Generation to meet their healthcare costs, and other costs of living in Singapore

	Fund Name	Purpose
12	Bus Service Enhancement Fund	Provide grants/loans or acquire property (movable or immovable) to improve and expand the range and reliability of bus services
13	National Productivity Fund	Provide financing and incentives for productivity enhancement and continuing education
14	Changi Airport Development Fund	Provide for the development of Changi Airport
15	Rail Infrastructure Fund	To support our rail infrastructure development needs
16	Special Employment Credit (SEC) Fund	To encourage employers to hire older Singaporean workers and to boost the employability of these older Singaporean workers by providing financial incentives
17	Deferment Bonus Fund	To fund the Deferment Bonus which is paid to affected CPF members to help them cope with the increase in the draw down age; and to fund the Voluntary Deferment Bonus which is paid to older CPF members who voluntarily defer their CPF Minimum Sum draw down age to age 65
18	CPF Life Bonus Fund	To encourage Singaporeans to enrol in CPF Life by providing a bonus.
19	Singapore Universities Trust	Provide matching grants for donations to universities' endowment funds
20	Community Silver Trust	Encourage donations and provide additional resources for the service providers in the Intermediate and Long-Term Care sector to enhance their capabilities, provide value-added services to achieve higher quality care, and enhance the affordability of step-down care for service users and patients
21	Trust fund for the Workfare Special Bonus (WSB) Scheme[16]	Provide funding for the WSB, a payment to older low-wage Singaporeans residing in Lower Value Properties as a bonus for engaging in regular and productive work
22	Cultural Matching Fund	To benefit the community through the advancement of arts and heritage in Singapore by (i) encouraging donations to eligible persons in the cultural sector; (ii) developing capabilities for the long-term sustainability of eligible persons in the cultural sector and the cultural sector as a whole, through the provision of matching grants
23	National Youth Fund	Provide resources to any eligible youth or youth body to encourage and support youth development and youth sector development

[16] Workfare Special Bonus Trust Fund was closed on 28 Dec 2017.

APPENDIX

MINUTES OF PROCEEDINGS

13th Meeting

Tuesday, 9th April 2019

12 noon

PRESENT

Ms Foo Mee Har *(in the Chair)*
Miss Cheng Li Hui
Dr Chia Shi-Lu
Mr Darryl David
Mr Christopher de Souza
Assoc Prof Daniel Goh Pei Siong
Mr Lee Yi Shyan
Mr Alex Yam Ziming

1. The Committee deliberated.

Adjourned to a date to be fixed.

14th Meeting

Tuesday, 23rd July 2019

12 noon

PRESENT

Ms Foo Mee Har *(in the Chair)*
Miss Cheng Li Hui
Dr Chia Shi-Lu
Mr Darryl David
Mr Christopher de Souza
Assoc Prof Daniel Goh Pei Siong
Mr Lee Yi Shyan
Mr Alex Yam Ziming

1. The Committee deliberated.

2. The Committee considered a memorandum submitted by the Ministry of Finance (MOF) in respect of (a) Special Transfers; (b) Supplementary Estimates for FY18; (c) monitoring efforts to build Singapore as a Global-Asia node of technology and development; (d) national SkillsFuture Movement and budget allocated; and (e) cybersecurity and resources.

3. The Committee further deliberated.

Adjourned to a date to be fixed.

15th Meeting

Tuesday, 1st October 2019

12 noon

PRESENT

Ms Foo Mee Har *(in the Chair)*
Miss Cheng Li Hui
Dr Chia Shi-Lu
Mr Darryl David
Mr Christopher de Souza
Assoc Prof Daniel Goh Pei Siong
Mr Lee Yi Shyan

ABSENT

Mr Alex Yam Ziming

1. The Committee considered a further Memorandum submitted by the Ministry of Finance in respect of (a) Special Transfers; (b) monitoring efforts to build Singapore as a Global-Asia node of technology and development; (c) national SkillsFuture Movement and budget allocated; and (d) cybersecurity and resources.

2. The Committee also considered a written representation by the Singapore Business Federation.

3. The Committee deliberated.

Adjourned to a date to be fixed.

16th Meeting

Tuesday, 12th November 2019

11.00 am

PRESENT

Ms Foo Mee Har *(in the Chair)*
Mr Darryl David
Mr Christopher de Souza
Mr Lee Yi Shyan
Mr Alex Yam Ziming

ABSENT

Miss Cheng Li Hui
Dr Chia Shi-Lu
Assoc Prof Daniel Goh Pei Siong

1. The Committee deliberated.

Report

2. The Chairman's report brought up and read the first time.

3. Resolved, "That the Chairman's report be read a second time paragraph by paragraph.".

   Paragraphs 1 to 165 inclusive read and agreed to.

4. Resolved, "That this report be the report of the Committee to Parliament."

5. Agreed that the Chairman do present the Report to Parliament when copies are available for distribution to Members of Parliament.

Adjourned sine die.