Optimising vocational school development

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Optimising vocational school development for priority industry sectors in Indonesia using location quotient analysis

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ABSTRACT: Vocational schools prepare students to join the workforce with practical skills for specific jobs. However, there is a disparity between vocational schools and the demands of business and industry, and a mismatch between the skills and knowledge acquired by the graduates and the workplace requirements. The purpose of this research is to assess the compatibility of vocational schools in a specific region in Indonesia with regional priority industries. To achieve that data were drawn from the Indonesian Central Bureau of Statistics and derived through interviews. The procedures were as follows: 1) identifying the leading sectors using the location quotient; 2) assessing the compatibility of vocational school development with the priority sector; and 3) determining the elements that contribute to the suitability. The findings confirm the disparity between the growth of vocational schools and regional priority industries. Community interest, existing skills programmes, availability of facilities and infrastructure, practical activities in schools, and collaboration play a role in optimising the growth of vocational high schools with leading industries.

INTRODUCTION

In the process of national development, three main pillars are needed; namely, natural resources, human resources and technology. Out of these three pillars, the most important and most decisive in the successful development of a region are human resources [1]. Moreover, one of the factors that has the greatest contribution to human resource investment is education. Education is said to be the main catalyst of human development, with the assumption that the more educated a person is, the higher the awareness of health, political participation, and so on. One of the education programmes that prepare students to enter the workforce with practical skills for a specific job is vocational schooling. Thus, vocational schools' programmes should be aligned with the needs of industry in a region or country. In other words, vocational schools must be linked and matched with the needs of the community in relation to employment, and there must be compatibility between the community needs and educational programmes offered in the region [2].

In Indonesia, the discrepancy between vocational schools' programmes and the needs of businesses or whole industry have an impact on the gap in skills and knowledge possessed by vocational school graduates and the industry needs. This results in less vocational school graduates being employed in accordance with their field of expertise. Therefore, it is necessary to develop vocational schools whose programmes are in accordance with the leading sectors in each region in order to create a greater compatibility between the abilities/competencies of vocational school graduates and the needs of the industry [3]. The growth of vocational schools based on the priority sector's needs might take the shape of additional expertise-developing programmes and even establishment of new school units, if critically needed in an investigated region [4]. The addition of expertise-developing programmes that are in accordance with the priority sector must be based on internal and external conditions. By paying attention to these conditions, it is expected that the skills and competencies acquired by graduates will meet the needs of the regional industry, and they will be able to enter the workforce immediately upon graduation [5].

Link-and-match is a form of adjusting the needs of the industry and vocational schools' programmes. Vocational schools have to respond to the needs of students and the community, with the intention of creating a greater compatibility between educational programmes and the requirements of the community [6]. The link-and-match policy for vocational schools has been operationalised in the form of implementing the Dual System Education programme. Dual System Education is an effort by educational institutions to carry out their learning activities in, and outside, the school environment, such as in manufacturing (both large, medium, small and household industries).

Economic growth in each region is influenced by economic factors and non-economic factors [7]. The differences that exist in each region encourage the development of the region through the poles of growth - areas that have a set of specific conditions for a particular development and are determined to utilise their resources to grow and progress. The concept of growth points highlights that economic activity within an area tends to agglomerate around small and

active points called growth poles. In such area, *the polarisation current* will go in the direction of the growth pole [7]. This polarisation occurs because the growth pole region has a comparative advantage; namely, there is a sector in that area with strong connections to other sectors, and it is a large contributor to the economic growth of the region [8]. Such a sector is referred to as a leading sector. Economic growth in the polar region can encourage economic growth in the surrounding areas.

One of the urban areas in Indonesia is Gresik Regency that was investigated in the study outlined in this article.

Based on the literature review, it was concluded that vocational schools should be built based on the needs of a potential area. However, studies on the development of vocational schools based on the leading sectors of the region in Indonesia are still limited. Therefore, this study aimed to conceptualise the development of vocational schools based on the leading (priority) sector. To achieve this goal, three stages were carried out; namely: 1) analysing leading sectors in Indonesia; 2) analyse the linkage of vocational schools with the leading sectors; and 3) identify factors that influence the linkage of the vocational schools with the leading sectors. The conceptual framework of this study is depicted in Figure 1.

