SOCIO-TECHNICAL FRAMEWORK FOR YOUTH UNEMPLOYMENT CASE OF VOCATIONAL SCHOOL GRADUATES

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Abstract

Youth unemployment from vocational school graduates is still a problem that attracts the attention of vocational education sector. Especially in the current conditions, the distribution of information technology and the Covid-19 pandemic is a new challenge. A systemic approach is needed to overcome this issue. There are two approaches to be implemented, namely social and technical approaches. The objective of this research is to obtain the cause of unemployment in vocational school graduates. Furthermore, an overview of solutions can be obtained in preparing the workforce for vocational school graduates based on society's latest technological and social developments. This study produces a composite indicator to find the causes of youth unemployment from vocational school graduates through a socio-technical analysis approach. In addition, it presents the scale and characteristics for every indicator that is used in this research. Using these frameworks and indicators, further research can be conducted by developing a model for preparing the vocational school graduate workforce to fit in the latest technological and social developments.

Keywords: Composite indicator, Socio-technical framework, Vocational school graduates, Youth unemployment.

1. Introduction

Discussion regarding unemployment is inevitable, especially among educated youngsters (15-24 years old) whose number continues to increase day by day. This case does not only occur in developing countries but also in developed countries. There are many factors that cause the youth unemployment. For instance, the government policies to the process of preparing the workforce. In terms of policy, there are differences in each country. Several studies have discovered that the youth unemployment rate is higher in the countries that regulate the labour market compared to those that are less regulated. As in Germany, France, and Spain, employers are restricted in making decisions to recruit and lay off workers. This is different for Ireland and the UK, which allow employers to make decisions in recruiting and laying off workers [1-3].

Another main reason is that most of young people who work in industrial sectors are sensitive to economic cycles. For instance, in the manufacturing industry, they are vulnerable to economic downturns. It is because of the mismatch between their skills and the level of work required due to the lack of work experience. These problems have resulted that the unemployment rate is being consistently higher in the youth population than the adults in many countries. Thus, the problem of youth unemployment becomes an unavoidable social problem. According to data from *Badan Pusat Statistik* BPS (Central Berau of Statistics) Indonesia, in February 2021, the Open Unemployment Rate (TPT) of the of the young population (15-24 years old) is the highest one, reaching up to 18.03 percent. Meanwhile, the TPT for the older population (above 60 years old) is the lowest at 1.29 percent. This pattern also applies in February 2020 and August 2020. Compared to February 2020, there was an increase in TPT in all age groups. However, when it is compared to August 2020, there was a decrease in TPT in all age groups, namely: 2.43 percent points for the young age group; 0.47 percent points for the 25-59 years old group; and 0.41 percent point for the age group of 60 years old and above. The fact can be seen clearly in Fig. 1.
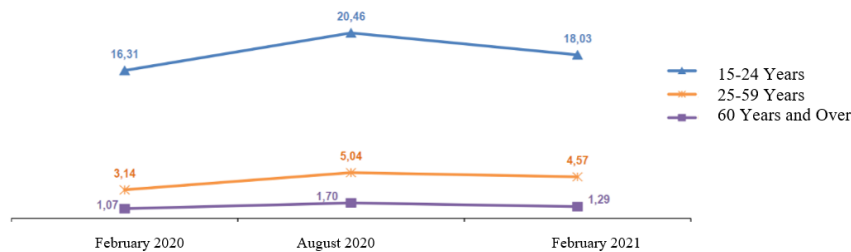

**Fig. 1. Open unemployment rate (TPT) trends by
age group (percent), February 2020-February 2021 [4].**

The grouping based on education from this TPT, in accordance with education category, has the same pattern in February 2021, August 2020, and February 2020. In February 2021, the TPT of graduates of Vocational High Schools (VOCATIONAL SCHOOL) is still the highest compared to graduates of other education levels, which is equal to 11.45 percent, while the lowest TPT are those with elementary school education (SD) and below, which is 3.13 percent [4]. The grouping based on the educational level can be seen in Fig. 2.
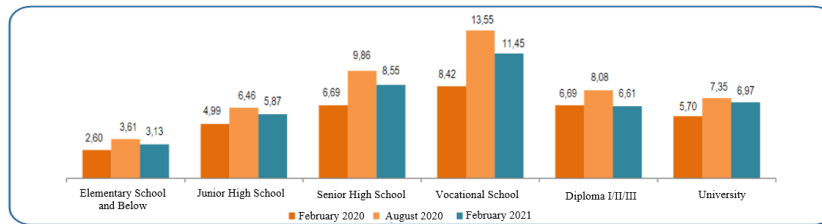
**Fig. 2. Open unemployment rate (TPT) by highest
education level (percent), February 2020-February 2021 [4].**

