

Promoting Development with Needs and Winning the Future with Skills: The Course, Architecture, and Characteristics of Vocational Education and Training in Singapore

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Abstract: Vocational education and training in Singapore are one of the key factors in promoting Singapore's economic and social development. In different historical periods, Singapore's vocational education and training have responded to the needs of national construction and industrial development through different institutional arrangements. At the same time, Singapore's vocational education and training adhere to the cultivation of skilled talents as the core, formulate strategic plans, establish implementation institutions for vocational education and training, launch vocational guidance plans that cover all citizens, and form a strategic plan for vocational education that promotes development based on demand, establishes a long-term mechanism for national skill updating through the "Skills Creation Future Plan", and promotes the development of vocational education through joint efforts from multiple parties. Typical features such as establishing a smooth channel for connecting vocational qualification certificates.

Key words: Singapore; Vocational education and training; Course; framework; features

Technical and Vocational Education and Training (TVET) is one of the key factors in promoting Singapore's economic and social development, as well as a strategic measure for Singapore to fully develop human resources, promote industrialization and technological progress.

1 Promoting Development through Demand: The Evolution of Vocational Education and Training in Singapore

1.1 Establishing vocational colleges during the colonial period

Singapore was under British colonial rule in the 19th century. In order to serve colonial rule, the colonial government paid some attention to the issue of technical education and appointed some education committees to conduct research and publish research reports. In 1930, the first public vocational school founded by the government was established at Newton Circus on Scotts Road, providing apprenticeship courses such as radio, car repair, and mechanics to elementary school graduates for the first time. In 1937, the colonial government organized researchers to continue investigating and researching vocational education, systematically examining the establishment of schools by the British and Dutch governments in Jakarta and Bandung, and released the Cheeseman Report. The report suggests linking technical training with good employment prospects and career development, which was later reflected and implemented in government education policies.

After the end of World War II, Singapore's economy and trade began to gradually recover, with a strong demand for skills in trade and commercial activities, and vocational education also recovered and developed. A large number of vocational schools have emerged, such as Geylang Technical Center, Malay Technical School, and Maris Stella Vocational School. However, these vocational education institutions were limited by the educational conditions at that time and could only provide basic vocational

training at lower levels such as cooking, housekeeping, and secretaries. To keep up with the pace of industrialization and develop a diversified economy, Singapore must have a large number of skilled workers. In 1952, Legislative Council member Thio Chan Bee led the call for the establishment of a polytechnic to meet the urgent need for skilled workers in Singapore's industrialization process. In October 1954, the Singapore Institute of Technology was established, funded by the British colonial government for construction and operation, and appointed as its dean.

1.2 Timely Clarify the Direction of Vocational Colleges in the Early Stage of Independence and Founding of the People's Republic of China

After the establishment of the new government, the primary problem faced was to address the high unemployment rate in the country, and the government set economic growth as the country's top strategic priority. The newly established Singapore Institute of Technology has keenly captured the huge demand for skilled technicians, technicians, and engineers from the country's economic development, and has readjusted and determined the direction of education with a focus on training graduates and full-time students' employability, providing solid human resource support for the government's new economic policy of "rapid employment creation through industrialization". In the early 1960s, Singapore's economy was dominated by labor-intensive industries and transit trade, with many factories mainly producing low-tech products such as clothing, textiles, and toys. With Malaysia and Indonesia adopting the "import substitution" industrial development policy, Singapore's transit trade economy has been severely impacted. To address this situation, the Singaporean government has implemented a "rapid industrialization" strategy, adopting a large number of preferential policies for the business sector, attracting multinational corporations to develop business in Singapore, and ushering in a reform curtain of rapid job creation. The government has proposed three goals for vocational education through the "Zeng Shuji Report": firstly, to

establish a Singapore Vocational College(SVI)specialized in teaching craft skills,recruiting high school graduates who have completed at least two years of secondary education and do not take the"O Level"(ordinary level)exam through academic means to study two-year craft skills courses;The second is to divide middle schools into four types:academic high schools,technical high schools,commercial high schools,and vocational high schools,to meet the needs of the market for semi skilled workers(including management,accounting,and sales and other commercial auxiliary staff);The third is to expand the scale of technical level courses at the Singapore Institute of Technology to meet people's needs for continuous improvement in knowledge and skill levels. The setting of these three goals has had a profound impact on Singapore's technical education and training system,designing a framework for the future of Singapore's vocational education and training system,and clarifying the role and status of various levels of the school system in the industrialization process,which is of groundbreaking significance.