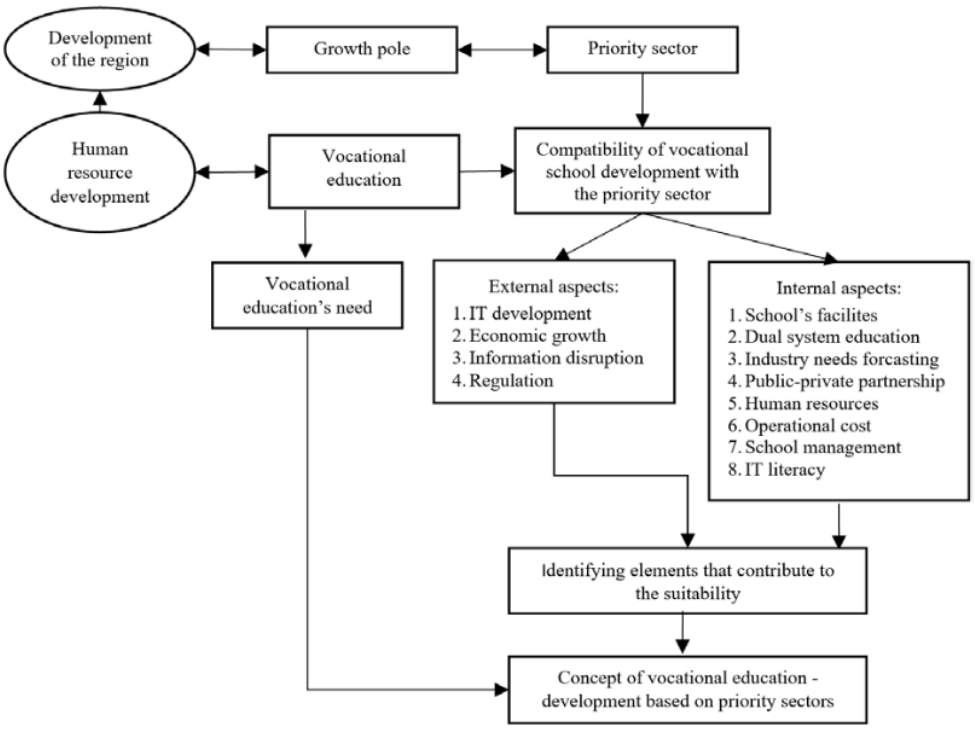

Figure 1: Conceptual framework.

METHOD

The study is descriptive - it describes the conditions factually, and is accurate regarding resource conditions that occur in the research site; and it is exploratory because it aims to identify variables and parameters of factors that affect the suitability of vocational schools' programme alignment with leading sectors.

As mentioned above, Gresik Regency, Indonesia, was the focus area in this study. The selection of the sample was based on the condition that Gresik County belongs to the developing districts in the manufacture, wholesale and agricultural sectors. This study utilised primary and secondary data. Primary data refers to the information collected directly by the researchers, while secondary data refers to the information collected by a third party. The primary data was derived from interviews and the secondary was provided by the Central Bureau of Statistics (*Gresik Regency in Figures 2021*). The research variables were: types of community activities, vocational school expertise programmes, school facilities and infrastructure, dual system education, vocational school co-operation with industry, and the competence of teachers and employees.

The study included three stages mentioned above, but more specifically: 1) identifying leading sectors in Gresik Regency, Indonesia, through location quotient; 2) analysing the relationship between vocational school development in that regency and the leading sectors; and 3) identifying factors impacting on the relationship between vocational school development and the leading sectors.

To calculate the level of vocational schools' needs for each district in Gresik Regency, Equation (1) determined by the Ministry of Public Works in Indonesia was utilised [9].

$$S_{SLTA} = \frac{(L_{SLTP5} - L_{SLTPS})}{E} \times \alpha\,\% \quad (1)$$

Where:

S_{SLTA} - high-school classes' needs;
L_{SLTP5} - projection of junior high-school graduates for five years;
L_{SLTPS} - number of junior high-school graduates who can be accommodated in the available classes;
E - capacity of the study room (classroom) that is most effective and efficient based on environmental conditions (30 students);
α % - percentage of junior high-school graduates who continue to high school (71.62 %).

