Chapter 8
Career and Technical Training in Singapore: Transforming Singapore's Human Capital for the Future Economy

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Acronyms/Abbreviations

ACTEP	Advanced certificate in technical education programme
AWWA	Asian women's welfare association
CDC	Community development council
CE	Compulsory education
CET	Continuing education and training
CFE	Committee on the Future Economy
CoC	Certificate of competency
CPE	Committee for private education (previously known as council for private education)
DPP	Direct-entry-scheme to polytechnic programme
e2i	Employment and Employability Institute
ECG	Education and career guidance
ELP	Earn and learn programme
ERP	External review panel
EV	External validation
FEC	Future Economy Council
GCE	General certificate of education
GCE A-Level	Singapore-Cambridge General Certificate of Education Advanced Level
GCE 'N(A)' Level	General certificate of education 'normal (academic)' level
GCE 'N(T)' Level	General certificate of education 'normal (technical)' level
Higher Nitec	Higher national ITE certificate
IAL	Institute for Adult Learning

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ICT	Information and communications technology (also known as infocomm technology)
IHL	Institution of higher learning
IQAF	ITE quality assurance framework
ISAR	Institutional self-assessment report
ISC	ITE skills certificate
ITE	Institute of Technical Education
ITM	Industry transformation map
LOC	Letter of collaboration
MER	Minimum entry requirement
MOE	Ministry of Education
MOI	Memorandum of intent
MOM	Ministry of Manpower
MOU	Memorandum of understanding
MRO	Maintenance, repair and overhaul
MTI	Ministry of Trade and Industry
Nitec	National ITE certificate
NP	Ngee Ann Polytechnic
NS	National service
NTUC	National Trade Unions Congress
NYP	Nanyang Polytechnic
PET	Pre-employment training
PFP	Polytechnic foundation programme
PQAF	Polytechnic quality assurance framework
PSEI	Post-secondary educational institution
PSLE	Primary school leaving examination
QAF	Quality assurance framework
QAFU	Quality assurance framework for universities
RP	Republic Polytechnic
SF	Skills framework
SP	Singapore Polytechnic
SSEC	Singapore standard education classification
SSG	SkillsFuture Singapore
SUSS	Singapore University of Social Sciences
TACs	Trade associations and chambers
TP	Temasek Polytechnic
TVET	Technical and vocational education and training
VITB	Vocational & Industrial Training Board
WLTD	Work-Learn technical diploma
WSG	Workforce Singapore
WSQ	Workforce skills qualifications

8.1 Introduction

The Ministry of Education (MOE) is the central authority for both formal TVET and continuing education in Singapore. The key TVET providers at the post-secondary level, comprising the Institute of Technical Education (ITE) and the five polytechnics, are the major suppliers of TVET to support Singapore's economic growth and transformation.

This profile is represented by the Institute of Technical Education (ITE). Information outside the purview of ITE is extracted from the public domain websites of government agencies involved in skills development in Singapore.

The Singaporean economy is driven by its manufacturing, financial and tourism sector that employs skilled personnel trained to perform role-specific tasks. Particularly, in the wake of Industry 4.0, a highly skilled Singaporean workforce—*that is future ready*—is seen as the key contributor in advancing a world-class economy that is diverse, inclusive and globally competitive. With no significant natural oil and gas reserves in its possession, Singapore's real natural resources indeed are its people.

The Technical and Vocational Education and Training (TVET) system, policies and initiatives in Singapore are in line with the needs of industry. TVET along with continuing education and adult and lifelong learning has paved the way for the development and progression of a knowledge- and skilled-based economy.

In particular, the Institute of Technical Education (ITE) and the five polytechnics (Nanyang Polytechnic, Ngee Ann Polytechnic, Republic Polytechnic, Singapore Polytechnic and Temasek Polytechnic) under the Ministry of Education are the major suppliers of TVET in Singapore. These, along with other post-secondary educational institutes (PSEIs), offer a wide range of current and relevant occupation-based programmes that cover various sectors and industries including design, education, engineering, finance, health, hospitality and tourism, IT, law, media and communications, real estate and more.

At the same time, the private sector is an integral part of the TVET system in Singapore. Since it plays a significant role in developing a skilled, future-ready and an employable workforce, the government has forged close partnerships with key stakeholders from the industry.

Of late, SkillsFuture is one of the key national initiatives of the government towards advancing TVET. SkillsFuture Singapore (SSG), a statutory board under the Ministry of Education (MOE), is tasked to implement SkillsFuture initiatives by working with educational institutions and training partners to build a vibrant landscape of high-quality, industry-relevant training. Alongside, Workforce Singapore (WSG), a statutory body under the Ministry of Manpower (MOM), is mandated to drive efforts to help Singaporeans assume quality jobs and careers, while addressing industry manpower needs.[1]

This profile outlines the TVET system in Singapore and provides information on more recent efforts and developments.

[1] MOM (Ministry of Manpower Singapore) (2016).

8.2 Socio-economic Background

Singapore is a city state with a population of 5.78 million in 2017.[2] The population pyramid in Fig. 8.1 shows that close to 51% of the population is in the age group of 25–54 years old and a balanced sex ratio of 0.96 male to female residents.

Singapore's GDP and per capita GDP in 2017 are about US$324,000 million and US$94,000, respectively. Economic growth has slowed from 2012 to 2017 compared to the previous decade, with GDP growth between 1 and 3%, but has recovered at 3.6% in 2017 with better global outlook. The economy relies mainly on exports, particularly of electronics, petroleum products, chemicals, medical and optical devices, pharmaceuticals, as well as its transportation, business, and financial services sectors. In recent years, the government has successfully attracted major investments in advanced manufacturing, pharmaceuticals, and medical technology production, besides reinforcing its reputation as Southeast Asia's leading financial and technology hub (See Footnote 2).

Owing to its low birth rate of 8.7 births/1000 population (2018 est) and a rapidly ageing population, the government has to concentrate effort to increase the skill

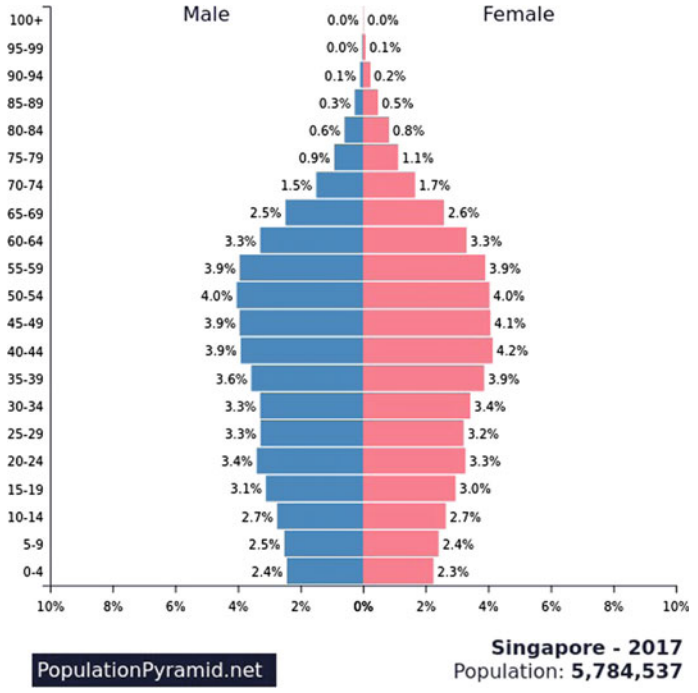

Fig. 8.1 Singapore's population pyramid in 2017 (Population Pyramids of the World from 1950 to 2100. *Singapore* 2017)

[2]Central Intelligence Agency (2018).

level and productivity of its labour force so that it is has the resources to sustain its economy and take care of its elderly residents. Singapore has a highly skilled labour force as 79.4% of the residents aged 25 years and above have secondary education or higher qualifications[3] (2016 est). Total unemployment rate is a low of 2% of the labour force in 2017. The majority of the labour force works in the services sector (73.7%), followed by the industries (25.6%) (See Footnote 4).

8.3 TVET Mission, Legislation and Strategy

8.3.1 Mission

SkillsFuture,[4] a national movement started in 2015 and overseen by the Future Economy Council (FEC),[5] seeks to provide Singaporeans with the opportunities to develop their fullest potential throughout life, regardless of their starting points (schooling, early career, mid-career or silver years). With the help of education and training providers, employers or unions, Singaporeans have access to a variety of resources to help attain skills mastery and lifelong learning. Through this movement, the skills, passion and contributions of every individual will help Singapore realise the future it has envisioned.

