TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING PROSPECT FOR HIGHER LEARNING INSTITUTION

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Abstract. The TVET agenda is rapidly increasing the government's priorities. Articulation principles for the TVET program introduced by the Malaysian Qualifications Agency (MQA) opened a new chapter in the country's education system. This principle has consolidated the assessment of industry and academic skills and allowed student mobility within all TVET providers in Malaysia. This article discusses the continuity of TVET programs from school to higher education to enhance the interest in TVET as the preferred educational pathway. The focus of the discussion is on the relationship between the types of programs offered, industry needs, and the employment of graduates. The article tries to answer two very basic questions, which are, what are the types of TVET programs offered? And, is the offering of TVET programs in line with industry needs? Generally, the marketability of TVET graduates is higher than that of public universities and private higher learning institutions. There are various options for TVET graduates to pursue higher education. The challenge is to develop an evaluation process for the industry and academic skills equivalent to TVET graduates. Higher learning institutions are urged to seize the opportunity from TVET graduate's enrolment to enrich the curriculum and promote high technology innovations needed in the industry.
Keywords: *TVET, academic pathway, higher learning, critical employment, industrial opportunities*

Introduction

Despite escalating uncertainties in the global landscape, Malaysia's economy remains resilient. The GDP is forecast to expand by approximately 4% in 2023 and between 4% and 5% in 2024 (Ministry of Finance, 2023). This confidence was driven by the momentum of global economic growth following increased demand, investment and trade activities, and digital transformation. In the Budget 2022 Speech tabled by the Minister of Finance on 29 October 2021, the government reiterated the importance of the Technical and Vocational Education and Training (TVET) program to shift the country's development direction strategy. This is evidenced by the government's action to channel RM200 million to strengthen the implementation of the planned program in the Twelfth Malaysia Plan (RMK-12) (2021-2025) (Kementerian Kewangan Malaysia, 2021). The Budget 2023 has a significant focus on human capital, particularly the development of TVET graduates with skillsets tailored to industry requirements through a collaboration of 50 companies primarily GLCs with TVET institutions. These institutions encompass community colleges, industrial training, and national youth skills institutes. As of July 2023, 10 Management of Change (MoC) agreements have been signed that outline the agreed scopes of collaboration, encompassing the transfer of knowledge, sharing of equipment, and the development of curriculum. Additionally, to enhance industrial cooperation, RM17 million has been invested in the National Dual Training System (SLDN), enabling over 8,000 trainees to participate. Currently, RM2.6

million has been allocated to the Academy in Factory (AiF) program to train 20,000 trainees on the jobs. These programs reflect the Government's commitment to enhancing the skillset and employability of TVET graduates, contributing to a dynamic and skilled workforce that is crucial for the nation's progress (Ministry of Finance, 2023).

The field of technical and vocational education and training (TVET) has changed throughout history, usually in response to the demands it receives from the societies it serves. Over the past few years, various terms have been used to describe elements of the field that are now conceived as incorporating TVET (Maclean and Wilson, 2009). These include apprenticeship training, vocational education, industrial arts, technical education, technical/vocational education (TVE), occupational education (OE), vocational education and training (VET), career and technical education (CTE), etc. Several of these terms are commonly used in specific geographical areas. For example, in Europe the term vocational education and training (VET) is in common usage, while in the United States the current term is career and technical education (CTE). Additionally, many in the field are advocating for the use of continuing vocational education and training (CVET). There are also several different dimensions that can be used to define vocational education and training such as its location (company-based, apprenticeship, school-based), character (initial, continuing), etc. At the second International Congress on Technical and Vocational Education, held in the Republic of Korea in 1999, UNESCO and ILO (in consultation with their respective Member States and partner agencies) jointly agreed upon using the term technical and vocational education and training (TVET) in future in order to unite the field.

The focus on TVET's agenda and policy changes in recent years brought a new focus to the transformation of TVET in Malaysia. At the end of 2019, the Malaysian Qualifications Agency (MQA) as the quality assurance body of the country's higher education system has issued a circular on the Principles of Articulation of TVET Programmes (Agensi Kelayakan Malaysia, 2019b). This principle allows accreditation certification to be granted to TVET programs to attract students. The implementation of a single quality assurance system through the principle of articulation makes the educational path of TVET graduates more accessible. The experience of TVET graduates will be recognized and they will have the opportunity to pursue their studies up to a doctoral degree. However, from a different perspective, it may raise questions about the original purpose of the TVET programme, which is to meet the requirements of the industry. This article outlines the continuity of TVET programmes from the school level to the Malaysian Higher Education Institutions (IPT). The question that is attempting to be answered is: (a) what are the types of TVET programs offered?; and (b) is the establishment of TVET programmes in IPT in line with the needs of the industry?

