

The Malaysian TVET Forum 2019

“Unlocking the Economy Through Technical and Vocational Education & Training”

Proceeding from discussions on 24th January 2019
at Hotel Istana Kuala Lumpur

Key points

- Malaysia needs skilled artisans and technicians to fill skill gaps in various sectors of the economy including the building and construction industry, power and energy plants, water distribution and sanitation systems, and large public works. Trained workers are also in short supply in the hospitality, manufacturing, and agro-processing sectors.
- The 11th Malaysia Plan projected the percentage of skilled workers among the local workforce to be enhanced from the current 28% to 35% by year 2020. To meet the requirements of the industry, the annual intake of TVET students' needs to be increased gradually from 164,000 in 2013 to 225,000 by 2020.
- TVET needs to take account of the needs of the future. Production and task will require knowledge and skills in cloud computing, big data analytics, robotics, automation, IoT and other features that engineers requires to perform jobs effectively in an Industry 4.0 environment.
- Education should introduce fundamentals at early stages of learning with applied skills. There should also be more team-based learning and use of creative tools to spur innovation. It is vital to mix arts in STEM to enable students to bring about the best solutions. Elements of STEM should be infused into all subjects of learning rather than be taught as a separate subject.
- Malaysian schools are not sufficiently equipped for career guidance. Counsellors need to be trained to identify students who are TVET proficient and guide them towards the right channels.
- The industry should be given a leading role in deciding what it requires from the workforce and how they train their future workers. Greater collaboration is needed between the industries and academics, where industry players can offer their facilities and knowledge with partnering universities.
- Industries need to allocate funds to retrain staff over a period of time. The HRDF should also allow funding in new areas to meet retraining needs. At the same time, individuals need to make an effort to be retrained with the availability of much materials and certifications online.
- The government can support the industry by introducing tax incentives to companies participating in vocational training.
- TVET students face issues in funding their education. Such funding can be industrial-driven. A financial assistance programme in similar fashion to PTPTN can be introduced. Parents can ordinarily withdraw from the Employees Provident Fund to fund their children's education, but such a provision is not provided for TVET studies. Industry players can come together collectively to appeal to the Ministry of Finance to seek withdrawals from EPF for TVET training purposes.
- There is a lack of control in Malaysia towards certified occupations, such as electricians and plumbers. Such controls should be enforced to improve quality and create more revenue.
- Centralised data is needed to ascertain the number of available workers and certified professions by skillsets in Malaysia to enable better management and decision making. However, there needs to be willingness from industry players to share their data. Lack of this data makes it challenging to appeal to investors.
- The government needs to do more to increase the number of enrolments. TVET providers should come together to promote their courses and institutions in education fairs, highlighting TVET as an option.
- Despite several government agencies having TVET programmes, there needs to be greater coordination of the TVET curriculum and course design by the National TVET Empowerment Committee. The draft TVET Masterplan should be made available to all stakeholders for input.

PROCEEDINGS REPORT

Kingsley Strategic Institute THE MALAYSIAN TVET FORUM 2019

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24th January 2019 | Hotel Istana Kuala Lumpur

WELCOME ADDRESS

Tan Sri Michael Yeoh, President, Kingsley Strategic Institute (KSI)

With the Fourth Industrial Revolution (IR4.0) and digital disruptions, TVET will be critical in the provision of the skill and manpower that industries need. The frequent issues raised in many discussions on IR 4.0 are talent shortages and skill gaps which are currently being faced. With greater focus and the rethinking of TVET, these talent gaps can be addressed. This is the age of disruptive technologies which is characterised by the “3As” - analytics, artificial intelligence, and algorithms. Addressing these challenges require a competitive and skilled workforce, a role which TVET can fill.



A new public-private partnership is needed to speed up the delivery of TVET programmes. Discussions are needed to make TVET more attractive and popular to the younger generation, as it has been difficult to encourage younger people to enrol in TVET courses. The cause of this needs to be identified. Perhaps the industry needs to respond by making remunerations more attractive to TVET graduates.

The government's plans for TVET requires a comprehensive and holistic approach with inputs from the private sector as to how they can partner with the government and industry to ensure that TVET is successful in Malaysia. TVET in other countries in the likes of Germany and Japan have been identified among countries which have delivered TVET well and can be models for Malaysia. Malaysia should learn from international experiences, benchmarking best practices as one of the key strategies to ensure TVET becomes successful.

OPENING KEYNOTE ADDRESS

Puan Junita Binti Mohamed Ali, Director, Planning and Research, Manpower Department, Ministry of Human Development Malaysia (On behalf of YB Tuan M. Kulasegaran, Minister of Human Resources Malaysia)

“Unlocking the Economy through Technical & Vocational Education & Training”

With the global economy recovering and labour force improving, albeit at a slower pace, global unemployment in 2018 is projected at around 5.5 percent, which is slightly better than 2017's reading of 5.6 percent on the back of a better global GDP outlook. Global growth is projected at around 3.6 percent in 2018 from 3.3 percent in 2017. Youth unemployment, which are unemployed individuals aged 15 to 24 being a typical age range that covers those who have completed high school or graduated from colleges and seeking jobs, remains relatively high. Global youth unemployment is higher than global unemployment at 13.2 percent in 2017 and is estimated to hover around the same level in 2018.

Malaysia's unemployment rate was around 3.4 percent in 2017 with the youth unemployment rate being over three times higher at around 10.8 percent. Among ASEAN member countries, the rate of youth unemployment is lowest in Singapore at 4.6 percent, followed by Thailand at 5.9 percent, Vietnam 7 percent, Philippines 7.9 percent, and Indonesia 15.6 percent. Outside ASEAN, China's youth unemployment in 2017 stood at 10.8 percent while India posted 10.5 percent.

Malaysia's unemployment rate of 10.8 percent in 2018 was likely due to a mismatch of skills. A report issued by MIDF Research revealed that this was influenced by soaring graduate unemployment which spiked to 9.6 percent or approximately 204,000 people. This also makes up 40.5 percent of total unemployment. Furthermore, from the overall number of job vacancies in 2018, 76 percent were for elementary occupations followed by 10.3 percent for plant and machinery operators and assemblers based on the data provided by the Department of

Statistics Malaysia. Low-skill jobs made up 86.3 percent of job vacancies in 2018 while high-skill job vacancies suited for fresh graduates accounted for 4.1 percent of job vacancies.

The Eleventh Malaysia Plan (11MP) projected that the percentage of skilled workers among the local workforce would be enhanced from the current 28 percent to 35 percent by year 2020. To achieve this target, TVET is to become a game changer to meet the demands and requirements of the industry, addressing the mismatch. For this to happen, the annual intake of TVET students' will be increased gradually from 164,000 in 2013 to 225,000 in 2020.



At the domestic level TVET is under the purview of six (6) ministries, namely the Ministry of Education, Ministry of Human Resources, Ministry of Works, Ministry of Agriculture, Ministry of Agro-based Industries, Ministry of Rural Development, and the Ministry of Youth & Sports. In 2018, the allocated budget for TVET implementation stood at MYR4.9 billion. In total, there are 564 public TVET institutions, complemented by another 690 private TVET institutions. The existing challenges pertaining to TVET is not solely confined to budget constraints but also include multitude of factors such as dual accreditation bodies, overlapping of courses offered by the institutions, suitability of TVET institutions locality, non-uniformity of entry requirements, different fee structures, competent and qualified instructors, and active involvement of the industries.

To rectify the issues in Malaysia's TVET system, several measures need to be implemented to strengthen and improve TVET delivery implementation. This include the elevation of the quality of TVET programmes and TVET instructors. It is essential for TVET instructors in both public or private institutions to gain industrial experience to ensure that they are kept abreast with the latest in technology. Another critical aspect of TVET is that it is significantly different from the normal academic pathways of apprenticeships, internships, and work-based learning programmes components.

