Workforce Skill Development Policy Guideline for Industrial Revolution in Thailand

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Author’s contribution
The sole author designed, analysed, interpreted and prepared the manuscript.

Article Information
DOI: 10.9734/JESBS/2021/v34i1130376
Editor(s): (1) Chih-Wei Pai, Taipei Medical University, Taiwan.
Reviewers: (1) Sharif M. Abu Karsh, Arab American University, Palestine. (2) Po-Lu Chen, National Taichung University of Science and Technology, Taiwan. (3) P. R. Jeyalakshmi, Regional Center of University of Calicut, India.
Complete Peer review History: https://www.sciarticle4.com/review-history/77003

ABSTRACT
An article presents policies for Thailand’s workforce development under the context of the 4th Industrial Revolution. It will be helpful for executives to design policies to improve the country’s workforce. Within context, the changes from the impact of the Industrial Revolution were due to the influence of Disruptive Technology. The paper explores directions, trends, impacts, and policies for managing labor issues in the Disruptive Technologies era. Studying the opinions of 26 CEOs and executives of businesses in Thailand (2019-2020) used or affected by the Industrial Revolution, obstacles, feedback, focusing on issues, concepts about Disruptive Technologies, and vocational education concepts. They are using qualitative research methodology and procedures to support policy. The study results are the impact of Industrial Revolution on Thai workers and technological TVET Institution to develop Thai people during Industrial Revolution, educational management to develop Thai people in the Thailand 4.0 Therefore focuses on increasing labor skills and educating to create new skill / Upskill /Reskill for workers under reality.

The policy document also outlines recommendations from the public and private executives. The CEOs have advised on the issue of developing the skills and performance of the workforce in the future. The changes in the skills of older workers and summary provide policy recommendations to educational institutions and governments.

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Keywords: TVET; industrial revolution; disruptive technology; workforce.

1. INTRODUCTION

In the year 2030, more than 14% of the workforce is at high risk of replacing by automation, and another 30% changes in skills used in the workforce. Many countries worldwide have struggled to create young and working-class people with high enough work and life skills for disruptive technology [1-7]. Linked to changes in work and employment, Disruptive Technology is a term that describes the large-scale changes that have occurred from modern technology of robotics and automation [8]. It will have an immediate and severe impact on careers and work skills, a crucial part of the fourth industrial revolution [9-14].

In Joseph Bower and Clayton Christensen's article "Disruptive technology: catch the wave," he said that some new technologies could destroy or change the order of existing market domination or even create new markets [15]. Furthermore, in 1997, Clayton M. Christensen said that the model of technological development, Sustaining Technology, was a gradual improvement. Disruptive technology, a new storm, may initially be incomplete but can improve rapidly and efficiently beyond mainstream technology. Technology forecasters have identified a group of disruptive technology, artificial intelligence, 3D printing, advanced materials, and nanotechnology that create and expand each other, affecting socioeconomic, political, geographic, and population factors [16,17].

National Economic and Social Development Board (NEC) Information Specify the quarter unemployment rate. 3 (2017) at 1.2%, or 450,000 unemployed, 0.9% higher than the same period last year, 1% or 400,000 above the standard threshold. The use of industrial machinery is increasing, but the use of the industry is in line with the government's Thailand 4.0 policy, and the industry needs to use machinery in part because Thailand is moving into an aging society. The proportion of older people now reaches 10% of the population of 67 million, and in the future, it will increase to 20%, so the industry must prepare for production processes in line with people of working age due to lower birth rates.

For Thailand, "Thai People's Development 4.0" is the most critical factor driving the country from middle-income trap countries to high-income countries. The ideal educational arrangement for the development of Thai people 4.0 is TVET, In this paper, TVET is the brief name of Technical Vocational Education and training. Which is recognized worldwide for its role in preparing people to participate in the creation of work values and critical sources of the workforce and skilled workforces, and critical skills in the 21 centuries for TVET learners including 1) Science, Technology, Engineering, Mathematics (STEM), 2) problem-solving, and 3) 4C's (critical thinking). Communication, collaboration, and creativity. This study aims to explore directions, trends, impacts, and policies for managing labor issues in the Disruptive Technologies era, studying the executive's opinions of businesses used or affected by Disruptive Technology, obstacles and feedback, and other issues.