1.3 Timely establishment of vocational certification system during the period of rapid economic growth

In the 1960s,Singapore's economy grew rapidly and began to transition from labor-intensive industries to knowledge-based industries.Research and development,engineering design,computer services,and other activities in various fields of society increased significantly,and the quality requirements of employees in various industries further improved.The problem faced by the government began to shift from striving to create employment opportunities to providing higher value jobs for limited human resources. In order to integrate vocational skills and testing standards,and establish a unified skills training framework suitable for both school students and employed adults,the Industrial Training Bureau merged with the Adult Education Bureau(Lembaga) in 1979 to establish the Vocational and Industrial Training Bureau(VITB),responsible for conducting vocational and technical training,establishing skill standards and certification systems.The Vocational and Industrial Training Bureau has a Skills Certification Committee,which includes the chairman of the Industry Advisory Committee,representatives of licensing agencies,employers,the Economic Development Bureau,standard setting agencies,and trade unions.The Skills Certification Committee divides students'ways of obtaining skills certification into two categories:one is to obtain skills certification through training courses offered by vocational colleges;Another type is to obtain skill certification through continuing education and training,including attending prescribed training courses,apprenticeship training,employment,self-study,etc. The Skills Certification Committee has also developed a three-level system of National Vocational Skills Certification(NTC),which,tog ether with the two types of skills certification channels mentioned above,constitutes a complete skills appraisal and certification system.The main contents of these three levels are as follows:

National Vocational Skills Level 3 Certificate(NTC-3):Master the basic knowledge and skills of a certain profession,and possess the basic skills to become a skilled worker.Obtaining the NTC-3 certificate requires one to two years of basic training or apprenticeship training.

National Vocational Skills Level 2 Certificate(NTC-2):Proficient in mastering all the knowledge or skills required for a specific profession or skill.Obtaining the NTC-2 certificate requires

two years of full-time skills training or five years of on-the-job work experience.

National Vocational Skills Level 1 Certificate(NTC-1):The highest level skill certificate,equivalent to a technical master.Obtaining the NTC-1 certificate requires years of work experience and continuing education and training.

In addition to the above three levels,there is also a Cer qualifications of Competency,usually issued to specific artisan industry skills in a narrow sense,such as construction,navigation,sh ipbuilding,and marine engineering.At this point,with the promotion of the Vocational and Industrial Training Authority,Singapore has established a comprehensive national vocational certification system.

1.4 Promoting the Transformation and Connection of Vocational Education in the Era of Internationalization

After the 1990s,the pace of global economic integration accelerated,and the world economy showed a new development trend led by the high-tech information industry.Emphasis on research and development,innovation,and high value-added services became the mainstream of the times.The adjustment of economic structure means that Singapore will simultaneously implement new vocational education reforms.In 1991,Singapore released a report titled"Improving Primary Education",which included two recommendations that had a significant impact on the development of vocational education and led to the restructuring of the Vocational and Industrial Training Authority.Firstly,it recommended that all students must receive at least 10 years of general education before entering the next level of training;The second is to add"technically oriented"courses in the middle school stage,laying the foundation for entering vocational education and training after graduation.These suggestions have changed the previous requirement for students to complete 8 years of primary and secondary education before engaging in vocational training,allowing them to make more flexible development choices based on their interests,qualifications,and potential.The proposal also facilitated a new unified diversion system,and vocational education was officially included in the scope of formal education,achieving the dual track unity of vocational education,which is a significant change in education policy.In 1992,the Vocational and Industrial Training Bureau was renamed as the Institute of Technical Education(ITE),better highlighting the connotation of high-level skills courses offered by educational institutions such as ITE.Subsequently,the School of Arts and Crafts Education implemented a"4P"transformation development strategy,which involves the transformation of people,including faculty,culture,and abilities;Product transformation,including course and certificate transformation;Place transformation,including infrastructure and learning environment transformation;Promotion transformation,including image,brand,and promotion transformation.After more than 20 years of strategic planning and continuous efforts,the School of Arts and Crafts Education has led Singapore to complete the transformation and development of vocational education,gradually being accepted and recognized by people,becoming the first educational institution to receive the Singapore Quality Award.Singapore has also opened up multiple learning and further education pathways for vocational education students.For example,students who have obtained a certificate from the Advanced National Bureau of Arts and Crafts Education and achieved a GPA of 3.5 or above can choose to pursue further

education through the following pathways: firstly, entering the second year of the Institute of Technology to study a three-year diploma program in related majors; The second is to enter the first year of the Institute of Technology to study related three-year diploma courses, and some courses can be exempted; The third is to enter the first year of the Institute of Technology to study a three-year diploma program in related majors; The fourth is to enter the first year of the Institute of Technology to study a three-year diploma program in related majors, with exemption from the first six months of courses. For students with an average GPA of 2.5 to 3.5 in the School of Technology Education, meeting certain conditions is also eligible to enter the three-year diploma program in related majors in the first year of the College of Science and Technology. If you only obtain a certificate from the National Bureau of Technology and Education, but have an average GPA of 3.5, you can also enter the first year of the Institute of Technology to study engineering diploma courses. Due to the fact that the vast majority of students in the School of Technology Education can achieve an average GPA of 2.5 or above, this bridging system has built a bridge between vocational education and obtaining a diploma from the Institute of Technology (see Figure 1).

2 Winning the Future with Skills: The Architecture of Vocational Education and Training in Singapore

2.1 Strategic planning

Singapore's vocational education has implemented a large number of educational strategic plans in the development process, and at the beginning of the 21st century, strategic plans such as "Breakthrough Strategy", "Excellence Strategy", and "Pioneer Strategy" were released.