The SkillsFuture initiative **has four key thrusts**[6]:

1. Help individuals make well-informed choices in education, training and careers.
2. Develop an integrated high-quality system of education and training that responds to constantly evolving needs.
3. Promote employer recognition and career development based on skills and mastery.
4. Foster a culture that supports and celebrates lifelong learning.

8.3.2 Legislation

'SkillsFuture Singapore Agency Act 2016 (No. 24 of 2016)'[7] and 'Workforce Singapore Agency Act (Chapter 305D)'[8] are the two acts that govern TVET strategy and implementation in Singapore.

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[3] United Nations Development Programme (2018).

[4] About SkillsFuture. (n.d.).

[5] About the Future Economy Council (n.d.).

[6] See Footnote 4.

[7] Singapore Statutes Online (2016).

[8] Singapore Statutes Online (2003).

8.3.3 Strategy

Sectoral Manpower Development Plan[9]
SkillsFuture Singapore (SSG) will work closely with employers and other key stakeholders to design and implement a framework to enable individuals to advance in their careers by climbing skill ladders.

In collaboration with sector lead agencies, employers, and unions, SSG will co-develop medium-term manpower and skills plans for each key sector, in order to support industry growth and productivity efforts. These sectoral manpower strategies will identify sector-specific manpower and skills requirements over a five-year period, and outline a holistic package of measures to meet these requirements.

Industry Transformation Maps (ITMs)[10] ***and Skills Frameworks (SFs)***[11]
Under the S$4.5 billion Industry Transformation Programme, road maps have been developed for 23 industries to address issues within each industry and deepen partnerships between government, firms, industries, trade associations and chambers.

The FEC will take overall responsibility for the implementation of the ITMs. To do so, the FEC has six subcommittees, with each subcommittee overseeing a group of ITMs within the same broad cluster of industries. The ITMs are grouped into six clusters,[12] each comprising a group of them from the same broad cluster of industries, namely manufacturing, built environment, trade and connectivity, essential domestic services, modern services and lifestyle. Each ITM will consist of a growth and competitiveness plan, supported by four pillars, i.e. productivity, jobs and skills, innovation, and trade and internationalisation.[13,14]

The Skills Framework,[15] which is an integral component of the Industry Transformation Maps, is co-created by employers, industry associations, unions and the government for the Singaporean workforce. The Skills Framework provides key information on sector and employment, career pathways, occupations/job roles, as well as existing and emerging skills required for the identified occupations/job roles. It also provides a list of training programmes for skills upgrading and mastery.

The Skills Framework aims to create a common skills language for individuals, employers and training providers. This further helps to facilitate skills recognition and support the design of training programmes for skills and career development. The Skills Framework is also developed with the objectives to build deep skills for a lean workforce, enhance business competitiveness and support employment and employability.

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[9] Sectoral Manpower Development Plan (SMDP) (n.d.).
[10] Industry Transformation Maps (ITMs) (2016).
[11] Skills Framework (n.d.).
[12] See Footnote 10.
[13] MTI (Ministry of Trade and Industry Singapore) (2017).
[14] MTI (Ministry of Trade and Industry Singapore) (2016).
[15] See Footnote 11.

8.4 TVET Governance and Financing

8.4.1 Governance

The **National Manpower Council** comprising the Ministry of Trade and Industry (MTI), the Ministry of Manpower (MOM) and the Ministry of Education (MOE), is responsible for national skills manpower planning and training. MOE oversees policy implementations introduced by SSG.

SkillsFuture Singapore [16,17]

SSG will drive and coordinate the implementation of the national SkillsFuture movement, promote a culture and holistic system of lifelong learning through the pursuit of skills mastery, and strengthen the ecosystem of quality education and training in Singapore.

SSG will strengthen the adult training infrastructure by taking on all existing functions of the Committee for Private Education (CPE) and the Institute for Adult Learning (IAL) to enhance the capabilities and professionalism of adult educators. SSG will play a key role in the quality assurance for private education institutions and adult training centres. Together with educational institutions and training partners, SSG will ensure that students and working adults have access to high-quality, industry-relevant training throughout life. SSG will also bring together synergies in continuing education and training (CET) and pre-employment training (PET), so skills requirements will continue to meet the demands of different sectors of the economy.

SSG is committed to high standards of corporate governance. The SSG Board and Management have established a framework to ensure strict adherence to good corporate governance practices. The SSG Board provides guidance and advice to the SSG Management on all matters under SSG's purview, including its policy, regulatory and promotional roles. It also reviews and approves the strategic plans and budgets of SSG. The SSG Board members come from diverse backgrounds such as the unions and the private and public sectors. This allows SSG to tap on their varied experiences and perspectives.

Workforce Singapore [18,19]

WSG oversees the transformation of the local workforce and industry to meet ongoing economic challenges. WSG will promote the development, competitiveness, inclusiveness and employability of all levels of the workforce. This will ensure that all sectors of the economy are supported by a strong, inclusive Singaporean core.

While its key focus is to help workers meet their career aspirations and secure quality jobs at different stages of life, WSG will also address the needs of business owners and companies by providing support to enable manpower-lean enterprises

[16] About Us (n.d.).

[17] See Footnote 1.

[18] See Footnote 16.

[19] See Footnote 1.

to remain competitive. Furthermore, it will help businesses in different economic sectors create quality jobs, develop a manpower pipeline to support industry growth, and match the right people to the right jobs.

WSG is committed to high standards of corporate governance. The WSG Board and Management have established a framework to ensure strict adherence to good corporate governance practices. The WSG Board provides guidance and advice to the WSG Management on all matters under WSG's scope, including its policy and operational and promotional roles.

The WSG Board also reviews and approves the strategic plans and budgets of WSG. WSG Board members are selected from a diverse range of backgrounds, from the unions, and the private and public sectors to tap on their varied experiences and perspectives.

8.4.2 Financing

MOE provides development and recurrent funds to all educational institutions including TVET institutions like the Institute of Technical Education and the five polytechnics.

The total amount of development funds for education fluctuates according to the needs. Figure 8.2 shows Government of Singapore's total development expenditure on education on an annual basis from 1981 to 2016.

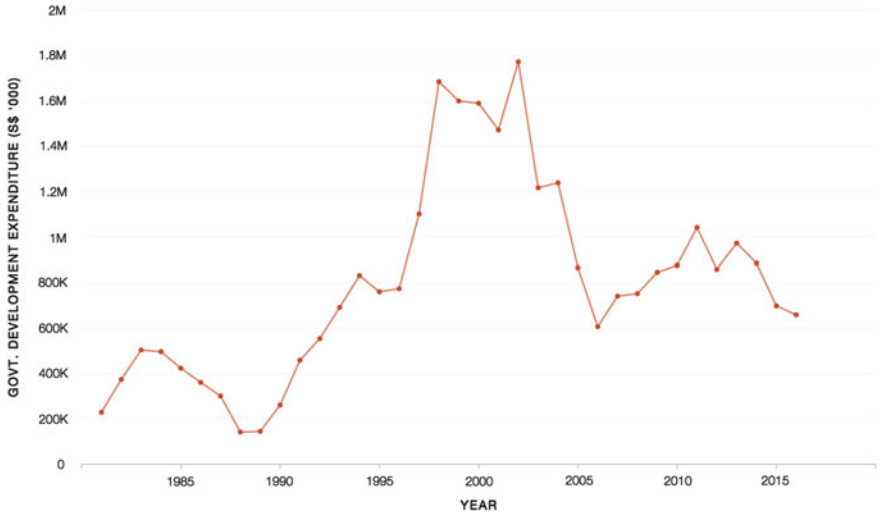

Fig. 8.2 Government development expenditure on education (Government of Singapore 2017a)

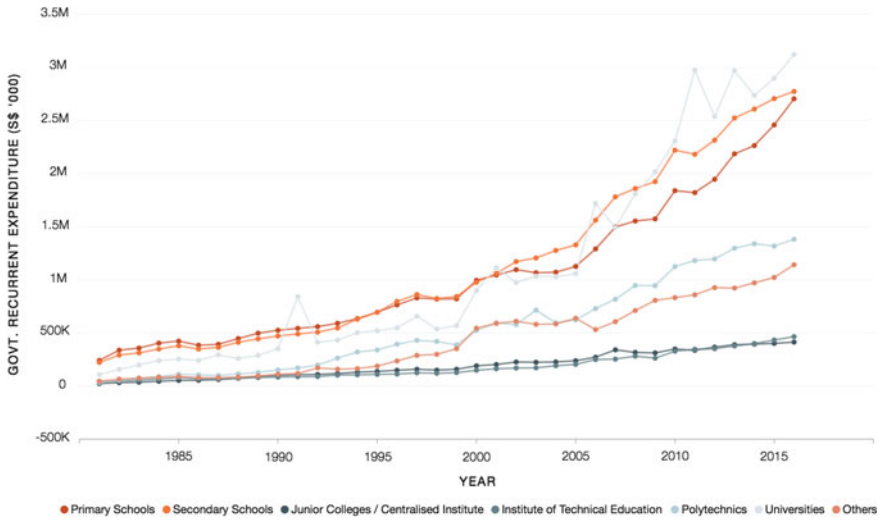

Fig. 8.3 Government recurrent expenditure on education by type of educational institution (Government of Singapore (2017b)

The distribution of government recurrent funds based on type of educational institutions for the period 1981–2016 is shown in Fig. 8.3. The general trend is that the amount has continuously increased each year.