The next challenge is the current technological developments that also affect people's behaviour. We are familiar with the era of Industry 4.0 and Society 5.0. Sociologically, both have changed the whole order of human life. Perhaps, it is still stick in our memories that the development of technology accelerated so rapidly. It has changed all patterns of people's living behaviour. There are many things existed in the past but lately seem to have just disappeared. Technology has changed the way of life, the way of learning, business and the economy, patterns of relationships and patterns of interaction among humans. Nowadays, almost everything is inseparable from the influence of technology. The development of IoT (Internet of Things) creates many changes in all aspects of daily life. One of the examples is doing a lot of activities online as the recent behaviour of people's lives. This digital era is also marked by the presence of new professions that never existed before, such as content creators, social media specialists, UI/UX designers and so on. On the other hand, beside creating new professions, industry 4.0 era will also eventually erase some currently existed professions. In the future, we will experience a period where some professions will disappear and become parts of history. It is like a phase that repeats itself as happened earlier in the Industrial Revolution of the 19th century where human power began to be replaced by machines. The Industrial Revolution 4.0 brings not only updates and conveniences to modern life today, but also has a big challenge to face in the future. One of the examples is the birth of new unemployment. When the workforce cannot quickly adapt to the current developments and make changes, likewise the scope of preparing its workforce.

Moreover, related to unemployment, what needs to be considered is the decrease in world economic growth that occurred in early 2020, including Indonesia. This is due to the corona virus 2019 outbreak that has hit the whole world [5]. Corona virus is a large family of viruses that cause illness ranging from mild to severe symptoms. As a new acute infectious disease, corona virus disease 2019 (Covid-19) was first reported in December 2019 in Wuhan. On January 30, 2020, the World Health Organization declared it a public health emergency of worldwide concern [6, 7]. Due to the corona virus hits all countries in the world, on March 11, 2020, the World Health Organization (WHO) officially announced that the Corona virus outbreak was a global pandemic [8]. Covid-19 has an impact on economic growth in the form of a decrease economy level in the world, including Indonesia. The International Labour Organization (ILO), in its report, also warned of the impact of the Covid-19 pandemic on the labour sector. The ILO estimates that the number of job losses could rise to 195 million workers due to COVID-19 which triggered a wave of layoffs [9]. Unemployment is a problem faced by all countries, both developed and developing countries. Before the Covid-

19 pandemic broke out, the global unemployment rate was already high, reaching 190 million. Additionally, if it is included with the impact of the pandemic, the unemployment rate in various parts of the world will increase significantly [9]. This is because many countries choose to implement regional quarantine (lockdown) to suppress the spread of the epidemic [10, 11]. Lockdown is not only limiting the mobility of people, but also more. It is the impact of the lockdown which causes a decrease in the mobility of goods and capital. When the lockdown is implemented, many factories, offices and other business fields are closed or operating with limited capacity. Thus, the need for manpower is drastically reduced. Many workers have been fired or even laid off as part of the business efficiency agenda in the middle of a crisis. The impact of the Covid-19 pandemic was felt by the increasing number of unemployed, both unemployed due to the layoffs, as well as the unemployment of those who graduated from school (fresh graduates) when this pandemic occurred. The Covid-19 pandemic has also created uncertainty in getting a job, and even bigger social problems.

In response to the problem of youth unemployment, an approach that uses two sides at the same time is needed. It is called as a social and technical approach. In accordance with the needs, the socio-technical system approach can be applied [12-14]. This study proposes the use of socio-technical thinking systems and composite indicators to determine the causes of youth unemployment of vocational school graduates. Furthermore, an overview of solutions can be obtained in preparing the workforce for vocational graduates based on the latest technological and social developments in recent society.