The concepts and theories involved in this research consist of two parts: 1) concepts about Disruptive Technologies and effects 2) concepts on Technical Vocational Education and Training (TVET)

1.1 Concepts about Disruptive Technologies and Effects

Disruptive technology refers to innovations or technologies that are used to create markets and value products that apply technology and severely impact the market of existing products, as well as potentially causing businesses that use traditional technologies to be knocked down or closed, unlike conventional innovations that Nama uses for efficiency-enhancing purposes. Increase product quality or reduce traditional route costs only. In its report, the McKinsey Global Institute identified 12 technologies that would influence global change:

1) **Mobile Internet** is a tool that uses Internet technology to connect with the world, such as mobile banking, which is an Internet financial transaction.

2) **Automation of Knowledge Work** is a technology or intelligent and intelligent software used to diagnose diseases to achieve accuracy or legal analysis.

3) **The Internet of Things** implants smallest to smallest sensors to transmit communications, which can be used, such as recognizing the quality of the soil from sensors sprinkled in the soil, knowing which crops should be grown with the best yield.
4) **Cloud computing** is a data storage technology and software that enables small businesses to compete with large businesses without investing in a high computer.

5) **Advanced robotics technology** is used in surgery to minimize patients' impact and accurate surgical outcomes.

6) **Autonomous vehicles are technologies** that are substituted in agricultural or forestry exploration, as well as military.

7) **Next-Generation Genomics** is an improved technology that develops genes to treat diseases.

8) **Fuel Cells** for use in electric vehicles and Highbridge. Next-generation storage

9) **3D Printing** technology is a 3D printing system that reduces the cost of production of goods by being used in dental and medical applications.

10) **Advanced Materials** technology is always the production of new materials such as self-cleaning materials. Ultra-strong and light, etc.

11) **Advanced Oil-Gas Exploration and Recovery** is a technology that advances in pioneering oil and gas mining. This makes it more oil and gas.

12) **Renewable Electricity Technology**: The Technology generates electricity from sources that never end, such as sunlight, wind, waves, hot springs, etc.

1.2 **Effects of Disruptive Technology**

Christensen, C. M., & Raynor, M. E. [18] classified the technology into two categories: sustaining technologies, a technology-focused on improving the efficiency of products in traditional mechanical systems. The other type of technology is called Disruptive technologies, which develop products/services to have new systems and look cheaper. Disruptive technology may or may not be the latest technology, perhaps an existing one. However, there are changes in specific market elements, such as quality, production process efficiency, cost, or price, making these technologies the right conditions desirable to become popular with the market.

1.3 **Concept about Vocational Education Educational & Training Techniques (TVET)**

The relevant concepts and theories in this section include 1) meaning, Technical Vocational Education and training (TVET), and 2) the skills required for TVET in the 21st century as follows: Technical Vocational Education and Training (TVET) is recognized worldwide for its role in preparing people to participate in creating work value and skilled sources of the workforce. According to a 2001 joint publication by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Labour Organization (ILO) on Technical Vocational Education and Training for the 21 Century, TVET is defined as 1) as an essential component of the ordinary line, 2) prepares people into the profession and the world of work effectively. Itohan Oviawe, J., Uwameiye, R., & Uddin, P. S. O., [19] Similarly, UNESCO (2009) defines TVET as public and private educational institutions in many forms. Formal or informal education is intended to provide all community members with access to this learning path throughout their lives.

