

## Strategy for Enhancing Quality of Labor through Technical Vocational Education & Training Faces Industry 4.0 Challenges

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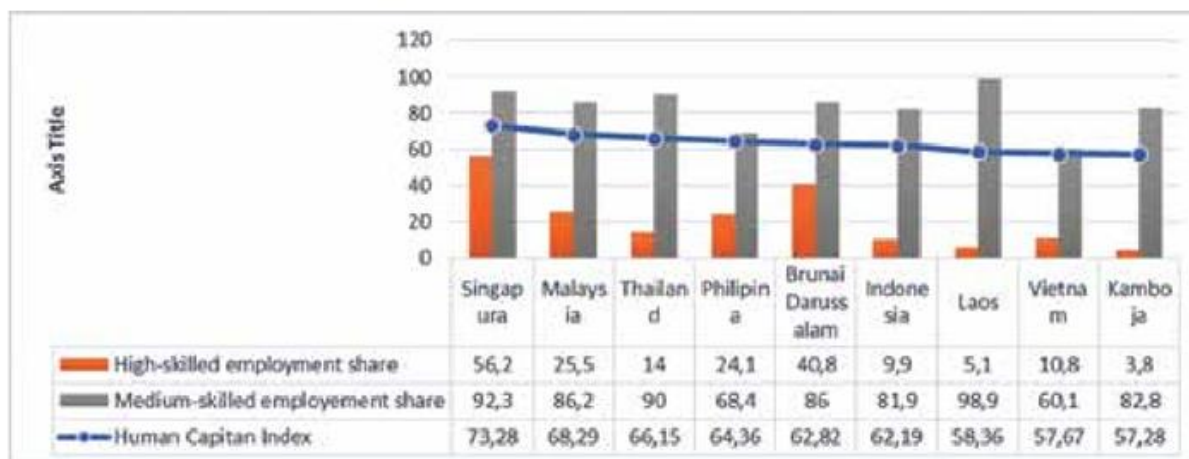
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**Abstract.** The field of Indonesian Manpower, the low competence of manpower makes it increasingly difficult for workers to find work. Vocational education which is more oriented on expertise and mastery of practice can be a solution to reduce unemployment and prepare workers in the Era of the Industrial Revolution 4.0 and global labor market competition. This study aims to analyze the readiness of the Indonesian government in improving the quality of human resources through technical vocational education and training. The research method used is descriptive qualitative. Primary data collection is done through FGD mechanism and questionnaire distribution. From the results of the study it can be concluded, reforms need to be made to the technical vocational education & training system, among them; relating to the provision of infrastructure and equipment to support the use of industry 4.0 technology, the creation of Vocational high School that have advantages and graduates needed by the labor market, avoiding overlaps between vocational high School, vocational training center and polytechnic, and the empowerment of associations, industry and society in improving the vocational system. Improvements to the technical vocational education & training system need to be supported by a sustainable funding system including through the Unemployment Benefit and Skill Development Fund.

**Keywords:** Technical Vocational Education & Training, Workforce Quality Improvement, Industrial Revolution 4.0, Unemployment Benefit, Skill Development Fund

**INTRODUCTION** In 2017, the majority of Indonesia's population worked in the informal sector at 50.64% (BPS, 2017). Informal workers in general have not received adequate social protection and employment so that they are included in the category of vulnerable workers (Infid, 2018). The Indonesian workforce is 60% junior high school and below, so the

largest employment rate in the community is dominated by people with low education (BPS, 2017). Indonesia is in the 10th position of ASEAN countries when viewed from the perspective of high skilled employment share and ranks third lowest for medium skill employment (WEF, 2018). Human Capital Index in ASEAN countries can be seen in Figure 1.

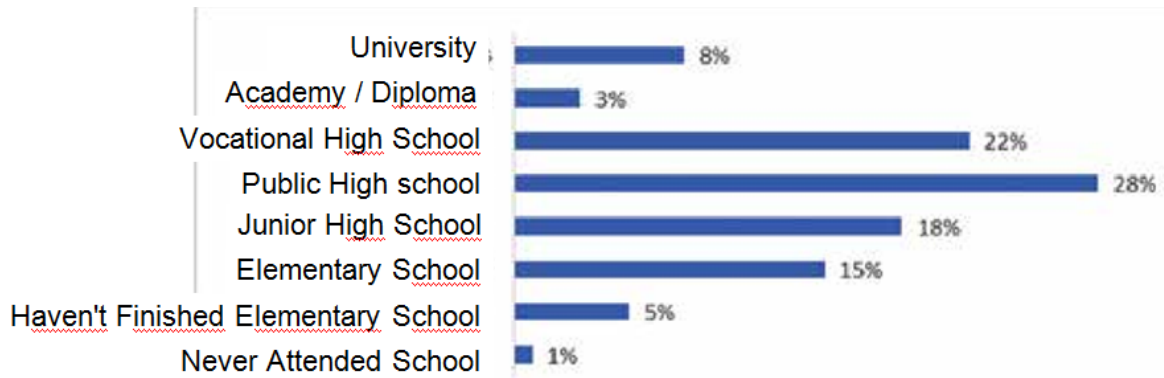


**Figure 1.** Human Capital Index, High Skilled and Medium Skilled Employment ShareSource : Word Economic Form 2018

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The biggest unemployment rate in Indonesia when viewed based on education level, the biggest contribution is Public High School. Senior secondary education that focuses on skills, namely Vocational High Schools, also contributes

high to the unemployment rate, even though the graduates have been prepared as workers who can be directly absorbed by the labor market (BPS, 2016). The level of unemployment for each level of education can be seen in Figure 2:



**Figure 2.** Unemployment Rate Based on Education Level in Indonesia 2016 Sumber :  
Coordinating Ministry for Economic Affairs

Projections going forward with the 4.0 industrial revolution, there will be a need for new workers who are growing rapidly. This is an opportunity as well as a threat to Indonesia's young workforce to get decent jobs. With the demographic bonus that will be experienced by Indonesia in 2030, it provides an opportunity for the Indonesian government to build a better welfare. The obstacle faced by Indonesia is that the level of education of the people is still low and unskilled. This is due to the quantity and quality of education in Indonesia is still low. The quality of education graduates in Indonesia has not met the needs of the workforce and the business world, so that many industries find it difficult to get a competent workforce in accordance with technological developments.