Malaysia needs skilled workers in the form of competent artisans and technicians to fill skill gaps in various sectors of the economy, including the building and construction industry, power and energy plants, water distribution and sanitation systems, and large public works. Trained workers are also in short supply in the hospitality, manufacturing, and agro-processing sectors. There is also a need for highly-skilled technical personnel to drive the agenda of transforming economies through value-addition to the primary commodities and natural resources.

The Ministry of Human Resources and other TVET stakeholders are committed to uplifting the quality and standards of TVET in Malaysia. At the same time, the Department of Skills Development (JPK) will continue to review and implement National Skills Occupational Standard (NOSS) that will cater for new skills in the coming years. In order to nurture and attract interests in society, particularly at youth level, skills-based competitions are continuously being organised at the national, regional, and global levels.

“Problem, Project, Production” learning modules which engage students in authentic, “real world” tasks intended to simulate actual workplace situations, will also be embedded in the curriculum to better prepare students for the working environment. This plan also includes continued funding under the Skills Development Fund (SDF) for TVET students pursuing high demand programmes by industries. The existing SDF loan mechanism for employee upskilling and reskilling will be revamped to increase the number of recipients through a cost-sharing arrangement with the industry. The heavy reliance of private institutions on the loan disbursement from the government is unsustainable in the long-run. Hence, it is important for industries to be deeply involved in the financing aspect of TVET.

A recent study by Price Waterhouse Coopers (PwC) commissioned by the Ministry of Human Resources proposed that funding should be industrial-driven. Malaysia could emulate the TVET system in Germany which industry is an active participant in financing of the apprenticeship programme. This include the provision of apprenticeship allowances, practical training, and tuition fees, while the government is responsible for the remuneration of TVET instructors and the physical infrastructure. Even the Chambers of Commerce works closely with the industry to develop curriculum or syllabus, as well as examination questions. The German government and its industry have a common understanding on the methodology of its TVET delivery, which is 30 percent theory and 70 percent industrial training.

With the coming of the IR 4.0, TVET training institutions must integrate the 11 important pillars in their training, such as Internet of Things (IoT), cloud computing, cybersecurity, augmented reality, artificial intelligence (AI), robotic, and data analysis. While IR 4.0 may potentially affect jobs, new jobs will replace traditional jobs and these will require different skill sets. TVET institutions will need to improve their ways of imparting skills to students. Graduates will face an uphill battle to find employment to which they have to adapt to the changing work environment as quickly as possible. The workplace will be transformed and digital means will be utilised to reskill staff. Robot automation is projected to take 800 million jobs by 2030. Hence, it is critical for human beings to acquire skill sets that will complement the machines and other changes brought by IR.4.0.

As the nature of work evolves according to the changes of technology, the skills needed for future workers will also undergo change. The top 10 skills requirements for future workers identified by the World Economic Forum are; complex problem solving, critical thinking, creativity, people management, coordinating with others, emotional intelligence, judgement and decision making, service orientation, negotiation, and cognitive flexibility. The future work environment demands workers who can learn quickly, solve problems more creatively, adapt, and respond to new situations more effectively.

Emotional intelligence and creativity have gained a higher order of priority. Being creative includes having the ability to think in unconventional ways and promote divergent thinking. With the vast availability of data and resources, workers have limitless possibilities and multiple sets of choices towards problem solving processes. These are the set of skills that must be taught by TVET institutions to prospective students.

TVET is a branch of education that cannot be overlooked by any government as it is through TVET that a nation is able to become an industrialised nation. Great economies such as Australia, Germany, Korea, and Japan place strong emphasis on the development of TVET education. If Malaysia is to become a strong economy, it needs to believe in TVET. Negative perceptions towards TVET by members of society need to be changed to encourage more youth to enrol in TVET programmes. Employers also need to recognise TVET qualification. Most important of all, greater commitment from all stakeholders is needed, particularly from the industry, in making TVET the first choice of education/training and not the last option. A long awaited TVET transformation policy is in the pipeline with the intent of having a single accreditation body for TVET.

SESSION 1

Mainstreaming TVET in the Education System

Moderator:

Prof. Dr. Ramlee Mustapha, Professor of Technical and Vocational Education, Faculty of Technical and Vocational Education, Universiti Pendidikan Sultan Idris (UPSI)

There are only ten professors specialising in TVET in Malaysia, but none of them are in the top advisory committee. The split in TVET between vocation and academics is not new, with debates ranging from the time of Plato and Aristotle. Plato's concept of education comprised of ideas, but lacked substance. Aristotle disagreed as he was a philosopher of substance comprised of physical elements. Some argue that academics and vocation need to be integrated or else democracy will not flourish. Others say that God created humans differently, therefore arguing that vocation needs to be separated from academics. Such differences in schools of thought is reflected in Malaysia, leading to different models following these concepts.

Speakers:

Dato' Syed Azuan Syed Ahmad Al-Idrus, D.I.M.P., Managing Director, IPN Education Group (M) Sdn Bhd

Malaysia is in need of competent TVET graduates upon entering the industry. To be a leading provider in TVET, teaching cannot be purely academic. There needs to be a division between pure academics and pure practitioners. Teaching of academics is important for the impartation of knowledge which the industry requires. However, there is a mismatch in skill, resulting in top performing students being unable to secure jobs matching their level of academic performance.

Though TVET is often known for its practical work, it also requires critical thinking in today's work environment. Hence, there is a need to focus on both competency and skill. However, skills are lacking among diploma students coming from polytechnics. Students have not been prepared by their lecturers to carry out the most basic of work tasks. This is the issue when TVET is made purely academic. It should be the responsibility of educators to ensure that TVET graduates are able to work and perform tasks which are suited to the industry.

When teaching TVET, an industry practitioner should be present in the academic system. These roles should not be purely academic. This will ensure that graduates are trained to suit the needs of the industry. To fulfil this need, universities now have industry linkage departments. Unfortunately, the persons in-charge of these departments do not themselves have the relevant experiences needed in manufacturing or business.

Mr. Harry Tan Huat Hock, PJK, Secretary-General, National Union of the Teaching Profession (NUTP)

The minimum wage should be raised to MYR1,500. As such levels of wage is high for current unskilled workers, the solution is to provide them with the necessary additional skills to justify this increase in pay.

There are too many people involved in TVET, each wanting their say on its policies. With six ministries offering TVET education, it is unclear which one has the final say. In the past, those with the closest links to the Ministry of Finance has the most influence, but this is not good for the country. A clear direction is needed.

The Ministry of Education (MoE) has established community colleges with the aim of building local communities as a knowledgeable and trained workforce. This provides an alternative route for students who have dropped out. The MoE's plan are comprehensive as it attempts to cover every sector from the formal to informal economy.

There are 36 polytechnics with the primary aim of providing degrees. Conventional polytechnics are open to all SPM leavers. On the other hand, metro polytechnics have been established to meet social economic needs, targeting working students who are in need of upskilling. There are full-time programmes for bachelors, diplomas, and certificates. In 2013, 90,000 students have undergone polytechnic training, while in 2017 this has increased to approximately 100,000. Yet, the government needs to do more to increase the number of enrolments as it is the way forward.

There are also vocational courses offering TVET training to students from the age of 16 years old. From 2013 to 2018, there have been 14,243 students in vocational colleges. There is an urgent need for Malaysia to look at TVET knowledge not as alternative, but as main way to move the country forward.

Dr. Chan Chang Tik, Senior Lecturer and Coordinator (Academic Development), Monash University Malaysia

The National Dual Training System (NDTS) has a strong alignment between institutions and industries. At the initial stages, the day-release option should first be considered, rather than a block release. This will give students a better chance to adapt to new systems of training and learning. While in industry, students will learn the skills needed and gain work-process knowledge before going back to the institutions. Once they return to their institutions, collaborated learning methods should be used in informal learning spaces.