From the above definition, TVET aims to eliminate ignorance. Increase knowledge, develop skills, and cultivate the attitudes necessary to enter the profession and advance [20], in line with the concept of Instrumental Sornil and faculty [21], explaining that TVET's goal is to develop people to their full potential. With the environment in mind, Empower people for sustainable development, provide lifelong education, have professional qualifications, manage open and flexible learning. Certified and compared to transfer experience, high priority to vocational education by designating it as a national agenda. Investment reforms have been implemented in line with the development plan. There are benchmarks for indicators in quality management; there is a link between different studies. Continuing education and work Use performance-based learning with the core skills, skills needed for lifestyle. Personnel must have the right qualifications, quality, and qualifications, with continuous improvements for the status of graduates and professional workers to be comparable to other professional fields.

Reeve, E. [22] wrote an article titled 21st-century skills students need in technical and vocational education and training (TVET 21). Furthermore, develop teaching and learning based on current educational concepts and practices.

2. **MATERIALS AND METHODS**

In conducting a study on the policies and management of labor problems in the Disruptive
Technology era by the overall formulation of research methodology or methodology introduced in this study (Fig. 1).

The study authors established the qualitative research methodology. The summary is as follows:

2.1 Documentary Research

For determining the methodology by using qualitative research processes with documentary research procedures, the study participants initially conducted the study process following the methodology by using qualitative research processes to study and analyze data from documentary research by reviewing relevant concepts, theories, and literature.

2.2 In-Depth Interview

Methodology is defined by structured interviews as interviews using all the same questions, an open-ended interview, a flexible and open methodology process.

Populations and samples: The target audience is executives who play a role in shaping the country’s labor policies. The key informant interview method to be interviewed, explicitly assigning respondents because respondents are targeted to suit the needs of the study participants, who are called "important informants, who are executives who play a role in shaping state policies related to the production and labor. Business units using Disruptive Technology of 26 people in Thailand.

Qualitative information obtained through interview research and documents is analyzed and processed by linking relationships in various factual terms. Both logically and effectively, in which the analysis is released in the manner of depiction, leads to answers in the study and is summarized academically, accompanying the report's writing. To point out the business operator’s perspective on the skills needed to spread the associated Disruptive Technologies. In Thailand 4.0 and the skills needed for students, students, labor, technical, vocational education and training (TVET), in Disruptive Technologies, develop policies to prepare future workers for these businesses.

3. RESULTS AND DISCUSSION

The Industrial 4.0 era results from disruptive technologies transforming traditional global economic mechanisms based on innovation and modern technology add value and revenue to the industries. It is necessary to restructure the workforce to be ready and enhance applying and using modern technology. The study results will focus on disruptive technology's impact on Thai workers and technical career education and training (TVET) to develop Thai people in the Disruptive Technology era.

3.1 Impact of Disruptive Technology on Thai workers


![Fig. 1. Conceptual framework](image-url)
Global Institute also estimates that the use of these 12 technologies can have an economic impact. In 2025, the estimate is not just a guess but an in-depth analysis of critical applications and can generate value in many ways, including consumer surplus demand (consumer surplus), as a result of better products, cheaper, and cleaner environment.

Many research agencies predict the trend towards modern technology, both automation. AI, IoT (Internet of Things) robots are widely used to produce goods, services, and everyday life, whether to replace or even take over the labor market. The OECD [23] estimates that over the next 15 years, 14% of workers are at high risk of being replaced by automation, and 30% face significant changes in the skills they use. In addition, many countries worldwide have experienced the problem of not creating young people and working-class people with work skills and life skills high enough to face disruptive technology.

According to Tanad Kaewcharoempaisan’s (2017) research, the S Curve 4.0 ecosystem’s workforce strategy is 60-70 percent in 2022. The software, technology, and IT industries will be the biggest hits, second only to Bio-Technology and retail, engineering, and construction. The energy industry, gas, oil, petrochemical, and electricity, is less affected. The researchers estimated the workforce to be disrupted between 2018 and 2021, estimating the impact on the workforce that requires the provision or restructuring of work skills to support Disruptive Technologies at 50 percent as follows in Table 1.

