

Abstract

This academic paper aims to present the essence of vocational education and future workforce production and development. Since the world is transitioning to dependence on capital-technology industries, drawing on the potential of the best technologies of the modern era to apply in industrial systems which creates new innovations in the production system is essential. Moreover, having skilled workers with advanced industrial skills in line with the development of technology is also required because labor is an important mechanism to drive the industrial system. Both new and existing workers should be cultivated. At this point, strategy formulation for the development of national education is vital, especially institutions and vocational schools that produce and develop manpower to keep up with the future changes of the world and in line with the changes in the economy, society, and digital technology and the needs of the industrial sector. This article presents the dimensions of change in the future, the vocational education change, industry 4.0 and new skills of vocational education, quality driving in vocational education, and creating national-building vocation.

Keywords: national-building vocation, industry 4.0, workforce production and development

Introduction

Moving into the technological age in the industry or Industry 4.0 increase work efficiency, rapidity, and flexibility, as well as productivity of manufacturing systems. This creates a production revolution to drive the economy and embrace the growth of the industry. Changes in technology in the industry affect human living and working. The labor force must be prepared with the knowledge, attitude, and skills necessary for incurring changes so that they can work with robots and artificial intelligence. The preparation for labor with technology to replace must be in accordance with technology development so that they can develop skills and compete with the labor market abroad. Preparing people who are about to start a new job and giving priority to people who are already working through the practice of necessary labor skills is not only necessary for industrial and labor sectors but public and private sectors, establishments, and education must have good knowledge, attitude, and skills to be ready for changes. Particularly, vocational institutions that produce and develop manpower to enter the labor market must focus on the production of qualified workforce who are ready to work with the technology of change.

Future Dimensions of Changes

Education and human resource development from the pre- to post-industrial and digital technology era today, especially in vocational education. Vocational education institutions that produce and develop manpower must adapt and focus heavily on the design of vocational management that creates a new generation of people into opportunities and challenges with the changing dimension in the future. As a result, the manpower or workforce has the skills and ability to work with robots and artificial intelligence.

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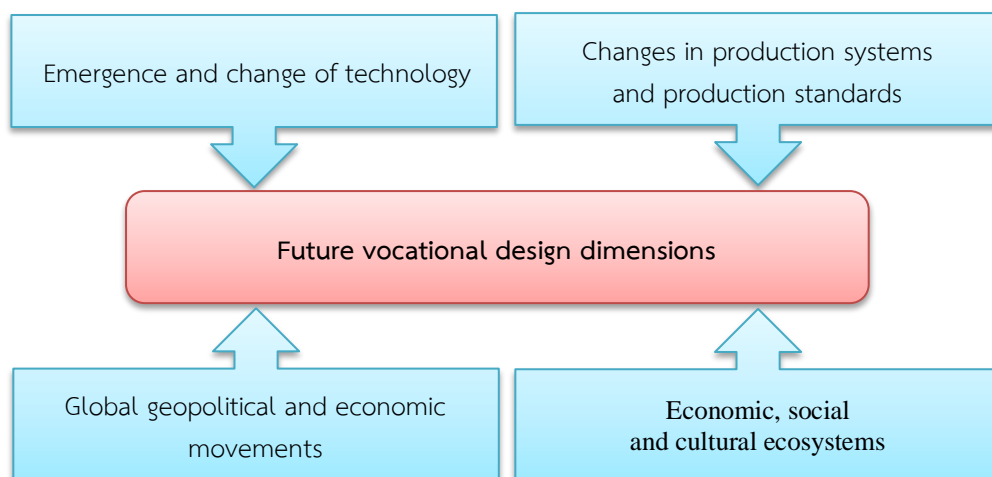


Figure 1 Design Dimensions of Future Vocational Education

1. Emergence and change of technology The emergence and rapid transformation of technology, from robotics, automation, artificial intelligence, communication, IT, information systems, Big Data, the development of the Internet of Things, etc. The movement of technology is a catalyst for changes in global society, from individual life to culture, economy, entry into the future of people, livelihoods, societies, and relationships to new business models, as well as energetic management of new foundations of thought.

2. Changes in production systems and production standards The shift of the industry and new production systems has aimed to reduce the cost of production processes with automation systems that rely on mechanical robots and intelligent management with limited human work, called knowledge-based production mechanisms. There are standards that regulate the whole system. The creation of economy - investment and development of the country's personnel must respond to the need for people development and achieve the goals of industry, manufacturing, and modern service.

3. Global geopolitical and economic movements The essence of the two sectors interacts significantly with each other. This helps to guide the direction to the “offensive or defensive” of countries with limited political and economic power, such as Thailand in order to create wealth and survive with the most minor loss according to the dynamics of the economic, trade, and financial wars.