1. Breakthrough strategy

The "ITE Breakthrough Plan" is the first five-year strategic planning blueprint for the new century, implemented from 2000 to 2004, with the goal of making the School of Arts and Crafts Education a world-class vocational education institution. This plan re-examines the fundamental starting point of vocational and technical education in Singapore, comprehensively improving the certificate system, curriculum, and teaching methods, so that these systems meet or even lead the world standards. The 'Breakthrough Strategy' has developed new courses and teaching models for the School of Technology Education. In terms of course design, core module courses account for 80% of the total course hours, with practical courses accounting for 70% and theoretical courses accounting for 30%, with a focus on cultivating students' professional and technical abilities. The new curriculum model sets a 15% class hour to cultivate students' life skills, such as communication skills, teamwork spirit, career development, and customer service abilities. In terms of teaching methods, a PEPP teaching model emphasizing teaching interaction and process orientation has been developed, which leads classroom teaching through four stages: Plan, Explore, Practice, and Performance. Teachers and students work together to develop learning plans, search for materials, and test learning outcomes in practice, ultimately achieving students' proficiency in presenting learning outcomes.

2. "Creating Excellence Strategy"

The implementation of the "ITE Advantage Plan" was from 2005 to 2009. The planning vision goal is to make the

School of Technology Education a global leader in technical education, committed to cultivating high-quality graduates who can work domestically and excel among their peers in the international community. The goals of the "Excellence Strategy" are as follows: firstly, to prepare students for the increasingly competitive global employment environment. In the era of knowledge economy, global competition is intensifying, and colleges of technology education must cultivate students' entrepreneurial abilities and skills and concepts to adapt to global development trends through courses, internships, and school enterprise cooperation projects. Secondly, to equip students and adults with lifelong employability. The School of Technology Education should increase course flexibility and collaborate with the industry to carry out skill certification. Thirdly, to enhance the global influence of the School of Arts and Crafts Education, with the goal of bringing its courses and services to the world. Fourthly, improve the comprehensive abilities of teachers in the School of Technology Education. The implementation of the "Excellence Strategy" has had a profound impact on the development of vocational education in Singapore. One is to establish a learning philosophy of "Hands on, Minds on, Hearts on" in the School of Arts and Crafts Education. 'Hand to hand' is to enable students to master workplace knowledge and skills, 'brain to mind' is to cultivate students' creativity, independent thinking, and adaptability, and 'heart to heart' is to enable students to have correct values and maintain a passion for lifelong learning. The second is to establish a management and education model of "one system, three academies" in the School of Arts and Crafts Education, and to change people's traditional views on the School of Arts and Crafts Education. The third is to enhance the professional abilities of teachers in the School of Technology Education. In 2007, the "Comprehensive System Capability" program proposed the "three-level professional competence" standard for the development of teachers' professional abilities: the first level professional competence is familiarity, which means mastering knowledge and skills; The second level professional ability is practical operation, which means having the ability to undertake enterprise projects or consulting work; The third level professional ability is leadership, that is, the ability to develop specialized technology. The fourth is to enhance the international status of the School of Technology Education. The World Bank points out that the Institute of Technology Education has become a world-class institution for post-secondary education. In 2007, when the Kennedy School of Government at Harvard University presented the "Government Governance Innovation Award" to Singapore, it was pointed out that vocational education at the School of Arts and Crafts Education is the most revolutionary government program and a typical paradigm worth promoting globally.

3. Innovation Strategy

The implementation of the 'ITE Innovation Plan' was from 2010 to 2014. The vision goal of the plan is to make the School of Arts and Crafts Education a leader in global technological education innovation. To achieve this vision goal, the School of Arts and Crafts Education has adopted the following approach:

Firstly, the education methods, teaching environment, and student participation models of the School of Technology Education have been redefined and thoroughly transformed. In 2012, the School of Technology Education launched the "Continuing Education and Training Skills Qualification Framework", simplifying courses and shortening class hours, allowing learners to obtain skills certificates

in only half the past time. In 2014, the School of Arts and Crafts Education implemented a new "Career Cluster Framework" (CCF) for training related vocational groups, enabling students to master multiple specialties within the same vocational group. In order to help ordinary (craft) students who only passed two subjects in the GCE "N" level exam better adapt to the learning progress of the School of Craft Education, the School of Craft Education began implementing the "Enhanced Nitec Foundation Program (ENFP)" in 2014, breaking down the course into more controllable unit modules, supplemented by academic foundation courses. To improve students' cultural level and computational skills.

Secondly, deepen and expand the cooperation between the School of Arts and Crafts Education and enterprises as well as other countries. The School of Arts and Crafts Education has signed a large number of cooperation agreements with global partners and established a network of cooperative relationships with many world-renowned multinational corporations. Based on this international cooperation advantage, the School of Arts and Crafts Education has launched the "Global Education Curriculum" to facilitate students' participation in overseas exchanges and corporate internships.

