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Identification Key Factor in Link and Match Between Technical and Vocational Education and Training with Industry Needs in Indonesia

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***Abstract*—Indonesia as a developing country has many problems in terms of providing a trained and professional workforce according to industry needs. For this reason, the Government developed the Technical and Vocational Education and Training (TVET) institution, to increase the supply of skilled labor for the job market and industry needs. The problem is that TVET graduates still do not meet industrial needs, which is indicated by a large number of unemployed graduates. This article aims to uncover the key factors that cause the lack of link and match between TVET and industry needs. The method used is a qualitative analysis of the phenomenon of link and match TVET and industry in Indonesia. The analysis is based on a literature review on the implementation of TVET in various countries and interviews with relevant stakeholders. The focus of the discussion includes 3 points: 1) How does TVET education currently meet the labor requirements needed by industry? (2) What factors need to be considered in increasing the link and match between the world of education, especially TVET and industry needs, (3) How to improve Link and Match between TVET and the industry. The result showed that there were 9 factors which became the main key influencing the link and match between TVET and industry needs. For this reason, efforts are needed to improve the relevance and suitability of TVET with the industry to improve the quality of graduates.**

Keywords: key factor, link and match, TVET, industry needs

I. INTRODUCTION

Law No. 20 of 2003 concerning the Indonesian Education System states that National Education has a function to develop capabilities and shape dignified national character and civilization in order to educate the life of the nation. This is in line with the ideals of the founders of the Indonesian Nation which were expressed in the opening of Constitution. Explicitly, the founder of Indonesia has formulated the concept of national education which goals to evolve the students' potential to be believed and faithful in God, have a moral noble, healthy, knowledgeable, capable, creative, independent, become a democratic and responsible citizen and able to play an active role in efforts to educate the life of the world. For this reason, all efforts to improve the quality of education must be based on the objectives of the country listed at the opening of the 1945 Constitution.

The rapid advancement of science and technology in the 21st century requires all elements to change adjusting the development of science, technology, globalization and industrial revolution 4.0 that cannot be contained in all parts of the world and all aspects of human life [1], [2]. The world of education cannot be separated from the influence of globalization, it is also required to make fundamental changes. These changes can take the form of: (1) a paradigm shift from the perspective of the lives of local people to global society, (2) changes from interaction and social cohesion to democratic participation (especially in education and citizenship practices), and (3) changes in economic growth to human development. UNESCO as the world organization that handles education issues in 1998, has formulated four pillars of education are: (1) learning to know, (2) learning to do, (3) learning to live together and life with others, and (4) learning to be, as well as lifelong learning (learning throughout life).

The national economy in all country and their education system are strongly influenced by the growth of science, technology, and industry. The rapid industrial expansion in industry 4.0 era which is happening at a remarkable pace push improved the requirements for manpower with high knowledge and skill. The manpower needs to be provided with basic technical skills and advanced knowledge that must be updated regularly, to meet the demands of globalization and the manufacturing sector. Some researchers have observed that the rapid development of science and technology has affected in increased qualifications of workers with new and complex competence, especially for technicians and engineers in the labor market and industry [4], [20]. Likewise, the demand for technicians and engineers in electrical engineering [2].

Macro data shows that in Indonesia today there is a tendency that many new vocational educational institutions are opened massively to increase the number of graduates who is ready to work. This is in line with the Ministry of Education and Culture's strategic plan to change the proportion of vocational schools become 70% compared to 30% of public schools in 2025. The problem is that the opening of vocational schools is not accompanied by the provision of adequate infrastructure, competent teacher capabilities, partnership and collaboration with the industry and good financial management. On the other hand, productive employment opportunities in Indonesia are also limited, so educated unemployed people are relatively high [24]. Another problem, based on the predictions of McKinsey Global Institute (MGI) in 2030, Indonesia is predicted to experience a shortage of educated and skilled workers, but precisely the excess of unskilled labor. There is a gap between demand and availability of labor Educated work is also supported by ILO data (2015) on workers who do not meet educational and skills qualifications whose

proportion reaches more than half. The existence of these problems is increasingly urgent to be addressed in line with the implementation of the ASEAN Economic Community and various other regional agreements at the global level because the lack of educated and skilled labor will be filled by foreign workers. Thus, the collaboration and synergy of the university high with the business world and the world of industry both at the national and international levels need to be improved.