To prepare workers to enter employment in the formal sector, it turns out that formal education is not enough, so they finally can only enter the informal sector. vocational and Education training are needed to fill the gap in formal education in Indonesia. Graduates of vocational and education training have not yet to meet the job market. This is due to the absence of a mechanism for direct work placement or apprenticeship after completing vocational and education training (Infid, 2018).

The Government of Indonesia has created a Vocational and Education Training Roadmap for 2017-2025 as an effort to overcome the not yet achieved link and match between Vocational and education training outputs with industry needs. This study aims to analyze the



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efforts of the Indonesian government in preparing the quality of human resources in the industrial revolution 4.0 through Vocational and Education Training.

Previous studies relating to the analysis of Technical Vocational and Education Training (TVET) conditions in Indonesia have not yet discussed the government's strategy to be able to manage TVET in an integrated manner through the Skill Development Fund and Unemployment Benefit funding system. This research is more focused on an analysis of the readiness of the Indonesian government in carrying out the 2017-2025 Vocational Education and Training Roadmap along with the opportunities and challenges faced.

## METHOD

The research was carried out through theoretical and empirical studies of relevant research references and results, and continued through Forum Group Discussion/(FGD (Supari, Nita, et all, 2019). The research method is qualitative with data collection techniques through in-depth interview methods, observation methods, document methods. (Spradley, James P. 1979). Presentation and analysis of data is done through the stages of description, analysis, and interpretation (Creswell, John W. 2013).

## RESULTS AND DISCUSSION

### Concept (TVET) and Perspectives on Education in Indonesia 21st Century

In various literatures related to education, the term TVET is often found, which stands for Technical and Vocational Education and Training. The purpose of Education and Training is the occurrence of behavior changes in the direction that is in accordance with the wishes. From specific objectives, both have differences in terms of achievement. Education is more directed towards general and less tangible knowledge, while training is more directed towards specific and more tangible behavioral skills. It can be concluded that training is part of a more specific education. The technical education is an educational program that aims to prepare workers at the technician or sub-professional level one level above the craftsman but below the professional. Vocational education is an education program to prepare workers at the craftsman or company level at the primary level. In TVET education and training run in rhythm where TVET is education and training which aims to prepare the workforce according to the needs and demands of employment in this case is the business and industrial world that is link and match (Unung, Jalius, 2018).

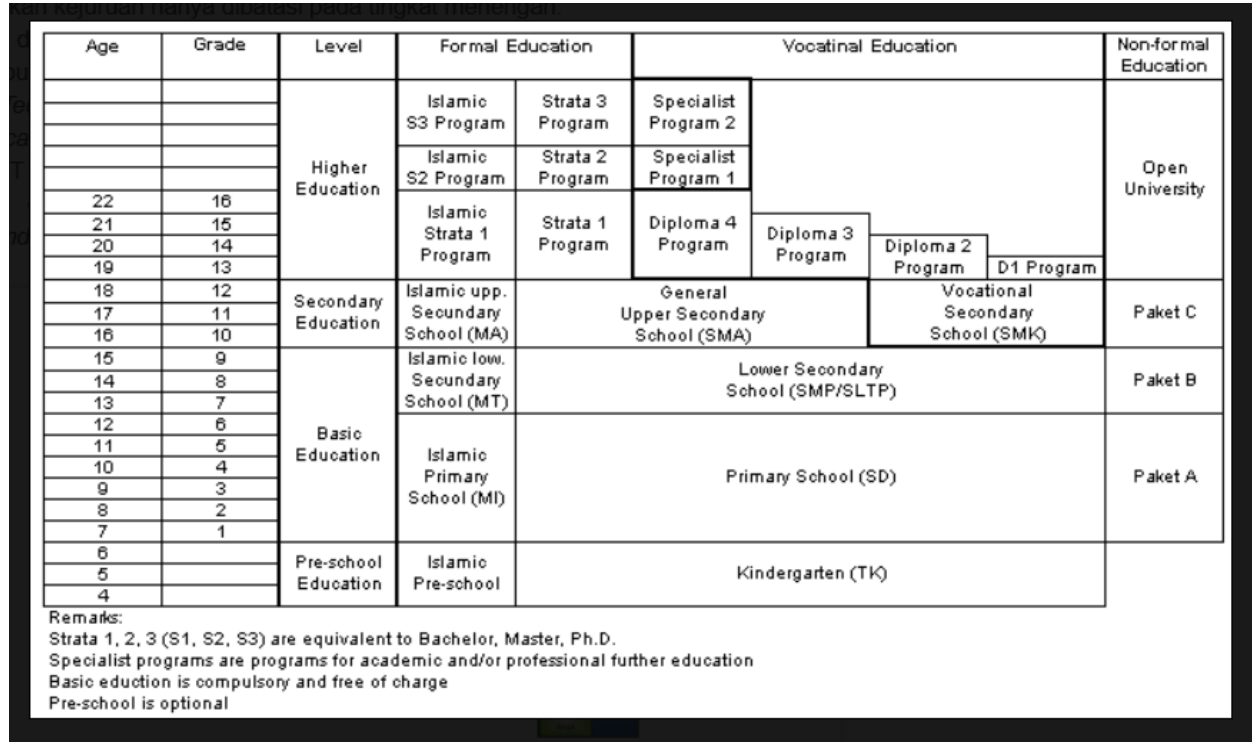
Guided by the National Education System Law No 20/2013 Article 14; there are the terms "Vocational Education" and "Technical Educational". The purpose of vocational education, which is secondary education, is to prepare students to work in certain fields. Technical Education which is a higher education aims to prepare students to have certain occupations and



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areas of expertise equivalent to a bachelor's program. Based on the definition from UNEVOC, vocational education and technical education are

referred to in one term, namely Vocational Education. The position of vocational education and technical education can be seen in Figure 3.



**Figure 3.** Indonesian Education Scheme in Perspective UNEVOC

In general the main objective of TVET is to prepare a skilled workforce. In Indonesia, the term vocational education is used for secondary education, such as vocational education/SMK and technical education for higher education such as the scope of academies, colleges, polytechnics, institutes, and universities. Legally it can be seen in the Law on the National Education System (Sisdiknas) Number 20 of 2003. Article 15 of the National Education System Law (Unung, Jalius, 2018).