Thirdly, enhance the innovation ability of the School of Technology Education. In 2010, the School of Technology Education implemented the "REAL Leadership Learning Series" course, hiring corporate supervisors and leadership to teach and cultivate teachers' leadership skills. In 2013, the Institute of Technology Education was established to strengthen the cultivation and development of the core values of the college. In 2013, the School of Arts and Crafts Education pioneered the "Mini Mall" teaching model at the Central College, where students operate barbershops, fashion shops, cafes, delicatessen shops, and other stores. With the help of enterprise management experience, students are guided and trained, allowing them to gain real work experience on campus.

4. "Pioneer Strategy"

The implementation of the ITE Trailblazer's strategy was from 2015 to 2019. The vision goal of the plan is to make the School of Arts and Crafts Education a pioneer in vocational and technical education, and to transform Singapore's current vocational skills training model from targeting specific job positions to a career development oriented approach. According to this plan, Singapore will explore new skill paths based on career development oriented learning in the workplace; Exploring new teaching and learning methods and new teaching methods for specific professional disciplines through information and communication technology and autonomous learning; Promote the career development oriented training that employers value to a higher level; By exploring new industry cooperation models, companies and industries have greater autonomy in promoting workplace learning and internships. Plan to achieve the expected goals by implementing the following key strategies:

Firstly, setting up dynamic courses to enhance students' self-adaptation ability. The School of Technology Education sets dynamic courses based on the development and changes of the country and industry, enabling graduates to master specialized skills to adapt to industry changes. Launch an "on-the-job training program" to enable students to continue updating and enriching new skills after graduation.

Secondly, adjust teaching methods and expand effective learning opportunities. The School of Technology Education adopts

new teaching methods, including the use of the latest information and communication technology and improving learning spaces tailored to different professional needs, to create more flexible and autonomous learning opportunities for students based on real environments.

Thirdly, provide students with a comprehensive educational experience. The School of Technology Education provides students with diverse personal development courses, strengthens the organizational platform for career guidance, and provides students with more learning support and rich learning experiences.

Fourthly, promote strategic cooperation and teacher training. The School of Technology Education has established a new model of industry university cooperation, connecting employers, global partners, communities, and alumni to work together to expand students' development opportunities beyond classroom learning.

2.2 Implementing agency

Under the guidance of the Singapore Deep Skills Development Authority (SSG), the Workforce Singapore (WSG), and the Singapore Workforce Skills Qualification Framework (WSQ), the institutions implementing vocational education and training in Singapore are mainly the Institute of Technology (ITE), Polytechnic (Polytechnic), Singapore Employment and Functional Training Center. The National Workers' Federation consists of numerous certified training institutions such as learning centers, trainers, mass media, and higher education institutions, which participate in the management and provide course services.

1. College of Arts and Crafts Education

The Institute of Arts and Crafts Education is the main provider of vocational and technical education in Singapore, as well as the main developer of national skills certification and standards. It is fully funded by the Singapore government. ITE belongs to the post secondary in education system in Singapore, which is roughly equivalent to the level of secondary vocational education in China. The School of Arts and Crafts Education usually admits graduates holding GCE (N) level certificates to study the National Bureau of Arts and Crafts Education Certificate (Nitec) course, or graduates holding GCE (O) level certificates to study the Advanced National Bureau of Arts and Crafts Education Certificate (Higher Nitec) course. The School of Arts and Crafts Education establishes extensive partnerships with enterprises to impart industry expertise and ensure that graduates possess the necessary skills for the industry. The School of Technology Education provides a large number of internship opportunities for enterprises, providing students with meaningful work-based learning and training under the guidance of industry mentors. Graduates of the School of Technology Education who wish to continue their studies can also further study the Technical Diploma Programs of the School of Technology Education by obtaining Nitec or Higher Nitec certification qualifications, or enter the School of Technology to continue their studies.

2. College of Technology

There are five polytechnics in Singapore (Nanyang Polytechnic, Singapore Polytechnic, Yi'an Polytechnic, Temasek Polytechnic, and Republic Polytechnic), and their vocational education and training are comparable to China's higher vocational education level, mainly cultivating technicians and technicians. The Institute of Technology recruits approximately 40% of GCE (O) level graduates or students who have obtained the Nitec/Higher Nitec

certificate qualifications from the School of Technology Education. There are also some outstanding fourth year high school students who have obtained GCE N(A) level certificates and enrolled through the Polytechnic Foundation Program (PFP) to study practical oriented courses. In addition, in-service adults with relevant work experience are recruited through the Polytechnic Early Admissions Exercise to receive further education and training. These five polytechnics are the main providers of professional development programs and services for continuing education and employment positions in Singapore. They are all under the jurisdiction of the Singapore Ministry of Education, and each college is an independent and independent educational entity. There is also competition in terms of student resources, faculty, school enterprise cooperation, and school influence.