The Indonesian Bureau of Statistics (BPS) announced data that stated unemployment in Indonesia was dominated by TVET graduates, vocational school graduates (11%) and Diploma Education (7.92%). This is ironic considering that TVET is an education that aims to prepare graduates to be ready to work. For this reason, it is necessary to find reasons why TVET graduates are the biggest contributors to unemployment in Indonesia. This article is part of the plan to develop and improve TVET's education model in Indonesia in an effort to improve the quality of education and improve workforce competence. This article will discuss the link and match between TVET and industry needs. In the next study, an in-depth evaluation of the gap between TVET and industry needs will be carried out, especially in the area of electrical engineering. From the results of this gap evaluation, a TVET education model will be developed that can meet the needs of industries in Indonesia

II. RESEARCH METHOD

The method used in this study is the study of literature and in-depth interviews with stakeholders involved in TVET education. Literature study was conducted by examining research results related to TVET in various countries while interviews were conducted to 1) industry parties, namely technicians and engineers working in companies in the electricity sector, 2) TVET parties consisting of managers, instructors and students in Higher Educations, 3) Vocational Training Managers in Indonesia and 4) TVET Managers in Indonesia. The interview focuses on the types of questions: (1) Does TVET education currently meet the labor requirements needed by the world of work and industry? (2) What factors need to be considered in improving the links and compatibility between the world of education, especially TVET with the needs of the world of work and industry, (3) How to improve relations and compatibility between the world of education requires TVET and the world of work and industry.

III. TVET IN INDONESIA

TVET is one of the most important education sectors in Indonesia designed to produce ready-to-work human resources to increase productivity and the national economy. Indonesia has regulated education issue in Law No. 20 of 2003 including TVET. Indonesian TVET system consists of two parts, are (1) vocational education, and (2) vocational training system for work.

A. Vocational Education

Indonesia provides vocational education the upper secondary level in vocational schools (Sekolah Menengah Kejuruan or SMK) and higher-level vocational education in Universities, Institutes, Polytechnics, Technical Colleges under the supervision of the Higher Education Board (Direktorat Pendidikan Tinggi – DIKTI). The vocational higher education was called as professional education. Graduates can obtain an intermediate degree in Diploma 1, 2 and 3 (D1, D2, D3) and applied bachelor in D4. The education institutions in Indonesia was developed, monitored, evaluated by The National Education Standards Agency (Badan Standar Nasional Pendidikan – BSNP). The accreditation process and quality control are carried out by the National Accreditation Agencies [15].

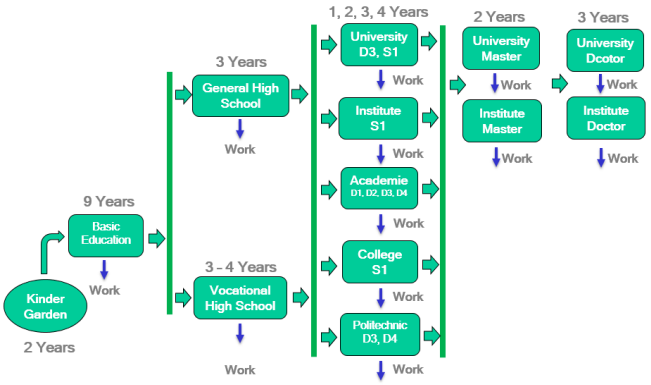

Fig. 1. Education system in Indonesia

B. Vocational Training

Vocational training in Indonesia was regulated by the Labor Law (UU 13/2003) and the regulation (PP 31/2006) about the national training for work system. This program is managed by the Ministry of Manpower and Transmigration that provide labor training centers. It offers some vocational training to increase the competencies graduate from general high school, vocational school, and higher education institutions to fulfilled industry demands [15].

IV. LINK AND MATCH BETWEEN TVET AND INDUSTRY

The rapid change in the world of work as a result of globalization and the industrial revolution has demanded anticipation and evaluation of the competencies needed by the working world. The dynamics of the relationship between institution educations with the world of work studied by several experts, including [26], [25] mainly related to the gap between outcomes higher education and world competency demands work. The role of TVET institutions in providing a competent workforce in the industry 4.0 era is very important. The national economy desperately needs a competent workforce so that it requires a quality education system especially TVET.

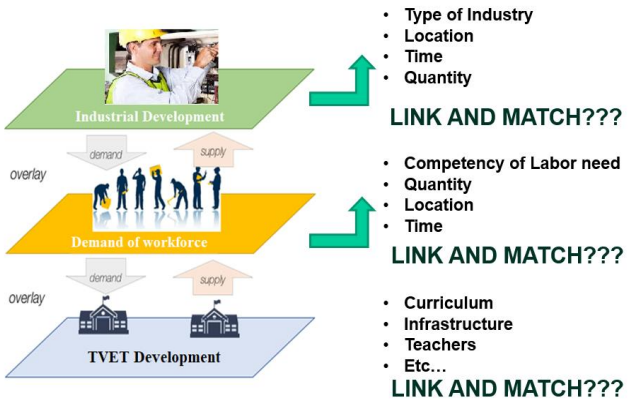

Fig. 2. Link and Match between TVET and Industry Needs

The link and match between TVET Institutions and industry are very important to be continually improved. TVET institutions must have good and deep relationships with relevant industries to optimize learning in preparing graduates effectively and efficiently. For this reason, a system is needed that is able to collect and analyze information about future labor needs that can be used at the right time to produce employees with the skills needed at the time and location where the skills are needed as shown in fig. 2 [1], [12], [27].