To identify the leading sectors in each district, location quotient (LQ) analysis was applied [10]. The LQ analysis tool was used to find out how big the level of specialisation of the base or leading sectors is. The LQ method is carried out by comparing the portion of value added by a particular sector in the studied region with the portion of value added by that sector nationally. In this study, to determine the leading sector of each district, the labour variable was used per each district. The input data covered community activity (labour) in the manufacture, wholesale and agricultural sectors per district and Gresik Regency. Mathematically, the LQ equation can be written as follows:

$$LQ = \frac{l/e}{L/E} \quad (2)$$

Where:

l - number of workers in a particular sector per district;
e - total number of workers per district;
L - number of workers in a certain sector in Gresik Regency;
E - number of workers in Gresik Regency.

Information:

LQ > 1 is a sector base (flagship)
LQ < 1 is a non-base sector (non-flagship)

To analyse the relationship between vocational schools and the priority sector of each district in Gresik Regency a chi-square test was conducted. To find out the factors that cause the discrepancy between vocational schools and the priority sector of Gresik Regency, the Delphi analysis technique was used. The Delphi technique uses a systematic procedure to obtain a consensus of opinions from a group of experts. The basic principle of Delphi analysis is anonymity. All experts or knowledgeable participants respond separately and anonymity (mutual unawareness between them) is strictly maintained. Through iteration, the assessment of each individual is assembled and communicated back to all the experts who participated in the comment in two or more rounds.

RESULTS AND DISCUSSION

Identifying Key Sectors

Based on the physical characteristics of the land, Gresik Regency is divided into four parts; namely: a) Northern Gresik Regency includes: Panceng District, Ujung Pangkah, Sidayu, Bungah, Dukun and Manyar District; b) Central Gresik Regency includes: Sat Sampeyan District, Balong Panggang, Benjeng, Cerme, Gresik and Kebomas District; c) Southern Gresik Regency includes: Menganti, Kedamean, Driyorejo and Wringin Anom District; and d) the territory of the Bawean archipelago and surrounding small islands, which include: Sangkapura and Tambak District that are centred in Sangkapura.

To find out the leading sectors in Gresik Regency, the LQ method was explored. Where a sector had an LQ value > 1, it was considered the base sector (priority/super), while a sector with an LQ value < 1 was treated as a non-base sector (not a leading sector). The sector that has an LQ value of > 1 is the manufacture sector, construction and the gas and water supply sector. However, there are six sectors with an LQ value of < 1, so they are the non-base sectors. These sectors include: the agricultural sector, wholesale, mining, finance, transportation and the service sector.

The agricultural and wholesale sectors contribute greatly to the gross regional domestic product (GRDP) of Gresik Regency, with respectively 10% and 22% (Figure 2). However, the LQ value of these two sectors is < 1, so it can be concluded that the contribution of the agricultural and wholesale sectors to the GRDP of East Java is small. In fact, Gresik Regency land is suitable for rice fields and brackish water fisheries. Therefore, it is crucial to develop the agricultural and

wholesale sectors and achieve high competitiveness compared to other regions, and as a result Gresik Regency will make a larger contribution to the GRDP of East Java.

