

# Evaluation of Indonesian Technical and Vocational Education in Addressing the Gap in Job Skills Required by Industry

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**Abstract**— The demand for labor change in the industrial revolution 4.0 era has become a fundamental challenge for Technical Vocational Education and Training (TVET) to quickly and efficiently meet the needs of changing economic skills and especially in the field of electrical engineering. Indonesian Central Bureau of Statistics released data on unemployment rates in Indonesia is still relatively high and dominated by vocational education graduates. It is ironic considering that vocational education is designed to prepare graduates who are ready to work. It is allegedly due to the lack of links and matches between TVET and the world of work and industry. This article will comprehensively evaluate the relationship and compatibility between TVET and the world of work in the field of electrical engineering. The research uses a qualitative approach based on observation, interviews, and discussion with practitioners of TVET in electrical industries. The findings of this study indicate a substantial mismatch between TVET and the needs of the business and industrial world, especially in the electrical engineering field. Most TVET Institutions in Indonesia have limitations in terms of quality human resources, facilities, and infrastructure that meets standards, lack of cooperation with industry, curricula that are in line with work needs, and weak in modern work culture on campus. Based on data analysis and findings, recommendations for a framework to strengthen relations between TVET providers and the manufacturing sector have been proposing for use by education planners in building or improving existing TVET.

**Keywords**— *evaluation TVET, job skill, skill gap*

## I. INTRODUCTION

The rapid progress of science and technology in the 21st century marked by the industrial revolution 4.0 requires all elements to change all aspects of human life [1], [2]. In general, national economies in all countries are highly developed by growth, technology, and industry. The rapid industrial expansion in the industrial era 4.0, which occurred at an extraordinary pace, increased the need for a workforce with high knowledge and skills. The workforce needs to have the necessary technical and advanced skills for safety approvals needed by the world of work and industry. Some researchers have increased the development of knowledge and technology has increased the qualifications of workers with new and complex competencies, especially for technicians and engineers in the labor market and industry, likewise, the demand for technicians and engineers in electrical engineering [3], [4].

Changes that occurred in the Industrial Revolution era 4.0 encourage innovation in the field of technology that has an impact on fundamental changes to lives. One example of change is the emergence of a battle between conventional and online business. This change in business pattern has never been imagined before, like in transportation, trade, lodging, rental and other businesses. The impact, the public becomes easier to get services and even at very affordable prices. Disruption does not only mean the phenomenon of change today but also reflects the meaning of the phenomenon of future change [5], [6]. The era of disruption can encourage the development of new products or services, creating diverse consumers and lower prices but can also disrupt or damage existing markets. The era of disruption will continue to give birth to significant changes to respond to the demands and needs of consumers in the future. It is not only in the change in ways or strategies but also in the fundamental aspects of the business. The domain of the disruption era extends from the cost structure, culture to the industrial ideology. The implication is that business management is no longer centered on individual ownership, but becomes a division of roles or collaboration or cooperation [6], [7].

The pattern of change caused by the industrial revolution 4.0 and the impact of technological disruption is certainly very influential in education. The primary purpose of TVET is to produce graduates who are ready to enter the world of work and industry, are required to be able to produce graduates who have competence [1]. Future TVET graduates are required to master the knowledge, skills, work attitudes needed in the industrial revolution 4.0 era. For this reason, TVET needs to reform how to explain and match the education system to meet the future. Changes in education include a paradigm shift from the perspective of local people's lives to global society, changes from social interaction and cohesion to democratic participation, and changes in economic growth to human development. UNESCO as a world organization that handles educational problems in 1998, has formulated four pillars of education, namely: (1) learning to know, (2) learning to do, (3) learning to live together and living with others, and (4) learn to be, as well as lifelong learning (lifelong learning).