There is a gap between the education system with the job market and industry in Indonesia [24], [27]. Graduates produced by education institutions are not appropriate with what industries need. The link and match concept between TVET institutions and industries need. There are for aspects that must be considered to link and matched between TVET and industries need are 1) Quality, 2) Quantity, 3) Location and 4) Time [28]. Government as a regulator must be able to control the four aspects to reduced and minimized the gap between TVET and industries need.

V. KEY FACTORS LINK AND MATCH TVET AND INDUSTRY NEEDS

The praxis of TVET and vocational education in general in the world are driven mostly influenced by two foremost figures, John Dewey and Charles Prosser. In Indonesia, the development of TVET was more influenced by John Dewey's philosophy and in its implementation adopted the Prosser theory. The basic principles of organizing vocational education were put in place by Charles Prosser in 1925 as the most widely used theory of vocational education. This theory states 16 main things in the implementation of vocational education as work education.

The 16 theories state that vocational education will be effective if as follows: (1) Learning environments must be designed as closely as possible with the real work environment. (2) Education and training process are carried out in the same way, with the same operations, the same tools, and the same machines as in the work itself. (3) Students are accustomed to thinking and working as needed in real work. (4) Motivate students to increase interest, knowledge, and skills at the highest level. (5) Just for anyone who needs, wants and is able to profitably it. (6) Forming thinking and work habits continuously in accordance with the needs of the job. (7) Teachers and instructors must competence and have a successful experience. (8) Students must have a minimum productive ability. (9) Pay attention to job market demand. (10) Students must be given job habits and character. (11) Students must be given a reliable source from the experience of the occupational experts. (12) Students must be given a specific body of content according to their needs at the job market. (13) Meet the specific needs of any group when they need it. (14) Teaching methods must pay attention to relationships with students who consider the specific characteristics of the particular group. (15) Management and administration must be flexible than rigid and standardized. (16) Needs sufficient financial support.

VI. RESULTS AND DISCUSSION

Based on literature studies in various countries and interviews with TVET stakeholders in Indonesia, the following results were obtained:

1) TVET's condition in Indonesia is now quite good but of course, there are still many problems that must be resolved. One of the main problems of TVET in Indonesia is the work and industry world contest on TVET education to improve links and compatibility. Now, this is impressed because TVET lacks support from the world and industry. Regarding the industry in TVET education it is better not only for work practice programs or student internships, which are approved in other aspects such as policy and strategy, curriculum development and development, facilities and infrastructure development, teaching qualifications, teaching, evaluation, management of TVET, change and other related aspects.

2) Based on the literature review and interviews of the parties involved in TVET in Indonesia, 9 key aspects that are crucial can be identified, namely:

   a) Policies and Strategy

      Providers and users of TVET must link and match the policies and strategies to increase the efficiency and effectiveness of the TVET system in Indonesian. A good strategy can guarantee all stakeholders can know and understand their respective abilities to work effectively and efficiently [13], [22]. The strategic policy and objectives of a TVET organization can be managed by developing human resources in accordance with the enhancement of knowledge and skill [10].

   b) Curriculum

      TVET institutions must design and apply the curriculum in line with the industry needs. The curriculum must be reviewed and updated regularly to adjust the growth of science and technology, learning and teaching methods, the needs of the job market and industry, globalization, and the industrial revolution. The curriculum must be designed involve with relevant industries for preparing high competent workforces that have adaptive knowledge and skills [3], [6], [14], [17].

   c) Learning and Teaching

      TVET institutions must provide a variety of flexible learning methods to accommodate the diverse needs of students and their learning styles. There are many methods of learning methods in vocational engineering programs such as Project-Based Learning, Work-Based Learning, Distance Learning, E-Learning, Blending Learning [2], [8], [23].

   d) Partnership

      TVET institutions must have a good partnership and cooperation programs with related industries as a strategy to improve quality. Collaboration and partnership with industry have a central role in the success of TVET institutions that have a major influence on national economic growth. Collaboration between TVET and industry can be done in the form of curriculum development, industry visits, the involvement of industry experts as guest lecturers, seminars and workshops, student internships, training for teachers, staffs in industry, training for industrial staffs in TVET Institutions,

research, and other relevant activities [16], [21], [31].