Materials and Methods

This article is written based on a study of the library i.e. an online resource. Researchers utilize Google Scholar as the primary database because it is easily accessible, free and there is content from indexed journals (Lewandowski, 2010). According to Fagan (2017), Google Scholar's coverage is widening over time compared to Web of Science and Scopus, although there are shortcomings in some other aspects such as content gaps, phantom data, easy-to-manipulate citation counts, lack of

transparency and limitations for empirical biblimetric studies. The main source of this study was obtained through google search with only two keywords 'TVET Malaysia' and 'higher education' (higher education) which provided 178,000 entries. Researchers however limited the search to five views because on the sixth display it was found that the listed resources were repetitive sources, topics focused more on higher education and the study resources were not based on local issues and data. The sources assessed included two reports from the Ministry of Higher Education (MOHE), six reports from local agencies, five reports by overseas agencies and 22 journal articles.

In general TVET and its related issues have attracted various parties. At the highest level of reporting by agencies such as Ministry of Human Resources (Human Resources Development Fund, 2019), Economic Planning Unit (Unit Perancang Ekonomi, 2015), Institute of Strategic and International Studies Malaysia (Azahar, 2022), and Khazanah Research Institute (Hamid, 2022) linking the importance of TVET to economic growth and national development. The development and importance of the country's TVET is also reported by international agencies such as UNESCO (SEAMEO-VOCTECH Regional Centre, 2019), Asia Pacific Economic Cooperation (APEC) (APEC, 2014), ASEAN Secretariat (ASEAN, 2022), Yusof Ishak Institute (Da Wan et al., 2018) and Asia Foundation (Subramaniam and Bush, 2022). These reports are based on an analysis of the country's TVET supply structure followed by recommendations for future steps. The Ministry of Higher Education (MOHE) report focuses more on policy matters related to the country's TVET planning framework (Ministry of Higher Education, 2017; Ministry of Education, 2015). The topics of referenced journal articles can be classified into the TVET framework (Haneef, 2021; Che Rus and Mohamad Yasin, 2020; Hassan et al., 2019; Sauffie, 2015; Minghat and Yasin, 2010); curriculum development (Kamarudin et al., 2021; Hashim et al., 2016); teaching and learning strategies (Ahmad et al., 2023; Ibrahim et al., 2022; Razak et al., 2022; Hussain et al., 2021; Chan and Mohammad, 2019; Rosly et al., 2019; Hashim et al., 2017); teacher training and research opportunities (James et al., 2023; Subramaniam and Aziz, 2023; Hasnan et al., 2019); program sustainability (Hong et al., 2023; Jamaludin et al., 2018); issues and challenges (Fadzil et al., 2022; Azmi et al., 2018; Ismail and Abiddin, 2014). Analysis of the sources listed above became the basis for the writing of this article.

Results and Discussion

TVET institution in Malaysia

TVET refers to education and training that prepares persons for gainful employment (Fawcett et al., 2014; Maclean and Wilson, 2009). The process can take place either in formal schools, or increasingly in post-secondary community and/or technical colleges, or informally by means of training at the workplace and increasingly by distance media. TVET is often linked to the field of science and technology (S&T) which includes education, training and skills development related to various areas of employment, production, services and life skills (UNESCO, 2016). TVET is a lifelong learning activity that can lead to the awarding of qualifications covering various skills development opportunities in national and local contexts. In addition to learning, the development of literacy and numeracy skills, transversal skills and citizen skills are important components of TVET. Thus, the key characteristics of TVET can be summarized as encompassing the educational and training process, comprehensively developing talent, and across all areas of employment. In line with the definition given

by UNESCO, the Malaysian Qualifications Agency (MQA) defines TVET as an educational and training process that has an employment direction with a major emphasis on industrial practices (Agensi Kelayakan Malaysia, 2019a). It aims to produce a competent workforce in all areas to achieve the socio and economic objectives of the country.

Based on the above definition, TVET can be referred to as learning aimed at developing skills related to specific employment practices and learning aimed at preparing students to participate in the field of employment. Currently various learning channels including online platforms such as YouTube (Aziz et al., 2022), gaming apps (Zamri and Tan, 2022) and etc. In both instances, the learning followed may be geared towards direct access to the labour market or as a basis for access to higher education and training by participating in certain jobs. TVET also includes programmes aimed at enabling workers to become more productive with the ability to adapt to the rapidly changing labour market and economy. TVET in Malaysia includes formal and informal learning to provide Malaysians with the necessary knowledge and skills in the world of work. The programmes are implemented through three institutions of different backgrounds namely schools, training centres and private institutions (Kementerian Pendidikan Malaysia, 2020). There are currently more than 10 ministries, private sector and state governments that jointly administer about 1,200 TVET providers in Malaysia.

Since 2004, TVET in Malaysia is based on a national dual-training system, emulating the system in Germany. Initially TVET students spent about 70-80% of their training through industrial placements while the rest were taught in TVET institutions (Azahar, 2022). Now, that approach has changed slightly. TVET's eligibility rating based on the Malaysian Qualifications Framework (MQF) is as per *Table 1*. The Malaysian Qualifications Framework (MQF) was introduced in 2007 as Malaysia's declaration on the qualifications and quality of programmes based on the national education system. The revision in 2017 has created two comparative sectors, namely the Technical and Vocational Education and Training (TVET) sectors, and the Academic sector.