### 3.2 Career Education and Training (TVET) to develop Thai workforce

Education management for Thai people development In Thailand 4.0, there must be two emphasizes 1) increasing labor skills and 2) educating to create new workers following reality. Technical Vocational Education and Training (TVET) is recognized worldwide for its role in preparing people to create work value and skilled sources of the workforce. According to a 2001 joint publication by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Labor Organization (ILO) on Vocational Education and Technical Studies and Training for the 21 Century, it defines TVET as 1) as an essential component of the ordinary line, 2) as a way to effectively prepare people into the profession and the world of work. Similarly, UNESCO (2009) defined TVET in many forms as public and private educational institutions. Formal or informal education is intended to provide all community members with access to this learning path throughout their lives.

Reeve, E. [22] wrote an article titled 21st-century skills students need in technical and vocational education and training (TVET 21). Furthermore, develop teaching and learning based on current educational concepts and practices. It also means providing the critical skills needed in the 21 century, critical skills in the 21 centuries for TVET learners, and guiding how to build these skills in TVET programs, including science, technology, engineering, mathematics (STEM), problem-solving, and 4C’s (critical thinking, communication, collaboration, and creativity), which are consistent with the concepts in Serbphong Prabhyai’s article [24]. The necessary 21 skills of technical and vocational education learners in Thailand, the management of technical and vocational education in Thailand. Those involved need to provide students with core knowledge and key skills of the 21 centuries: 1) STEM skills, 2) problem-solving skills, and 3) 4 C’s skills. Detailed summary in Table 2.

### Table 1. Estimating the impact on the workforce that requires

<table>
<thead>
<tr>
<th>First S-Curve (people)</th>
<th>New S Curve Industry (people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Modern vehicles</td>
<td>1 Robots</td>
</tr>
<tr>
<td>2 Intelligent electronics</td>
<td>2 Aviation &amp; Logistics</td>
</tr>
<tr>
<td>3 Travel &amp; Health Tourism</td>
<td>3 Biofuels &amp; Biochemistry</td>
</tr>
<tr>
<td>4 Agriculture &amp; Biotechnology</td>
<td>4 Digital</td>
</tr>
<tr>
<td>5 Food Processing and Promotion</td>
<td>5 Comprehensive Medical</td>
</tr>
<tr>
<td>Total 6,509,264</td>
<td>101,482</td>
</tr>
<tr>
<td></td>
<td>103,001</td>
</tr>
<tr>
<td></td>
<td>3,796</td>
</tr>
<tr>
<td></td>
<td>11,576</td>
</tr>
<tr>
<td></td>
<td>44,060</td>
</tr>
</tbody>
</table>

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Table 2. Summary of core knowledge and key skills of the 21 century

<table>
<thead>
<tr>
<th>STEM Education</th>
<th>Creative Problem Solving 5-Step</th>
<th>4Cs Skill for learning and innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>S—Science</td>
<td>Step 1: Accessing</td>
<td>1) Creativity and innovation</td>
</tr>
<tr>
<td>T- Technology</td>
<td>Step 2: To come up with a solution</td>
<td>2) Critical Thinking and Problem-Solving</td>
</tr>
<tr>
<td>E- Engineering</td>
<td>Step 3: Selecting and preparing</td>
<td>3) Communication communicates</td>
</tr>
<tr>
<td>M- Mathematics</td>
<td>Step 4: Problem planning</td>
<td>4) Collaboration, collaboration</td>
</tr>
<tr>
<td></td>
<td>Step 5: Take action</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Summary of recommendation from CEOs and executive

<table>
<thead>
<tr>
<th>Issue</th>
<th>Recommendation</th>
</tr>
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<tbody>
<tr>
<td>1 Provides Technology</td>
<td>The business agency provides technology workers with the following qualifications to determine the following qualifications in time. Use technology as language skills. Manage data, improve Literacy.</td>
</tr>
<tr>
<td>2 Real Sector Needs</td>
<td>Technology skills, Adaptation skills, Quick learning skills, Emotional intelligence</td>
</tr>
<tr>
<td>3 Improve Skill for Lag People</td>
<td>Ways to improve employee skills (Lag People): develop to learn, understand, and use technology at a basic level, Focus on creating an experience for employees by providing training in departments or sending training in educational institutions or training in the organization by bringing talent, digital generations.</td>
</tr>
</tbody>
</table>