3. Singapore Deep Skills Development Authority

The Singapore Deep Skills Development Authority is a statutory body under the Ministry of Education (MOE) of Singapore and is also the leading agency of the "Skills Creation Future Program". The Deep Education Bureau, through the Private Education Council and the Adult Learning Institute, plays its main responsibilities with the aim of promoting and coordinating national deep skills development activities, strengthening the construction of adult training infrastructure, promoting Singaporeans to master and master skills, improving the technical ability and professionalism of working workers, promoting a culture of lifelong learning, and consolidating Singapore's high-quality education and training system, continuously meeting the needs of different economic sectors through the continuous improvement and development of skills among in-service workers.

4. Singapore Labor Bureau

The Singapore Labor Bureau is the statutory committee of the Ministry of Manpower in Singapore. Its main responsibilities include overseeing the transformation and upgrading of Singapore's labor force and industry to address current economic challenges; Promote the development of labor at all levels, enhance labor competitiveness, enhance labor inclusivity and employability; Ensure that all sectors of Singapore's economy receive support from a strong and inclusive Singapore core workforce. Although the focus of the Singapore Labor Bureau is to help employees achieve their career aspirations and obtain high-quality work at different stages of their lives, it also meets the needs of business owners and businesses by providing human resource support, keeping labor-intensive enterprises competitive. It also helps businesses in different economic sectors create high-quality employment opportunities, develop human resource channels to support industry growth, and match suitable people with suitable job positions.

5. Employment and Functional Training Center

Under the initiative of the Singapore Labor Development Authority (WDA), Singapore Labor Fund (SLF), Singapore National Employers' Federation (SNEF), and National Workers' Union (NTUC), the Employment and Functionality Institute (e2i) was established in 2008. At present, the center has become a one-stop service center for the "Skills Creation Future Program", providing a wide range of vocational training services, including all practitioners from ordinary workers to professionals, from enterprise managers to managers, who can benefit from it. Provide professional guidance through career counseling, training skills enhancement, job matching, and other

methods, develop on-the-job training courses, help workers improve their employability, help employers create new job opportunities for workers, improve work skills, conduct skill training, and recruit workers. It also collaborates with the School of Technology Education and the School of Science and Technology, connecting students, employers, and training institutions through its extensive network of relationships, helping students better understand career choices and development in different industries.

6. National Workers' Federation Learning Center

The National Trades Union Congress (NTUC) is a national trade union federation organization and a network of professional associations and partners across all departments in Singapore. The goal of the National Workers' Federation is to help Singapore maintain competitiveness and enable workers to maintain lifelong employability; Improving the social status and welfare of Singaporean nationals and workers; Promote the establishment of strong, responsible, and compassionate labor groups that include individuals of all social classes, ages, and nationalities. The courses offered by the National Workers' Federation Learning Center include information and communication technology, IT professional certificates, soft skills and culture, work environment safety and health, employment skills system, customer service training, trade, cleaning, labor skills certification, and manufacturing skills. According to statistics, the National Workers' Federation Learning Center has trained over 1.7 million enterprise supervisors and in-service workers, collaborated with more than 10000 companies, identified training needs, formulated course plans, and provided the latest training courses.

7. Other certified training institutions

Any institution that wishes to provide WSQ courses or WSQ and private education course training must meet the certification standards established by the Bureau of Deep Education (SSG), which means that the training institution becomes an Approved Training Organization (ATO) or an Approved Training Organization Private Education Institution (ATO PEI) when obtaining SSG certification to provide WSQ training. Currently, there are three types of WSQ training and certification institutions in Singapore. The first type is Public ATO or Public ATO PEI, which refers to institutions that provide training to the public; The second type is a certification and training institution (Both "Public and In House" ATO) that is both public and internal to the institution, or a private education certification and training institution (Both "Public and In House" ATO PEI) that is both public and internal to the institution, which refers to an institution that provides training to the public and its employees; The third type is an In House ATO only, which only operates within the organization and provides training to its own employees.

2.3 Career guidance

Since its independence and founding, Singapore has attached great importance to career guidance for working workers and regarded it as an integral part of the overall education system. In August 2014, the "Skills Future" training program led by the Deputy Prime Minister, Ministry of Education, and Ministry of Finance of Singapore began to be fully implemented, aiming to provide comprehensive career guidance to the public.

1. Guidance for in-service personnel

The SkillsFuture Work Learn Bootcamp is a new three-year pilot training program for work learning. This program provides

training on specific job roles, behaviors, thinking styles, and technical skills for fresh graduates (in the early stages of career development) and individuals in the middle stages of career development in departments with urgent human resource needs. This training program is jointly developed by the Bureau of Fine Arts, the five major polytechnics, the School of Technology Education, and a non-profit organization affiliated with McKinsey & Company in the United States. So far, in addition to implementing the project in Singapore, the non-profit organization has developed and implemented short-term centralized training camps in 23 professions in 9 countries to train and place young people in work, with over 17000 job positions arranged. Participants in this training program receive 8 to 12 weeks of institutional intensive training before seeking employment. TechSkills Accelerator is a professional development initiative framework for information and communication technology (ICT) professionals and non ICT professionals. This program enables training participants to acquire and enhance new knowledge and skills required in their field of expertise, while maintaining competitiveness to meet the challenges of the rapidly developing digital age. Employers of ICT and non ICT companies can use the "Skills Acceleration Program" to attract new hires or mid career professionals to their companies, or provide relevant ICT skills training for existing employees. The Skills Acceleration Program currently provides training opportunities through the following 8 sub projects.