The government recurrent expenditure on education per student for the period 1986–2016 broken down by the type of educational institution can be seen in Fig. 8.4. The general trend is that the expenditure per student at ITE and polytechnics has remained higher than the expenditure per student at primary or secondary school.

8.5 Education and TVET System

8.5.1 National Education System

As seen in the Singapore Education System (Fig. 8.5), Singapore has six years of primary education, four to five years of secondary education, two or more years of post-secondary education, including university. TVET courses are offered at secondary level, as well as at post-secondary level through ITE, five polytechnics, apprenticeship systems and continuing education.

According to the Compulsory Education (CE) Act,[20] a child of 'compulsory school age' is one who is above the age of 6 years and who has not yet attained the age of 15 years. Compulsory Education was implemented in Singapore in 2003.

[20]Compulsory Education (n.d.).

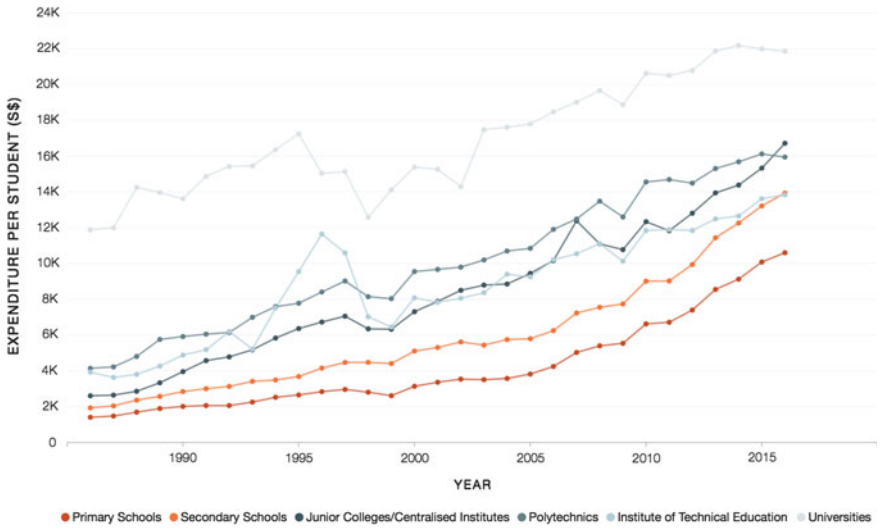

Fig. 8.4 Government recurrent expenditure on education per student (Government of Singapore 2017c)

The first cohort of pupils under CE are Singapore citizen children born between 2 January 1996 and 1 January 1997 who are residing in the country.

8.5.2 Formal TVET System (PET—Pre-Employment Training)

Singapore's education policy is shaped primarily by the global economic landscape and the industry's human resource requirements. Its leaders have a good understanding of how its education system can nurture every citizen to succeed in the knowledge economy.

Progression Pathways

The current education system has both vertical and lateral progression pathways to allow every child to work towards their aspirations according to their strengths and learning pace (Fig. 8.6). After receiving at least ten years of formal education, students have the options to join the following post-secondary educational institutions (PSEIs)[21]:

1. Those who are more academically inclined may opt to study a pre-university course, either at a junior college (2-year course) or at a centralised institute (3-year course) and then take the GCE 'A'-Level examinations in order to gain entry to university.

[21] Post-secondary (Education) (n.d.).

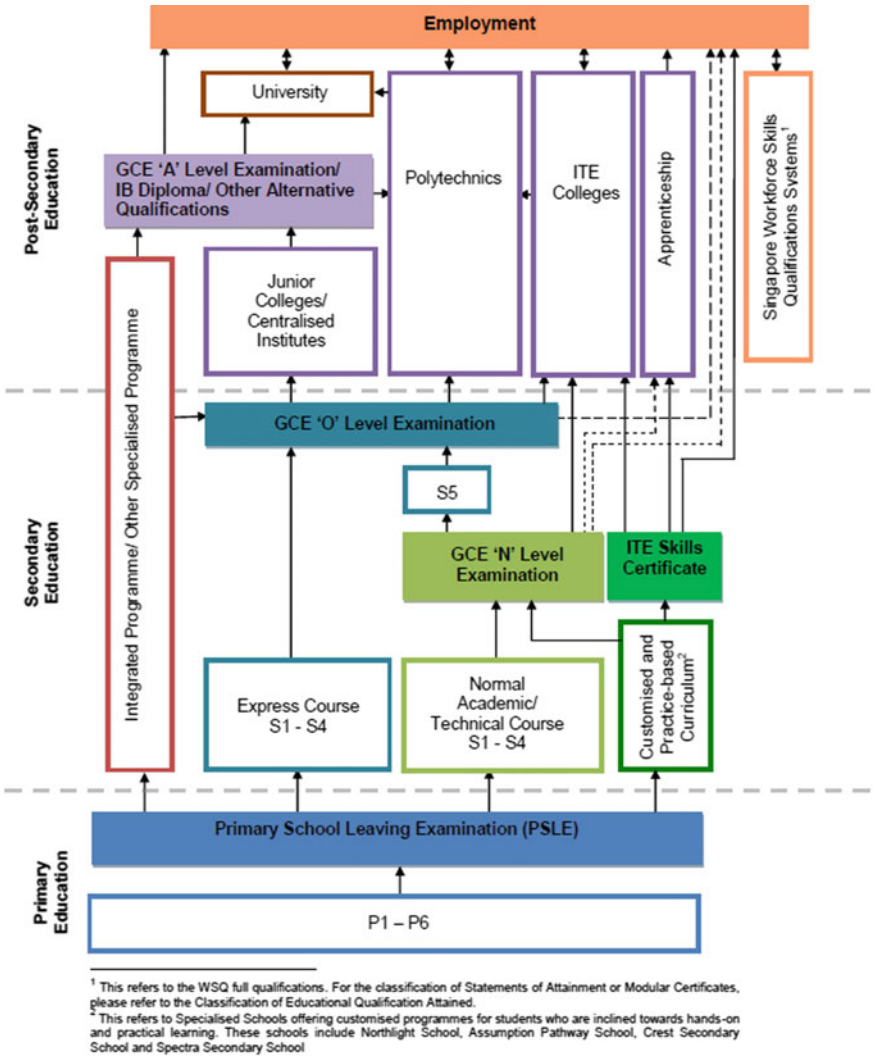

Fig. 8.5 Singapore education system with CET system (Department of statistics (Ministry of Trade and Industry Singapore) 2015)

2. Those who prefer a diploma that focuses on technical skills required of middle-level professionals may pursue a programme at one of the five polytechnics (3-year course).
3. Those who are vocationally inclined may acquire trade skills at the Institute of Technical Education (ITE) and be awarded the National ITE Certificate *(Nitec)* that is industry recognised.