Research has found that 60 percent of learning takes place at home. In institutions, 20 percent of learning takes place outside the classroom. These forms of learning will require lecturers to readjust their methods, moving away from lecture notes and PowerPoint slides, and use learning activities instead. Such activities can be conducted online or offline, be it on virtual spaces or face-to-face. This way, learning takes places through interaction.

Assessments can then be carried out while these activities are taking place. Therefore, assessment is part of learning and vice versa. Such methods of assessment is also less intimidating to students. Before students can engage in learning, a safe learning environment needs to be created to encourage students to speak their mind and interact freely. Once this space is created, students will be able to feedback to one another more openly, which is a powerful tool to support learning. Through these interactions, students also build soft skills.

Formal and informal learning also requires synergy with the industry. Industry would only be willing if they can achieve an economies of scale. To achieve this, the many TVET institution in Malaysia can form a consortium to gain the necessary volume. Once the industry has these skills, partnerships would not be difficult because due to the mutual benefits and synergy that is created.

Curricular development is an important aspect that requires industry involvement to ensure what students learn is up to date. Having this synergy would also allow students to return to the academic pathway if students want to return to the universities to earn degrees. In attempt to make training modules more relevant, TVET institutions want industry captains to teach their students, but face time constraints. The solution is to make it a blend by allowing industry captains to conduct the teachings online. Some forms of hands on learning can be done through simulation and augmented reality. However, certain hands-on aspects of learning need to come from

the industry. Face-to-face interactions with industry captains can be done over the weekend if they are available. Problem-based learning methods can also be used where TVET students can study real-world problems. However, students and lecturers need training before these two approaches can be introduced.

TVET needs to be made demand driven and industry driven. In South Korea, 40 percent of secondary school students prefer to go for TVET. However, it is only 10 percent in Malaysia as of 2017. South Korean TVET students have the opportunity to return to the university. Malaysia is attempting to follow this practice. This will allow better synergy between local and international universities. Malaysian students and parents still have the perception that only university degrees will lead to higher paying jobs. TVET programmes also offer high salary programmes, such as AI and IR4.0 programmes. Success stories in TVET also need to be highlighted to create more awareness. More importantly, there needs to be an assurance of quality in teaching and that students are able to perform to expectations.

Ms. Melinda Lim, Co-founder and Chief Academic Officer, Dwi Emas International School

Entrepreneurial programmes can be integrated into a student's lessons plan to develop entrepreneurial experience. One such student from Dwi Emas has developed an aquaponics system and was able to sell its produce. The student experimented between bok choy and kale before deciding to focus on the latter due to higher returns. In this exercise, the student applied biology, chemistry, physics, economics, and business studies, all in one practical experience.

Despite the efforts by UNESCO to integrate interdisciplinary studies, not enough is being done. Many issues are arising from the present education system, such student debt, which has amounted to USD1.5 trillion in the United States alone. In Malaysia, 8 out of 10 businesses fail very year. There is also the issue of "grantpreneurs", which are businesses that operate based on giving grants.

Another former student from Dwi Emas started a business refurbishing old cars while studying in an automotive college. By the time the student graduated, he has sold 500 cars. In another example, a young 8-year old girl started a tea business which has grown and even has an ice cream chain to sell her tea in Malaysia. In Dwi Emas' "powerpreneur" global programmes, students were taught how to start and operate a global business. Students are also encouraged to put some of their profits aside for education. Through these practical entrepreneurial events, students have to pick up the necessary skills for the business to be successful, such as the need to have good English proficiency in order to draft letters.

Q&A

Mr. Sascha Alexander Kuhn, German Dual Vocational Training / Malaysia-German Chamber of Commerce pointed out that graduates are more attractive if they have industry relevant skills and knowledge. Industries can sponsor trainings and absorb these graduates back into the industry which result in graduates having relevant training and knowledge. Trainees who spend 70 percent of the time in the industry learning industry relevant skills and the remaining 30 percent of the time in training institutes are absorbed by companies that give them fair paying jobs. Malaysia already has the tools in place but implementation is lacking. The government can support the industry by introducing tax incentives for companies participating in vocational training to ensure that young Malaysians who have completed training will have secured jobs.

A delegate lamented that often times when TVET is carried out, which involves many practical aspects, parents will give many opinions. He asked the panel how to bring parents on board and more aligned to what TVET is about, being a mix of practical and theoretical learning. The current TVET syllabus requires students to be practitioners in the industry for several years before they can teach. However, if they have done preliminary levels of work, this is all they know. If they teach, by the time their students graduate, what they have learned will be out of date. In Germany, one must have at least master's degree before they can teach. The delegate then asked what can be done to change the current system.

Ms. Melinda Lim shared that getting parents to cooperate and change is a huge challenge, particularly in Asia because of the general perception that children must complete their education with flying colours and head on to university. It would help if the industry engages with parents and warn them about students coming out with degrees but are unable to function. Perception needs to change to realise that it is not about academic performance, but how well they can contribute to the industry.

Dato' Syed Azuan Syed Ahmad Al-Idrus shared that parent involvement in inculcating the career choices of their offspring is important as it shapes what they want to be in the future.

Prof. Dr. Ramlee Mustapha shared that in Germany, there are applied universities designed for those who are already working in the industry to gain additional skills. For example, an automotive mechanic can pursue a PhD and even go on to design Formula 1 cars.

Dr. Dzaharudin Mansor explained that one of the problems faced as to why graduates are unable to apply skills like problem solving, critical thinking, and a love for learning in the real world is because such skills should have been developed earlier in academic life rather than later. TVET and academic skills should not be split as both their application in the real world is required. The approach of education should introduce fundamentals at the early stages of education with the application of applied skills at a later phase.

Mr. Harry Tan Huat Hock reminded delegates to have considerations for persons receiving education, what their interests are and what they require. When they are put in focus, applying solutions that sees to their needs would be more effective.

Dr. Chan Chang Tik concurred that theory and practical approaches should be combined as it will lead to practical application of what students have learned. It will not work if it is entirely practical nor is it effective to have the application of theory only towards the later stages. Explanation of what takes place during practical exercises should be complemented with theory.

Ms. Melinda Lim stressed that students at a young age should be exposed to all the different areas of learning from music, drama, dance, language, maths, and science. They should also pick up skills like team building, collaboration, and creativity. Education centres should identify the passions of students to enable them to pursue their interest.

SESSION 2

STEM Integration in TVET

Moderator:

Prof. Dr. Ong Eng Tek, Deputy Dean (Research & Innovation), Faculty of Human Development, University Pendidikan Sultan Idris (UPSII)

Speakers:

Mr. R. A. Thiagaraja, Chief Executive Officer, K-Pintar Group / Founder & President, Federation of Malaysia Training Providers & TVET Associations (FMTA)

Educate, in Latin, means “Edu” – Draw, “Cate” – Out. Hence, educators are meant to draw out the best talents and abilities from students, regardless of age. STEM cannot be separated from TVET and is an integral part of it as it requires analytical and critical thinking in numeracy skills.

TVET can be categorised into two separate categories. The first involves higher levels of STEM which is required in tertiary education. Such students will become computer scientist, engineers, and innovators who will come up with innovative products and services. Another category is the “meatier” TVET talent, which are for those who are not academically gifted. The key then is to tap into their passion, interest and talent to harness their potential. Both these forms of TVET can add value to businesses, society and the country at large. At the same time, they can help nurture students and enable them to turn their ideas into reality.

Students are asked to come up with solutions by creating the technology or processes which are practical for improvement. This requires TVET students to have STEM knowledge to develop the ability to think differently and to analyse. Now, the focus is on STEAM with the additional “A” for Art skills. While pushing students to become innovators, it must not be overlooked that the things they innovate and produce is meant for society. This requires good interpersonal communication and empathy. Therefore, skills in the arts are vital for STEM integration.

Based on findings by the Economic Planning Unit (EPU) and the World Bank, the current composition of the workforce comprises of 28 percent skilled workforce, with the remaining 72 percent being unskilled. Half of this unskilled workforce is between the ages of 35 to 45 years old. Retirement age has been extended to 60 years old. This makes all these members of the workforce prospective students for TVET. They need to be given the opportunity to learn and instil STEM, knowledge, and skills, as well as industry relevant qualification.