2. Research Methods

This study aims to develop a model for the preparation of vocational high school graduates who can adapt to the latest technological and social developments. The research method of socio-technical systems thinking, and composite indicators are used to achieve these objectives. This section describes the concept of socio-technical systems thinking and its application in current research, as well as the concept of composite indicators.

2.1. Socio-technical system thinking

The collaboration of humans with machines and technology in providing job support and activities is the beginning of the emergence of socio-technical systems. This thinking begins to examine the relationship between technological aspects and social aspects of the workplace. Then, progress to the study of industrial supply networks. This concept has been used in multidisciplinary and interdisciplinary sciences such as psychology, and more recently, including computer science and IT. However, at first, this concept was only used in the social sciences. The Industrial Revolution 4.0 also triggered the development of Society 5.0 into something that greatly affected social aspects. The need for a socio-technical system to analyse this impact is growing. The socio-technical concept begins to develop when considering the technological and social factors needed in organizational transformation [15]. Furthermore, in 2000, socio-technical principles were introduced by Clegg [15]. He stated that every component in the organization is mutually dependent on one another. So, consideration of the effects of each component is needed when there is an organizational change [15]. There

are three external factors and six internal factors in the socio-technical framework [16]. External factors consist of regulations, financial situation, and stakeholders. At the same time, the internal factors consist of Technology, Infrastructure, and Processes, Goals, People, and Culture. In this study, we use this framework to develop a model for preparing a vocational school graduate workforce that can adapt to the latest technological and social developments. Figure 3 shows the socio-technical framework. In this research, we use this framework to develop a model for preparing a vocational school graduate workforce that can adapt to the latest technological and social developments.
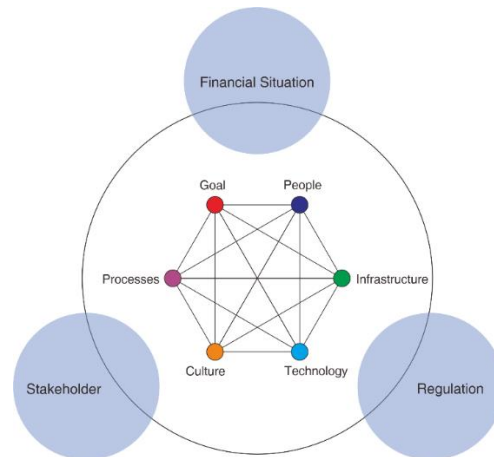

Fig. 3. Socio-technical framework (adapted from [16]).

2.2. Composite indicator

Composite is a term in materials science. It is the formation of a combination of two or more materials to produce a more substantial material. In this case, we try to generate one performance indicator. We do this by combining multiple indicator contexts collected from multiple indicator values. Several indicators are required to evaluate organizational performance, which will result in different indicator values. When describing organizational performance, one performance indicator is needed to avoid mistrust about the value of the indicators used to represent performance. Performance assessment in various sectors has used composite indicators. For instance, Drago [17] created an interval-based composite indicator for analysing and measuring poverty. Valcárcel-Aguiar et al. [18] proposed a composite index to assess the feasibility of sustainable urban living. Sitepu et al. [19] proposed a method of composite indicators to assess organizational readiness for the adoption of industry 4.0. Several composite indicators discuss unemployment, such as the study conducted by Hadjivassiliou et al. [20] who propose statistical indicators to measure decent work. The ILO also uses composite indicators to measure decent work for youth which are used in monitoring, evaluation, and learning in labour market programs [21]. The application of composite indicators that focus on youth unemployment of vocational school graduates is not found in the literature. This research uses the composite indicator method as part of an approach to prepare a vocational school graduate workforce that can adapt to the latest technological and social developments. The three main

steps in using the composite indicator method are normalization, weighting, and aggregation [22]. When indicators are measured using different units of measurement, normalization is required. The next step is the weighting, which is assigned to each indicator. The weighting of the indicators is done by considering how important the indicators are. Next, the aggregation step is used to obtain a single performance value from the difference between each indicator value [22].