Mainstream TVET in the world generally rests on the definition of jobs in the business and industrial world (DUDI). Thus, in general, talking about technical learning and vocational education is always

associated with employment calculations and economic growth (Waras, 2017). Through TVET, prospective workers are guided as well as being equipped with knowledge and skills so that prospective workers can become workers who have strong identity of work and have high order thinking skills.

Working in the industry is in a different environment from the school environment. Development of soft skills for the long term includes the development of mental endurance, work discipline, scales endurance, and positive behavior of students / residents learning. While the short-term goals include: developing insight into work in the industry (Suharno,

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Kamsidjo, et al (2017). Vision of TVET XXI Century is the development of technical and vocational education and training for all communities, lifelong learning, creating welfare equality and equity, alleviating poverty & unemployment, increasing career, strengthening sustainable development (Putu, 2016). According to Sudira (2018), the XXI century workforce must be prepared to be ready to work, able to improve the quality of production and services in the world of work and be

able to become entrepreneurs. TVET's learning strategy needs to be more flexible and innovative so that it can give birth to a competent human resource where competency acquisition has three main elements namely 70% experience, 20% training and 10% education (Moedjiman, 2018). The process of acquisition of competencies and the path to improving the quality of human resources can be seen in Figure 4

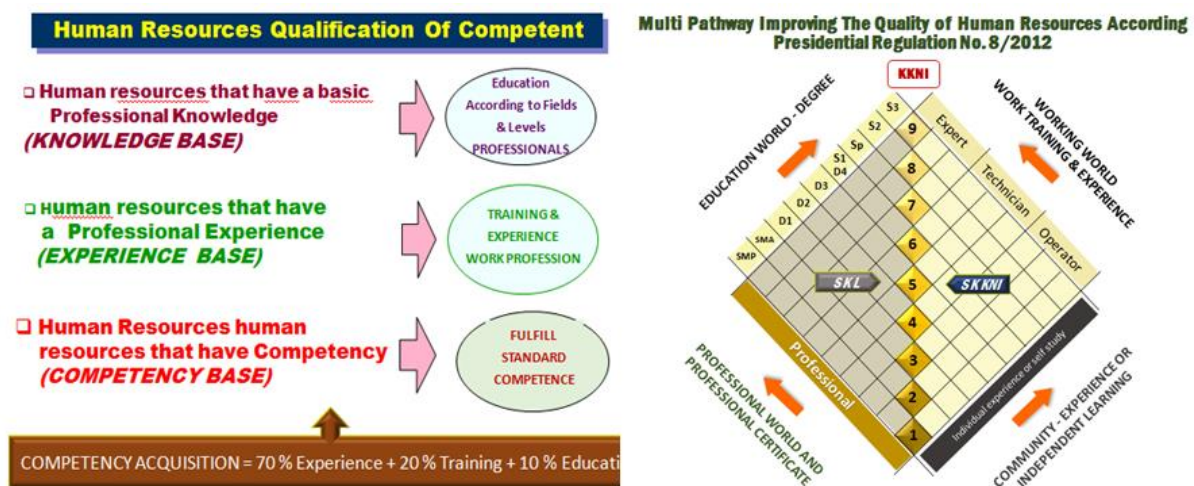


Figure 4. The Process Of Acquiring Competencies And Improving The Quality Of Human Resources Resources (Moedjiman, 2018)

According to Trilling & Fadel (2009) XXI Century competencies include; learning and innovation skills consist of mastering diverse knowledge and skills, critical thinking and problem solving, communication and collaboration in collaboration, and creativity and innovation, digital literacy skills namely information literacy, media literacy, and ICT literacy, career and life skills consisting of flexibility and adaptability, initiative, social and cultural interaction, productivity

and accountability, leadership and responsibility. Multi competencies and knowledge in the XXI century and the industrial era 4.0 needed must be integrated into the vocational and vocational education elements. Government policies for the revitalization of vocational education and vocational education in Indonesia must include the Industrial Era Vocational Education Chronosystem 4.0 which includes, learning systems, education units, students, and



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educators and education personnel (Muhamad Yahya, 2018). Vocational and vocational education can play a maximal role in economic development if harmony is pursued with the world of work around it, both in terms of quantity, quality, location, and time. Vocational education and vocational education will also play a maximum role in economic development if they are able to integrate their programs with the existence of regulations, policies, planning, and government budgeting in the era of regional autonomy as it is today (Slamet, 2011).

### **Absorption of Vocational Workforce & Prediction of Workforce Competency Needs in the Industrial 4.0**

TVET is an education that is focused on preparing and equipping graduates to be immediately ready to work according to the type of field of expertise. However, there is still an assumption that vocational education is considered as second class causing limited development of vocational education in Indonesia. The presumption that is developing at this time is that the condition of vocational education in Indonesia is still unable to be aligned with countries with advanced vocational education such as Germany or Singapore because of the limited access and quality of vocational education in Indonesia. In fact, vocational education provides practical competency training in preparing graduates to be ready to work immediately and immediately absorbed in the labor market.

In facing the development of automation trends, good human resource planning is needed, including for vocational education graduates as a basis for the development of Vocational Education (SMK), Vocational Training Centers (BLK), and Polytechnics. The development of vocational education itself must be based on the needs of the industry in the future which will certainly be influenced by the level of economic growth and also the different levels of automation in each industry.

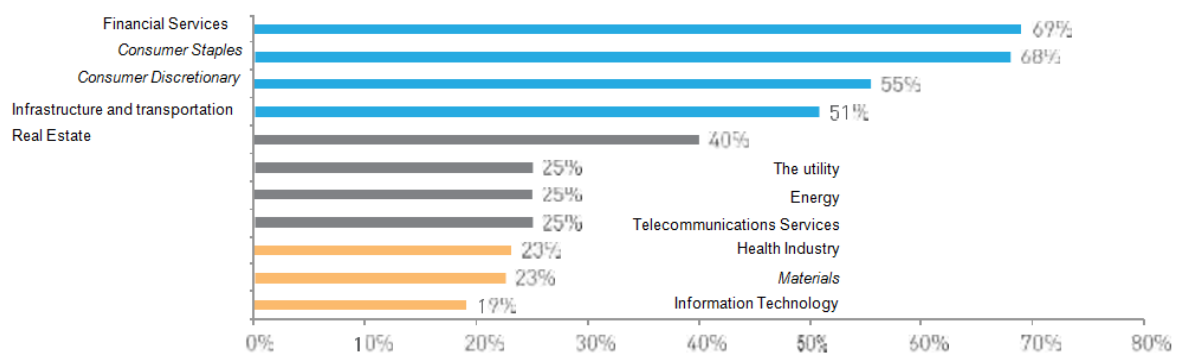
The trade, restaurants and accommodation sectors along with Community, Social and Individual Services are the two sectors that have experienced increased absorption of vocational graduates. On the other hand, although the agricultural sector remains the largest absorber of vocational graduates, in the past 10 years there has been a decline in absorption from this sector. The highest growth of the industrial sector per year in the 2016-2025 period is estimated to be in the health industry sector (14.49%), IT (12.74%), and telecommunications services (10.15%). This is driven by various factors such as demographic developments, community incomes, and also trends in automation and digitalization. The digitalization factor will be a key factor in changing the competency needs of the workforce. The 4.0 Industrial Revolution driven by information technology will create a lot of new competency needs from the workforce. However, this