To improve the national economy, the Government of Indonesia has developed vocational education as the spearhead of the preparation of human resources. Over the past ten years, the government has increased vocational education at secondary and higher levels. It can be seen from the Ministry of Education and Culture's strategic plan to change the proportion of vocational schools to 70%

compared to 30% of Catholic schools in 2025 [1, 2, 25]. The policy of opening vocational education is excellent, considering that Indonesia has a large population of 267 million in 2019 (BPS, 2018). Based on data on the directorate of higher education, there are 563 electrical engineering study programs and 166 electronic engineering study programs. Increasing the amount of education is expected to improve the quality of work in Indonesia and increase the improvement of the national economy. However, the expansion of vocational education that is not accompanied by labor demand and quality will backfire for vocational education itself.

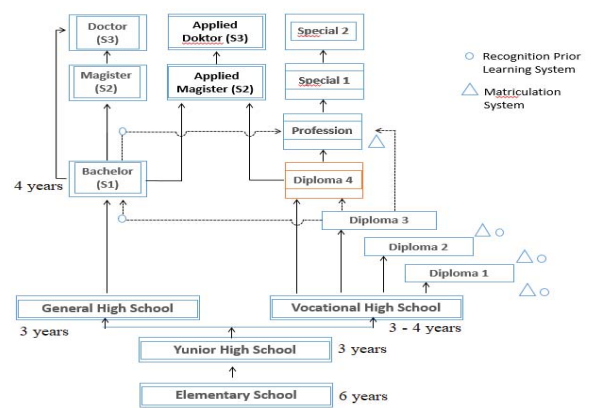
However, reality shows that many vocational education institutions produce unemployment. Based on the release of data from the Indonesian Central Bureau of Statistics, the number of unemployed in Indonesia is dominated by vocational education (11%) and diploma education. (7.92%). It is in sharp contrast to TVET's educational goals for preparing courses to be ready to work. A large number of vocational education graduates who are unemployed shows a severe problem in the management of TVET education in Indonesia. There are many gaps between the competencies of TVET graduates and industry needs. These gaps can be caused by various factors, including the gap between supply and demand, the gap in curriculum content in TVET education, the gap in the competence of teachers who teach in TVET education, the equipment gap used in vocational education, the gap in learning methods and others.

This phenomenon is a big problem that needs to be investigated why vocational education graduates are the most significant contributor to unemployment in Indonesia. This article is part of research on developing a vocational education model in Indonesia that will discuss and evaluate vocational education, particularly in electrical engineering, in addressing the skills gap required by industry.

## II. LITERATURE REVIEW

Historically vocational education emerged from human needs to increase technical competence and increase their economic position in society. There are many notions about vocational education. Vocational education is defined as technical training provided in schools or classes under public supervision and control or contract with the State Council or local educational institutions. It is carried out as part of a program designed to suit individuals to find work as semi-skilled workers or skilled or technicians in a recognized job [7]. TVET is broadly defined as education primarily to direct participants to acquire practical skills, skills, and understanding and is required for employment in certain occupations, trades, or occupational groups [8]. Practical skills or knowledge can be provided in various settings by many providers in both the public and private sectors.

Challenges Vocational education in the present and future is related to quality, relevance, and efficiency. How vocational education can meet the needs and demands of the world of work, quality, and organized more effectively and efficiently [9]. Vocational education in Indonesia is divided



into two categories, namely secondary level vocational education, which is held at the vocational school level, and vocational tertiary education in tertiary institutions. Vocational higher education is called professional education.

Graduates can obtain intermediate degrees in Diploma 1, 2, and 3 (D1, D2, D3) and applied a bachelor in D4. Educational institutions in Indonesia developed, monitored, evaluated by the National Education Standards Agency (BSNP). The accreditation and quality control process is carried out by the National Accreditation Board [15].

The philosophy of vocational education mostly uses the theory of democratic education conceived by John Dewey and the basic principles of the implementation of vocational education recommended by Charles Prosser. Dewey explained that the TVET mechanism must be developed with a democratic educational pattern. Students must be directed to be able to explore their capacity to participate in all aspects of social life. Vocational education must be able to carry out the process of cultural transmission and transformation through equality of position in race, ethnicity, socioeconomic status in society. Every student has a complementary view of others, can solve problems [8].