3. Results and Analysis

3.1. Architecture system approach for youth unemployment of vocational graduates

In this section, we present the design of the architectural system as an approach between methods in assessing the relationship between the methods used to prepare a workforce of vocational school graduates who can adapt to the latest technological and social developments. This approach consists of a socio-technical framework, composite indicators, and the youth movement of vocational school graduates. Each element in the socio-technical framework is applied as an indicator to develop existing conditions. For example, the "process" element is used as an indicator to see the curriculum, teaching materials, and adoption of Education 4.0. The result of the socio-technical framework is a score that examines the conditions of preparation of vocational school graduates. It is then used as input for the composite indicator method to produce an index of the causes of the movement of young vocational school graduates. This index is compared to the readiness level, a scale to reflect organizational conditions for preparing vocational school graduates. Figure 4 shows the approach to finding the causes of the emergence of young vocational school graduates and determining the solution model.
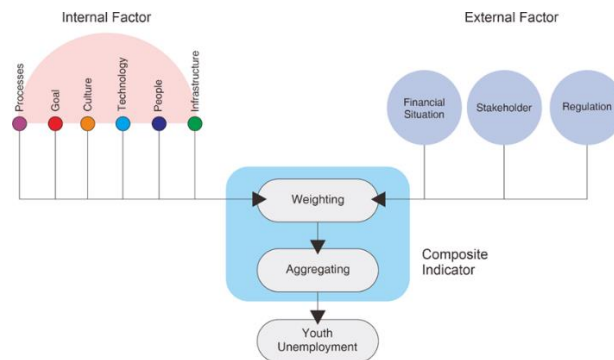
**Fig. 4. Architecture system approach
for unemployment of vocational graduates.**

The socio-technical framework developed by Davis et al. [16] used in this study. As shown in Fig. 4, this framework consists of the social and technical aspects of the system, which are influenced by external factors. The elements in the social and technical aspects are goals, people, infrastructure, technology, culture, and processes, while the external consists of regulations, financial situation, and stakeholders. The existing conditions of the social and technical aspects of the organization. These elements are used to read the condition of graduates' preparation in reducing youth unemployment from vocational school graduates.

3.1.1. Goals

Goals provide unified guidance and direction for those involved in the organization. Goals also have a strong influence on the quality of other aspects of planning. With reasonable goals, it can provide an effective mechanism for evaluating and controlling the organization [23-25]. The vision of the organization and the desire of top management to reduce unemployment for vocational school graduates reflect the Goal indicators. Organizations that include the readiness of graduates to work with their vision will have an impact on reducing unemployment for better vocational school graduates, primarily if this organization has implemented its vision into strategic and operational plans. Figure 5 shows the scale for the goal indicator.

1	2	3	4
• There is no vision from the organization to reduce unemployment for vocational school graduates • There is no commitment from top management to reduce unemployment for vocational school graduates	• There is a vision from the organization to reduce unemployment for vocational school graduates • There is no commitment from top management to reduce unemployment for vocational school graduates	• The organization's vision to reduce unemployment for vocational school graduates have been translated into a strategic plan • There is a limited commitment from top management to reduce unemployment for vocational school graduates	• The organization's vision to reduce unemployment for vocational school graduates have been translated into a strategic plan • There is a full commitment from top management to reduce unemployment for vocational school graduates

Fig. 5. The scale of the goal indicator.

3.1.2. Process

The "process" indicator reflects the procedure for implementing tasks within the organization [26, 27]. Important characteristics as the steps to reduce unemployment for vocational school graduates are the learning system used, curriculum, teaching materials, and the adoption of Education 4.0 [28-31]. Education 4.0 is a general term used by education experts to describe various things in integrating technological advances both physically and not physically into learning [32]. Figure 6 shows the scale of process indicators.