Table 1. *Equivalence of qualification level in IPT Malaysia.*

MQF level	Credit minimum	Sector	
		TVET	Academic
8	*	-	Doctor of Philosophy (research)
	80	-	Doctor of Philosophy (coursework/mixed)
7	*	-	Master (research)
	40	-	Master (coursework/mixed)
	30	-	Post-Graduate Diploma
	20	-	Post-Graduate Certificate
6	120	Bachelor	Bachelor
	64	Graduate Diploma	Graduate Diploma
	34	Graduate Certificate	Graduate Certificate
5	40	Malaysian Skills Advanced Diploma (DLKM)	Advanced Diploma
4	90	Diploma in Malaysian Skills (DKM)	Diploma
3	60	Malaysian Skills Certificate (SKM level 3)	Certificate
2	30	Malaysian Skills Certificate (SKM level 2)	Certificate
1	15	Malaysian Skills Certificate (SKM level 1)	Certificate

*Note: * means no credit equivalent.*
Source: Agensi Kelayakan Malaysia (2021b).

TVET ministry of education Malaysia

The percentage of expenditure for technical and vocational programmes in institutions under the Ministry of Education (MOE) has increased from 3.88% in 2020

to 4.05% in 2022 (Kementerian Pendidikan Malaysia, 2023). It can be considered large because the percentage of allocation for technical and vocational programs is only 4.55% compared to 11.5% for academic secondary programs. The expenditure is still considered equivalent as there are only 88 Vocational Colleges and 9 Technical Schools compared to 10,230 total number of schools nationwide. Ministry statistics recorded that there were 54,210 students currently attending 81 courses at the Vocational College. The popular courses include electrical, electronic, and automotive technology, welding, cooling, and air conditioning technology, as well as several courses based on computer systems and information technology. In addition, there are 5,189 students studying mechanical engineering, E&E, civil, agricultural science, and commerce at the Technical School. The enrolment is still small, with only 18.6% compared to 319,775 upper secondary students in various school categories nationwide.

Starting in 2012 the Ministry of Education Malaysia (KPM) has implemented the Transformation of Vocational Education (TPV) to dignify vocational education as the primary stream (Latif, 2020). TPV has transformed the landscape of TVET education in providing quality KPM vocational college graduates with high employability salary to meet the requirements of the Fourth Industrial Revolution (4IR). KPM is committed to improving access and equity in education for groups of students who are not interested in academics and are interested in the TVET field. Among the TVET programmes provided are:

Malaysian Vocational Diploma Program (DVM). The DVM program is implemented at 87 MOE Vocational Colleges (KV). DVM is offered to Form Three students and the period of study is 4 years 5 months. In the first two years the student will attend a certificate-level program (at the age of 16-17 years). After meeting the requirements, students are awarded the Malaysian Vocational Certificate (SVM) and are eligible to continue their studies at the diploma level. The duration of diploma level education is for two years and five months On-the-Job Training (OJT) in the industry.

Upper Secondary Vocational Education Program (PVMA). PVMA is a skills programme offered to Form Three students at 349 National Secondary School (SMK) and Vocational Special Education Secondary School (SMPKV). Tempoh program ini adalah selama dua tahun dan selepas menjalani program ini, murid yang layak serta kompeten akan mendapat Malaysian Certificate of Education (SPM) dan Malaysian Skills Certificate (SKM) Level 2.

Upper Secondary Industrial Apprenticeship (PIMA). PIMA is a program based on the concept of *Apprenticeship* and is offered to 124 National Secondary School (SMK). This programme is offered to Form Three students who have low academic achievement for a period of two years. Within a week of learning, students will spend two days at school for academics and three days in industry for hands-on learning. At the end of the study the students will get SPM and a certificate of testimony from the industry.

Malaysian Skills Certificate Programme (SKM). The SKM program is offered at the MOE Vocational College. This program is for year four students. The SKM program is provided in full-time mode of study at the Vocational College with SKM level 3 certification and a program based on the *Apprenticeship concept* in the National Dual Training System (SLDN) mode.

TVET ministry of higher education

TVET The Ministry of Higher Education consists of 4 universities in the Malaysian Technical University Network (MTUN), 36 Polytechnics and 104 Community Colleges.

The level of TVET program at MOHE starts at the Community College which offers certificate and diploma level programs (Latif, 2020). Polytechnics offer diploma and bachelor's programmes while MTUN offers diploma and above programmes up to the doctorate level. Starting September 2019, MTUN has offered a Bachelor of Technology program that focuses on students' abilities and skills in vocational skills. This program aims to expand the career path of TVET graduates to further their studies and get better jobs. In 2022, enrolment at 36 Polytechnics nationwide was 77,816 trainees, involving 25,170 new admissions. In addition, 31,967 trainees have completed training (Kementerian Pendidikan Malaysia, 2023). This makes polytechnics and community colleges the largest TVET providers in MOHE and also contributes to 20% of the country's TVET enrolments. Polytechnics prove excellence internationally specifically for institutional evaluation and program delivery by Asian Pacific Accreditation and Certification Commission (APACC). A total of 35 TVET institutions in the Asia Pacific region have received international accreditation from APACC. Nine of the top 10 places according to the score obtained were held by Polytechnic Malaysia. Apart from the Ministry of Education Malaysia (MOE) and the Ministry of Higher Education (MOHE), TVET programmes are also run by other ministries, namely the Ministry of Rural Development (KPLB), Ministry of Youth and Sports (KBS) and Ministry of Human Resources (MOHR).