(1) The Company Led Training Program is a part of the overall architecture of Singapore's "Smart Nation" program, aimed at cultivating new hires or mid career professionals to become urgently needed skill experts in the industry. The training content includes network security, data analysis, artificial intelligence, machine learning, and software engineering.

(2) The Critical Information-Comm Technology Resource Program Plus is an initiative of the Information and Communication Media Development Authority (IMDA) in Singapore, aimed at supporting information and communication technology workers in participating in training courses and skill certification to keep up with the pace of technology transfer and maintain industry relevance and production capacity.

(3) The Professional Conversion Program for the ICT Sector aims to provide skill conversion training for professionals, managers, administrators, and technicians in the mid career development stage, enabling them to enter new professions or departments with good development prospects and opportunities.

(4) The Skills Future Earn and Learn Program (ELP) is an 18 month work learning program where every Singaporean citizen can receive a bonus of S\$5000 for registering for training. The aim is to help fresh graduates from Polytechnic and Institute of Technical Education (ITE) seize the opportunity at the beginning of their career related to the subject, allowing them to utilize the skills and knowledge they have acquired at school to gain more opportunities.

(5) The Skills Framework for Infocomm Technology (ICT) is a roadmap for the development of ICT capabilities in Singapore. Employers and ICT professionals can refer to this framework to determine the types of skills and abilities required and develop training strategies.

(6) The Skills Future Study Award for the ICT Sector is designed for ICT professionals in the early and mid career stages. Participants can receive a reward of S\$5000 to cover out of pocket expenses related to the course and can also be used for government

course fee subsidies.

(7) The Tech Immersion and Placement Program (TIPP) aims to enable non ICT professionals, especially those who transition from science, technology, engineering, and mathematics (STEM) or other disciplines to ICT professions, to be placed in technical positions after receiving short-term intensive and immersive training courses provided by industry practitioners.

(8) The "Skills Acceleration Program" Immersive Training Pilot Project (Te-SA Pilot Immersive) is a pilot project established by the Singapore Information and Communication Media Development Authority in collaboration with rapidly growing technology companies, providing an immersive training experience for mid career professionals, managers, and administrators.

2. Guidance for employers

The SkillsFuture Leadership Development Initiative aims to support aspiring Singaporeans in acquiring critical leadership skills and experience through internal company training programs or industry association training, in order to cultivate the next generation of Singaporean business leaders. This plan is also applicable to companies registered or participating in shares in Singapore. Employers committed to developing employee leadership potential can contact their respective government agency account managers for more information. The SkillsFuture Employers A Awards program is a tripartite initiative that recognizes the significant efforts made by employers in investing in employee skill development, encourages employers to participate in the Skills Creation Career Program, and establishes a lifelong learning culture in their workplaces. The 'Employer Reward Plan' is open to all registered entities in Singapore, including small and medium-sized enterprises, large corporations, and voluntary welfare organizations. The criteria for winning awards include the following aspects: firstly, participating in the "Skills Creation Future Plan" or making efforts to create a lifelong learning culture in the enterprise. The company should demonstrate how it supports the 'Skill Creation Future Plan' and develops employees' abilities to meet the needs of the business, organization, and individuals. The second is to recognize employees' skills and professional abilities in employee recruitment and career development. The company should be able to demonstrate that they have adopted a skills framework in evaluating employees and recruiting candidates, and provide examples of employees who have made good career progress as a result of this implementation. The third is to align the personal development efforts of employees with the national human resources development goals. The company has taken measures to improve productivity, create a good working environment, and strengthen its competitiveness and sustainable development capabilities. The SkillsFuture Mentors (SFM) program is an on-site mentoring program established for the personal development of small and medium-sized enterprise employees, aimed at improving their labor skills and overcoming the challenges faced by enterprises in providing internal training. The mentor provides on-site guidance for 9 months in small and medium-sized enterprises to enhance their training capabilities, enhance their employees' work skills, and help enterprise managers develop their auxiliary guidance abilities.

3. Guidance for training institutions

Training institutions need to collaborate with other partners in the Continuing Education and Training (CET) system to keep up with technological progress and globalization to meet Singapore's innovation and productivity driven economic development

needs. The 'Training and Adult Education Sector Transformation Plan' focuses on key development areas in the training and adult education (TAE) sector, helping Singaporeans start continuing education and training, continuously pursuing skill mastery and lifelong learning. The key areas and recommendations identified in this plan are as follows:

(1) Identify new development opportunities. Understanding and mastering the segmented markets served by training institutions will enable them to identify potential growth areas and effectively reposition solutions.

(2) Support enterprises to enhance their competitiveness. TAE providers must analyze, understand, and effectively respond to the needs and challenges faced by individual learners and business enterprises in pursuing lifelong learning.