4. Economic, social and cultural ecosystems The changing economic, social, and cultural ecosystems result in the transition of self-management of humans and society and the world environment to the digital world. The traditional transitions from agricultural society culture to commercial society, industrial society, and post-industrial society have changed the thinking and livelihoods. The culture of the digital age is in a new and borderless economic ecosystem. People can access knowledge “when needed” and enter the world through the virtual world. Additionally, Big Data databases make work and life easier.

The world changes and so does vocational education.

Vocational education is a study aimed at developing people with skills that meet the needs of labor markets. Therefore, it shall keep pace with economic and global trends to prevent the curriculum from falling behind. UNEVOC identifies the challenges for labor markets that may continue for decades as follows:

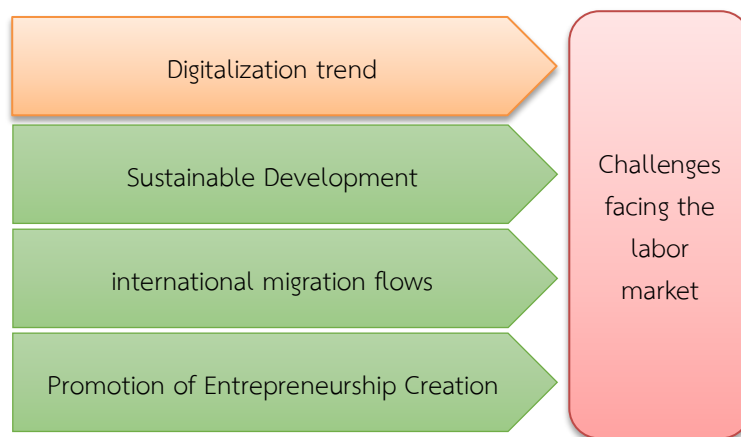


Figure 2 Challenges faced by the labor market

1. Digitalization The world of work in the future will progress rapidly and be increasingly intelligent until we are unable to keep up. It affects people directly in terms of becoming part of work or completely changing the nature of the current work. Manual work and routine work are going to be extinct soon. But what cannot be predicted is where technology will stop developing. If digitalization is still a problem that "disrupts" the labor market, then modern workers must also be aware of the development of innovation.

2. Sustainable development The new feature the business sector is looking for from workers is environmental awareness. Businesses in the future will be operated by considering using the least natural resources for the worthiest production and jointly maintaining the environment through corporate culture and other lifestyles. This attribute causes by instilling the right attitude and knowledge in the education system.

3. International migration+ In a globalized world that allows students to study abroad and migrate internationally independently, technical and vocational education in many countries is a system that accommodates many international students. It prepares vocational students to enter the country's labor market with quality. As a result, future vocational education must consider the plan to admit international students to study together with domestic students and teachers.

4. Promoting entrepreneurship Technical and vocational education learning at the global level offered courses to promote entrepreneurship for the advancement of individuals and economic society. The entrepreneurial concept study gives workers a broader view of market trends and consumer needs, a flexible problem-solving perspective, and situational adaptation. These are good survival skills in the rapidly-changing labor market.

Industry 4.0 with New Skills of Vocational Education

Human resource development plays an important part in the success of the economy. If workers' skills are not in line with the needs of the industry, it may prevent the economy from achieving its potential. The 4th Industrial Revolution impacted people's jobs and professional skills. Therefore, it is necessary for everyone to understand the application of digital technology and have digital literacy. At this point, human resource development is an important issue. International Labor Organization (ILO) analyzed the impact of Industry 4.0 and revealed that workers working in electronics and electricity are at high risk of being replaced by automation. Low-

skilled or unskilled jobs may be affected. Computers will be used to replace routine jobs. The skills needed in the 21st century, in connection to Industry 4.0, were workers must have the ability to learn to use technology expertly and learn to work with various data formats, including understanding and considering the environmental and social impacts of different technological and innovative options. The creation of educational, training, and learning alliances are required to develop technical and vocational training courses.