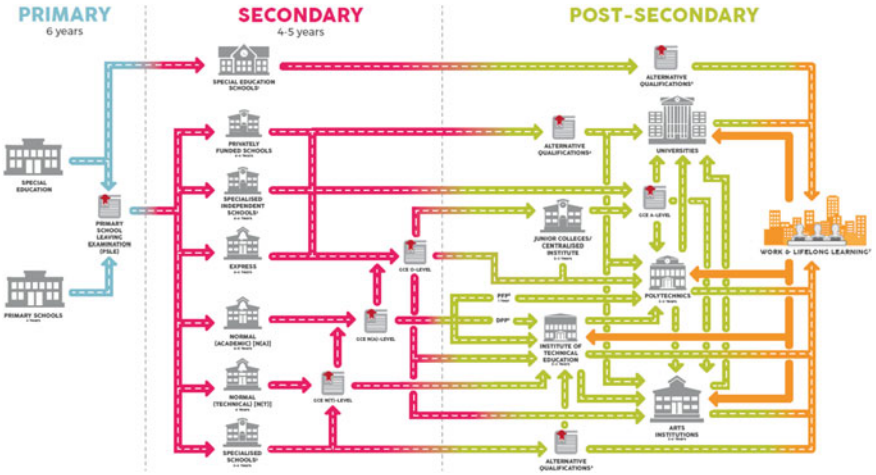

Fig. 8.6 Singapore's education system and pathways (MOE (Ministry of Education Singapore) 2017)

TVET Institutes and Studies

ITE and polytechnics are the key providers of TVET at post-secondary level.

(a) **Institute of Technical Education (ITE)**[22,23]
Institute of Technical Education Act (Chapter 141A)[24] led to the establishment of the ITE on 1 April 1992. As a post-secondary institution, the ITE took over the role and functions of the Vocational and Industrial Training Board (VITB) (1979–1991) and focused its effort on meeting manpower needs at the technician and semi-professional level. ITE offers close to 100 courses across 12 sectors, covering industries in engineering, business and services, electronics and IT, applied and health sciences, design and media, hospitality and tourism. To support lifelong learning and ensure continued relevance, ITE's programmes also cater to ITE graduates and adult learners who enrol in its part-time courses. ITE has three colleges (College East, College West and College Central) that were built one after another since 2005. Together, they have student enrolment of about 28,000 full-time students (2017). With a 'One ITE System, Three Colleges' education and governance model, ITE is able to offer high-quality courses that are delivered consistently across the colleges. ITE's unique 'Hands-on, Minds-on, Hearts-on'[25] education philosophy nurtures students holistically through applied learning in authentic environment, opportunities to apply cre-

[22] About ITE (n.d.).
[23] See Footnote 21.
[24] Singapore Statutes Online (n.d.).
[25] Varaprasad (2016).

ative thinking to solve real-world problems and programmes that imbue sound values towards self, others and the community.

ITE provides pre-employment career and technical training to secondary school leavers. About 25% of secondary school leavers join ITE for full-time career and technical training. ITE courses lead to the National ITE Certificate (*Nitec*) or the Higher National ITE Certificate (*Higher Nitec*).[26] Students are typically between 17 and 19 years old when they enrol in ITE courses.[27] The required educational qualification to enter post-secondary studies at ITE is GCE 'O'- or 'N'-Level certificates for full-time courses.[28]

Apart from full-time institutional training, students can also acquire skills certification through traineeship programmes conducted jointly by companies and ITE. ITE also offers Technical Diploma Programmes (TDPs) in collaboration with foreign partners in niche areas such as automotive engineering and culinary arts, to provide additional pathways for skills upgrading. Those who are interested in furthering their education can also be considered for admission to the polytechnics based on their *Nitec* or *Higher Nitec* qualifications.

The government's 2016 recurrent expenditure on training provided by ITE was around S$465 million.[29]

(b) **Polytechnics**

There are five polytechnics in Singapore,[30] namely Nanyang Polytechnic (NYP), Ngee Ann Polytechnic (NP), Republic Polytechnic (RP), Singapore Polytechnic (SP) and Temasek Polytechnic (TP). They offer a wide range of post-secondary courses in diverse fields which equip graduates with practical knowledge and skills to meet the economy's manpower needs.

GCE 'O'-Level school leavers may enrol in one of the five polytechnics in Singapore to pursue full-time diploma programmes. Most of the polytechnic graduates enter the workforce after graduation, but about four in ten would go on to obtain a university degree within five years of graduation from the polytechnic. Therefore, polytechnic education with its practice-oriented curricular in exciting fields such as biomedical and life sciences, design, hospitality and tourism management, and interactive and digital media has become an attractive alternative to the more academic junior college education for progression to the university.

To enter polytechnics, the required educational qualifications are GCE 'O'-Level certificates, *Nitec* or *Higher Nitec* qualifications for full-time (3-year) diploma courses. Those with other qualifications such as GCE 'A'-Level certificates may also be considered. Students with GCE 'N'-Level certificates may apply for a place in the polytechnics through the Polytechnic Foundation Programme, which admits students to the foundation year of a specific diploma course.

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[26] Progression Opportunities (n.d.).

[27] Ting (2015).

[28] See Footnote 26.

[29] MOE (Ministry of Education Singapore) (2017).

[30] A guide to polytechnic education—Introduction (n.d.).

Students in the polytechnics are given opportunities to immerse themselves in the relevant industries via work attachments that vary in duration from six weeks to six months or longer for selected courses. Such exposure to industry work and culture provides students with on-the-job experiences, as well as opportunities to network with practitioners. Owing to the practice-based learning approach, students acquire valuable life skills and become creative problem solvers. The polytechnics have excellent training facilities, including industry standard laboratories and workshops, well-equipped lecture halls and tutorial rooms, and libraries with comprehensive physical and digital collections.
The government's 2016 recurrent expenditure on training provided by the polytechnics was around S$1.38 billion.[31]

8.5.3 Formal TVET System (CET—Continuing Education and Training)

Every child in Singapore has the opportunity to receive education for at least ten years. This is followed by post-secondary education for more than 90% of the secondary school leavers. For this reason, non-formal and informal TVET is insignificant in Singapore. Furthermore, with SkillsFuture, the government has invested extensively to meet the training needs of adult learners to ensure that their skills remain relevant to the economy.

Mr Ong Ye Kung[32] then Minister for Education (Higher Education and Skills) in his opening address at The Lifelong Learning Festival 2017 outlined the government's plans to ramp up CET delivery capacity via employers, private training institutes and Institutes of Higher Learning (IHLs).

Over the next few years, from 2017 to 2020, MOE will expand CET delivery capacity significantly, by ramping up delivery by IHLs. This will ensure that CET delivery system rests on three equally strong pillars—employers, private training institutes and IHLs—each playing a critical, systemic role.

The government is working with the unions and industry bodies to build up the second CET pillar—private sector training institutions, to offer subsidised training directly to individual workers. Today, there are about 50 private-sector led CET centres offering training for workers across many industries. Community Development Councils (CDCs) and NTUC's Employment and Employability Institute (e2i) have helped connect individual workers to relevant training courses offered by CET centres, making the promotion of lifelong learning a strong tripartite effort. To upgrade their skills and enhance their employability, workers can sign up for the Workforce Skills Qualifications (WSQ) programmes.

[31] See Footnote 29.

[32] See Footnote 29.

Table 8.1 Singapore standard educational classification[a]

Level of education	Benchmark
No qualification 1 Pre-primary/lower primary education	Did not pass primary school leaving examination (PSLE) or equivalent
Primary qualification	Passed PSLE or equivalent
Lower secondary qualification	Did not pass general certificate of education (GCE) at 'Normal' ('N') or 'Ordinary' ('O') level or equivalent
Secondary qualification	Obtained at least one pass at GCE 'N' or 'O' Level or equivalent
Post-secondary qualification (non- tertiary)	Obtained at least one pass at GCE 'Advanced' ('A') level or equivalent or awarded at least an ITE Nitec or higher Nitec certification or equivalent
Polytechnic diploma	Awarded a diploma or advanced diploma by a polytechnic
Professional qualification	Obtained a certificate, diploma or other qualification by a professional body or vocational institution
Bachelor's or equivalent	Awarded bachelor's degree or equivalent by a university
Postgraduate diploma/certificate qualification (excluding master's and doctorate)	Awarded postgraduate diploma or certificate by a university or postgraduate educational or training institution
Master's and doctorate or equivalent	Awarded postgraduate degree or equivalent by a university or postgraduate educational institution

[a]Department of statistics (Ministry of Trade and Industry Singapore) (2015)

8.6 National Qualifications Framework

The Singapore Department of Statistics has developed **the Singapore Standard Educational Classification** (SSEC) for statistical purposes (as shown in Table 8.1). The SSEC distinguishes between various educational levels according to education type (primary, secondary, post-secondary, etc.), but does not set or describe any competency outcomes for these levels.