### 2.1 TVET and Industry Relationship

Rapid changes in the era of the industrial revolution 4.0 require the world of work and industry must respond to changes quickly and accurately. Various changes are needed to improve work effectiveness and process efficiency to survive and develop excellence. One aspect needed is human resources, both those that already exist or that will enter the workforce. For this reason, the role of TVET is needed in providing resources that can adapt to a dynamic environment. TVET Institutions must open and establish relationships with the world of work and industry to respond to changes in human resource needs. The dynamics of the relationship between educational institutions and the world of work are studied by several experts, including [9], [10] mainly related to the gap between higher education outcomes and world competencies demanding employment.

TVET institutions need to improve relations with the industry. Good relationships are intended to optimize learning in preparing graduates effectively and efficiently. Therefore, an appropriate and accurate information system is

Figure 1. Indonesia Education Model

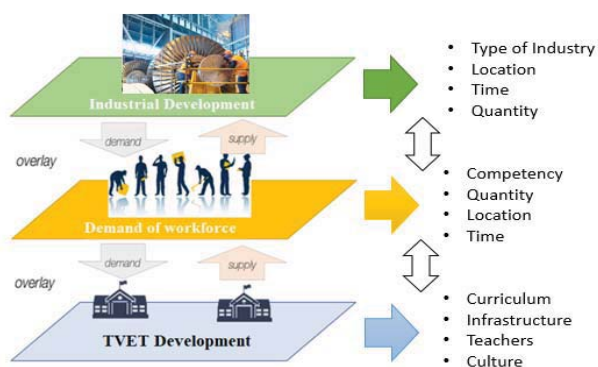


Figure 2. TVET Institution and Industry Relationship [35]

needed in collecting and analyzing data on future workforce needs. Data and information contain the qualifications required, the number and time, and location of their needs [11, 12].

The relationship between TVET institutions and industry can be seen in various aspects. There are several critical factors formulated by researchers in the TVET field and summarized as follows: 1) Policies and Strategy. The first and primary factor in overcoming the work skills gap between TVET institutions and industry is the policy and strategy [13], [14]. The policies and strategic objectives of the TVET organization can be managed by developing human resources following increased knowledge and skills [15, 25].

2) Curriculum, the curriculum is a blueprint for the education system, for that TVET institutions must design and implement the curriculum following industry needs. Curriculum reviews and improvements must be carried out periodically to suit the development of science and technology, teaching and learning methods, the needs of the labor market and industry, globalization, and digital transformation in the era of the industrial revolution 4.0.. The curriculum must be designed by involving related industries to prepare a highly competent workforce that has adaptive knowledge and skills [16], [17], [18].

3) Learning Process, the Learning process is essential factor in the success of the TVET Institution to meet the needs of the industry. The TVET institution must provide a variety of flexible learning methods to accommodate the diverse needs of students and their learning styles. There are many learning methods in vocational engineering programs such as Project-Based Learning, Job-Based Learning, Distance Learning, E-Learning, Blending Learning, and other active learning [2, 19].

4) Partnership, The success of the TVET Institute in meeting the needs of the world of work and industry cannot be separated from participation and cooperation with the right industry. Collaboration and partnerships with industry have a central role in the success of TVET institutions, which have a significant influence on national economic growth. Cooperation between TVET and industry can be carried out in various forms of activities such as student internships, industrial visits, curriculum development, seminars and workshops, the involvement of industry experts as guest lecturers, training for teachers, staff in the industry, training for technical staff at the TVET Institute, research, and other related activities [20], [21].

5) TVET needs to be accredited by an independent professional body to ensure that the program is relevant to industry needs without the intervention of unauthorized parties. TVET accreditation has an important role in improving the quality and relevance of education according to the needs of industry and the job market. Good accreditation can be used as a means of monitoring, evaluating, and improving vocational education programs with an agreed mechanism that is accepted by the TVET community and other stakeholders. [22], [23], [24].