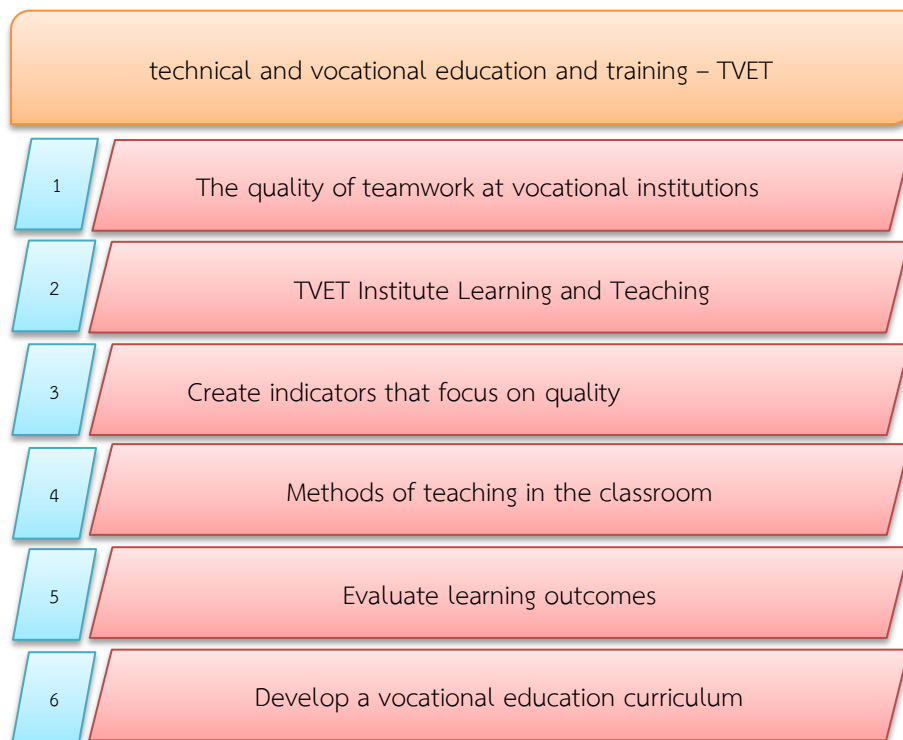


Figure 3 Development of Technical and Vocational Training Curriculum (TVEC)

The TVET Center provides effective instruction by focusing on the following implementation:

1. Promote quality culture and team working at vocational institutions.
2. Transform the learning and teaching paradigm of TVET.
3. Create quality-oriented indicators and set standards for quality improvement.
4. Promote classroom teaching for self-learning ability.
5. Evaluate learning outcomes using assessment tools in the classroom.
6. Cooperate with the industrial sector to improve and develop a vocational education curriculum.

Driving the Quality of Vocational Education

The Office of the Vocational Education Commission is the main organization in the production and development of manpower. It is necessary to plan and develop manpower to meet the needs of the establishments and have the ability to deal with changing technologies by emphasizing learners with critical skills and foreign language communication. In addition, the focus must be on the development of vocational teachers to have practical knowledge, ability, and specific expertise, including using digital platforms for learning. As a result, teachers can provide quality education management under the Human Capital Excellence Center (HCEC), and the production and development of vocational manpower meet the needs of the entrepreneurial sector.



Figure 4 Human Capital Excellence Center: HCEC

1. **Standard** Every vocational school should provide education according to vocational standards.
2. **Expert** Vocational institutions should have educational contexts conducive to vocational education management in specialized fields, focusing on dual system management.
3. **Excellence Center** Vocational institutions should have educational contexts and spatial contexts that facilitate vocational education management in the fields that meet the country's target S-Curve industrial development with a focus on an intensive vocational dual system.
4. **Human Capital Excellence Center: HCEC** Vocational institutions should be educational institutions that has a spatial context to enhance excellence and expertise, especially specialized colleges according to the value chain of occupations in industries in line with the country's target S-Curve industrial development. The vocational institution should be ready to upgrade to a specialized college and cooperates with domestic or foreign establishments intensively in the management of dual vocational education for at least 80% of the total number of learners. The establishments should participate in curriculum development, learning management, teacher development, learner development, and quality supervision at all stages of vocational education management.

Creating "National-Building Vocation"

Amidst a world that is transitioning to dependence on capital and technology-intensive industries, high-skilled workers are essential. The strategy for national education development focuses not only on general education but also gives considerable importance to vocational education. Vocational education is widely accepted in countries like Germany, South Korea, and Singapore with globally recognized quality. These countries are moving forward with the national industrial economy strategy, therefore the development of the vocational education

system always goes hand in hand. Because the global economy never stops, people development strategy through vocational education needs to be reformed and adapted in accordance with global industrial-economy trends.

The reform of vocational education instruction at each time mainly aims to produce labor to meet the labor demand trend at that particular time. To produce human resources to answer real situations, learners shall be allowed to learn through practical experience as much as possible. Vocational education in Germany implements a dual system of teaching where theoretical classes at school are organized along with internships in paid industrial establishments. Weight is placed more on the internship, in which students take experience from practice to share in the classroom. The dual system is considered very successful since it can produce students with skills that meet the company's needs and are ready to work as soon as graduation. Many students often work with internship companies. If not, they are qualified to work for other companies. Likewise, South Korea took Germany's model to pilot a new vocational school, called Meister Vocational High School (MHS) Program, which emphasizes learning from real practice as well as studying at school. MHS also emphasizes project-based learning (PBL) to reinforce important soft skills, including planning, team working, problem-solving, and creativity. In addition, MHS adopts the 'Employment First, University Later' concept. It supports students to start working in the industry immediately after graduation so that they have solid work experiences before furthering their higher education. Additionally, educational institutions in Singapore place great emphasis on providing hands-on learning. For example, the Institute of Technical Education (ITE), the main vocational education institution in Singapore, places more weight on learning through practice than theoretical learning in a proportion of 70:30. Furthermore, there are work-study programs to intensify the skills, knowledge, and experience of students. The success of vocational education in Germany, South Korea, and Singapore is largely due to the openness of the private sector to engage with education and the emphasis on learning from working with industrial establishments.