Following the World Bank’s definition, one needs to have a minimum qualification of a diploma to be considered a skilled worker. The International Labour Organisation (ILO) also considers diploma holders to be skilled

workers, but at the same time they attain specialised status in their respective jobs which are mainly fed through TVET. This way, they are able to demand for higher salaries.

Branding and perception of TVET is poor as it is perceived to be only for weak students. This needs to be corrected. STEM education can contribute to economic development with improved productivity, cultivating innovation that will lead to process improvements and higher efficiency. This also allows TVET graduates to demand for higher salaries, leading to higher profitability for the company and a higher GDP for the nation, ultimately contributing to the goal of high-income nation. These developments begin from schools.

There needs to be additional effort to push for STEAM skills in students which can then be applied as they enter the workforce. An important stakeholder in this ecosystem are the industrial players, which is the demand side as it bridges relevant skills for their needs. Global innovators with strong STEM skills are sharing ideas to solve societies problems. Other skills, such as collaborative intelligence, humanities, drama, arts, music, language, and other creative skills need to be embedded into STEM, which is why it is now STEAM. It is vital to mix arts in STEM to enable students to bring about the best solutions. Integrating the arts into STEM will also attract more students to take up STEM skills.

Dato' Prof. Dr. Noraini Binti Idris, Chairperson, National STEM Movement / President, IMT-GT Uninet STEM

Despite much interest on STEM and TVET there has been no improvement for either of these aspirations in Malaysia. In the past, TVET was not perceived to be in the academic mainstream and considered as an undesired field. Yet in the past, lab assistants only required SPM qualification due to the simplicity of the task required. This is no longer the case as in the polytechnic level, there are many high-end machines that require higher ability, though not necessarily requiring knowledge in the sciences.

In Malaysia, only less than 10 percent of secondary schools are involved in TVET, which is significantly lower than many developed countries like Germany and Switzerland which is 60 percent. In Singapore, 75 percent of secondary schools are involved in TVET. Many of their lab assistants have bachelor degrees, putting their level of TVET and STEM knowledge at high standards.

In the International Mathematic Reading and Science results for 2015, rankings for science and mathematics for countries in the likes of Singapore and Japan were at the top. Unfortunately, Malaysia ranks close to the bottom. Therefore, Malaysia is in need of concrete action to improve its situation. Countries like Switzerland are well-known for its watches and Germany for its cars because of its strong TVET and STEM skills which has allowed them to design such products. Malaysia needs its own niche. Much discussion on this matter have taken place, but has proven to be mere lip service.

The introduction of STEM and TVET must begin from a young age, as early as pre-school, and be carried on in primary school, secondary school, tertiary education, and even during their careers. Despite several government agencies having TVET programmes with good teaching materials, there have been disagreements on how the TVET agenda should be carried out. This is an obstacle to Malaysia's success. More practical and hands on experiences needs to be given to the young.

Technology is playing a role in TVET which has become affected due to the IoT and AI. Ways of teaching need to adapt to be relevant to the needs of the industry and demands of the market. Teachers and trainers need to be skilled, qualified and equipped with modern knowledge in order to cope with rapid changes. Policy makers must take immediate action to respond to these developments.

The National STEM Movement has initiated a mentorship programme where university students are mentored by industry partners. TVET and STEM are poised to be the primary jobs of the future worldwide, which is why students need to be equipped with these skills. Schools and universities need to be equipped with the necessary infrastructure and work closely with the industry. Country's like Finland and Singapore encourage their secondary school students to form start-up companies which are funded. Initiatives like this will allow the country to move forward.

Prof Dr David Asirvatham, Executive Dean, Faculty of Innovation and Technology (FIT), Taylor's University, Malaysia

The impact of future technologies, like driverless vehicles, need to be considered. Such cars have the ability to self-diagnose. Machines with AI are being made. Such developments have implications for TVET. A traditional mechanic will be unable to service a driverless car, and yet the profession has not yet been trained sufficiently to prepare for such eventualities. Graduates of today, which may have planned to be employed for the next 30 years, will become obsolete in only 5 years. Therefore, the future must be taken into account when designing TVET curriculum.

Drones are expected play a major role around the world from surveillance, deliveries, construction, and other tasks. However, there may not be enough engineers and programmers for these drones. Despite much discussion surrounding Industry 4.0 and its features, such as IoT, cloud technology, mobile internet, big data, and AI, insufficient amounts of this have been integrated into TVET nor university curriculum and syllabus. With the rise of automation in the coming 10-20 years, 30 percent of jobs will cease to exist.

As computing becomes key, STEM will play a major role in producing the necessary computer engineers and software developers which Malaysia still lacks as not enough Malaysians have such skills, forcing it to open door to expatriates. These strategies need to be relooked. LinkedIn has identified jobs, such as data scientist, machine learning engineers, sales development engineers, and others that cater for these types of specialisations as jobs of the future. Despite these developments, opportunities in TVET are expected to be on the rise. However, should there be a lack of effectiveness in designing these syllabuses, TVET will go on a decline.

TVET has been emphasised in various forums by the G20, UNESCO, and ASEAN as a main strategy to produce skilled workers. Malaysia's various initiatives need to be evaluated for its effectiveness, leading to the formulation and implementation of the right policies. TVET will be a major supplier of the workforce which will be critical for the economy of Malaysia. It needs to embrace green technology and play its part in the United Nation's Sustainable Development Goals (SDGs). UNESCO has highlighted three strategies for TVET; entrepreneurship, gender equality, and sustainable development.

STEM faces challenges in Malaysia. There is reduced enrolment in the sciences in secondary school which needs to be addressed. Critical thinking skills need to be inculcated in graduates. Unfortunately, stakeholders of STEM are also in denial. When presented with the shortcomings of STEM, they act as though the situation is fine. They need to accept the problem before plans and solutions can be developed.

Negative perceptions towards TVET, which is seen as a second-class education, needs to be changed. More soft skills need to be developed with skills that are relevant to the industry, addressing training mismatches between what is taught and what the industry needs. There has also been a lack of innovation and acquisition of life long learning.

To introduce more innovation in TVET, there needs to be more project-based learning. Teaching of concepts must be strengthened in terms of ideas and understanding. Skills and knowledge require equal emphasis. There should also be more team-based learning and an increased use of creative tools to spur innovation. The environment should allow for failure as innovation is a field that may need one to make multiple attempts before experiencing success.

Mr. E. H. Lim, Chief Executive Officer, Eduspec Holding Berhad

Applied sciences or project-based learning needs to be included in mainstream curriculum beginning from the first years of a person's education which requires activity or thematic-based learning. However, there is insufficient funding allocated to research to seek ways of integrating these components.

The integration of STEM education into TVET is most suitable for the industry as it involves real-world application. However, STEM taught in places of learning has not incorporate project-based learning nor critical thinking. This is compounded by the fact that each country has their own definition of STEM and own plans of using STEM to achieve different outcomes. Malaysia, for example, uses STEM to increase the intake of science-stream students. This is not an advisable means of pushing STEM as it can lead to unintended outcomes.

Project-based learning teaches the value of collaboration and involves multidisciplinary skills. For example, the Entertainment Technology Centre at the Carnegie Mellon University (CMU) task its postgraduate students comprising of graphic designers, programmers, and linguistic experts on STEM which are tasked to work on

projects. Many of its current STEM projects revolve around robotics, which is one of the best ways of conducting STEM education. TVET's emphasis on vocation and technology through a hands-on approach by its very nature offers an ideal integration of STEM by providing a strong foundation to develop STEM competencies and skills. The Global STEM Alliance is good platform to find out more about STEM. They have developed their own standards together with the Stanford Research Institute on what STEM skills should be.