TVET ministry of rurl development (KPLB)

It is reported that there are 280 TVET institutions under KPLB with an enrolment record of 61,986 students (Kementerian Pembangunan Luar Bandar, 2022a). The MARA TVET institutions consist of GIATMARA, MARA Skills Institute, MARA Higher Skills College, MARA-Japan Industrial Institute, German-Malaysian Institute and Universiti Kuala Lumpur. TVET MARA offers a wide range of programmes covering the entire level of TVET education, ranging from Certificate, Diploma, Bachelor, Masters level up to Doctor of Philosophy level. It was reported that in 2021 a total of 14,192 students had graduated for diploma (24.2%) and certificate (75.8%) programmes from training institutions under KPLB (Kementerian Pengajian Tinggi, 2022). According to the ministry's media statement, the KPLB TVET Educational Institution has also received various recognitions and successes at the international level. For example, in April 2022, Kolej Kemahiran Tinggi MARA (KKTM) Masjid Tanah, Melaka made history when it became the first TVET Educational Institution to receive the Platinum Award from the Asia Pacific Certification and Accreditation Commission (APACC). Meanwhile, six (6) other institutions under MARA namely MARA-Japan Industrial Institute (MJII), KKTM Kuantan, KKTM Ledang, KKTM Sri Gading, KKTM Rembau and KKTM Kemaman also won the Gold Award at Asia Pacific level (Kementerian Pembangunan Luar Bandar, 2022b). Among the success factors of these institutions is to focus on high-impact TVET programmes in advanced technology areas such as aerospace, shipbuilding, rail technology, robotics, advanced manufacturing, biomedical, electronic industrial and others. The MARA TVET education and training system has been developed based on industry needs and applied also with the necessary skill set components for IR4.0 technology. Several industry centres of excellence (ICoE) were also established in TVET MARA to provide real exposure to the needs of the industry to students. TVET MARA also focuses on the development of graduates who will venture into business. Entrepreneurship applications are also applied in the curriculum for all TVET MARA programs. The technopreneur

development model known as the MARA Startup and Accelerator Edupreneur Model (MSEAD) has been developed specifically for TVET MARA and is a framework in shaping the entrepreneurial mindset, coaching entrepreneurs in a structured manner, together with a holistic support system specifically for Bumiputera's (Latif, 2020).

TVET ministry of youth and sports

The Ministry of Youth and Sports Training Institution (ILKBS) is a Public Skills Training Institute under the supervision of the Youth Skills Development Division (BPKB), Ministry of Youth and Sports which includes 8 National Youth Higher Skills Institutes (IKTBN), 13 National Youth Skills Institutes (IKBN) and one Golf Youth Skills Academy (AKBG) (Latif, 2020). The objective of the establishment of ILKBS is to provide skills training opportunities through various approaches to produce skilled youths to meet the needs of the country. ILKBS offers various programmes to youths to participate in TVET programmes. ILKBS offers 164 courses covering 14 key areas in 22 ILKBS with the approval of the Malaysian Skills Certificate (SKM), Diploma Kemahiran Malaysia (DKM) and Malaysian Skills Advanced Diploma (DLKM). ILKBS also offers Modular Programme, National Dual Training System (SLDN), Bootcamp and Short-Term Courses. The cooperation and close understanding of Smart Partnership between ILKBS and the industry was also established to provide industry exposure during the study as well as to improve the marketability of ILKBS graduates. It was reported that in 2021 a total of 2,507 students had completed training for diploma (14.1%) and certificate (85.9%) programmes from training institutions under KBS (Kementerian Pengajian Tinggi, 2022).

TVET ministry of human resources

There are two main departments in the Ministry of Human Resources related to TVET, namely the Department of Manpower (JTM) and the Department of Skills Development (JPK) (Latif, 2020). JTM serves as a centre for training skilled personnel for the local industrial market, collecting labour information, and placing job seekers in the private sector. The implementation of TVET at KSM is led by JTM which was established in 1967 to implement training programmes from certificate level to advanced diplomas in various skills areas. There are 41 Manpower Department Training Institutions (ILJTM) conducting TVET programmes currently comprising 32 Industrial Training Institutes (IPL), 8 High Technology Training Centres (ADTEC) and one Japan-Malaysia Technical Institute (JMTI). ILP conducts a training program at the Malaysian Skills Certificate (SKM) Level 1 to 3. ADTEC and JMTI only conduct Diploma Kemahiran Malaysia (DKM) Level 4 and above skills training programmes. TVET KSM also offers Modular Programs, Reskilling and Upskilling Programs, National Dual Training System (SLDN), and Short-Term Courses. TVET KSM also collaborated with the industry to provide industry exposure during their studies as well as to increase the marketability of KSM TVET graduates. It was reported that in 2021 a total of 5,497 students had completed training for diploma level programmes (0.8%), diplomas (15.4%) and certificates (83.8%) from ILKA under KSM (Kementerian Pengajian Tinggi, 2022).