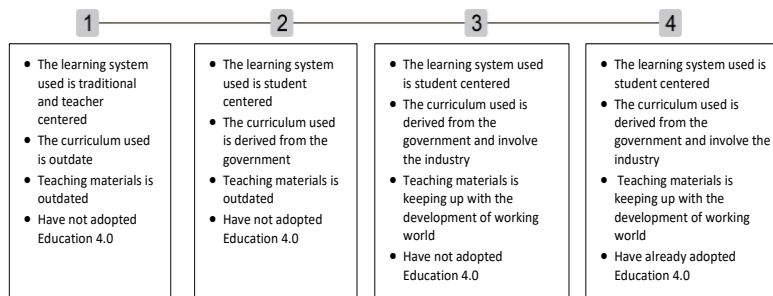| 1	2	3	4
• The learning system used is traditional and teacher centered • The curriculum used is outdate • Teaching materials is outdated • Have not adopted Education 4.0	• The learning system used is student centered • The curriculum used is derived from the government • Teaching materials is outdated • Have not adopted Education 4.0	• The learning system used is student centered • The curriculum used is derived from the government and involve the industry • Teaching materials is keeping up with the development of working world • Have not adopted Education 4.0	• The learning system used is student centered • The curriculum used is derived from the government and involve the industry • Teaching materials is keeping up with the development of working world • Have already adopted Education 4.0

Fig. 6. The scale of process indicator.

3.1.3. Culture

Culture reflects the values and norms that guide the behavior of people in the organization [33-35]. As for influencing factors, important behaviors have been identified as follows: character building, soft skills development, adaptation to intelligent community conditions, and innovations to the impact of the COVID-19 pandemic. The effect of the COVID-19 pandemic is included as an influential factor because it has a significant influence on increasing unemployment. The rapid adaptation of vocational education in response to this will impact the potential for increasing unemployment. Figure 7 presents the scale for the cultural indicators.
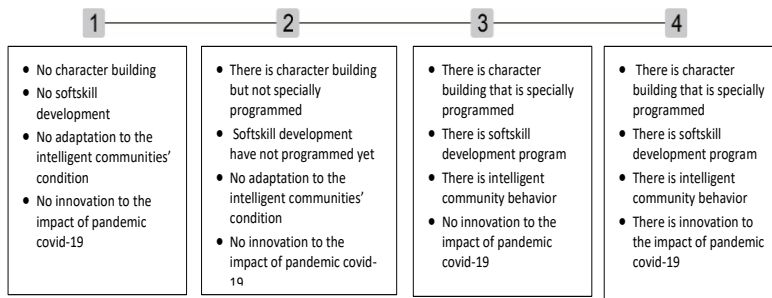
1	2	3	4
• No character building • No softskill development • No adaptation to the intelligent communities' condition • No innovation to the impact of pandemic covid-19	• There is character building but not specially programmed • Softskill development have not programmed yet • No adaptation to the intelligent communities' condition • No innovation to the impact of pandemic covid-19	• There is character building that is specially programmed • There is softskill development program • There is intelligent community behavior • No innovation to the impact of pandemic covid-19	• There is character building that is specially programmed • There is softskill development program • There is intelligent community behavior • There is innovation to the impact of pandemic covid-19

Fig. 7. The scale of culture indicator.

3.1.4. Technology

Technology is needed to support the existing developments, both learning and working skills. In particular, recent information and communication technology play an essential role, widely known as Industry 4.0 [36, 37]. Personal characteristics are essential to support in reducing unemployment for vocational school graduates in terms of technology. It uses the latest technology, equipment, and easy access to get broad and up-to-date information. Figure 8 presents the scale of the technology indicators.
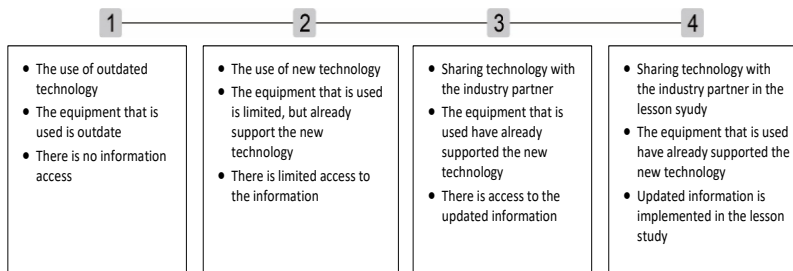
1	2	3	4
• The use of outdated technology • The equipment that is used is outdate • There is no information access	• The use of new technology • The equipment that is used is limited, but already support the new technology • There is limited access to the information	• Sharing technology with the industry partner • The equipment that is used have already supported the new technology • There is access to the updated information	• Sharing technology with the industry partner in the lesson syudy • The equipment that is used have already supported the new technology • Updated information is implemented in the lesson study

Fig. 8. The scale of culture indicator.