Teaching STEM requires a focus on critical thinking, problem solving, creativity, and innovation which are essential for the workforce. This is being carried out in the Philippines where STEM is being integrated into its Year 11 and 12 syllabi. In Indonesia, its Sekolah Kemahirans are planning to integrate STEM into its curriculum under digital literacy.



The choices in policy is whether to conduct TVET with STEM or to conduct TVET and STEM. The difference is that STEM education offers an infusion of STEM skills in each of its courses and in each subject that is being taught. Though challenging, this can be incorporated. Even music can be taught using a STEM approach. However, this requires more research to be conducted in actual places of teaching and learning to find ways to infuse STEM skills into teaching various subjects.

Many countries are adopting subjects that teach more STEM skills, placing it as an additional subject or a different platform to enable students to learn STEM skills. There needs to be an alignment of outcomes of what the government wants and come up with clear policies that will allow industry players to follow. There should be concrete effort through a coordinating body.

A World Bank report advised that the optimum age teaching of STEM skills should begin at a younger age. Therefore, when students reach high school and TVET, it would merely be a matter of reinforcement. Data needs to be integrated across each TVET institute to allow for better management. This way courses can be aligned and managed property.

Q&A

Assoc. Prof. Elajsolan V. M. Mohan, National Association of Private Education Institutions (NAPEI) pointed out that the definition of TVET is confusing as it is uncertain if they comprise of polytechnics or places for skill development. The school education system is quite divided. If the ratio for STEM is supposed to be 60:40, then there is already a mismatch as schools normally only have two classes in science streams with the rest being arts. Despite the high demand from the TVET sector, in terms of jobs, there is a need to change the mindset of the general public as it is still perceived to be an undesired career. Many still want to have a degree. The government needs to do more promotions to educate the public, emphasising the importance of TVET to change the mindset of parents. Perhaps the government can offer incentives to attract more TVET students who lack the financial means through the Ministry of Human Resources. Many centres are closing down. Also, many TVET students are from the B40 group, whom are in need of funds. TVET student need a financial assistance programme in similar fashion to PTPTN. This effort will help meet the requirements of the TVET industry.

Dato' Prof. Dr. Noraini Binti Idris clarified that the former Ministry of Higher Education's (MOHE) Blueprint 2015-2023 emphasised seriousness towards TVET. In the Blueprint, TVET is no longer described as a secondary career, but as an important pathway toward completing a university degree. This effort is still being presented by the government. More mentoring programmes in schools are needed in school. There are collaborations with the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC) to address the shortage of STEM and science streams in school. Many students do not do well in higher-order thinking for PT3 due to poor maths and science that requires a minimum C-grade to be admitted into the science stream. This led to a massive decline in science stream enrolment. In 2018, only 19 percent of the 443,000 students were enrolled in science streams. This may lead to further repercussions in fulfilling STEM and TVET requirements that is needed for Malaysia to become a high-income nation. All stakeholders need to work together. Industries need to partner with TVET institutions to provide the infrastructure in an effort to improve STEM and TVET for the future.

Mr. E. H. Lim opined that the current form of streaming in old fashion as it is still based on pure sciences. In independent or private schools, students are allowed to select their preferred combination of science subjects and it is not necessary to take all the science subjects. There needs to be an allowance for fusion as in the real world, work requires multidisciplinary skills. It is questionable if traditional forms of streaming are still relevant.

Mr. R. A. Thiagaraja stressed that Malaysian mindsets need to change to one which is prepared to celebrate failure. Otherwise, nurturing innovation and creativity is unlikely. It needs to change its approach to wanting to learn from mistakes and come up with better solutions. In terms of financing students, parents can ordinarily withdraw from the Employees Provident Fund (EPF) to fund their child's education, but such a provision is not provided for TVET studies. The industries can come together collectively to write to the Ministry of Finance to seek withdrawals from EPF for this purpose.

Prof. Dr. David Asirvatham. To elevate TVET towards academic excellence, there is a need to improve the quality of graduates through the curriculum. Teachers also must be trained and upgraded. Attractive salaries are required to attract good students into TVET. For this to happen, there needs to be high value and productivity to justify better earnings. This requires planning and good policies from the government. In several countries, occupations like electricians and plumbing is carried out by those certified. Unfortunately, there is a lack of control in Malaysia as foreign workers can be brought in to carry out these tasks for lower pay and quality. Hence, greater controls is needed with the enforcement of appropriate policies.

Ir. Daniel Lim Kim Chuan shared that during an industry transformation forum in Singapore in October 2018, Malaysia was categories as beginners in the Industry 4.0 ratings. The median age of Malaysia's population is 25 years old, which is a working age. He then asked how can such a gap existing in the working population be addressed and if there is a strategy or road map to address issues of perception. He also asked if an IT platform can be used to address issues of unemployment.

Mr. E. H. Lim clarified that much of it comes back to the availability of data to know the skillsets of available workers. Blockchain can be used to record student competencies. This will help in employment. Those already working require a centralised data centre in terms of recording skills developed by employees or noting the type of skills they hope to pick up. Centralised data is needed, otherwise it will be difficult to manage. But there needs to be willingness from industry players to share their data.

Mr. R. A. Thiagaraja pointed out that in the 11MP, the government has set a clear direction that gave much emphasis on TVET. But its focus was on an industry-driven TVET. Hence, there needs to be a matching of skills between the TVET institutes and the industries to close the gap. An industry-driven TVET will led to better employability and marketability due to the relevance of skills needed by TVET graduates. There is no data or figures available pertaining to the number of available certified professions that exist in Malaysia. Lack of such data makes it challenging to appeal to investors. Policy makers and TVET providers need to engage with HR practitioners. There is also a lack of public-sector industry recognition of public TVET qualification. There is no pay scale for TVET graduates. On the other hand, the public sector has standard HR and remuneration policies as they go by academic qualification, instead of just TVET qualifications. Hence, there needs to be a special remuneration category and benefits plan. Otherwise, it will affect the marketability of TVET graduates.

Prof. Dr. David Asirvatham stressed great urgency to address these issues as more jobs will be replaced by automation. Various stakeholders need to take account of this, including those from industry, government, as well as individuals. Industries need to allocate funds to retrain staff over a period of time. The government needs to have appropriate policies. The HRDF needs to be relooked to allow funding in new areas. Individuals need to make an effort to be retrained, especially with the availability of much material and certifications online on sites like Coursera.

SESSION 3 ***TVET and Industry Engagement***

Moderator:

Dr. Malini Eliatamby, Chief Academic Officer, INTI International University and Colleges Malaysia

Speakers:

Dr. Dzaharudin Mansor, National Technology Officer, Microsoft Malaysia

IR4.0 is accelerating with data and AI. The President of Argentina, Mauricio Macri, once said that there was a race between education and machines. Therefore, TVET programmes need to be relooked as the type of skills companies need will change rapidly. To deal with changing demand of skills from workers, there is a need to build the habits of life-long learning in students.

Companies like Google and Facebook leverage on mobile data and cloud computing platforms that have made them very successful. With data, AI, and IoT, companies like Spotify and Uber are disrupting traditional companies. There will be more of such companies emerging. Klaus Schwab, the CEO and Founder of the World

Economic Forum (WEF) said that “In the new world, it is not the big fish which eats the small fish, it's the fast fish which eats the slow fish”. There is much opportunity for the SMEs. Many successful companies in recent times began as SMEs. But even large companies should rethink the way they do business. Companies that do not change will disappear.

In 2007, Blackberry's stock prices were at its high point. It was also the year the iPhone was introduced. Blackberry continued to perform well for the next three years, but following this, the company became irrelevant. The mistake they made was not innovating using different business models. Other businesses will face similar challenges in IR4.0. Leveraging on existing capacities and capabilities to create business growth, there will be ongoing shifts in technology which will drive business and industry disruptions. Therefore, new capabilities need to be created, either to disrupt or defend against disruptions. Employees need to be reskilled and upskilled on a constant basis. Such is the challenge faced by education which needs to create and prepare a workforce that is able to learn and relearn.