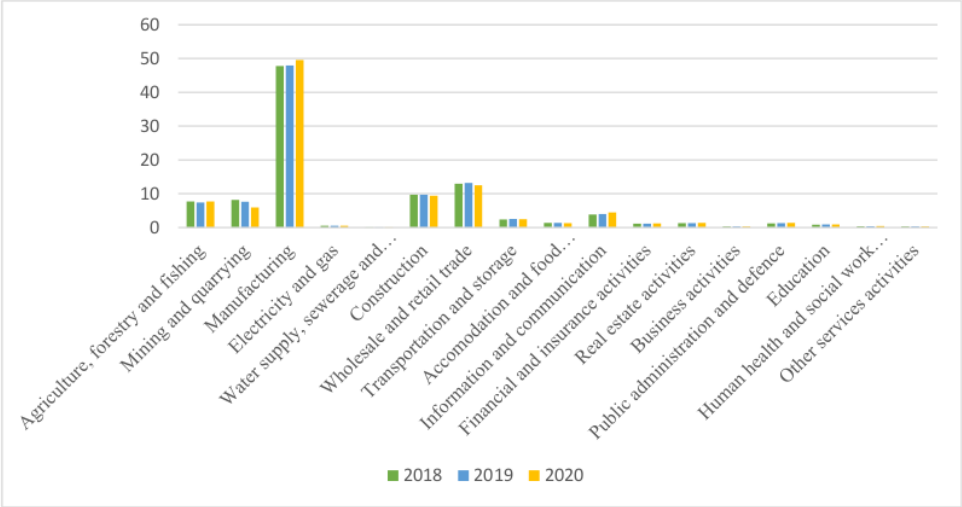

Figure 2: Gross regional domestic product of Gresik Regency 2018-2020.

Table 1: LQ analysis of each region of Gresik Regency.

Part	LQ			Priority sector
	Agriculture	Wholesale	Manufacture	
Northern	1.25	1.35	0.8	Wholesale
Central	1.02	1.02	1.10	Manufacture
Southern	0.87	0.87	1.36	Manufacture
Bawean Island	1.72	0.33	0.16	Agriculture

Based on Table 1, it can be seen that Northern Gresik has two sectors whose LQ value is > 1; namely, the agricultural and wholesale sectors, but the LQ value of the wholesale sector is greater than agriculture so in this part of Gresik, it appears that wholesale is the priority sector. However, when viewed from the priority sector of each district of Northern Gresik (Table 2), it can be seen that there are three districts (50%), where agriculture is the leading sector, while wholesale is the priority sector in two districts (33%) and manufacture is the priority sector in one district (17%). So, when viewed from the priority sector of each district, the priority sector of Northern Gresik is the agricultural sector. This is because the contribution of the agricultural sector when viewed as the number of all districts in Northern Gresik is greater than the contribution of the wholesale sector considered as the number of all districts. So, the LQ value for the agricultural sector of entire Northern Gresik is greater than the LQ value for the wholesale sector.

Table 2: LQ analysis of Northern Gresik.

Part	District	LQ			Priority sector
		Agriculture	Wholesale	Manufacture	
Northern	Dukun	1.98	0.08	1.81	Agriculture
	Panceng	1.87	0.02	1.07	Agriculture
	Ujungpangkah	1.83	0.24	1.44	Agriculture
	Sidayu	1.02	0.51	1.92	Wholesale
	Bungah	1.12	0.66	1.65	Wholesale
	Manyar	0.36	1.84	0.76	Manufacture

Central Gresik has three sectors whose LQ value is > 1 (Table 1); namely, the agricultural sector, wholesale and the manufacture sector, but because the LQ value of the manufacture sector is greater than the others, so in Central Gresik manufacture appears to the superior sector. However, when viewed from the priority sector of each district in Central Gresik (Table 3), it can be seen that within the six districts, there are two districts (33.3%), where wholesale is the priority sector, two districts (33.3%), where manufacture is the priority sector and two districts (33.3%), where agriculture is the priority sector. So, when viewed from the leading sector perspective, each district has the same opportunity to become a leading sector. However, because the contribution of the wholesale sector when viewed as the number of all districts

in Central Gresik is greater, when compared to the contribution of the agriculture sector and manufacture as the number of all districts, so the LQ value for the wholesale sector of the entire district in Central Gresik is greater than the LQ value for the manufacture and agriculture sectors (wholesale > manufacture > agriculture). The largest contribution of the wholesale sector came from Kebomas District (with an LQ value of 3.04) and the second largest came from Cerme District (with an LQ value of 1.39). The amount of contribution made by the two districts is due to many industries operating in this area, especially Kebomas District, there are many large, medium and small industries.

Table 3: LQ analysis of Central Gresik.