ITE Certification Framework

The following framework is an example of TVET certification frameworks from the Institute of Technical Education. ITE provides four levels of certification:

- ITE Skills Certificate for courses that require completion of primary school education as an entry requirement;
- National ITE Certificate (*Nitec*) for courses that require completion of GCE 'N' or GCE 'O' as an entry requirement with prerequisites for certain courses;
- Higher National ITE Certificate (*Higher Nitec*) for courses that require GCE 'O' or GCE 'N(A) with prerequisites as an entry requirement; and
- Technical Diploma or Work-Learn Technical Diploma for courses that require relevant *Higher Nitec/Nitec* as an entry requirement in specific industries.

Certificate of Competency (CoC) is a new certification introduced in 2017 to cater to professionals, managers, executives and technicians looking for short courses to help them in their career progression/transition or to keep abreast of changes in skills needed by the markets. CoC courses generally do not have minimum entry requirements (MER) to facilitate access to adult learners. However, prerequisite knowledge of work experience in the relevant areas where necessary will be indicated in the course promotional material as an advisory note to applicants. MER may be stipulated for courses where regulatory requirements have to be complied with. The ITE Certification Framework is shown in Fig. 8.7 as follows:

National Skills Framework

At the national level, the **Skills Framework**[33] is a recent collaborative initiative between the government and employers, industry associations, unions and professional bodies, as part of the Industry Transformation Maps.[34]

A Skills Framework (SF) is outlined below in Fig. 8.8.

Effort is underway to develop Skills Frameworks to support the Industry Transformation Maps. Starting from 2016, the Skills Frameworks are being launched progressively for various sectors. As of March 2018, the SF has already been launched for 21 sectors in total.[35]

The **Singapore Workforce Skills Qualifications** (WSQ)[36] is a national credential system that trains, develops, assesses and certifies skills and competencies for the workforce. As a continuing education and training (CET) system, WSQ supports the SkillsFuture movement to:

- Promote recognition of skills and competencies to facilitate progression, mastery and mobility;
- Promote holistic development of the workforce through technical and generic skills and competencies;
- Support economic development by professionalising skills and competencies to drive industry transformation, productivity and innovation efforts; and

[33] See Footnote 11.

[34] See Footnote 14.

[35] Skills Framework: Which are the Sectors? (n.d.).

[36] Singapore Workforce Skills Qualifications (WSQ) (n.d.).

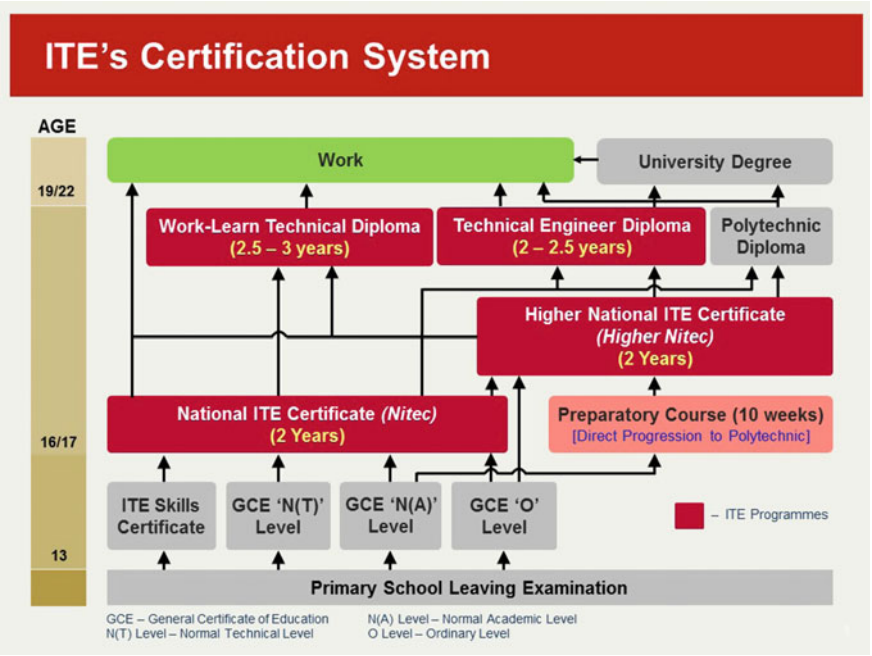

Fig. 8.7 ITE certification framework. *Source* ITE

- Encourage lifelong learning.

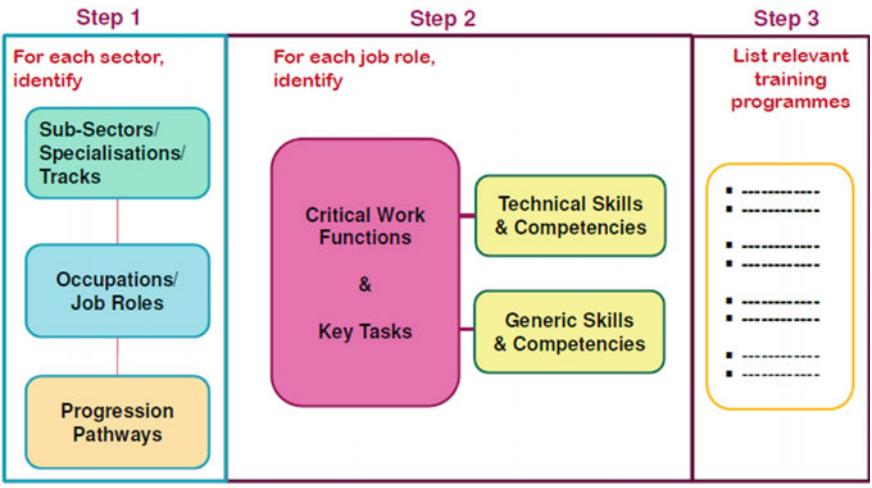

Fig. 8.8 Skills framework (Foo 2017)

Training programmes developed under the WSQ system are based on skills and competencies validated by employers, unions and professional bodies. This process ensures existing and emerging skills and competencies that are in demand are used to inform training and development under WSQ.

8.7 Quality Assurance and Standards

***Workforce Skills Qualifications* (*WSQ*)**[37]
With the roll-out of the Skills Frameworks in 2016, the WSQ adopts the skills and competencies covered in the Skills Frameworks. The WSQ programmes are funded and quality-assured by SkillsFuture Singapore, which awards the WSQ certifications.
Quality Assurance Framework (QAF)
MOE introduced the ITE Quality Assurance Framework (IQAF) and Polytechnic Quality Assurance Framework (PQAF) in 2007 to ensure that the ITE and polytechnic systems and structures for resource allocation, human resource management and other organisational processes are properly aligned to achieve its mission.

Key features of the QAF include:

- **Assessment Cycle**: 5-year cycle.
- **Review Methodology**:
  - ***Institutional self-assessment***: The institution will submit its Institutional Self-Assessment Report (ISAR) to the MOE prior to the site visit. The ISAR is a self-assessment against 25 institutional goals in five areas: governance and leadership, management and strategic planning, teaching and learning, industry linkages and service.
  - ***External Validation (EV)***: An External Review Panel (ERP) commissioned by the MOE will then conduct a 5-day EV (site visit). The review will culminate in a qualitative report (EV report) that confirms good practices and identifies areas where action for improvement is required or recommended.
- **Quality Improvement Projects**: The institution will then submit action plans with clear milestones to address areas identified for improvement in the EV report. It is also required to submit a progress report on the action plans and issues raised by the EV at the annual Performance Review Forum with the MOE.

8.8 TVET Graduates

According to the Education Statistics Digest 2017 by the Ministry of Education Singapore,[38] engineering is the most popular course among ITE students (Table 8.2),

[37] See Footnote 36.
[38] See Footnote 29.

Table 8.2 Intake, enrolment and graduates of ITE by course (full-time), 2016[a]

Courses	Intake		Enrolment		Graduates	
	Total	Female	Total	Female	Total	Female
Total	14,763	5635	27,519	10,346	12,516	4863
Applied and health sciences	1234	740	2322	1427	988	632
Business and services	4152	2591	7411	4594	3654	2334
Design and media	965	479	1851	921	735	373
Engineering	4488	647	8483	1164	3753	469
Electronics and infocomm technology	3318	859	6324	1638	2858	764
Hospitality	606	319	1128	602	528	291

[a]MOE (Ministry of Education Singapore) (2017)

followed by business and services, and electronics and infocomm technology, respectively. Similar to ITE, the most popular course at polytechnics is also engineering (Table 8.3). The next popular courses are business and administration, information technology, and health sciences, respectively.