e) Accreditation

TVET institutions need to be accredited by a professional body to guarantee that the program is relevant to the industry needs. Accreditation of vocational education programs is an instrument to improve the quality and the relevant for industry needs and the job market. The purpose of the accreditation is to monitor, evaluate and increase the vocational education programs with the agreed mechanisms accepted by the TVET community and other stakeholders [5]. Moreover, accreditation is a very important process to maintain the quality of vocational education so that TVET can be recognized and graduates can work in various countries in the world [5], [18].

f) Funding and Quality Management

Finance is an important factor in the implementation of education, especially TVET. Therefore, TVET must have sufficient funding to provide vocational education both in terms of investment in facilities and infrastructure, costs of learning, certification, competency testing, and other costs. For that TVET must be managed well and professionally. TVET institutions can optimize collaboration with industry and related parties in managing and sharing resources included in joint funding [27], [28].

g) Teachers and Staff Development

TVET institutions must develop teachers and staff as main and most important resources through advanced study, training courses, seminar, workshop, and internship to increase knowledge and skills [1], [32]. TVET institutions must be able to manage advanced study programs for teachers and staff because they require a long period of time. TVET must be able to guarantee the sustainability of all learning and service processes during the sending of teachers and staff for further studies [35],

h) Culture and Atmosphere Academics

TVET institutions must develop a culture to prepare students and graduates in the aspects of soft skills that are relevant in the industry. Aspects of work culture in the world of work and industry must be an important part of the education process in TVET. Planting the importance of work culture and Occupational Health and Safety needs to be improved at TVET institutions. The success of workers in a job is not only influenced by factors of knowledge and skills related to the field of expertise but also influenced by interpersonal skills in the organizational context in the form of organizational culture [2], [11].

i) Facilities and infrastructure

TVET Institutions must provide facilities and infrastructure in supporting the learning process. Design of laboratory, workshop, tools, and devices used in lab-work must be suite to the industry [9], [33], [34]. Many TVET Institutions in Indonesia still have a problem in facing inadequate facilities to do the learning process both theory and practice in the laboratory.

3) To improve the quality of TVET Institutions, it is necessary to analyze the key factors whether TVET has links and matches with industry needs. The results of the analysis of TVET and the industry will produce gaps which then need to be improved to minimize the gap between TVET and the industry. The gap between TVET and industrial needs can be narrowed through good communication and relationships between TVET Institutions and related industries and involving relevant parties such as the Ministry of Education, Ministry of Manpower, 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.

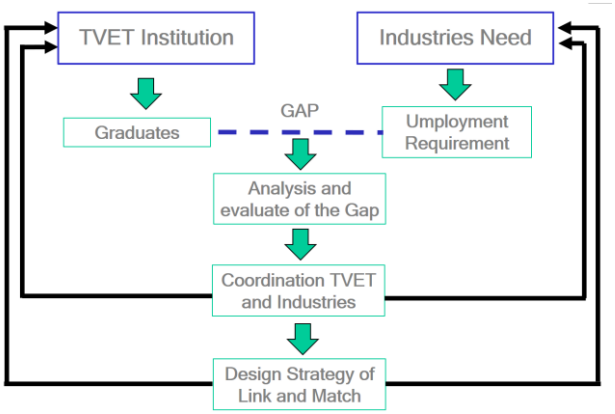

Fig. 3. Gap Analysis between TVET and Industry Needs

It is necessary to establish a body consisting of representatives of TVET stakeholders to hold regular meetings to identify the requirements of the industrial workforce, the number of workforce needs for each field of expertise, the location of needs in current, and period both now and in the future. Through the meeting, the TVET study program can be designed and developed to produce a qualified and competent workforce to meet industry needs. The TVET study program must be designed according to the following aspects: Policy and Strategy, Curriculum Development, Submission of Curricula, Industrial Partnerships, Accreditation, Quality Assurance, Teachers and Staff Development, and Cultural and Atmosphere Academics Aspects.

VII. CONCLUSION

Based on a literature review of the experience of the implementation of TVET in various countries and the results of TVET stakeholder interviews in Indonesia, several points can be concluded namely:

- TVET's current condition in Indonesia is generally quite good although of course there are still many problems that must be resolved. One of the main problems of TVET in Indonesia is the involvement of the world of work and industry in TVET education to increase link and match.
- Key aspects that are very important to consider in order to increase the link and match between TVET

and the industry are: 1) Policy and Strategies, 2) The Curriculum Development, 3) Learning and Teaching Method, 4) TVET and Relevant Industries Partnership, 5) Accreditation system in TVET, 6) Funding and Quality Management, 7), Teachers and Staff Development, 8), Culture and Atmosphere Academics, and 9) Facilities and infrastructure.

- To improve the quality of TVET in Indonesia, it is necessary to improve the TVET model that more involves the world of work and industry and pay attention to 9 key factors link and match TVET and the industrial world.

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