Part	District	LQ			Priority sector
		Agriculture	Wholesale	Manufacture	
Central	Duduksampeyan	1.28	0.74	1.25	Agriculture
	Gresik	0.00	0.55	1.51	Manufacture
	Kebomas	0.13	3.04	0.95	Wholesale
	Cerme	0.57	1.39	0.82	Wholesale
	Benjeng	1.08	0.53	1.31	Manufacture
	Balongpanggang	1.59	0.43	0.37	Agriculture

Southern Gresik has one sector whose LQ value is > 1; namely, the manufacture sector (Table 1). However, when viewed from the priority sector of each district in Southern Gresik, it can be seen that of the four districts, there are two districts, where agriculture is the priority sector (50%) and two, where wholesale (industry) is the priority sector (50%) (Table 4). So, when viewed from the leading sector perspective, each district of the two sectors has the same opportunity to become a leading sector. However, these two sectors have a slightly different LQ value of only 0.16. This is because the contribution of the wholesale sector, when viewed as the number of all districts in Southern Gresik is greater, when compared to the contribution of the agricultural sector as the number of all districts. So, the LQ value for the wholesale sector of the entire district in Southern Gresik is slightly greater than the LQ value for the agricultural sector (Table 4).

Table 4: LQ analysis of Southern Gresik.

Part	District	LQ			Priority sector
		Agriculture	Wholesale	Manufacture	
Southern	Menganti	1.36	1.04	1.10	Agriculture
	Kedamean	1.94	0.11	0.72	Agriculture
	Wringinanom	1.11	1.39	0.64	Wholesale
	Driyorejo	0.44	2.47	1.06	Wholesale

The largest contribution of the wholesale sector came from Driyorejo District (with an LQ value of 2.47) and the second largest came from Wringinanom District (with an LQ value of 1.39). The amount of contribution made by the two districts is due to many industries in this area, especially in Driyorejo District there are many large industries. In regard to agriculture, the largest contribution came from Kedamean District (with an LQ value of 1.94) and Menganti District (with an LQ value of 1.36). The Kedamean District has great potential in the agricultural sector because it has a large area of green land and well managed resources.

Bawean Islands have only one sector whose LQ value is > 1; namely agriculture (Table 1), so that the flagship sector of Bawean Islands is the agricultural sector (Table 5). Agriculture is also the priority sector when viewed from the perspective of individual districts. In this part of Gresik, the manufacture and wholesale sectors have a small LQ value. This is because the Bawean Islands have the potential for natural resources in the form of agriculture, and also it is due to limited accessibility to other areas (far from Central Gresik and the Surabaya, which is the centre of economic activity). Therefore, most of the population works in agriculture.

Table 5: LQ Analysis of Bawean Island.

Part	District	LQ			Priority sector
		Agriculture	Wholesale	Manufacture	
Bawean Island	Tambak	1.25	0.06	0.18	Agriculture
	Sangkapura	2.02	0.30	0.52	Agriculture

The Relationship between Vocational Schools and the Priority Sectors

After determining the leading sectors in each district, an analysis of the relationship between the type of vocational school and the superior sector in each Gresik part was carried out using a chi-square analysis tool, while to analyse the relationship between vocational schools and the superior sector of each district descriptive statistical analysis was used. In this study in relation to descriptive statistical analysis, a vocational school is said to be appropriate (has a relationship)

with the priority sector, if in that district the number of vocational schools in accordance with the priority sector has a percentage of ≥ 50%. There are different types of vocational schools in every district in Gresik Regency.

A large part of vocational schools with a priority sector in each district in Northern Gresik is not suitable, except for Manyar District; namely, the existing vocational schools include engineering and manufacture vocational schools, which is compatible only with Manyar District.

Of the six districts in Central Gresik, there are three districts whose vocational schools are in accordance with the leading sectors in each district; namely, Cerme, Kebomas and Benjeng. As for Gresik, Duduksampeyan and Balong districts, the existing vocational schools are not in accordance with the leading sector.

Of the four districts in Southern Gresik, there are two districts whose vocational schools are in accordance with the leading sectors in each district; namely, Wringinanom and Driyorejo Districts. As for Menganti and Kedamean, the existing vocational schools are not in accordance with the leading sector.

The Bawean Islands (Gresik part) do not have vocational schools, so 0% indicate that there is a discrepancy between vocational schools and the priority sector (agriculture).

Identifying Factors Causing Vocational School's Conformity with Leading Sectors

After identifying the discrepancy between vocational schools and the priority sector of each district in Gresik Regency, an analysis was carried out to find out the factors that caused the incompatibility of vocational schools with the priority sector using a Delphi analysis tool. This analysis was carried out on 10 questions/factors obtained from the synthesis results of the literature review. In the Delphi method, there are several stages in the analysis that must be carried out, which include determining respondents who have influence and interest in vocational school problems in Gresik Regency (expert respondents).