According to the Singapore Yearbook of Manpower Statistics 2018[39] for the year 2017, 86.4% of fresh graduates from polytechnics and 89.8% of post-NS graduates from polytechnics were employed either on a full-time or a part-time basis. The median monthly starting salaries for fresh graduates and post-NS graduates engaged in full-time work were S$2200 and S$2480, respectively. On the other hand, 79.9% fresh ITE graduates and 85.3% post-NS ITE graduates, respectively, found either full-time or part-time employment. The median monthly starting salaries for fresh graduates and post-NS graduates engaged in full-time work were S$1700 and S$2100, respectively (while fresh graduates comprise mostly females who are not liable for National Service (NS) after graduation and males who defer NS for further studies, post-NS graduates comprise male graduates who have completed their full-time NS, between April 2016 and March 2017 for 2017 data). Table 8.4 lists out the key statistics on employment outcome of graduates from Institutions of Higher Learning (IHLs) for the period 2007–2017.

[39]MOM (Ministry of Manpower) (2018).

Table 8.3 Intake, enrolment and graduates of polytechnics by course (full-time), 2016[a]

Courses	Intake		Enrolment		Graduates	
	Total	Female	Total	Female	Total	Female
Total	23,121	11,018	73,149	35,128	25,104	12,211
Applied arts	1721	1011	5236	3064	1783	1024
Architecture, building and real estate	623	371	2039	1207	743	420
Business and administration	4646	2846	15,203	9406	5595	3417
Education	586	548	1252	1181	307	277
Engineering sciences	6811	1395	21,334	4721	6939	1601
Health sciences	2537	1894	7806	5704	2556	1895
Humanities and social sciences	342	256	1020	758	353	261
Information technology	2769	906	9198	3175	3305	1275
Law	101	66	357	218	126	68
Mass communication	618	457	1920	1436	701	498
Science and related technologies	1296	789	4302	2634	1457	904
Services	1071	479	3482	1624	1239	571

Note
(1) Intake, enrolment and graduate figures refer to diploma courses only. Intake excludes students on Polytechnic Foundation Programme
(2) Intake includes direct entry to second year
(3) Refer to the Appendix for the classification of courses. Courses are classified according to course content of the highest weighting
[a]MOE (Ministry of Education Singapore) (2017)

8.9 TVET Personnel (Teachers)

8.9.1 Hiring Practices

The polytechnics and ITE recruit lecturers who have professional qualifications and working experience in the relevant industry. They bring with them a wealth of professional knowledge and expertise, as well as their own industry network.

8.9.2 Teachers' Professional Development

To help them stay in touch with the constantly changing industry practices, polytechnics and ITE lecturers can upgrade themselves through industrial and workplace attachment or attend postgraduate courses.

To assist academic staff in their roles as lecturers, polytechnic lecturers usually undergo a short induction course at the time of joining. However, in-service courses

Table 8.4 Key statistics on employment outcome of graduates from institutions of higher learning, 2007–2017 (MOM (Ministry of Manpower) 2018)

Institutions	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016[a]	2017
Universities (*NTU, NUS, SMU*)											
Proportion of graduates in the labour force who are employed (%)	94.5	91.3	90.6	90.7	91.4	91.0	89.3	89.1	89.5	89.5	88.9
Full-time permanent	89.8	87.3	84.7	84.8	86.4	85.6	83.4	82.7	83.1	79.9	78.4
Part-time/temporary/freelance	4.7	4.0	5.8	5.9	5.0	5.4	5.9	6.4	6.5	9.7	10.5
Median gross monthly starting salary of graduates in full-time permanent employment ($)	2750	2850	2700	2900	3000	3050	3050	3280	3300	3300	3400
Polytechnics											
Fresh graduates											
Proportion of graduates in the labour force who are employed (%)	93.0	89.8	88.5	91.5	92.1	91.0	89.8	89.2	88.9	90.6	86.4
Full-time permanent	75.3	68.5	62.6	68.5	67.0	65.4	62.7	59.4	57.9	55.8	52.8
Part-time/temporary/freelance	17.7	21.3	25.7	23.0	25.1	25.7	27.1	29.8	31.0	34.8	33.7
Median gross monthly starting salary of graduates in full-time permanent employment ($)	1700	1800	1700	1660	1850	1950	2090	2000	2100	2166	2200
Post-NS graduates											
Proportion of graduates in the labour force who are employed (%)	92.7	87.8	87.7	95.4	94.7	93.1	92.8	92.4	91.5	95.4	89.8
Full-time permanent	82.3	76.0	71.1	81.3	80.1	77.8	74.2	73.0	70.8	79.2	64.0
Part-timer/temporary/freelance	10.4	11.8	16.6	14.1	14.6	15.3	18.7	19.3	20.7	25.2	25.8
Median gross monthly starting salary of graduates in full-time permanent employment ($)	2000	2000	2000	2000	2100	2253	2250	2400	2500	2517	2480
Institute of technical education (*ITE*)											

(continued)

Table 8.4 (continued)

Institutions	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016[a]	2017
Fresh graduates											
Proportion of graduates in the labour force who arc employed (%)	92.9	88.2	81.1	84.7	84.1	83.2	81.7	83.0	83.2	86.7	79.9
Full-time permanent	71.1	61.9	57.6	57.8	63.5	51.5	62.4	59.3	48.4	40.3	40.2
Part-timer temporary/freelance	21.8	26.4	23.5	26.9	20.6	31.7	19.4	23.7	34.7	46.5	39.7
Median gross monthly starting salary of graduates in full-time permanent employment ($)	1217	1.300	1200	1.291	1300	1350	1410	1500	1700	1655	1.700
Post-NS graduates											
Proportion of graduates in the labour force who are employed (%)	93.9	90.8	88.4	90.4	89.6	89.6	89.9	89.4	86.8	86.1	85.3
Full-time permanent	79.8	76.4	76.4	78.3	79.7	79.4	80.4	78.6	63.0	67.3	63.7

(continued)

Table 8.4 (continued)

Institutions	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016[a]	2017
Part-time/temporary/freelance	14.2	14.4	10.0	1.20	10.0	10.2	9.4	10.8	23.8	18.8	21.8
Median gross monthly starting salary of graduates in full-time permanent employment ($)	1400	1600	1500	1600	1600	1700	1743	1835	1950	2000	2100

[a]2016 data for Universities have been updated

Notes

(1) Proportion in employment refers to the employed as a proportion of graduates who have entered the labour market as at the reference date, approximately 6 months after completion of final examinations

(2) Full-time permanent employment refers to employment of less than 35 h a week and where employment is not temporary. It includes those on contracts of one year or more. Before 2009, full-time employment refers to employment where normal hours of work is 30 h or more

(3) Part-time/temporary/freelance employment refers to employment of less than 35 h a week and where employment is casual, interim or seasonal. It includes those on contracts of less than one year

(4) Gross monthly starting salary comprises the basic salary, fixed allowances, overtime pay and commissions. Bonuses are excluded

(5) Fresh graduates refer to those who had completed their studies in the year, comprising mostly females who are not liable for National Services (NS) after graduation and males who defer NS for further studies

(6) Post-NS graduates refer to male graduates who had completed their studies about 2 years earlier. For example, 2017 data refers to male graduates who completed their full-time NS between April 2016 and March 2017 for Polytechnics and ITE graduates

(7) Universities refer to Nanyang Technological University (NTU), National University of Singapore (NUS) and Singapore Management University (SMU)

(8) Polytechnics refer to Nanyang Polytechnic (NYP), Ngee Ann Polytechnic (NP), Republic Polytechnic (RP), Singapore Polytechnic (SP) and Temasek Polytechnic (TP)

are normally provided by professional learning designers from the teaching and learning centres to ensure that lecturers are up-to-date with the most current pedagogical practices including the use of educational technologies for teaching delivery.

ITE's Total Organisation Capability initiative encourages its lecturers to enhance their competencies both in their individual and cross-domain capabilities. Besides workplace attachments and training courses, lecturers can hone their skills by participating in projects, consultancy work or experiencing real-world projects in the Technology Development Centres. In ITE, it is mandatory for new lecturers to undergo a rigorous Advanced Certificate in Technical Education Programme (ACTEP) that has duration of 40 weeks. Face-to-face modules are conducted during vacations and interspersed with practicum that is supervised by lecturer mentors. Experienced lecturers who would like to deepen their competencies in designing learning and leading pedagogic practices can attend in-service programmes at the diploma level. Other in-service lecturers can opt to attend courses that are related to the integration of ICT in lesson delivery, pastoral care or educational career guidance.