Accredited centre of the development of skills development

The drafting and enforcement of the National Skills Development Act 2006 (Act 652) has provided an opportunity for the industry sector to also implement TVET programmes. Under this act all skills training providers approved by the Department of Skills Development (JPK), Ministry of Human Resources are known as the Accredited Centre for Accreditation System to implement the National Dual Training System (SLDN) and Recognition of Previous Achievements (PPT). There are two categories of Certified Centres, namely Public Certified Centres and Private Accredited Centres. Certified Centre (PB) means a skills training provider, whether a training institution or a workplace (*workplace*) that has been approved by JPK to conduct skills training and offer Malaysian Skills Certification for specific areas and skill levels based on NOSS standards. The National Occupational *Skills Standard* (NOSS) is a document that outlines the skills required by a skilled worker working in Malaysia for a particular field and level of employment as well as the path to achieve such skills. To date, JPK has more than 1,200 Certified Centres (PBs) comprising almost 5,000 programmes that actively carry out skills training programmes. The Department of Skills Development (JPK), formerly known as the National Vocational Training Council (MLVK) is a Department under the Ministry of Human Resources which was established on 2 May 1989 through the reorganization of the National Industrial Training and Craftsmanship Certification Board (LLPPKK) which was established in 1971. The name MLVK was changed to JPK after the National Skills Development Act 2006 (Act 652) came into force from 1 September 2006. JPK is the Government agency responsible for formulating, promoting, and coordinating the strategy and development of the country's skilled manpower in line with the vision and mission entrusted to produce workers for employment needs and recognition at the national and international levels.

Figure 1 illustrates the educational pathway of TVET program in Malaysian education system. In principles, SPM or an equivalent qualification is not an entry requirement for a TVET programme that is designed without the learner having to attend the SPM or equivalent examinations (Agensi Kelayakan Malaysia, 2019a). For example, the Malaysian Vocational Certificate (SVM)/Malaysian Vocational Diploma (DVM) and Malaysian Skills Certificate (SKM)/Malaysian Skills Diploma (DKM)/ Malaysian Skills Advanced Diploma (DLKM) routes. Individuals without formal qualifications may enter an appropriate TVET programme at MQF Level 1-3 Certificate, MQF Level 4 Diploma, and MQF Level 5 Advanced Diploma programme based on the related level of competence and working experience. TVET graduates may progress to suitable MQF Level 7 Masters subject to fulfilling the entry requirements which are possess an MQF Level 6 Bachelor’s Degree; or possess the MQA Level 7 Accreditation of Prior Experiential Learning (APEL) certification. TVET graduates with an MQF Level 7 Masters qualification may further their studies to the relevant MQF Level 8 Doctorate programme.