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development will also eliminate the type of work currently replaced by automation.

The more diverse competencies needed in the future, companies will also recruit candidates who are considered to have expertise even if only armed with self-directed learning online. Going forward, online courses will increasingly progress with the development of augmented reality (AR), virtual reality (VR) and artificial intelligence (AI). Although university degrees still continue to play a large role after 2025, more employers will receive alternative qualification systems as each candidate changes their assessment and online self-directed learning options develop.

The level of automation in Indonesia is still quite low compared to other countries, and is expected to increase and reach its peak in the next 20 years. The highest level of automation risk for vocational graduates is in the financial services industry (69%), consumer staples (68%), and consumer discretionary (55%) due to routine and repetitive types of work. The industrial sector with the highest increase in vocational graduate employment needs in the future is the Information Technology industry sector (11.5%) and the health industry (11.3%) due to the high potential for industrial improvement and also a relatively low degree of automation. The projection of the level of automation in Indonesia by sector can be seen in the figure 5.



**Figure 5.** Projected Risk Level of Automation of Vocational Graduates by Industrial Sector

Source : McKinsey Global Institute

**TVET Development Strategy in Indonesia**

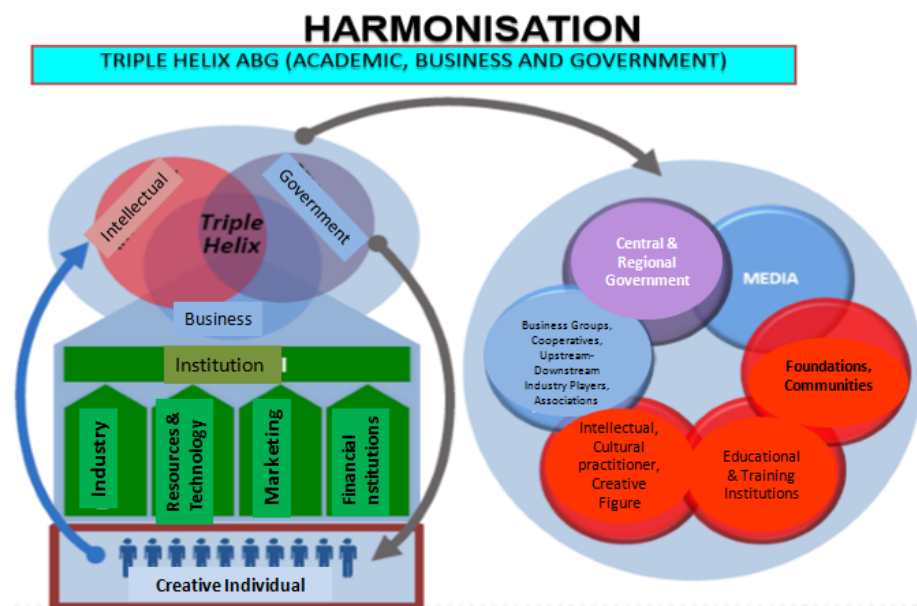
The government has prepared the 2017-2025 Vocational Education and Training Roadmap. In the roadmap the policy focus is wrong on vocational education and training institutions. Vocational High School (SMK) is intended to prepare workforce education level 2 operators of

the Indonesian National Qualification Framework (KKNI). Vocational students must be prepared to face the real jobs that exist in the business and industrial world. Polytechnic to prepare workforce education for higher level thinking and white collar jobs. As well as the Vocational Training Center (BLK) to prepare workforce

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training for those who need short-term skills as well as upskilling and reskilling for those affected by automation and critical economy. The focus of the policy is the fundamental improvement of vocational education and training which includes improving educational institutions, raising competency standards, increasing the

quality of apprenticeship, increasing facilities & infrastructure, increasing funding, and increasing coordination. To achieve the goal of fundamental improvement, it is necessary to harmonize between academic, business and government as shown in Figure 6.



**Figure 6.** Harmonization in the Framework of TVET Fundamental Improvement

Sumber : (Paristiyanti, 2016)

The learning system on TVET must be in accordance with the needs of employment so that it can increase graduates' absorption rates and work productivity in the industry. Employment productivity will be able to increase economic growth, economic growth will eventually be able to expand and open new jobs. The application of the Dual Training System, as in Germany, features around 70% learning in companies and 30% learning in vocational schools. The actual training takes place at the company while the vocational school

provides theoretical and background knowledge as well as reflections from work experience learning. Ideally, learning is arranged directly in the work process (Joachim, 2010).