6) Teacher's Development, TVET institutions must develop teachers as central and most essential resources through advanced study, training courses, seminars, workshops, and internships to increase knowledge and skills [1, 25]. The development of teachers and teaching staff should be a priority for TVET because it takes a long time. Human resource development can be done through formal and non-formal education. Staf development should not interfere with all learning processes and services.

7). Culture, TVET institutions must be able to develop an academic culture that is conducive to preparing students and graduates for industry-relevant soft skills. The cultivation of a work culture that is safe, productive, effective, and efficient, which characterizes the industry, must be an essential part of the educational process at TVET. Occupational Health and Safety is one of the most critical aspects in preparing vocational education graduates so that it needs to be improved in the learning process, both theory and practice. Soft skills such as interpersonal skills, communication, discipline, responsibility, respect for others, and organizational culture significantly affect the success of workers in a job and knowledge and skills in science. [11], [2].

8) Facilities and Infrastructure, TVET Institute must provide adequate facilities and infrastructure to support the learning process. Classrooms, laboratories, workshops, equipment, and devices used in learning activities must refer to work competencies in the industry [9]. Many TVET institutions in Indonesia, especially in electric power engineering, do not yet have adequate facilities to carry out the learning process, both theory and practice.

### III. METHOD

This study uses a qualitative approach to uncover the phenomenon of vocational education problems in Indonesia related to the suitability of graduate competencies with industry needs. Qualitative research is used to interpret and understand their experiences to understand the social reality of individuals to obtain, analyze, and interpret data content analysis from visual and textual material. This approach will provide a detailed understanding of human behavior, emotions, attitudes, and experiences of those involved in vocational education in Indonesia.

Data is collected through observation, the study of documents, and interviews. Observations were made on educational facilities and infrastructure, learning processes, and culture developed in the TVET environment. Document review is carried out on curriculum documents, policy studies, and government strategies in the development of TVET, the collaboration between TVET and stakeholders, especially with industry and accreditation documents. In comparison, interviews were conducted with academics who manage and teach in TVET education and industry

practitioners who work in the electrical engineering field. The focus of the questions on the interview is related to the problems of labor originating from TVET institutions and how efforts to overcome the gap in relations between TVET and industry.

#### IV. RESULT AND DISCUSSION

Based on observations of students who carry out practical work in the industry, following job recruitment in industry, and in-depth interviews with industry practitioners in electrical engineering in Indonesia, several findings can be described as follows.

##### 1. Policy and Strategies

###### a. Gap Between TVET and Industry

TVET's policies are less strict so that many industries recruit general education graduates (SMA and Bachelor) than TVET graduates (SMK, Diploma 1, 2, 3, and 4). The process of recruitment by the industry that considers the same between TVET graduates and academic education tends to harm TVET graduates. Policies to increase vocational education need to be adjusted to the number of labor demands and quality improvement. Practitioners in the industry regret that the implementation of vocational education policies is not optimal. This condition has an impact on the difficulty of finding workers according to industry needs. For this reason, the industry is forced to provide apprenticeship and education and job training both within and to job training institutions. Of course, this creates an additional burden for the industry.

###### b. Alternative Solution

Educational policy needs to be straightened where TVET's position is more focused on preparing graduates who are ready to work. The current practice is that many TVET graduates do not work but continue their studies and move on to academic education. The policy of increasing the number of TVETs must be accompanied by an increase in labor market demand and increased quality. The policy of revitalizing vocational education must revitalize truly vital aspects.