Summary of Education Management for Thai People Development In Thailand 4.0, there must be two emphases: 1) increasing labor skills and 2) educating new workers following reality. Realistic work means workers with flexible knowledge and skills and adapting to advanced technologies. Therefore, for work to meet the required standards, TVET development requires a professional standardization process, namely information related to work knowledge. Creating the necessary skills and attributes requires operational standards. Procedures and scope of operation Operational Equipment Proof of performance and expertise in technical skills knowledge, necessary competence and performance results, etc.

According to interviews with target audiences, executives shape state policies related to production and labor. The 26 business entities that operate Disruptive technology concluded that 1) the business agency provides technology workers with the following qualifications to determine the following in time. Use technology as language skills. Manage data, improve yourself regularly. 2) Skills of employees that the sector needs: technology skills, adaptation skills, quick learning skills, emotional intelligence, and 3) ways to improve employee skills: develop to learn, understand, and use technology at a basic level, focus on creating an experience for employees by providing training in departments or sending training in educational institutions or training institutions, and bringing talent, digital generations to the organization.

The general policy should support and directs what is expected. Do not discourage fear of disruption. Appropriate and flexible regulatory and legal policies and promote the country's ability to innovate or technology. At the same time, there must be a proactive policy if new technologies change the skill characteristics of the labor market by promoting technical career education and training (TVET) courses at both school and university level, flexible and adaptable. It can increase the learning opportunities of workers at work and throughout life.

4. CONCLUSION

Policy recommendations on the part of government and educational institutions for managing labor issues in the Industrial Revolution era.


2) In terms of data to get the data to work in the same direction. In the country's
technology and innovation, such as Artificial Intelligence: AI, Machine Learning. The collection of data of all relevant agencies following Article 1. To create a database and utilize the data to manage big data, such as the number of workers that must be produced should be in line with the needs of the labor market to achieve maximum efficiency. Increase the number of workers and reduce the unemployment of the number of domestic workers.

3) Establish standards, adjust attitudes, perspectives, and change values in Thai society to accept professional skills rather than focus on diplomas, focusing on graduating professions, having a job, or being independent.

4) A clear and concrete national strategy and a plan for developing technology and innovation must be defined. Such as Artificial Intelligence: AI, Machine Learning, etc., for both short-term and long-term plans (5 – 10 years) ahead while providing ongoing budget support.

5) It must raise awareness and awareness for people in the country, both in the private sector. The social sector and the general public have focused on the consequences of technology and innovation.

6) Promoting and supporting scholarships in technology and innovation such as basic technology in 4 areas: 1) Biotechnology 2) Nanotechnology 3) Material Science Technology Energy & Environment 4) Communication and digital information technology.

7) Government agencies such as the Department of Skill Development set standards, the Ministry of Labor should set and adjust the guidelines for training and development, focusing on 12 new technological and innovative skills to meet the needs of the workplace's workforce.

8) Students’ production of educational institutions under the Ministry of Higher Education, Science, Research and Innovation and the Ministry of Education should adjust the teaching curriculum to meet the needs of the market demand to meet the needs of the labor market sector.

9) The government should invest in opening a training center for speakers. Teachers with knowledge and expertise, including those at the center, must-have equipment. Advanced technology and increased access to the skills training of modern technology by providing a large and adequate number in all country regions.

10) Force and welfare are configured to motivate professionals in such professions. Work with educational institutions in teaching and research to develop new personnel and innovations in the country.

11) The government should focus on the national agenda for developing and raising awareness for the country's people in technology and innovation.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

As per international standard or university standard, participants’ written consent has been collected and preserved by the authors.

ACKNOWLEDGEMENTS

The author would like to thank all informants and qualified persons interviewed for information and participants in the Higher Certificate Program in Public Policy Management and Public Law. Class 18 The King Prajadhipok's Institute has been involved in coordinating information collection and compiled this article.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle4.com/review-history/77003