3.1.5. People

An organization is a group of people who will achieve a common goal. People have the responsibility to perform several tasks. These tasks will be completed properly if according to their interests. The preparation of vocational school graduates to

reduce unemployment is a shared responsibility, in terms of the people directly involved are teachers and students. So that the interest of teachers and students becomes an important indicator, another thing related to people in preparing vocational graduates to reduce unemployment is the skills possessed by teachers as the primary source at school. Figure 9 shows the scale for the people indicator.
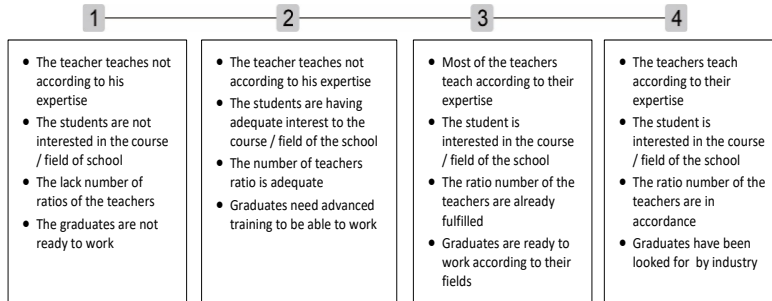

Fig. 9. The scale of people indicator.

3.1.6. Infrastructure

The preparation of vocational school graduates requires a good infrastructure. In this case, it relates to the various facilities owned by the school. Among them are the building to facilitate student learning, practical facilities to facilitate practicum, connectivity, and other supports in carrying out learning in various situations [38]. In the context of the situation, currently vocational school is in a post-pandemic situation and the rapid development of information technology. Figure 10 shows the scale of infrastructure.
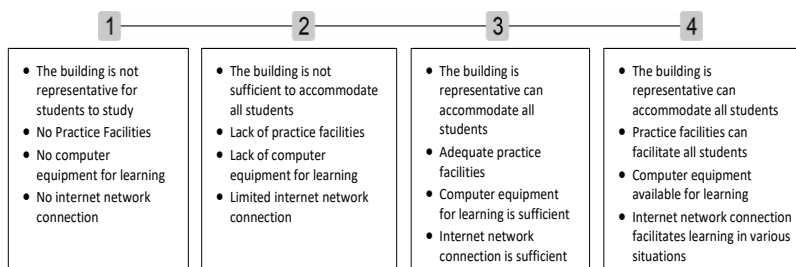

Fig. 10. The scale of infrastructure indicator.

3.1.7. Regulation

Regulation is an essential factor that acts as a driver to reduce youth unemployment from vocational school graduates. This indicator is used to evaluate existing regulations regarding youth unemployment of vocational school graduates in countries where the organization being assessed stands out. Regulations mean that there are incentives and guidelines for organizations to reduce youth unemployment for vocational school graduates. Figure 11 shows the scale for the regulatory indicators.
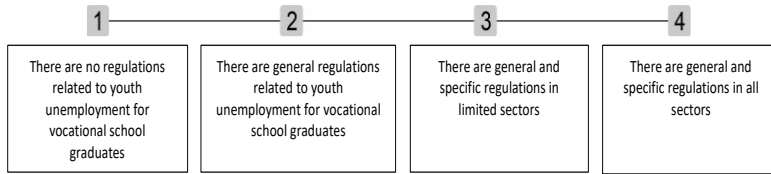
1	2	3	4
There are no regulations related to youth unemployment for vocational school graduates	There are general regulations related to youth unemployment for vocational school graduates	There are general and specific regulations in limited sectors	There are general and specific regulations in all sectors

Fig. 11. The scale of regulation indicator.