Based on the 2017 Global Talent Competitiveness Index, Indonesia has a good rating (ranked 65) in terms of Vocational and Technical Skills. With this position, Indonesia has the potential to get maximum results if fundamental improvements are made to the quality and vocational education system. Based on a survey conducted by INSEAD on the

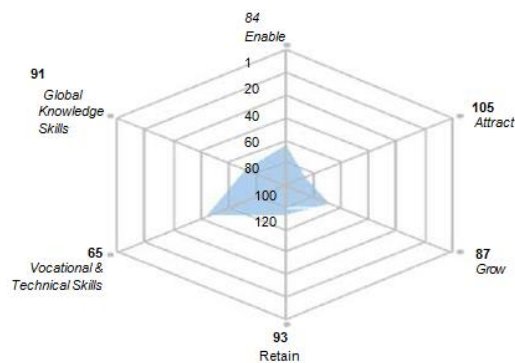


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Global Talent Competitiveness Index which can be seen in the figure 7, it was found that:

- Mid-level skill (vocational) in Indonesia turns out to be far better than 5 other fields, namely; Enable, Attract, Grow, Retain & High Level Skills (Global Skills)
- Indonesia is ranked 93 out of 118 countries in terms of expertise at the mid-level skills (vocational) level. Indonesia scores quite well on the

indicator of the population level with secondary education (ranked 65) where 22.44% of the population in Indonesia has secondary education. However, indicators of labor productivity and availability of technicians and associate professionals are ranked low (rank 76 & rank 89). From this it follows that the majority of vocational education graduates actually occupy low-level positions



**Figure 7.** Ranking of Indonesian Indicators on the Global Talent Competitiveness Index 2017

To improve the quality of vocations in the face of the Industrial Revolution Era 4.0, TVET revitalization is needed in Indonesia through; Curriculum revision, preparation of teaching staff from industry, implementation of dual system 3-2-1, construction of teaching factory, retooling and certification of vocational program teachers and Vocational Graduate Certificate (Muhamad Nasir, 2018). The

challenges facing developing countries to increase the effectiveness of TVET include; lack of funds for the supply of physical infrastructure and equipment, lack of trained instructors, difficulty in communication and coordination and inadequate ICT infrastructure (Mel, 2012). The seven pillars of vocational system reform in Indonesia can be seen in Figure 8.

# 7 PILLAR FOR REFORMING VOCATIONAL SYSTEMS IN INDONESIA

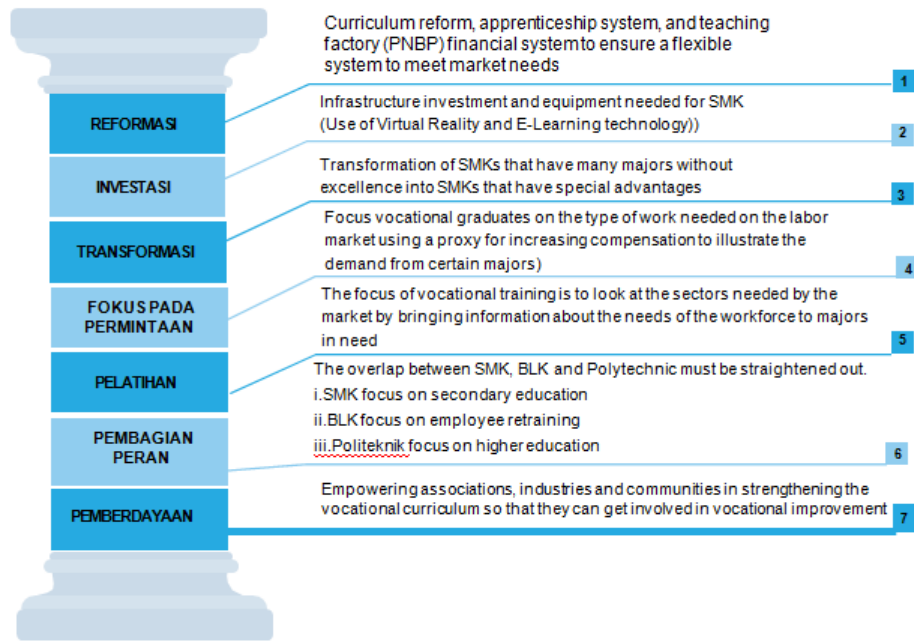


Figure 8. TVET Reform in Indonesia

On the seventh pillar, the parties expected to be involved in vocational empowerment are associations, industry and society, not trade unions. This choice is worthy of correction, because trade

unions have been an important actor in the development of worker quality (Infid, 2018). TVET's revitalization strategy in Indonesia can be seen in Figure 9.