(3) Establish achievement metrics between learning and efficient work performance. It is crucial for TAE providers to develop their own capabilities to track, measure, evaluate, and report learning outcomes, and persuade customers to continuously invest in learning.

(4) Strengthen training management and support business models. TAE providers can adopt new management systems or outsource non-core training management functions to release system resources or effectively deploy resources, focusing on core functions, ultimately improving operational efficiency, improving customer satisfaction, and achieving greater business returns.

(5) Strengthen learning infrastructure and institutional support for innovation. TAE providers should strive to become a learning workplace and encourage TAE professionals to continuously develop their skills. To achieve this goal, actively recruit, retrain, recognize, and retain one's own TAE professionals.

(6) Provide human resources for new job positions. Training suppliers must provide comprehensive turnkey solutions (consulting research training performance). In order to serve small and medium-sized enterprises, it is necessary to establish a wider range of cooperation between TAE suppliers and professionals to achieve economies of scale and improve efficiency.

(7) Deepen the cultural atmosphere of key skills through capacity development and specialization. TAE providers have a responsibility to create a workplace that fosters a culture of lifelong learning for the continuous development of TAE professionals. By establishing a reward system and encouraging TAE professionals to join the Adult Education Professionalization Scheme, they can obtain national qualifications.

4. Guidance for lifelong learning for all citizens

The SkillsFuture for Digital Workplace Program, formerly known as the Future@Work Program, aims to equip Singaporeans with a mindset of preparing for a future knowledge-based economy and mastering the basic skills necessary for society. Participating in this project training can help you understand the types of work in the future economic environment, be able to work in technology-dominated environments and apply common mobile applications, recognize the importance of network security in daily or work applications, and understand how to use data and information.

My SkillsFuture is an online portal that provides one-stop education, training, and career guidance, allowing every Singaporean to plan and explore their lifelong learning journey. For employees in the middle of their career development, this plan helps individuals understand their skill levels, clarify the

relevant labor skills they need to maintain, and provide appropriate training opportunities to help individuals bridge skill gaps. For ordinary Singaporean citizens, personal online learning program websites can guide them to discover their career interests and recommend corresponding training content before employment. For students in school, they can search for suitable jobs through websites and start their career. Students from elementary school to college preparatory programs will receive personal online learning accounts. The Skills Framework project was jointly created by employers, industry associations, educational institutions, unions, and the government for the Singaporean workforce, aiming to create a common skills language for individuals, employers, and training providers. Individuals in the early and/or middle stages of their career development can make informed decisions on education and training, career development, and skill upgrading by utilizing the departmental, employment, career/work roles, skills, and training information within the skills framework. Employers can use the detailed skill information in the skill framework to design progressive human resource management and talent development plans. Training providers can use the skills framework to gain a deeper understanding of departmental trends and needs, enabling them to innovate course design and training programs to meet departmental needs. For parents, teachers, and career counselors of students, skill frameworks can help them understand the industry and employment prospects, understand the job/work scope, work environment, and job attributes required by employers in various industries, and provide wise advice for students to choose the ideal pre-employment training plan.

3 The Development Characteristics of Vocational Education and Training in Singapore

3.1 Promoting development through demand and laying out strategic plans for vocational education

Singapore's vocational education closely revolves around the talent needs of different historical development periods of the country, guided by innovative talent education that meets industrial development and technological innovation, and cultivates a large number of graduates and lifelong learners for the country's future social production and life. For example, as early as the establishment of the Singapore Autonomous Government in 1959, the government established an educational policy of "developing practical education" to meet the needs of industrialization and economic development, cultivating practical talents who meet the needs of economic and social development. At the same time, Singapore also attaches great importance to the continuing education and training of in-service workers, and regards continuing education and training as an organic component of the overall education system. Continuing education and training provide basic education and skill enhancement training courses, address the gap between manpower and skills, support industrial development and create employment opportunities, promote education and career transformation through various channels, and enable the labor force to find efficient employment in the rapid transformation of economic models. Since entering the new century, Singapore has adjusted the traditional approach of pre-employment training for early education through the "Master Plan for Continuing Education and Training", and shifted to placing continuing education and training as the focus

of development. Singapore has ensured the sustainability of talent education through national level vocational education strategic planning and institutional design, made up for its resource scarcity in reality, and embarked on a characteristic development path that promotes development through demand and talent.

3.2 Establishing a long-term mechanism for updating national skills to win the future with skills

The Singapore government continues to attach great importance to skill training, encouraging citizens to consciously learn and voluntarily improve their skills through a series of top-level systems, skill strategies, and measures to support skill development, and establishing a long-term mechanism to maintain the updating of skills for all citizens. As early as the late 1970s, the Singapore government established the Skills Development Fund (SDF) system, which stipulated that employers must pay a certain proportion of vocational training funds and apply all of them to the vocational training of enterprise employees. The Singapore Deep Skills Development Authority often collaborates with the Singapore Labour Office and relevant industry organizations to release skill frameworks for various fields, in order to promote the mastery of national skills and lifelong learning, and provide skilled talent reserves for innovative economic development. For example, in July 2019, Shenzhen Bureau, together with the Labor Office and the Design Singapore Council, released a skill framework for the design field, which comprehensively covers the work content in the fields of design, business, innovation, science and technology, stipulates the corresponding skill levels for each work, and describes in detail the general skills and professional skills such as business model innovation, user experience design, design thinking, etc. Employers and training institutions provide a 'universal skill language' for assessing skill needs.