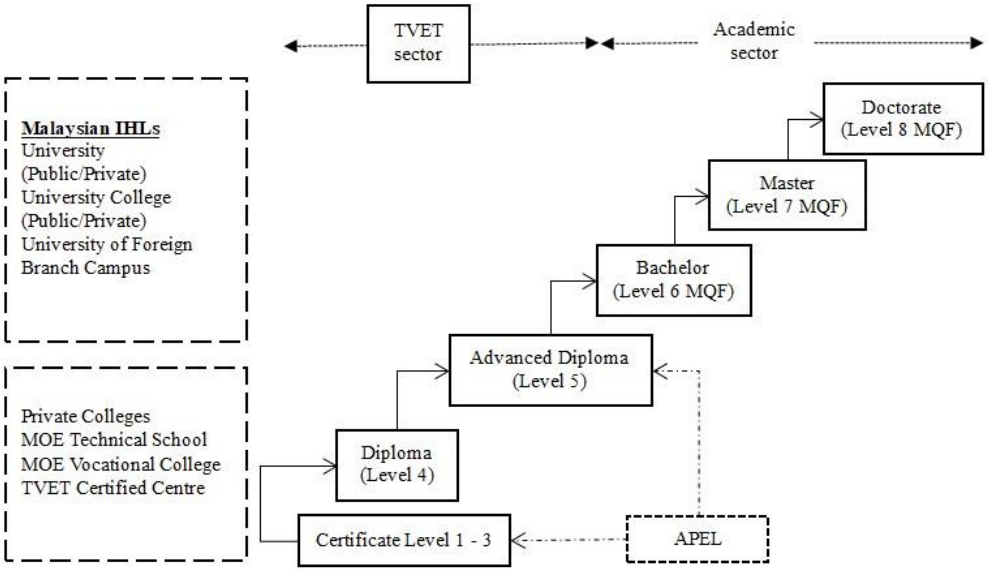

Figure 1. *The educational path of TVET programs in Malaysia.*

TVET prospects in Malaysian IHLs

Specialties required in the industry

In response to the question of the ability of Malaysian Institutions of Higher Learning (IHLs) to supply the necessary resources in the industry, the reference to the industry of the future must first be formulated. It can occur in two circumstances, namely through government initiatives to influence the development of the industry that the country needs in the future (Wong et al., 2004) or the ministry prepares to meet the possibilities or forecasts of the future as a result of global changes and pressures (OECD and ILO, 2018). In the Budget 2022 Speech, knowledge-based industries are given priority as well as industries related to electronics, chemical, petroleum, aerospace, and smart automation. The government is ready to spend up to two billion ringgit for this purpose and this opportunity is also open to overseas multinationals (Kementerian Kewangan Malaysia, 2021).

Industry requirements can be referred to the Critical Employment List (COL) published annually by TalentCorp and the Ministry of Human Resources (KSM). This list is published to identify job shortages and to help policymakers make decisions. A job is considered critical if it is skilful, sought-after and strategic (Kementerian Sumber Manusia, 2020). For example, a total of 58 jobs across 18 sectors were listed as critical for 2019/2020 compared to 49 jobs for 2018/2019. The latest MyCOL 2022/2023 data lists 37 jobs as shown in *Table 2* (Kementerian Sumber Manusia, 2023). This represents 8% of the 454 non-military 4 jobs based on the Malaysian Standard Classification of Occupations (MASCO) 2020. It is lower than the 42 jobs listed in MyCOL 2020/2021. But this difference is not unusual as the scope of 2022/2023 is focused on three sectors: Aerospace, Construction, and Manufacturing (Food Processing). All three sectors face challenges in hiring and retaining talent post-pandemic COVID-19. Nine jobs appeared at MyCOL for the first time in the 2022/2023 edition namely Quality Manager (1216), Medical Imaging & Therapeutic Equipment Technician (3211), Housebuilder (7111), Spray and varnish Painter (7132), Building Electrician (7411), Information & Communication Technology Installer and Services (7422), Food Machine Operator and

Related Products (8161), Earth Mobile Plant Operator (8342), and Crane Operator, Lift and Plant (8343).

***Table 2**. List of critical areas of employment based on the national education program code.*

National Education Code (NEC 2020)	Critical areas of employment (MyCOL) 2022/2023 (Code MASCO)
01 Education	
02 Literature & Humanities	
03 Social Sciences, Journalism & Information	
04 Business, Administration & Legislation	Managing Director and Chief Executive (1121)
	Financial Manager (1211)
	Business Services Manager (1214)
05 Pure Science, Mathematics & Statistics	
06 Information & Communication Technology	Information and Communication Technology Manager (1511)
	Software Developer (2512)
	Information Technology System Administrator (2522)
	Information & Communication Technology and Services Installer (7422)
07 Engineering, Manufacturing & Construction	Pengurus Kualiti (1216)
	Industrial and Production Engineer (2141)
	Civil Engineer (2142)
	Mechanical Engineer (2144)
	Mining Engineer, Metal Surveyor and Related Professional (2146)
	Electrical Engineer (2151)
	Civil Engineering Technician (3112)
	Electrical Engineering Technician (3113)
	Mechanical Engineering Technician (3115)
	Physics and Engineering Science Technician (3119)
	Aircraft Technician (3151)
	Manufacturing Manager (1321)
	Manufacturing Professional (2182)
	Manufacturing Supervisor (3122)
	Spray and varnish painter (7132)
	Welders and Fire Cutters (7212)
	Mechanics and Electricians (7412)
	Food Machine and Related Products Operator (8161)
	Machine Operators and Stationary Lodges (8189)
	Construction Manager (1323)
	Housebuilder (7111)
	Building and related Electrician (7411)
08 Agriculture, Forestry, Fisheries & Veterinary	-
09 Health & Welfare	Environmental and Occupational Health & Hygiene Professionals (2263)
10 Service	Research and Development Professional (2426)
	Medical & Therapeutic Imaging Equipment Technician (3211)
99 Miscellaneous unknown	Aircraft Pilots and Related Professionals (2173)
	Heavy Truck and Truck Driver (8332)
	Earth Mobile Plant Operator and Related (8342)
	Crane, Lift, and Related Plant Operators (8343)

A comparison of the Critical Employment List (COL) and the National Education Code (NEC-2020) showed the association between workforce requirements and expertise in the industry compared to the scope of program offerings in IPT Malaysia. The list in *Table 2* is based on the National Education Code (NEC-2020) developed by the Ministry of Higher Education (MOHE) and the ISCED Fields of Education and Training 2013 (ISCED-F 2013) set by UNESCO. Among the most in-demand and closest codes to be linked to TVET is code 06 which is information and communication technology; and code 07, i.e. engineering, manufacturing and construction. Other codes that can also be attributed to TVET are 05 which are pure science, mathematics, and statistics, and 08 which are agriculture, forestry, fisheries and veterinary.