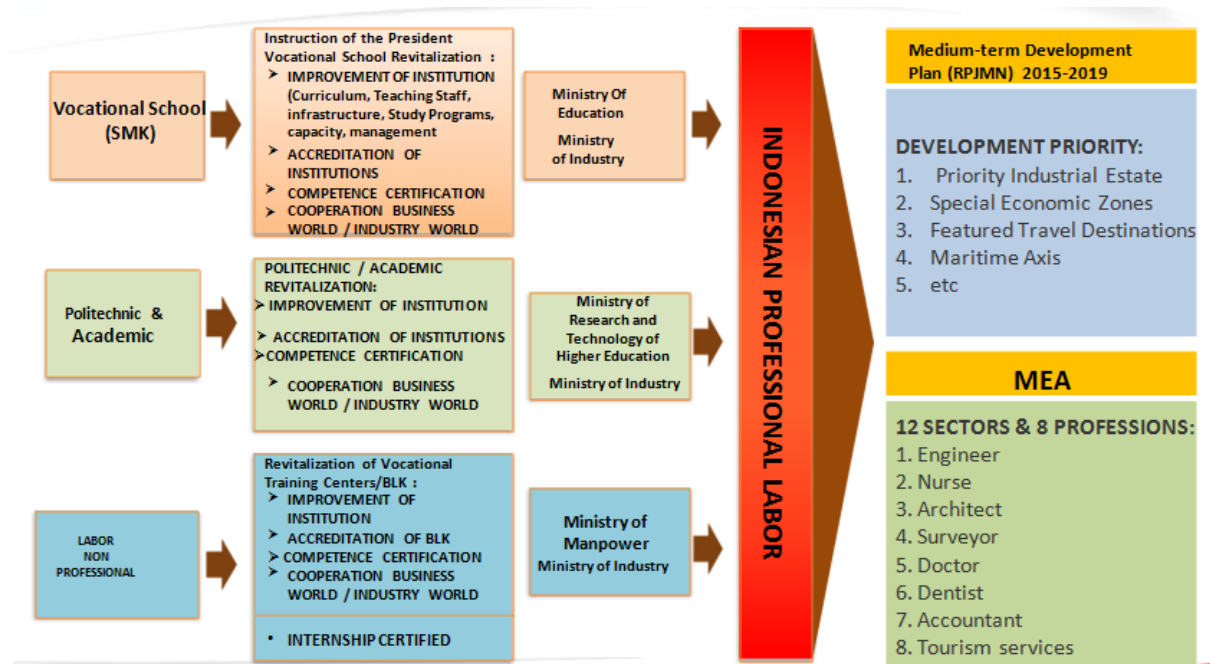


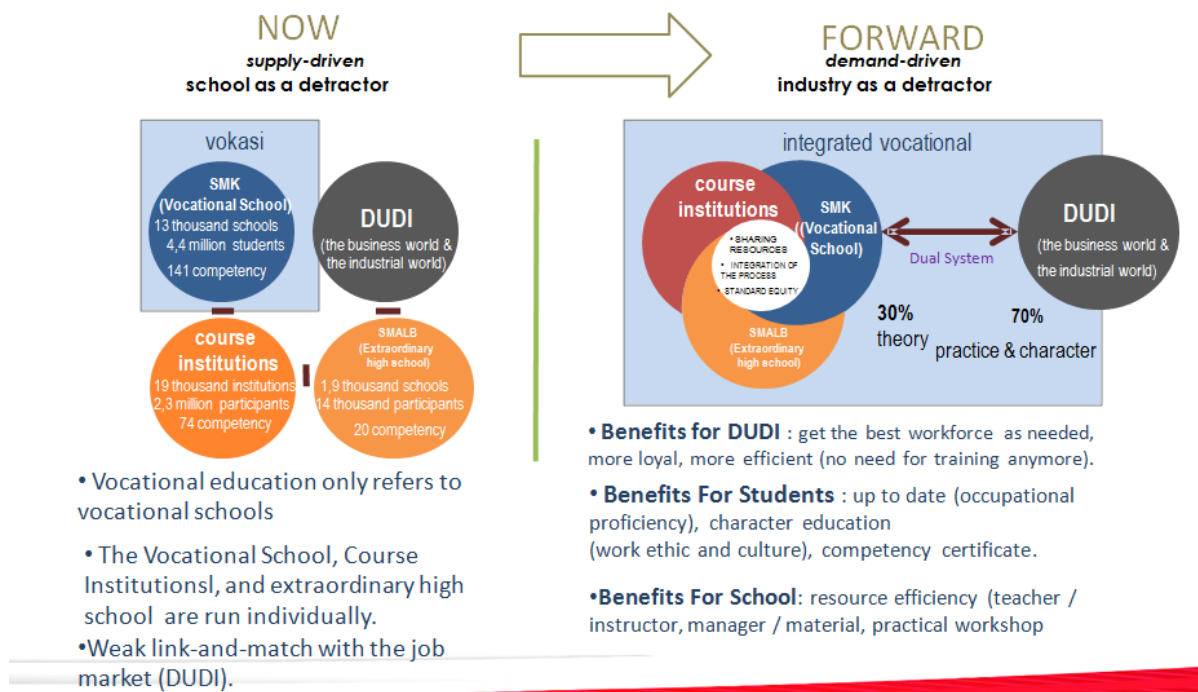
Figure 9. Revitalization of TVET In Indonesia

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**Vocational Education Revitalization**

The urgency of revitalization of vocational education is driven by conditions where each year there are around 3.3 million students graduating from high school / vocational school, while the capacity of tertiary institutions is only around 60-65%. So the rest of the graduates are forced to fight over the graduates of the Polytechnic and tertiary institutions to enter the job market. That is why the workforce profile has not experienced significant changes over the past 10 years. The industrial revolution 4.0 narrowed technical employment, for example a shoe factory 5 years ago operating with 20 thousand employees, now only 12 thousand employees are left because some jobs can be done automatized.

The establishment of new polytechnics must be endeavored to improve the capacity as well as the quality of human resources. If not, then the demographic bonus they have will not be optimal in their contribution. Productive age population with low education and skills can be predicted to have low productivity. In addition, they mostly work in low-income sectors. Revitalization of vocational education aims to improve the quality and competitiveness of human resources, especially the creation of skilled workers to meet the needs of industry and the implementation of development. Vocational Education revitalization strategies can be seen in the figure 10.



**Figure 10,** Revitalization Strategy For Development Of Vocational Education

**Revitalization of Polytechnic / Technical Educational**

Based on BPS data, the educated unemployment rate originating from



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universities and diplomas in Indonesia is still quite high at 13%. As many as 59% of polytechnic study programs are still accredited under B, while the industrial world mostly applies study program accreditation standards, so that many polytechnic graduates will not be absorbed into the labor market. To improve the quality of polytechnics in Indonesia, there are a number of things that are the main focus. First, polytechnics must have lecturers from industry, polytechnic programs must implement teaching factories, and broader development needs for vocational programs at the master and doctoral level are applied.

The dual system that has been implemented in Germany is the right choice for implementing a teaching factory. The advantages of implementing a dual system include; industry can help in transferring knowledge and skills to learners and bring the skills level of learners up to standards required from the industries, and industry is expected to develop graduates capacity in problem solving and working abilities (plus professional skills). The dual system has been implemented in several polytechnics with various schemes, namely:

- Production based learning has already been implemented by ATMI Surakarta, Polman Bandung, Polman Astra, ATS Sorowako, Polman Babel

- Problem Base Learning; has been introducing since 2012 to regional polytechnics
- Co-operative; (3-2-1 and 2-1-2-1) has been introducing since 2000 by Polman Bandung

The polytechnic revitalization program is one of the efforts made by the central government to build a better polytechnic program. In addition to the challenges of each program's governance and resources. One of the problems faced is the lack of industry lecturers in polytechnic education. The requirements to become a lecturer are regulated in Law No. 14 of 2005 concerning teachers and lecturers in article 46 paragraph 2 states that to be a lecturer, a minimum must meet the minimum qualifications of graduate master programs for diploma or undergraduate programs. This regulation makes it increasingly difficult to meet the needs of lecturers from the industrial side, especially for polytechnic programs

In TVET reforms that need attention is the willingness of competent teaching staff. TVET teaching staff is different from general education teaching staff, they must have the ability to prepare students to be able to make a living in the workforce and provide professional knowledge and professional competencies needed in certain jobs (Joachim, 2010). The teaching staff at TVET must be able to work within the framework of a cooperative system of vocational education and training, where companies and vocational schools share



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the responsibility for carrying out education and training to students. TVET teaching staff are obliged to work intensively with their partners, namely human resources development staff in the company. In addition, student assessment for the final certificate is in the hands of industry and trade associations (Kadin).