8.10 Private Sector Cooperation

Private sector plays a significant role in developing a skilled, future-ready and an employable workforce in Singapore and is an integral part of the national TVET system.

In order to (a) identify and promote the enhancement of industry-specific skills, (b) enhance individuals' employability, and (c) increase workforce productivity and improve the international competitiveness of commerce and industry, the *Workforce Singapore Agency Act* (*Chapter* 305*D*) along with other functions mandates the Workforce Singapore to collaborate with and support employers, relevant representatives of commerce or industry and public sector agencies in Singapore.[40]

IHLs foster partnerships with the private sector in myriad ways. For instance, ITE's partnerships with the private sector are established through the following programmes (Fig. 8.9).

ITE's strong engagement with industry can be seen from:

- Over 2600 employers as co-learning partners offering internships and workplace learning for students; and
- Over 200 active industry partnerships for authentic learning, industry and technology update and capability development.

[40] Singapore Statutes Online (n.d.).

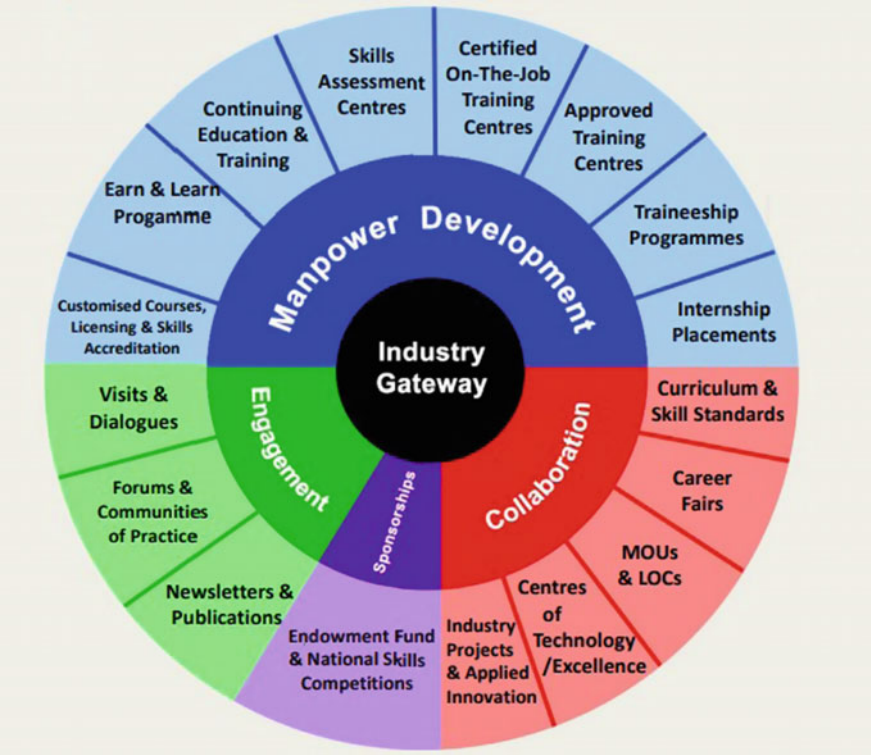

Fig. 8.9 ITE's industry gateways to build partnerships with the private sector (Ting 2015)

8.11 Current Trends and Practices

In the wake of Industry 4.0, a highly skilled Singaporean workforce—*that is future ready*—is seen as the key contributor in advancing a world-class economy that is diverse, inclusive and globally competitive. As a result, the government continues to strengthen and promote practice-based curricula to give learners real work experiences that will add mileage to their career progression. To better prepare our students for the future world of work, schools have introduced career guidance programmes to help them discover and explore their strengths and interests. The following efforts are examples of current trends and practices:

Earn and Learn Programme[41]

The SkillsFuture Earn and Learn Programme (ELP) is a work-learn programme that gives fresh graduates from polytechnics and the ITE a head start in careers related to their discipline of study. It provides them with more opportunities, after graduation,

[41] SkillsFuture Earn and Learn Programme (n.d.).

to build on the skills and knowledge they acquired in school, as well as helps support their transition into the workforce.

Participating employers can recruit local fresh talent, within three years of graduation or the Operationally Ready Date for National Servicemen and prepare them to take up suitable job roles. Participants in the programme can look forward to a structured career progression pathway within the organisation.

This programme is designed in collaboration with the industry to ensure relevance to employers and the growth of the sector. Since 2015, the SkillsFuture Earn and Learn Programme has been introduced in 25 sectors, including aerospace, biomedical sciences, food services, game development, healthcare, hotel, information technology and retail.

Apprentice-based Work-Learn Technical Diplomas[42]

Similar to the SkillsFuture Earn and Learn Programmes, the new Work-Learn Technical Diploma (WLTD) programmes are developed and delivered in close partnership with key employers. Learning takes place both at the workplace and on campus, with 70% of the curriculum time dedicated to On-the-Job Training. The Institute of Technical Education (ITE) will award these WLTDs.

The WLTD programmes last between 2.5 and 3 years. Up to 120 places across the four programmes have been offered for the first intake in April 2018. As a start, employers such as Certis CISCO, ST Electronics, Keppel Offshore & Marine, Sembcorp Marine Ltd, St Luke's Eldercare and AWWA have committed to providing training places for the WLTD programmes, and ITE looks forward to more companies coming onboard. With the new WLTDs, ITE graduates can look forward to career progression opportunities after completion of the programmes.

***Education and Career Guidance* (ECG)**[43]

Education and Career Guidance (ECG) is about equipping students, as well as adults with the necessary knowledge, skills and values to make informed education and career decisions. Through ECG, students and adults will be encouraged to learn more about their own interests, abilities and passions. By exploring the learning or education pathways and career opportunities available across different industries, individuals can take positive steps towards realising their aspirations, as well as embrace learning throughout their life.

A more structured and coordinated ECG system will provide relevant and timely support to individuals at different life stages—starting from the early schooling years and continuing throughout one's working life:

Primary, Secondary, Junior College and Centralised Institute students: A structured ECG curriculum has been in place for primary 3–6 students since 2012 and for students at the secondary level since 2014. On top of other education planning and career exploration programmes and activities, an interactive Web-based MySkillsFuture portal (https://www.myskillsfuture.sg/content/portal/en/index.html) that helps students discover their own strengths and interests will complement the ECG curriculum. ECG Counsellors in MOE schools will provide individual counselling or

[42] SkillsFuture SG (2017).

[43] Education and Career Guidance (ECG) (n.d.).

group guidance for students in education and career choices. Aside from supporting and collaborating with the relevant personnel to drive and facilitate the provision of quality ECG experiences for students, counsellors will communicate and engage with parents and industry partners where required.

ITE and polytechnic students: A minimum of 40–60 h across two years for ITE students and three years for polytechnic students will be set aside for ECG. Students can engage in ECG-related activities and lessons conducted in the classroom and participate in out-of-classroom activities such as industry immersion programmes, learning journeys and career talks. This will help them to continue developing skills to make informed career decisions and prepare them for a smooth transition into the workplace. Students will also be able to meet with ECG Counsellors in small groups or through individual appointments.

Students from the publicly funded universities: Dedicated career services offices or centres on campus offer career counselling services and preparation programmes that will help students identify and prepare for careers related to their strengths, interests and fields of study.

Adults: They may access career and training advisory services through the Workforce Singapore's (WSG) network of career centres. New workforce entrants, mid-career switchers or individuals in career transition can benefit from the suite of services provided by the career centres. The services include career coaching, employability skills workshops, networking sessions and more.

8.12 Ongoing Reforms/Projects

Singapore aims to embark upon the next phase of development towards an advanced economy and inclusive society. The **Future Economy Council (FEC)**[44] drives the growth and transformation of Singapore's economy for the future and foresees five futures for the nation. These are:

1. **Future Jobs and Skills**.
2. **Future Growth Industries and Markets**.
3. Future of Connectivity.
4. Future City.
5. **Future Corporate Capabilities and Innovation**.

In line with this, the FEC has set out three key areas of work,[45] which are to:

- Grow a vibrant and open economy that is connected to the world, and where trade association and chambers (TACs), unions, enterprises and individuals come together to harness opportunities;
- Strengthen the enterprises through industry-specific transformations to help them grow, innovate and scale up; and

[44] See Footnote 5.