The participation model of the private sector is not only about setting curriculum direction and accepting students for internships, but also about funding and teaching resource support, technical support, and counseling. This allows educational institutions to have more funds and resources to implement and improve the quality of education. At the same time, the participation of private institutions also motivates young people to attend vocational institutions, whether by providing scholarships for students or guaranteeing student work contracts after graduation by quota. Another sector that plays an important role in the advancement of vocational education is the government sector. Since the government recognizes the importance of vocational education as a priority, it has developed a policy that continually promotes the development of vocational education institutions, especially by supporting funding and resources, as well as facilities and infrastructure development. The government also plays a critical role in motivating more people to attend vocational education. In South Korea, the government has policies to waive tuition fees for students in the MHS program, provide scholarships for vocational students, and postponed enlistment for up to 4 years if students are employed immediately after graduation.

In a rapidly changing world, workers need to continuously improve their skills and learn new things, even after graduation. Encouraging human resources from the vocational education system to 'learn for life' is an important agenda and is another key to the success of people development. In Germany, the Continuing Vocational Education Training (CVET) Program has been established for workers who have graduated from vocational education and have some work experience. Their jobs may be disrupted by changes in economic structure or they have individual demands to upgrade their skills. CVET adopts a dual system, whereby workers can work and study at the same time. A study timetable is subject to agreement between learners, employers, and educational institutions. The government also continuously provides incentives for workers to enter the CVET program through tuition support and special contributions for the unemployed and low-skilled workers. While in Singapore, there is the Skills Future Singapore (SSG) Program, in which the government has collaborated with educational institutions and companies to create more than 10,000 short courses in various professional fields for workers who want to develop their skills. This program is not limited to workers who graduated from the vocational education system.

The Singapore government also motivates Singaporeans to take Skills Future courses by granting initial credit money to all citizens at the age of 25 and periodically replenishing the credit to support tuition fees. Particularly, after the COVID-19 crisis, the Singapore government offers more tuition support packages, especially for courses related to skills development in the post-Covid, such as digital skills and artificial intelligence. Moreover, new courses are added to increase more choices of studies. South Korea is another country that focuses on the skill development of graduates. Government agencies at national and local levels together with the Chambers of Commerce Council and vocational institutions have established a number of skills training centers offering a variety of courses. Online learning platforms, e.g., K-MOOC (Korean Massive Open Online Course), are developed. Like in Germany and Singapore, the South Korean government motivates people to enroll in these upskill courses through tuition support. Furthermore, the South Korean government also aims to expand vocational education curriculums to accommodate the transition of the workforce into the 4.0 era.

Upgrading Thai vocational education to be the core of the country's development requires mobilization in many aspects from many sectors, i.e., education sector itself, the government's vision, policy, and support, as well as private sector support. Another important factor is that the public sector must have a positive attitude toward vocational education; otherwise, vocational education development is impossible. The success of vocational education in Germany, South Korea, and Singapore may guide all sectors of Thailand to cooperate in driving vocational education seriously and continuously. If Thai vocational education can be pushed to be the gear of the country's economy and the key to national development, it will make the phrase 'national-building vocation' more realistic. This is an indicator for the success of vocational education in Thailand.

Conclusion

The world's situation is changing in terms of science, information advancement, economy, society, and politics. There are likely to be many disruptions from various factors, such as economic stagnation caused by the impact of the COVID-19 pandemic, and the overall forecast of the technology deployment in jobs and skills in the next five years. This all affects the education management that produces human resources with the skills and readiness to cope with the changes. The Office of the Vocational Education Commission is the main organization in the production and development of manpower which is the main force in the country's development. Therefore, it is necessary to plan and develop manpower to meet the needs of business establishments and have the ability to cope with rapid changes in technology. The information that the Office of the Vocational Education Commission used to support manpower production management in the future consists of future change dimensions, world changes – vocational education changes, Industry 4.0 and new skills of vocational education, and the drive for vocational education quality and vocational education national-building. If Thai vocational education can produce and develop manpower to be the gear to mobilize the national economy and the key to national development, it will be an indicator for the success of vocational education management in Thailand.

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