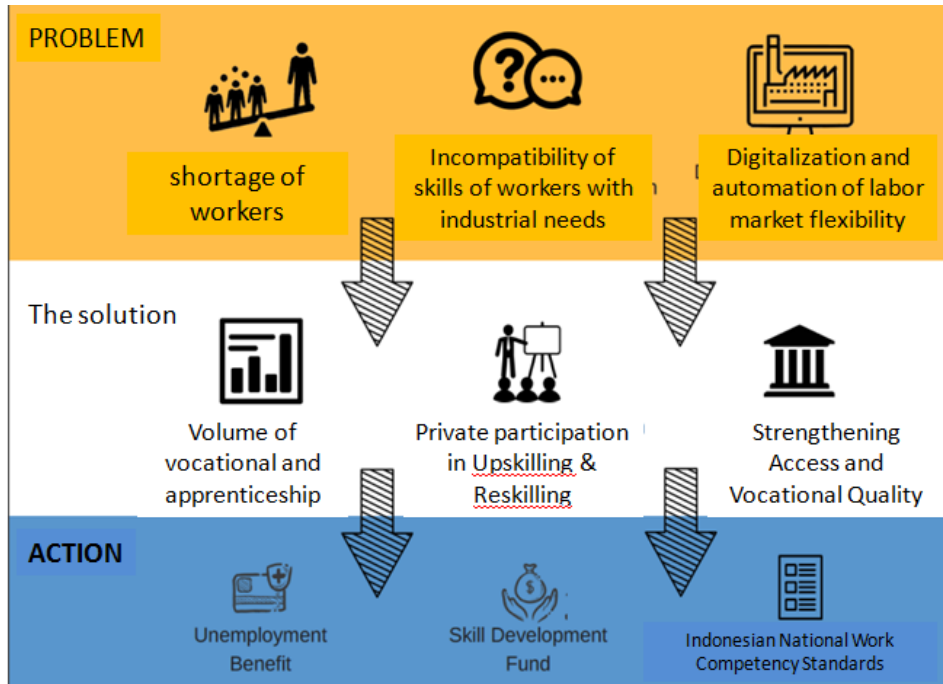
Another problem is the lack of applied teaching factory systems. To implement this mechanism, polytechnics are required to build cooperation with industrial partners so that students can not only practice in polytechnic laboratories, but also in direct companies. In Indonesia, only a few polytechnics open programs for master and doctoral degrees, so that it becomes a challenge in creating the qualifications of workers who have higher levels of education in the field of applied sciences. In addition to the challenges of governance and resources of each vocational program in Indonesia, the growing risk of automation certainly adds pressure on the workforce, especially graduates in the vocational field. Therefore it is necessary to plan carefully related to the development and distribution of vocational in Indonesia.

### **The concept of TVET Financing through the Skill Development Fund (SDF) and Unemployment Benefit (UB)**

To improve access and quality of TVET in Indonesia, it is necessary to collect and provide long-term learning funds. With the availability of a sustainable funding system,

it can encourage the volume and scale of training and apprenticeship scale. The government must be able to encourage the participation of private and industrial providers to be able to strengthen the quality of vocational training and education through modernization and revitalization of Vocational Training Centers (BLK), Vocational Schools (SMK), Private Training Institutions (LPKS) & Polytechnics.

The main principle in the development of SDFs in Indonesia is that the state is present through contributions from state budget funds so that it can provide funds on an ongoing basis, not all funds are spent. SDF is mutual cooperation through government and industry partnerships, so it is expected not to add to the burden of industrial costs (labor cost). Referring to the learning of countries that have successfully implemented the SDF, there is a linkage and synergy between the SDF and the Unemployment Benefit. The concept of Unemployment Benefit / Temporary Employment Guarantee for workers who have been laid off through investment in vocational education / Skill Development Fund as a means to provide skills according to the needs of industry and income support in the form of cash benefits as a social cushion during training programs. The role of SDF and UB development in solving problems of developing the skills of workers in Indonesia can be seen in Figure 11.



**Figure 11.** Problem Solving the Provision of Competent Workers through the SDF and UB

To prevent overlaps in the issue of TVET funding, education and training programs funded through SDF do not include education and training programs that have been funded by ministries such as vocational high schools (SMK), Polytechnics as well as non-academic educational programs such as the S-1, S -2 and the like. The support for SMKs such as instructor training, curriculum development, collaboration with polytechnics and certification processes can be funded through SDF.

In contrast to the education and training programs that have been carried out through LPDP, SDF relates to vocational non-degree and academic, universal for all citizens. SDF aims to serve and strengthen the capacity of providers including industry, BLK, LPKS and SMK. The main target of the SDF is to strengthen low

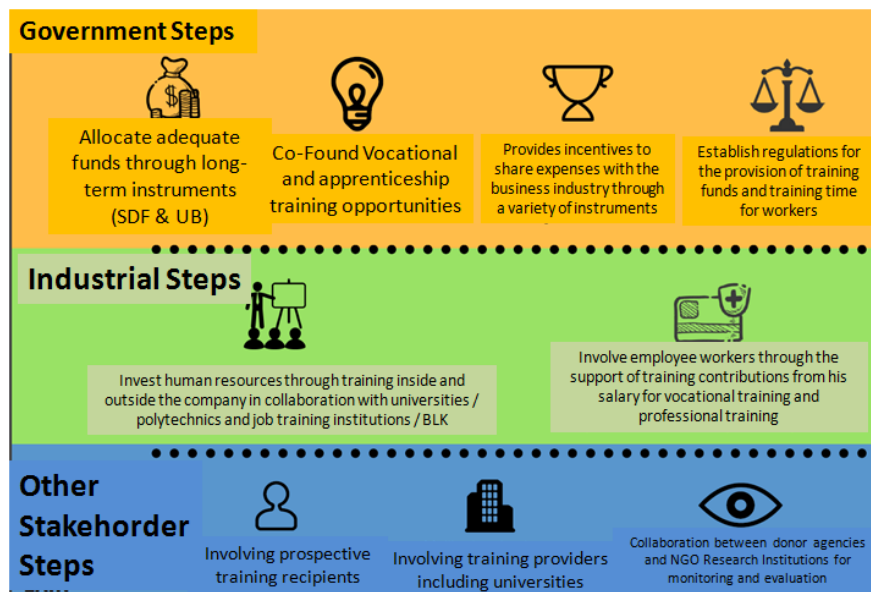
skills and middle skills where the condition of the Indonesian workforce is 60% elementary, junior high and vocational high school (BPS, 2017). The main types of training programs that will be supported by SDF are primarily job training, apprenticeship, certification, instructor strengthening, and vocational scholarships. There is a development and expansion of employment social security benefits which will include compensation for seeking work, returning to work and training allowances.