##### 2. Curriculum

###### a. Gap Between TVET and Industry

TVET's curriculum, especially in the electrical engineering field, is still not following the needs of the industry. The structure of subjects in the curriculum does not yet reflect compliance with the competencies required by industry, indicated by many TVET students and graduates who are less competent in standards, electrical drawing, international codes, measuring instruments, and work standards in the electrical engineering field. Students who carry out work practices in the industry complain about the mismatch between course content and the competencies required in the world of work. Likewise, many technicians complain about the necessary electrical abilities of students in the aspects of reading technical drawings, understanding of standards, working methods, and using measuring instruments.

###### b. Alternative Solution

The industry needs to be involved more intensively in TVET curriculum development. The elucidation of the graduate profile, the competencies needed which

are revealed to be a list of subjects, must be compiled together between TVET and industry appropriately. The curriculum as an educational blueprint must be a reference for all components of education. Infrastructure, learning, teachers, learning processes, culture development, and funding must refer to curriculum design. Revitalization needs to be done by an in-depth review of the vocational education curriculum, especially in electrical engineering. The preparation of the TVET curriculum must involve academics and industry practitioners who fully understand the problems in electrical engineering work.

##### 3. Learning Process

###### a. Gap Between TVET and Industry

The learning process at TVET still tends to be the same as the learning model in academic schools. The active learning process for preparing skills is often only done with simulations because of the limitations of the tools. Practical learning is still carried out based on the routine of old materials, even though it is no longer relevant to the development of science and technology due to the limited ability of teachers. Many students complain about learning too many theories that are not relevant to working in the industry. The courses are too stiff and only discuss the skin. Practitioners also stated the same thing, based on their experiences while studying at school.

###### b. Alternative Solution

TVET learning approaches, strategies, models, and methods need to be reconstructed so that students have a clear description of the work to be pursued. The learning process must be able to motivate students to learn well and continuously. TVET teachers must have competence in the field of work, job experience, and convey learning material well so that it motivates students to learn both independently and in teams. Dual system learning, such as in Germany, needs to be reviewed and implemented to sharpen student competencies. Learning theory in schools needs to be followed up with real work in the industry to enrich material and skills.

##### 4. Partnership

###### a. Gap Between TVET and Industry

The partnership between TVET and industry is mostly only on paper in a Memorandum of Understanding (MoU). Follow up from the MoU is still lacking. Implementation of collaboration between TVET and industry is only dominant in sending students to the practice industry and only takes three months. The lack of partnership sharpens the gap between TVET and industry. Industry practitioners expect research collaborations with vocational education to undermine their problems.

###### b. Alternative Solution

The partnership between TVET and industry needs to be increased in various activities such as compilation of curriculum, seminars, workshops, research, student internships, guest lecturers, industrial visits, training, exhibitions, guest lecture, and other collaborative activities. There needs to be a breakthrough in the concept of the relationship between TVET and industry. The government, through related

institutions, needs to facilitate collaborative activities through real policies and programs.

## 5. Accreditation

### a. Gap Between TVET and Industry

TVET accreditation still prioritizes administrative aspects. Many TVET institutions have the proper accreditation, but in reality, the conditions still do not meet the standards, especially the graduates. On the other hand, there is a TVET institution that is of excellent quality, but because of poor administration, it receives an ordinary rating.

### b. Alternative Solution

The TVET accreditation process needs to involve the industry. The preparation of the TVET accreditation form emphasizes the ability to produce graduates who have competencies according to industry needs.

## 6. Teachers

### a. Gap Between TVET and Industry

Many teachers do not have work experience in the fields taught. Learning processes more in aspects of theory and practice in laboratories where the equipment and conditions are not following the real conditions in the industry. Many teachers do not have work experience in the field being taught. The learning process is more on the theoretical and practical aspects of the laboratory where the equipment and conditions do not follow the real conditions in the industry. Many students complained about teachers and lecturers in delivering unclear material, and the material presented was not following the syllabus and lesson plans. Even if it is appropriate, the contents are too simple and not applicable. This opinion is reinforced by practitioners in the industry who state that the main problem of vocational education lies in the competence of teachers.