3.3 Efforts from multiple parties to promote the learning and development of vocational education application fields

The economic background of globalization and the increasingly diverse social needs in today's world have made it an inevitable trend for governments, schools, and society to establish cooperative development partnerships. The high-quality development of vocational education requires the linkage of multiple departments such as the government, education and training providers, employers, and society, the integration of resources, and coordinated promotion. The Singaporean government adheres to the "Talent Building Strategy" and always regards vocational education and training as the source of vitality for the country's employment prosperity and sustained economic growth. The highest decision-making level of the country has laid a macro development framework for the vocational education and training system since the "Zeng Shuji Report". The leadership of the Singaporean government regards talent as the most precious resource in Singapore, and ensures the development tension of vocational education and training through scientific vocational education decision-making, clear and specific vocational education regulations, and efficient implementation process. Education and training providers are frontline practitioners of vocational education and training, and are also the departments with the closest connections to students, parents, and the community. For example, as a major provider of vocational and technical education and training nationwide, the School of Arts and Crafts Education has established extensive partnerships with over 40 renowned enterprises in

14 countries worldwide, enabling students to share and learn the best practical experiences of these world-class enterprises. Employers develop and update training content based on enterprise standards and expected economic development changes, and jointly develop skill training frameworks with governments, industry associations, education and training institutions.

3.4 Establish a system for connecting professional qualification certificates through smooth channels

Singapore has established an education "Bridges and Ladders" system for efficient communication and connection between vocational education and general education, providing students with multiple flexible choices for personal education improvement and career development. For example, the School of Arts and Crafts Education issues three types of certificates: one is the National Bureau of Arts and Crafts Education Certificate (Nitec), which is equivalent to a Junior Technician Certificate. Completing the courses of the School of Arts and Crafts Education can obtain this certificate and apply for employment; The second is the Higher Nitec certificate, equivalent to an intermediate technician certificate, issued to approximately 5% of graduates with excellent grades; The third is the Master Nitec certificate from the National Bureau of Arts and Crafts Education, which is equivalent to a senior technician's certificate. It is issued to in-service personnel who have obtained the certificate and return to the Institute of Arts and Crafts Education for further education after employment. Graduates of the Institute of Technology Education can apply for the Advanced National Bureau of Technology Education certificate after obtaining the qualification of the National Bureau of Technology Education certificate. Those who pass the certificate are eligible to continue studying diploma courses at the Institute of Technology.

4 Conclusion

Faced with the challenges brought by the fourth wave of industrial revolution, Singapore has taken the demand for industrial development as the starting point, guided by technological innovation and talent education, and enhanced the country's core competitiveness through strong vocational education and training reform measures. At present, China has placed vocational education in a more prominent position in education reform and innovation, as well as in economic and social development. Further efforts are still needed to embark on the promising path of vocational education: firstly, to formulate a vocational education strategic plan that highlights foresight and early warning, as well as targeted and actionable, with the long-term goal of leading international technological innovation and the specific task of promoting individual skill improvement of the people; The second is to carefully design a vocational skill learning platform to promote the coordinated development of pre employment vocational education and post employment skill training; Thirdly, improve the incentive mechanism for multiple subjects to participate in the improvement of vocational skills; The fourth is to connect the general vocational field and create a space for the growth of outstanding talents.

Reference

- [1]Varaprasad N.50 Years of Technical Education in Sin-gapore:How to Build a World Class TVET System[M].Sin-gapore:World Scientific Publishing Co.Pte.Ltd,2016:96 + 125-126.
- [2]Skillsfuture SG,Becoming a WSQ ATO and WSQ ATO-PEI[EB/OL].[2021-12-21].<https://www.ssg.gov.sg/for-training-organisations/funding-and-accreditation/becoming-a-wsq-ato.html>.
- [3]SkillsFuture.Skillsfuture Work-learn Bootcamp[EB/OL].[2021-12-12].<https://www.skillsfuture.sg/worklearnboot-camp>.
- [4]Skillsfuture.Techskills Accelerator(TESA)[EB/OL].[2021-12-20].<https://www.skillsfuture.sg/tesa>.
- [5]Skillsfuture.SkillsFuture Employer Awards[EB/OL].[2021-12-08].<https://www.skillsfuture.sg/employer-awards>.
- [6]Skillsfuture.Training and Adult Education Sector Transfor-mation Plan(TAESTP)[EB/OL].[2021-12-13].[https://www.skillsfuture.sg/ProgrammesForYou # section5](https://www.skillsfuture.sg/ProgrammesForYou#section5).