TVET program offers at Malaysian IHLs

The list of programme offerings in Malaysian and overseas Institutions of Higher Learning (IHLs) that have been accredited can be referred to the Malaysian Qualifications Register (MQR) compiled based on the National Education Code (NEC). Among the programs linked to TVET are listed in *Table 3*. Generally, the Malaysian Qualifications Framework (MQF) allows TVET Level 4 (DKM), Level 5 (DKLM) and Level 5 (Bachelor) graduates from the TVET Sector to move to the Academic Sector to pursue their Master's degree (Level 7) and Doctoral Degree (PhD) (Level 8) at Malaysian IHLs. This route is also open to students from outside the school system as the Sijil Pelajaran Malaysia (SPM) requirement has been granted exemption based on the TVET Articulation Principles. However, the success of implementing this alternative route is highly dependent on the ability and readiness of the IHLs to identify the potential of students based on the guidelines and conditions set. Malaysian IHLs needs to develop support programmes to help TVET graduates follow and graduate more academic studies at IPT successfully. In addition, Malaysian IHLs can implement the Accreditation of Previous Experience-Based Learning (APEL) which is a systematic assessment based on previous employment experience and skills for the application of TVET graduates to the Masters and Doctor of Philosophy (Agensi Kelayakan Malaysia, 2021a) level.

***Table 3**. Offer of TVET-related programmes within Malaysia IHLs.*

Code	Field	Level of study			Number of programs*
		Bachelor	Master	PhD	
213	Audio-visual techniques and media production	131	8	1	466
214	Design	57	6	1	271
215	Craft skills	8	1	0	34
341	Wholesale and retail sales	14	2	1	46
342	Marketing and advertising	121	13	6	235
343	Finance, banking, insurance	138	53	14	329
344	Accounting and taxation	238	34	8	707
443	Earth science	18	21	11	50
481	Computer science	436	179	48	1260
482	Computer use	94	43	14	302
520	Engineering and engineering trade	13	51	47	131
521	Mechanics and metalworks	178	42	12	661
522	Electricity and energy	85	29	9	385
523	Electronics and automation	381	72	13	975
524	Chemistry and processes	119	41	13	201
525	Motor vehicles, ships, and aircraft	36	9	1	257
526	Civil engineering	154	69	10	505
527	Material engineering	15	13	2	39
540	Manufacturing and processing	28	17	9	84
542	Textiles, clothing, shoes and leather	1	1	0	8
543	Materials (wood, paper, plastic and glass)	8	5	0	29
544	Mining and extraction	6	6	2	14
545	Applied science	103	55	14	203
620	Agriculture, forestry, and fisheries	2	10	5	27
621	Crops and livestock	18	12	4	69
622	Horticulture	3	1	1	15
624	Fisheries	5	6	4	26
640	Veterinarian	3	3	2	9
815	Hair and beauty services	2	0	0	47
840	Transportation services	8	5	3	34
851	Environmental protection technology	4	5	2	16
853	Community sanitation services	4	1	0	24
860	Security services	0	2	1	3
862	Occupation, safety, and health	10	11	4	57
900	Engineering technology	0	1	0	1

**The total number of programmes covers all levels of study based on the Malaysian Framework (MQF). The actual number is smaller because MQF lists all programs based on*

the accreditation period and there is an overlap between previous and current programs including the amendment of the program name and the like.

Employability of Malaysian IHLs graduates

The question of the ability of Malaysian IHLs to offer programmes that are in line with the needs of the industry is often the priority of the leaders (Da Wan et al., 2020; Asimirana and Ismail, 2019). Employability is interpreted as a graduate working, pursuing studies, pursuing skills improvement training, and waiting for a job placement. After two years of COVID-19 challenges, the national graduate employability rate was 85.5 per cent in 2021, an increase of 1.1 per cent compared to 84.4 per cent in 2020 (Kementerian Pengajian Tinggi, 2022). In detail, 61.6 per cent of graduates were employed, 18.8 per cent were pursuing their studies, 3.3 per cent were waiting for job placement and 1.8 per cent were pursuing various programmes to improve skills. The increase in the employability rate of graduates is said to indicate the ability of the country's higher education ecosystem to produce quality graduates and meet the demands of the workforce from the industry. This statement is supported by current statistics showing that the Malaysian labour market continued to show improvement as the unemployment rate recorded a new low after the pandemic of 3.4 per cent in June 2023. The average unemployment rate in Malaysia is expected to drop further to 3.5 per cent in 2023 and return to the pre-pandemic level of 3.3 per cent in 2024 (MIDF Research, 2023).