### b. Alternative Solution

Teachers, as the backbone of TVET education, must have competence and work experience in the area taught. Teachers who have never worked in an industry need to be sent an internship for at least one year to have competence and industry work culture. There needs to be a change in the pattern of teacher and lecturer recruitment so that they are able to produce professional lecturers. The government needs to develop an effective and efficient teacher quality improvement program involving practitioners in the industry.

## 7. Culture

### a. Gap Between TVET and Industry

The work culture of the industry that prioritizes aspects of productivity, efficiency, safety, and discipline is still not optimal at TVET institutions. Many vocational schools are synonymous with juvenile delinquency, brawl, and other harmful things. This culture results in students and graduates not being ready when entering the world of work and industry.

### b. Alternative Solution

TVET institutions need to develop and instill a modern culture in the school environment. Culture formation can be done through academic learning activities in the classroom, practice in the laboratory, or other activities in the school. Planting discipline,

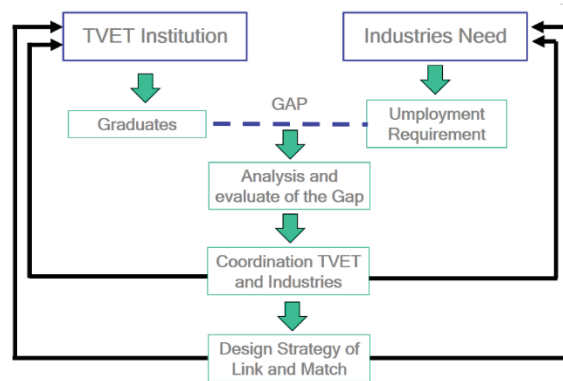


Figure 3. Addressing the Gap in Job Skills Required by Industry

honesty, accuracy, effectiveness, efficiency, and Gap Between TVET and Industry safety need to be accustomed to school activities in learning theory, practice, and extra-curricular activities.

## 8. Facilities and infrastructure

TVET facilities and infrastructure are still not following the needs of workers in the industry. Many vocational schools do not have standard laboratories and workshops. There are even vocational schools that do not have laboratory facilities for practice, so learning is done by simulation.

### a. Alternative Solution

TVET institutions need to design learning equipment, especially practices according to industry needs. The government needs to encourage closer collaboration between vocational schools and industry. It is necessary to develop the concept of sharing resources in vocational schools to improve effectiveness and efficiency.

Efforts to improve the quality of vocational education in Indonesia, especially in electric power engineering, need to be carried out by analyzing the factors that significantly influence the relationship and conformity with industrial needs. The analysis of the point of view of vocational education and industrial needs will result in a gap that then needs to be found for the root cause so that a solution can be found. The gap between vocational education and the need for labor in the industry can be overcome by carrying out good communication and cooperation.

The vocational education curriculum, especially in electrical engineering, must be well designed and involve input from stakeholders. Vocational education must improve the quality and quantity of cooperation with various parties related to the industrial sector. Vocational education needs to apply excellent and professional governance to planning, organizing, implementing, and controlling effectively and efficiently. Cooperation and communication need to involve related parties such as the Ministry of Education, the Ministry of Manpower, the Ministry of Trade, and other parties. The framework for gap analysis and coordination between TVET and industry needs and other is presented graphically in Figure 3.

## V. CONCLUSION

To overcome the gap between TVET education and industry needs requires efforts that involve many aspects. To overcome the gap between vocational education and industrial needs, it is necessary to have a body consisting of representatives of TVET stakeholders to hold coordination and regular meetings. This body aims to identify the need for the industrial workforce, the number of labor requirements for each field of expertise, and the location of current and future needs. Through these meetings, the TVET study program can be designed and developed to produce a qualified and competent workforce to meet industry needs. TVET study programs must be designed according to the following aspects: policies and strategies, curriculum development, learning processes, partnerships with industry, accreditation to guarantee the quality, teacher development, development of industrial work culture, and improvement of infrastructure quality.

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