TVET is about learning via applied skills, focusing a very particular set of skills which can be deployed in the workforce. To enable this, industry targets need to be relevant. The workforce also needs to be “future-proof”, where there is constant ability to upskill, reskill and relearn. The WEF's Future Job's Report 2018 has identified redundant roles and industries. Alarming, training for many of these jobs are still being taught. Even professions like lawyers and accountants are not safe. On the other hand, several stable roles have also been identified. However, these roles may also shift as machines and technology create other opportunities to make human beings more productive and efficient to augmentation.

To future proof the workforce, there is a need to have future-ready 21st century skills. This include communications, collaboration, critical thinking, problem solving, and global outlook empathy. Most importantly, a love for learning must be cultivated and ingrained into a new generation of students. Such developments cannot wait until tertiary education and must take place immediately at a young age when they are able to learn these skills more easily. Emphasis on STEM is also crucial as the work the next generation of workers need to apply is very technology-based. There is also a need to develop Malaysia's data and AI capacity as soon as possible.

A foundation for TVET needs to be laid in school to allow for more applied learning. TVET programmes should also be designed by employers as they know best what their needs will be.

Mr. Shahidan Abdullah, Senior Manager, National Strategic Initiatives, MIMOS Berhad

Things globally are changing at a very rapid pace. Benchmarks that use to take years for traditional companies to achieve can now be attained more quickly with lower budgets.

A common criticism against TVET graduates is that they do not have industry exposure. But this is not a new phenomenon, as many who enter the workforce also do not have any experience initially. Many questions were raised when Intel moved their production plant from Penang to China and Vietnam. This is because when their plant was built in 1974, talent was abundant in Malaysia.

For TVET graduates to be prepared for the job market, they first need to have industry exposure. To do this, there needs to be collaboration between the industries and academics. Industry players can offer their facilities to allow hands on exposure to allow graduates to pick up required skills. Classes can be conducted at a partnering industry's premises by the university. This will translate into a higher employability of graduates. Therefore, an industry's research programme and facilities can be offered for use to any education provider to enable this experience. TVET institutions can also design upskilling courses for instructors.

MIMOS provides TVET and STEM programmes as well as academic attachment to PhD and masters students, although internships are not offered to undergraduates (unless it is conducted under a joint programme by a university). MIMOS also offers its training programmes to any academic provider, assisting them to design and sell their programmes more effectively, including in the area of licensing.

Ms. Alpa Shah, Founder & Director, Future Leaders Internship Program (FLIP)

Internship programmes need to be arranged with industry players. This requires engagement with these industries which will also allow these industries to contribute meaningfully into TVET. Workplace internship placement programmes can be arranged to allow students to be aware of the types of skills required, rather than to realise the need for certain skills required by the industry after graduation, which is too late.

The government has given TVET much interest in recent times, emphasising that TVET's direction should be demand and industry driven. Industries in any country face the issue of mismatch between education and work. Students are also unsure of what their future unemployability will look like and what skills they would require. This gives more reason for all stakeholders to work more closely together, be it schools, academics, companies, and the community at large.

Current methodologies of conducting TVET have not been successful. To do things differently, all stakeholders need to come together under a common umbrella and work more closely in making TVET more useful in the workplace and life in general. Such work is best identified by students who will become aware of the requirements of work when there is strong industry engagement beginning from high school. Should students beginning at Form 4 be given proper career direction through proper counselling and real-life work experience through internships, it will reduce the possibility of career mismatches and allow for the positive build up of the future workforce. To create a strong talent pipeline, the career interest of the young must first be developed. When they know what they want in life, other things will fall into place.

Many in the industry recognise the difficulty in hiring people who are at middle-skilled jobs. There are several best practices from the United States that can be devised, such as on the job training, apprenticeship, internship, and co-opt education, but the one that stands out is skill acquisition through college. This is where the classroom is integrated with the opportunities to apply new concepts and skills in actual or simulated work settings. The problem with Malaysian education is that it is quite theoretical. Instead, what is needed is for it to be more practical. Another effective method is to have higher education with strong industry ties. In this method, educators are strongly linked with the employers.

Malaysian schools face the issue of sustainability when it comes to running effective career education programmes as school counsellors are not sufficiently equipped in terms of career guidance. Training is needed for these counsellors to enable them to guide students effectively. This will also allow them to identify students who are TVET proficient and guide them towards the right channels.

Successful public-private partnership should be maintained. The World Bank has identified several forms of partnership models. The first is the market economy, which is the German dual-system. This requires employers to sustain much of the labour cost. There is also the Japanese model, where a majority of labour comes from high school students, but this requires students to be very familiar with their subjects and career progression. It also requires good networking between counsellors and the companies.

Although there are many TVET policies in Malaysia, it is fragmented due to initiatives by different agencies. In the United Kingdom, a pilot programme called the Employer Ownership Pilot is commissioned where ownership of education comes from the employers. In this model, employers have access to public funds to build capacity of students and able to influence the training needs, in doing so, increasing its relevancy.

Ir. Hj. Shamil Abu Hassan, Dean, School of Advanced & Distance Learning / Head of Academia, Industry & Support Services, DRB-HICOM University of Automotive Malaysia

There are 792 colleges in Malaysia whom are involved in TVET. Even pure research academic-based universities are showing interest involvement in developing TVET, offering more hands-on activities. But its effective is in question as many lecturers and instructors are not TVET trained. There is a need for educators to go back to basics. Traditionally, all Malay men were "tukangs", whereby all of them had a form of TVET proficiency. This knowledge is passed down from generation to generation, becoming a form of apprenticeship.

A study found that a majority of college graduates only remember 15 percent of what they have learned in classes. This then forces the industries from which these students will go to retrain these fresh graduates, which is repetitive. It would be more efficient to take on these students earlier on from the universities and insert them into the industries to allow them to gain the necessary experiences in developing problem-solving techniques, communication, and solving complex problems. This way, by the time they mature, they will be able to contribute effectively to the industry. Course structures should be split to allow students to spend a duration of their course in the university and the other with a partner industry. More partnership of this form needs to occur for positive effect on the overall industry and the country.

Q&A

Mr. Goh Wai Meng, INTI College Penang shared that Desiderius Erasmus Roterodamus, a Renaissance era scholar, once said that “The main hope of a nation lies in the proper education of its youth”. TVET is bound to propel Malaysia to greater heights. Mr Goh then asked what would be the fundamental changes needed to ensure the effectiveness of TVET.

Mr. Shahidan Abdullah stressed a need for greater coordination of the TVET curriculum and course design by the National TVET Empowerment Committee.

Dr. Dzaharudin Mansor said that the main issue Malaysians face is in the application of knowledge. This is why TVET is trying to use an applied approach. Some people are able to achieve a combination of theory and practice through an academic approach, but this depends on the person, while others fare better using an applied approach through a TVET programme. This then needs to be bridged so that fundamentals can be strengthened. This way, applied and fundamental skills can be boosted. Early forms of education should be conducted using an applied approach. Theoretical learning should not be introduced too early on. Unfortunately, even children in kindergarten are undergoing exams. This does not set the conditions to develop a love for learning. After a path in applied learning has been undertaken, students should be allowed to choose their own path depending on their interest and inclination towards a TVET path through theory and practice or via an academic path.



Ms. Alpa Shah shared that fundamentally, for TVET to be successful as a first choice begins from the basics. Computer knowledge has been taught in school as part of learning how to use computers, but there could come a time when they will be taught how to make computers. Robotics and programming could be offered to students as an option by some private and international schools. Unfortunately, those in government schools might miss out on such opportunities. To enable students to understand what TVET is about, a more hands on programme can be offered to schools which can be initiated as an extracurricular programme that can gradually be incorporated into the system. This will allow students to have a glimpse of what they can expect when they take on TVET education. The salaries of trained TVET professionals is also very low. This does not give them a good impression. Instead, overseas, TVET graduates can earn even more than some professionals. More awareness of TVET is needed through education fairs, many of which have not highlighted TVET as an option. TVET providers should come together for such a fair to promote their courses and institutions.