The high employability rate of graduates is in line with the latest media statement by the Ministry of Economy in August 2023 which reported that the number of jobs in the second quarter of 2023 increased by 2.4 percent (Jabatan Perangkaan Malaysia, 2023). All sectors of the economy showed positive year-on-year growth led by the mining and quarry sectors with the highest growth rate of 3.6 per cent. This was followed by the manufacturing (3.1 per cent) and agriculture (3.0 per cent) sectors. Based on economic activity, the services sector recorded a total of 4.55 million jobs, making up 52.7 percent of the total jobs filled. This was followed by the manufacturing (26.9%, 2.32 million jobs) and construction (14.3%; 1.24 million jobs) sectors. By skills category, most of the jobs filled were in the semi-skilled category of 5.40 million jobs or the equivalent of 62.5 per cent, followed by skilled (25.0 per cent; 2.16 million) and low-skilled (12.5 per cent; 1.08 million). Ministry of Higher Education (MOHE) sources recorded that the percentage of employability of TVET graduates for 2022 was 92.5% compared to 90.2% for graduates of all fields from all IHLs nationwide (GREAT Web Portal, 2024). It is an increase of 4.5% compared to 88.0% in 2021. This statistic involves graduates of Polytechnics, Vocational Colleges, and Public Skills Training Institutions (ILKA) for graduates of Malaysian Skills Certificate (SKM) Level 1 to First Degree. The percentage of employability and employability of IHL graduates may be increased if the soft skills aspect is also given attention. This is because according to Noah and Aziz (2020) IPT graduates are found to have poor soft skills while the skills are highly valued by employers. In addition to knowledge and skills in the field of work, employers expect employees to have a set of human skills so that a task can be carried out better.

Although TVET programmes are gaining more attention as a result of the government's policies and the increasing awareness of school leavers on TVET programmes, TVET programmes still need to be expanded. Current data shows that the percentage of TVET enrolment in Malaysia is still the lowest compared to other

countries in Southeast Asia (ASEAN, 2022). Among the challenges to increase enrolment in this field are:

Negative perceptions of the public. One of the main factors affecting public support for TVET is social stigma. There are still a few individuals who believe that Vocational pathways are usually considered the second or last option after a conventional academic stream. This is reinforced by the assumption that vocational schools are for poor or dropout students. This perception is exacerbated by the view that TVET graduates are likely to engage with 3D jobs (dirty, dangerous, and degrading), compared to jobs in other service sectors that offer higher salaries. In addition, the direction of TVET graduates to pursue higher education is also unclear. In general, this condition can be attributed to a lack of awareness of the course and career opportunities about the program.

Lack of quality of TVET education. The efficiency of TVET instructors is one of the issues that have received attention. Past studies have shown that staff shortages have affected the quality of teaching at the institution. Many instructors are employed solely on the basis of academic achievement while less attention is paid to industry experience. This suggests that industry exposure is important to ensure the effectiveness of training. Another factor that has affected the quality of teaching is ICT mastery. Although this skill became more important, especially after Covid-19, it was still lacking among instructors. This resistance among educators can affect their ability and willingness to integrate new technologies into the classroom.

Fragmentation of governance and delivery. As the TVET ecosystem in Malaysia involves various providers and certification pathways, it has resulted in an unclear division of responsibilities with institutions operating in their own direction. There is also an overlap of programs between ministries, which leads to inefficient allocation of resources. Despite the establishment of JPK as a specialized agency to harmonize TVET standards and curriculum, the evidence of its effectiveness has yet to be shown.

Conclusion

The academic path of TVET graduates to higher learning institutions is increasing, which is no longer limited to programs offered at the Malaysian Technical University Network (MTUN). However, current data indicates that the percentage of TVET enrolment in Malaysia is still the lowest compared to other countries in Southeast Asia. Among the measures to be taken are: (i) increasing awareness of TVET, (ii) strengthening teaching proficiency, (iii) continuing to address governance issues, and (iv) addressing the lack of infrastructure. Academics in universities must engage in a greater role in reaching out to the target group in society to change their perceptions and correct their misunderstandings towards TVET. This effort has become easier due to job opportunities and high salary offers received by TVET graduates at the moment. However, it is still necessary to improve the effectiveness of information about TVET and its progress. For example, lecturers must go to schools to inform more clearly about higher education and career opportunities. This can be accomplished by organizing a joint program of students and parents through counselling and coaching services. The capabilities of the instructor should also be evaluated from a broader point of view. This should not be limited to technical expertise but also soft skills. These include technical competence (i.e. technology application, classroom management), non-technical competence (i.e. critical thinking, analytics, lifelong learning), personal qualities (i.e.

emotional control) and physical fitness. The TVET Articulation Principles introduced by the Malaysian Qualifications Agency (MQA) should be welcomed by school leavers to select 35 sub-fields in public and private IHLs across the country. Hundreds of programmes offered show that Malaysian IHLs has the ability to accept TVET graduates. This new alternative is a new opportunity to train TVET-trained resources at the highest level more broadly as the industry needs. However, the IPT needs to be ready to develop training, expertise, and programme content so that it is in line with the needs of the industry based on the list of critical employment areas (COL). This is important to ensure the expected high employability and employability rates.

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Conflict of interest

This study has considered the issue of conflicts of interest between both institutions, the Universiti Selangor (UNISEL) and Selangor Technical Development Centre (STDC). The researchers did not receive any remuneration or were in a position deemed to have an interest in the results of the study. None of the parties involved in this study received financial or similar benefits that were not declared at any time before, during, or after this study was conducted.

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