3.1.8. Economic/financial situation

The preparation of a workforce for vocational school graduates based on the latest technological and social developments in society as an effort to reduce youth unemployment for vocational school graduates is greatly affected by the economic situation. One of them is the need for large capital in the modification of technical aspects such as upgrading technology and infrastructure. The economic situation affects the ability of financial institutions to support investment in education. On the other hand, the current economic situation is also greatly affected by the COVID-19 pandemic [39-41]. Figure 12 displays the scale of the economic/financial situation indicator.
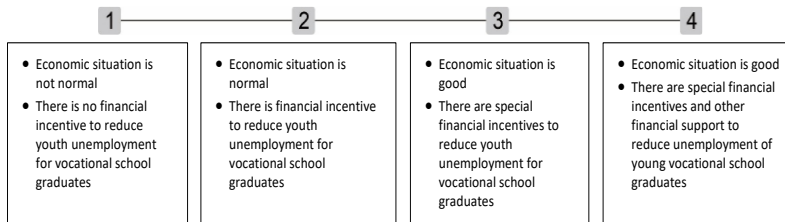

1	2	3	4
• Economic situation is not normal • There is no financial incentive to reduce youth unemployment for vocational school graduates	• Economic situation is normal • There is financial incentive to reduce youth unemployment for vocational school graduates	• Economic situation is good • There are special financial incentives to reduce youth unemployment for vocational school graduates	• Economic situation is good • There are special financial incentives and other financial support to reduce unemployment of young vocational school graduates

Fig. 12. The scale of economic/financial situation indicator.

3.1.9. Stakeholder

Stakeholders play an important role in encouraging efforts to reduce unemployment, especially youth unemployed graduates of vocational school. There are two important characteristics in this indicator. Firstly, the commitment of stakeholders related to support for reducing youth unemployment for vocational school graduates. The next indicator is related to the implementation of the support. If the relevant stakeholders have a good commitment and have implemented the support to reduce youth unemployment for vocational school graduates; organizational readiness will be increasing. Figure 13 presents the scale of the stakeholder indicator.
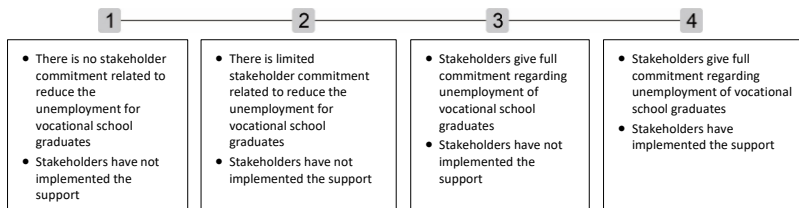

1	2	3	4
• There is no stakeholder commitment related to reduce the unemployment for vocational school graduates • Stakeholders have not implemented the support	• There is limited stakeholder commitment related to reduce the unemployment for vocational school graduates • Stakeholders have not implemented the support	• Stakeholders give full commitment regarding unemployment of vocational school graduates • Stakeholders have not implemented the support	• Stakeholders give full commitment regarding unemployment of vocational school graduates • Stakeholders have implemented the support

Fig. 13. The scale of stakeholder indicator.

3.2. Composite indicators for generating readiness index

The composite indicator method is a linear combination of variables. The scores obtained from the socio-technical analysis have been used to calculate the index. In this composite indicator method, the steps taken are weighting and aggregation. The weighting serves to determine the importance of indicators used, especially in assessing the causes and developing models to prepare a workforce of vocational school graduates who can adapt to the latest technological and social developments. When no indicator requires priority, the appropriate weights are used to assign the importance of the indicator. To produce a single index from various indicator values that vary, aggregation is carried out. This study uses the Linear Aggregation Method to generate an index of indicator values. The formulation of the linear aggregation method can be seen in equation 1.

$$I_{reason} = \sum_{i=1}^{9} M_i . w_i$$

$$\sum_{i=1}^{9} w_i = 1 \tag{1}$$

$$w_i > 1$$

4. Conclusions

This study aims to develop a model for preparing a vocational school graduate workforce to adapt to the latest technological and social developments using a socio-technical concept approach, looking for the main causes of youth unemployment from vocational school graduates. To find the causes of youth unemployment requires modifications in social and technical aspects. This paper demonstrates the use of socio-technical analysis methods as an approach to find the causes of youth unemployment from vocational school graduates and their composite indicators. As well as the scale and characteristics for each indicator used. Using these frameworks and indicators, further research can be done by developing a model for preparing vocational school graduates that can adapt to the latest technological and social developments.

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