Ir. Hj. Shamil Abu Hassan explained that in a product's life-cycle, a product goes from design, development, testing, validation, manufacturing, sales, and after sales. In this process, TVET comes in at the point of manufacturing. The phase of design, development, testing, and validation require engineers which skill sets are obtained from research-based universities. TVET expertise are then required for sales and aftersales. This is an area where those from research-based backgrounds should stay away from.

Dr. Guan Eng Chan, Ministry of Education disagreed that children should be streamed as young as pre-school to develop an inclination towards TVET. Instead, they need wholesome forms of education and should be allowed to explore and enjoy life, rather than to be streamed. In fact, the MOE's direction is to move away from streaming based on academic results. Students will soon be randomly placed regardless of grades and all can be part of the same classroom.

Dr. Dzaharudin Mansor clarified that he is not for streaming, but the way how education is presented by using an applied approach. Private schools lay the foundation by building on literacy and numeracy at an early age. They also have theme-based learning where these skills are applied. This is where an applied approach can be used on a variety of subjects.

SESSION 4:

TVET in a Digital World – Shaping the Future

Moderator:

Mr. Georg Chmiel, Executive Chairman, Juwai.com

Speakers:

Mr. Hasnul Nadzrin Shah, Director, Government and Regulatory Affairs, IBM Malaysia

In the digital economy, TVET has to be seen as a strategic enabler for national competitiveness. Malaysia needs to redefine national competitiveness as it has always been focused on economics. Instead, the country must ensure that it implements a “no one is left behind” policy.

One of the problems encountered as to why students underperform in school is because they spend time working beyond school hours and have no interest in the academic path. There is a need to consider Malaysia’s strategy in half a decade when the country becomes an aging population to ensure that every person is employable. This will lead to other positive effects, such as a fall in crime rates and an increase in the country’s competitiveness when people are employed.

TVET enabled employees will be an integral part of the digital transformation revolution. Malaysia has one of the highest numbers of digital natives (those who have spent a large part of their lives being exposed to the internet). This is key as one of the key employers of TVET graduates are the SMEs. However, SMEs are not prepared to adopt Industry 4.0 technologies. It is key for students who go through TVET to be digitally literate. This affects the context and content of the curriculum undertaken. Educators need to leverage on their natural propensity to draw knowledge materials from the web.

The means of identifying, training, recruiting and transitioning careers will have to change in order to maximise TVET and higher education students. TVET needs to be mainstreamed and become an integral part of the education process. Identifying students does not imply a need to stream students but to identify the competency and ability of students. Their learning propensity and preference should be reflected in their student record to enable them to be guided accordingly to increase their probability of getting hired. Businesses also need to change the way they train, recruit, retain and transition employees. TVET jobs are not sufficiently highlighted as many businesses do not understand the importance of TVET-enabled graduates.

In 1991, IBM embarked on its P-tech programme which involved the establishment of pathways to college through the early years of college and high school. The curriculum of specific colleges and schools are augmented for work-based learning. Students who graduate from the programme are then given the opportunity to join IBM. In the United States, 185 students have successfully graduated from the programme. Most of these students would be considered B40 students who do not have the financial ability to undergo college education. Out of these 185 graduates, 25 took up jobs with IBM while the rest pursued higher education.

Companies have to take up the role of engaging with students much earlier and working with schools. A challenge for this is the ability to scale. As it is not a national programme, only specific schools with resources are targeted. In the context of a digital economy, it is a matter of skills and theory. Therefore, it is important to identify the jobs of the future that can be TVET enabled. This includes application developers, associate programme managers, design researchers, and user experience designers. Though most of these jobs require a degree, practically, one is not required to perform these functions. To remedy this, IBM has introduced a global apprenticeship programme where those without degrees, but diplomas or industry certifications, can undergo a twelve-month programme. This will increase their chances of landing a job in the future.

The jobs of the future depend on its content. TVET being a critical enabler, needs to be agile, lean, and involve design thinking. Such methodologies led to experiences that add value. In essence, the use of TVET in the digital world already exist. It is only a matter of whether the business community wants to bring TVET-trained individuals into the business and make them productive.

Mr. Muhamad Ali Hajah Mydin, Chief Executive Officer, Penang Skills Development Centre (PSDC)

TVET as a form of higher education involves higher skill sets and mastery. There is much emphasis on preparing for jobs of the future. Yet, no one can be certain what these jobs will be. However, it is possible to look into the nature of such jobs. It is important for educators to understand these developments in order to prepare graduates to do the jobs of tomorrow.

One of the key fundamentals in making these preparations is to understand the direction the future is taking with IR4.0. As a “revolution”, the process implies that the way things are currently done will converge and become something new. IR4.0 involves the convergence of three different groups of technology; (i) operational technology (OT), (ii) information technology (IT), and (iii) finance technology. These three groups of technologies are converging to create something new to meet the demands of consumers. Such demands can be customised to the specific taste and request of customers. This requires industries to find a means of production using the three technological convergences in meeting these demands.

Such expertise are already available in colleges, but are taught individually. Instead, they should be combined. Future jobs will still require jobs in the area of electrical engineering, mechanical engineering, or mechatronics. However, the nature of achieving the goal of getting the processes right and maintaining machines will change. Production will require machines to be connected. A job order will be curated on the cloud, mobilising materials remotely. On the cloud, there will be an element of cyber security, data analytics, and other features machines will need to have. This is additional knowledge an engineer needs to have to perform jobs effectively in an Industry 4.0 environment. However, such lessons are not taught to engineering students, although universities have the content. Future engineers need to be enabled with such knowledge in order to perform their jobs well.

Rather than to mimic the production styles of developed countries, Malaysia will likely experience a slow migration to new forms of production that integrates technology to meet demand. Therefore, what is needed in the short-term is not advanced technology, but for people to be flexible to migrate in terms of skills in order to sustain in the coming years. Institutions should identify these three technology groups that universities have, ascertain the types of jobs industries will need, and try to combine them. This requires an education of the workforce with trainers and professors identifying these elements. Labs and machines need to be upgraded to provide students with the appropriate infrastructure. Only then can students be prepared correctly.

Mr. Hadzmi Yusof, Managing Director, Malaysia, Indonesia, Philippines and Vietnam, Frost & Sullivan

By 2030 there will be a completely different mindset towards employment. Currently, when employees join the workforce and big enterprises, they consider it to be their jobs set for life. However, with millennials, this will no longer be the case. There will be no more job security and there will be constant worries about the job, inducing employees to be constantly ahead of the curve. This will apply to both white and blue-collar workers.

Millennials view employment differently as they see a job as wanting things unique to them. Even a top student from foreign universities may have different expectations, one with more casual lifestyles. Also, the way millennials think about making money is different. This applies across all forms of work.

In countries like Germany, multiple skill-set can be acquired to allow the earning of steady income streams. For examples, plumbers can acquire a master plumber certificate which entitles them to a higher salary range. This allows individuals to move away from traditional office jobs to something more practical. Such mode of work allows greater flexibility and will be a standard feature in the future. This is known as the gig economy.

There are prominent forms of technologies which are enabling this. Smart phone penetration in Klang valley is more than 100 percent with people having an average of 1.3 handsets. AI will also place a prominent role with its features embedded in phones. In the next few years, AI will be more personal and designed to manage life. This also enables the workforce to have multiple jobs and skills. Robotics and automation will affect many jobs, some may even become obsolete.

Jobs will be determined by people. They will choose what they want, be it working part-time in a major firm and be a Grab driver at the same time. This lifestyle can be managed by AI and will be quite ubiquitous. Such changes will also result in better quality of jobs. Problems like having government linked companies (GLCs) with mundane permanent jobs which employees can hold for decades will eventually be phased out.