[45] About MTI—Future Economy Council (FEC) (2017).

- **Help Singaporeans acquire and utilise deep skills so as to take up quality jobs and seize opportunities in the future economy, and facilitate the building of a resilient and flexible workforce and great workplaces**.

The FEC, comprised of members from government, industry, unions and educational and training institutions, oversees the implementation of the recommendations put forth by the Committee on the Future Economy (CFE).[46,47] It will build on the work of the earlier Council for Skills, Innovation and Productivity, which includes SkillsFuture initiatives and Industry Transformation Maps. TVET in Singapore is positioned to support the five 'Futures', specifically Futures #1, 2 and 5.

The Committee for Future Economy (CFE) was set up in 2016 to identify future global shifts in the economy. This resulted in seven strategies that will prepare Singapore for the challenges in the next lap (see Fig. 8.10).

Programmes, projects and initiatives are being developed as part of ongoing reforms to support the achievement of FEC's goals, as well as implementation of strategies outlined by the CFE.

8.13 Key Issues and Challenges

According to renowned recruitment firm Robert Walters' annual global survey, the top five professionals in demand are technology specialists, digital marketers, investment professionals, skilled contractors, and regulatory and compliance professionals.[48] To tackle the anticipated future skills challenges, the Ministry of Trade and Industry has outlined the following 'Future Skills for Future Growth' strategies (see Fig. 8.11):

[46] Future Economy (n.d.).

[47] Read the Full Report (n.d.).

[48] Tang (2017).

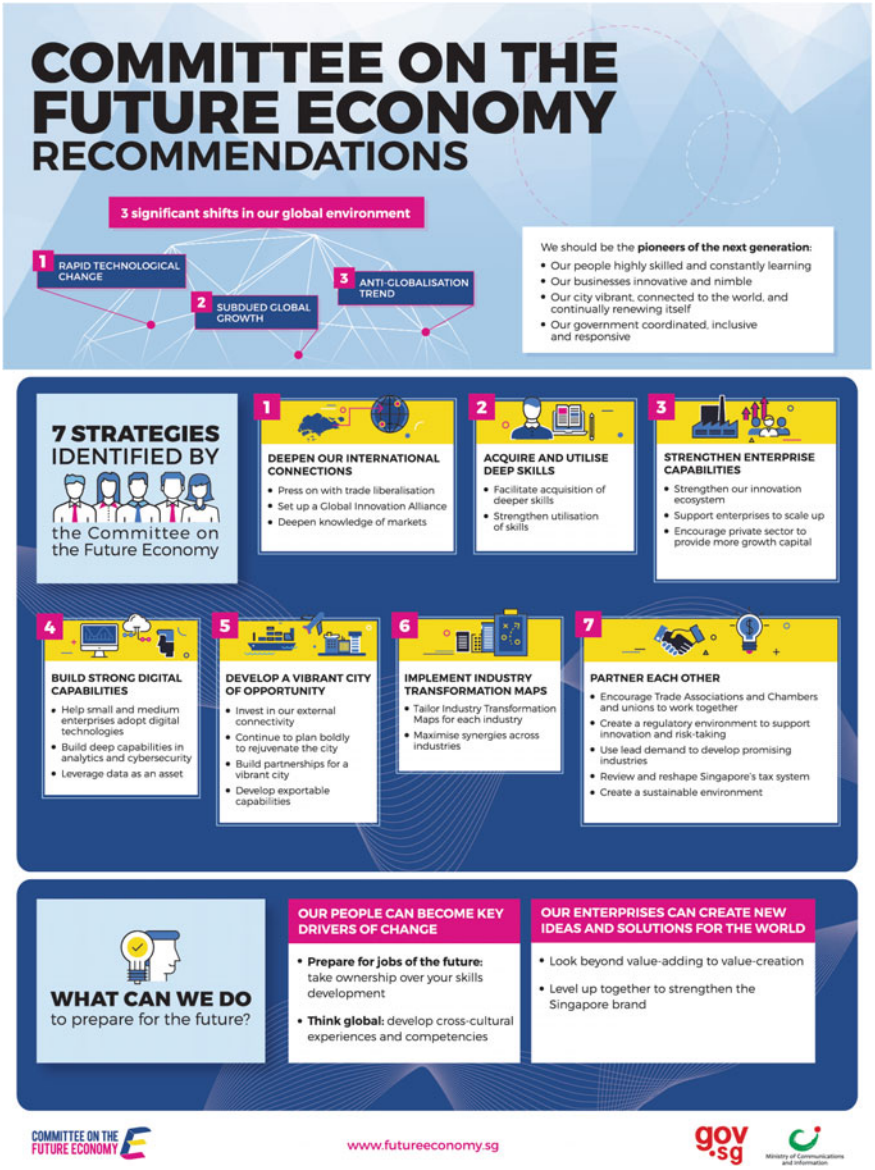

Fig. 8.10 Committee for future economy's recommendations to deal with shifts in global environment (See Footnote 46)

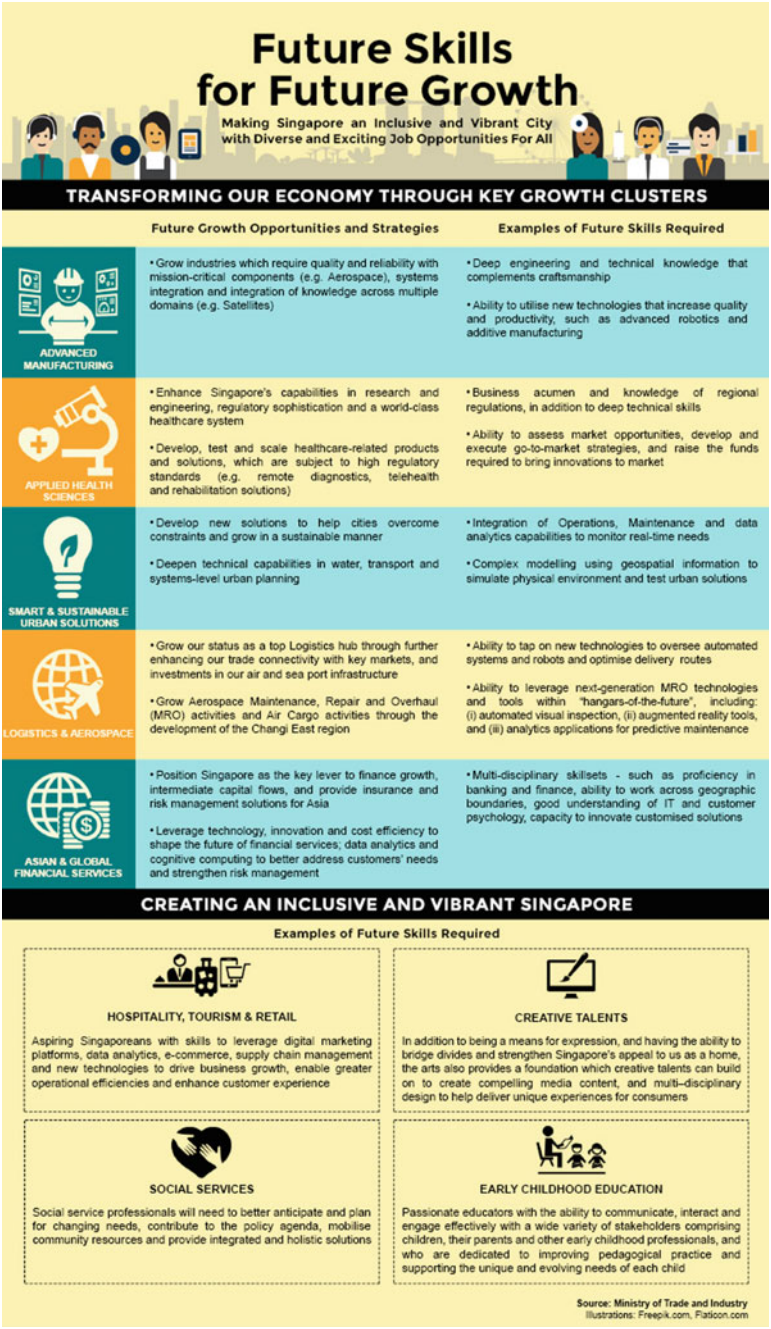

Fig. 8.11 Future skills for future growth (Singapore Industrial Automation Association 2014)

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