Road map for SDF implementation in Indonesia must be carried out in stages; The first five years are targeted at 1-2 million training and 1 million apprenticeship with a target to strengthen the millennial youth workforce that is still working, who are laid off and who will be working / pre employment. The road map for the

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provision of SDF funds is also carried out in stages; the first five years through APBN and LPDP funds and through the relocation of JKK and JKM funds in TK BPJS, industry dues began in year 3. To create sustainable social security for employment it is necessary to increase development and implementation by involving tripartite participation (government, entrepreneurs,

and trade unions) to ensure the implementation of dialogues and sustainable social partnerships, so as to encourage Indonesian workers to be more productive and competitive. Steps that can be taken by the government, industry and other stakeholders in an effort to improve the skills and competence of the workforce can be seen in Figure 12.



**Figure 12.** Steps that can be taken by the government, industry and other stakeholders in an effort to improve the skills and competencies of the workforce

**CONCLUSION**

Key Elements of TVET's success in Indonesia include; building a Vocational Training system, establishing standards, implementing Vocational Training and assessment & certification. The quality of the training program is demonstrated by the level of success of the certification, as well as the proven effectiveness of the success of graduates in working and have added value after practicing.

The TVET development policy recommendations in Indonesia are as follows:

- Improvement of curriculum in vocational education. The development of vocational curriculum must be aligned with the demands of the Industrial and Business World (DUDI) with three main criteria, namely labor market demand (demand-driven), the relationship between employers (industry) with vocational education institutions (links) and compatibility



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between graduates vocation with employer / industry (match). Vocational graduates must obtain certification for each competency that has been fulfilled so that vocational graduates can have more than one competency certificate.

- The fulfillment of productive lecturers by making rules so that skilled teaching staff can teach. There is a need for regulations that require a higher education background for teaching staff to be one of the factors that makes it difficult for productive lecturers with expertise in accordance with vocational education majors to teach. Even though in Indonesia there are not many higher education programs for vocational (master and doctoral). If changes are made to the rules for vocational education, it will open up opportunities for the addition of productive lecturers
- Improving the quality of vocational education advice and infrastructure. The involvement of the industry in improving the quality of vocational education facilities and infrastructure is important in suppressing the asymmetry of industry needs and the quality of graduates. Although government involvement in providing facilities and infrastructure is important, DUDI is also needed to help. In this way, vocational development will not only rely on the government unilaterally (supply driven)
- Creating an online job platform. Not only is a job information platform as

widely available today, the vocational sector requires a platform that is collaborated between industry, associations and vocational education institutions to provide information on what sectors are looking for workers and what types of jobs are needed.

### REFERENCES

- Creswell, John W. (2013). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Third Edition, SAGE Publications. Thousand Oaks California.
- Dunn, Mel. (2012). Nonformal, Informal Education And Poverty Reduction – A Role For TVET. *International Journal of Education*, 6(2), 97 – 106.
- International NGO Forum on Indonesian Development (Infid). (2018). *Vokasi di Era Revolusi Industri (Kajian Ketenagakerjaan di Daerah)*. Jakarta. Prakarsa.
- Joachim, Dittrich. (2010). Can Indonesia Learn Something from the German Model of TVET Teacher Education. *Journal EDUCATIONIST*, 4(2), 67-77.
- Muhamad Nasir. (2018). *Peningkatan mutu vokasi dalam Menghadapi era revolusi industri 4.0* Kementerian Riset, Teknologi, dan Pendidikan Tinggi.
- Muhammad yahya. (2018). *Orasi Ilmiah Professor bidang Ilmu Pendidikan Kejuruan*. Universitas Negeri Makassar.





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- Paristiyanti Nurwardani. (2017). *Indonesia TVET Higher Education Policies and Strategies On Harmonisastion and Internationalisation*. Jakarta, Ministry Of Research, Technology and Higher Education Republic of Indonesia.
- Pemerintah RI. (2013). *UU Sistem Pendidikan Nasional No 20 Tahun 2013*. Jakarta.
- Putu. (2016). *TVET Abad XXI Filosofi, Teori, Konsep, dan Strategi Pembelajaran Vokasional*. Yogyakarta, UNY Press.
- Slamet. (2011). Peran Pendidikan Vokasi Dalam Pembangunan. *Jurnal Ekonomi. Cakrawala Pendidikan*, 30(2), 189-203.
- Spradley, James P. (1979). *The Ethnographic Interview*. Wadsworth Publishing Company, Belmont, California.
- Sudira, P. (2018). Metodologi pembelajaran vokasional abad XXI: Inovasi, teori dan praktis. Yogyakarta, UNY Press.
- Suharno, Kamsidjo Budi Utomo, Muhammad Khumaedi. (2017). Evaluasi Proses Pelaksanaan Program "Kompas Masa Depan" di Sekolah Menengah Kejuruan Negeri 2 Adiwerna. *Journal of Vocational and Career Education*, 2(2), 59-66.
- Supari Muslim, Nita Kusumawati, Euis Ismayati, et al. (2019). Theoretical And Empirical Studies Of The Use Of Problem Base Learning In The Technical And Vocational Education And Training (TVET) In The Context Of The XXI Century. *Indonesia Journal of Learning Education and Counseling*, 1(2), 133-143.
- Trilling, B & Fadel, C. (2009). *21st-century skills: learning for life in our times*. US, Jossey-Bass A Wiley Imprint.
- Unung Verawardina, Jalius Jama. (2018). Philosophy TVET Di Era Derupsi Revolusi Industri 4.0 Di Indonesia. *Jurnal Filsafat Indonesia*, 1(3), 104-111.
- Waras Kamdi. (2017). *Inovasi Pembelajaran Teknik Dan Vokasi: Antisipasi terhadap Perubahan Paradigma Belajar*. Kementerian Riset, Teknologi, Dan Pendidikan Tinggi Universitas Negeri Malang (Um), Malang.
- World Economic Forum. (2017). *The Global Human Capital Report*. WEF.