Jobs will become borderless. Malaysia is a small country when compared to its neighbours. Many countries have caught up with Malaysia's level of manufacturing and general industries. In response, Malaysia needs to expand its portfolio beyond its borders. This requires a wider skillset.

Mr. Ngan Chee Hwa, Deputy Managing Director (Education & Training), German-Malaysian Institute

To navigate the next Industrial Revolution, it is crucial to foster lifelong learning and the habits of autonomous learning. Henning Kagermann emphasised the features of autonomy when it comes to IR4.0. When machines are connected to the IoT, they can decide on their own autonomously. The Boston Consulting Group identified adapting skills as the primary requirement of the future workforce. This includes social competencies, learning capacity, teamwork, responsibility, and problem solving.

As traditional forms of teaching become obsolete, new methods will need to be employed to enable students to learn by doing. However, this first requires a change from the teachers themselves. The comfortable way of lecturing and providing notes to students is merely spoon feeding. Student performance in practice is very much based on how well they can memorise. It is difficult to accurately describe students as skilled-graduates based on such forms of assessment.

There is a need for lifelong learners to face the challenges of Industry 4.0. Encouraging students to think outside the box first requires a change in approach of teaching. Teacher-centred learning methods have led to low levels of self and active learning among students. On the other hand, tutorials have higher forms of effectiveness towards student learning. The best method is problem and project-based learning where students can benefit the most. Industry 4.0 requires autonomous learners, such as those from Generation Z, who can continuously learn and adapt to the changes of technology in the industry by themselves.



The 4C's; collaboration, critical thinking, communication, and creativity are needed. These elements need to be introduced in education, requiring a shift in teaching and learning. Lifelong learning needs to be empowered to fulfil the needs of Industry 4.0 and the 21st century education outcomes. Talents need to be prepared and shaped so they are adaptable and able to follow the changes in industry. Teachers need to move away from traditional mindsets, put learning first and teaching to come second. Teacher will then play the role of facilitator with students becoming active in the process of learning. This is the basis of outcome-based

education which is not about what is taught but what is learned, not what one knows but one does with what one knows. Approaches to TVET education are being done in isolation. This requires innovation and a combination of their competencies into projects with problem-based learning.

Q&A

A delegate asked the panel what immediate action they would like to see from the government in terms of TVET implementation which were relevant to their fields of expertise.

Mr. Georg Chmiel believes in lesser government intervention and much rather they stay away from the industry. The industry should be allowed to define what they need.

Mr. Ngan Chee Hwa gave the German example where the Chambers of Industry and Commerce were the ones driving the TVET requirements. However, in Malaysia, commerce chambers are segregated along ethnic lines. There needs to be a chamber from the industry overseeing the whole requirement and not by ethnic settings.

Mr. Hasnul Nadzrin Shah hopes for a draft TVET masterplan. The government has to be open, transparent, and confident that input from stakeholders is for betterment of all.

Mr. Muhamad Ali Hajah Mydin advised the government to give industry a leading role in deciding what kind of workforce it requires. This way, there is no room for mismatch and error, as industry can decide how to train their workers.

Mr. Hadzmi Yusof shared that in Korea, the government works very closely with the chaebols. This results in graduate training being relevant to the chaebols. There needs to be closer relationship between the universities and big employers.

Prof Dr Titik Khawa Bt Abdul Rahman, Asia E-university, in posing a question to panel, pointed out the limitations of time when it comes to the upskilling and reskilling of employees. Therefore, the utilisation of digital

technologies is vital for TVET. Technological tools, like augmented reality or virtual reality are crucial in TVET training. She then asked for the panel's opinion about online learning for TVET.

Mr. Muhamad Ali Hajah Mydin agreed that technological tools are important for the current workforce as it allows employees to learn despite time constraints. However, the fundamentals of learning any form of skills, such as understanding the technology and practicing the actual skills still requires a more hands on approach. Introducing technology at an early age is not recommended as it takes away the fundamentals of building skills of innovation. When workers are more experienced, the utilisation of such technologies for further development is quite useful.

Mr. Hasnul Nadzrin Shah shared that employees in IBM are required to do online learning with credits given for participation. The delivery of lessons is always conducted via video and assessments are conducted through Q&A. IBM does not yet use virtual or augmented reality, but instead uses videos to guide the practical application on factory floor. For businesses, the importance of speed and marketability is important.

CLOSING ADDRESS

“The Future of TVET – Reshaping Our Perception of Education”

Ms. Zainab Ahmad, Senior Director (Academics), Department of Polytechnic and Community College Education (DPCCE), Ministry of Education Malaysia (On behalf of YB Teo Nie Ching, Deputy Minister of Education Malaysia)

TVET has changed in tandem with changes brought upon by IR4.0. In fact, education as a whole is going through rapid change to match the pace of change in the workplace and society. The acquisition of knowledge and skills imparted on students is expected to be better than what has been presented by institutions of learning in earlier times.



Innovations with major impact is much expected and has become necessary. Such acceleration is due to developments in IT and communication during last few decades. Significant progress has been made in addressing the acceptance of TVET into the education mainstream. However, TVET is still perceived as the second-best option compared to general academic education. This causes students to fail in securing job opportunities to build their careers. Changing lingering perceptions against TVET in education has proven not to be an easy task. Policy announcements must not convey that TVET is simplistic, nor is it only for the non-academically inclined. In fact, modern TVET requires significant foundation in academic competencies.

TVET, as a human capital development strategy, covers both preemployment and in-service training. However, TVET should first be fulfilling the livelihood of individuals and ensure gainful employment for its graduates to function as productive citizens of the country. Their contributions need to be aligned to the needs of the industry and society as a whole. The availability of high-skilled workers is necessary for sustainable economic development.

According to the Global Competitiveness Report 2018 released by WEF, Malaysia ranks 25th out of 140 nations. Malaysia is also one of three non-high income economies featured in the top 40. Among the Asia-Pacific economies, Malaysia was ranked 8th out of 26 economies. In ASEAN, Malaysia remains second behind Singapore. Hence, Malaysia's position is good in the global context, but there is still room for improvement. It needs to tackle minimum salaries and its dependency on foreign worker using manual and less cognitive demanding jobs. As a country, Malaysia needs to leverage on the adaptation of technology driven by IR4.0.

As economies transform, so too must TVET, which must change and adapt to the new configuration of economy and different cluster of needs. Malaysia's economy has seen a radical shift from agriculture production and light manufacturing to services. In the traditional manufacturing sector, new technologies and quality requirements have changed the skill set requirements for competitive growth. This change has also been affected by declining global jobs requiring manual and routine cognitive skills. There has also been an exponential increase in jobs requiring expert thinking and expert communication.

It was reported that the average starting salary of vocational and technical graduates is between MYR2,000-5,000 per month. For those in highly specialised areas, the pay is even higher than university graduates.

Statistically, most TVET institutions have reported that their graduates' rate of employability to be more than 90 percent and are employed within a year upon graduating. Though such results are expected, the future is about levelling up the technical skills, becoming more cognitive and less hands on, with more of the "T" in TVET.

The future will see huge demand for high end skills, such as cloud computing, robotics, automation, IoT, and big data analytics capabilities. TVET graduates urgently need to be prepared for these developments. Apart from technical skills, TVET students also require a strong cluster of skills. According to the WEF, the top 10 skills that are desired by employers by 2020 are cognitive flexibility, complex problem solving, critical thinking, creativity, people management, coordinating with others, emotional intelligence, judgement and decision making, service orientation and negotiation skills. These attributes must be imparted through formal and informal learning using pedagogy methods such as design thinking and collaborative learning.

The Department of Polytechnic and Community College Education (DPCCE), as the secretariat of the TVET Empowerment Committee, will be continuing the efforts initiated by YB Nurul Izzah Anwar, although she is no longer its chairperson. The department is committed to facilitating the discussion leading to a more efficient coordination of TVET between the six ministries in fulfilling the countries needs for a skilled workforce.

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