Based on the results of the stakeholder analysis, there were six experts (stakeholders) as respondents in this study:

1. Head of the Vocational Education Section from the Education and Culture Office of Gresik Regency;
2. Principal of Vocational High School;
3. Chairman of the Special Job Fair of Vocational School;
4. Section Head of Labour Placement from the Gresik Regency Human Resources Office;
5. Chairman of the Indonesian Entrepreneurs Association of Gresik Regency;
6. Chairman of the Chamber of Commerce and Industry of Gresik Regency.

The data for Delphi analysis were obtained through an open questionnaire. The distribution of the questionnaires was carried out as a repetitive process through three-time iteration. Thus, there were three surveys and three questionnaires for all stakeholders. The results obtained were factors that cause the incompatibility of vocational schools with the priority sector in Gresik Regency.

The questions were:

1. What is the public interest in the vocational school?
2. What is the capacity of the existing skills programme?
3. What is the current availability of facilities and infrastructure?
4. What is the competence of vocational school students?
5. How is the implementation of practical activities set up in the vocational school?
6. How is the government policy being applied in the development of the vocational school?
7. How is the implementation of the dual education system being carried out?
8. How do educators predict the future needs of the work market?
9. How is the collaboration going between the vocational school and industry?
10. What is the influence of the rapid development of science and technology?

The results of the exploration of opinions from respondents about the factors that cause the incompatibility of vocational schools with the priority sector are as follows:

Public Interest Factor

The respondents argued that the public interest/view factor was the cause of the incompatibility of vocational schools with the priority sector in Gresik Regency, especially for the agricultural leading sector. The community tend to think that there is no need for agricultural vocational schools as the graduates can only become farmers. The agricultural sector has long been present in the Gresik community, however, it has recently begun to be marginalised due to the rapid development of technology and industry. This development shifts the lives of people who were originally farmers to manufacture, and hence they are more interested in vocational schools with technology and manufacture expertise programmes.

Existing Vocational School (Expertise Programme) Factor

The respondents argued that the existing vocational school (expertise programme) factor was the cause of the incompatibility of vocational schools with the priority sector in Gresik Regency. So far, the direction of the expertise programme in Gresik Regency has not been based on the needs of business and manufacture. This can be seen from the existing expertise programmes that have experienced full capacity (automotive mechanics and machining engineering).

Limited Facilities and Infrastructure Factor

The respondents argued that the availability of facilities and infrastructure was the cause of the incompatibility of vocational schools with the priority sector in Gresik Regency. Vocational schools prepare their students to enter the workforce with appropriate skills, so every vocational school should have adequate practical equipment and practice places (workshops) both in terms of quantity and quality, so that the skills taught could be truly absorbed. However, in fact, in Gresik Regency, the equipment and practice places are not adequate in vocational schools, which are included in the *lower middle* level.

Lack of Practical Activities Factor

The respondents argued that lack of practical activities in vocational schools was the cause of the incompatibility of vocational schools with the priority sector in Gresik Regency. The curricula in vocational schools should include practical activities (more dominant at 70%) and the remaining 30% should be theoretical. However, in fact, most vocational schools in Gresik Regency prepare their graduates only theoretically not practically even though to enter the workforce more practice is needed than theory.

Competence Factor of Vocational School Students

The respondents argued that the competence factor of students was the cause of the incompatibility of vocational schools with the priority sector in Gresik Regency. The level of students' abilities in science and technology can influence the industry to form co-operation with vocational schools or not. The industry may be willing to form co-operation, if the quality of the vocational school concerned is high and the competence of its students also appropriate for the industry's needs. However, as this is often not the case, several large industries in Gresik prefer co-operation with schools outside Gresik that are more qualified.

Government Policy Factor

The respondents argued that the government policy factor was the cause of the incompatibility of vocational schools with the leading sectors in Gresik Regency. In the current period of regional autonomy, it means that each region has the right to regulate and manage itself, including education. However, in Gresik Regency, the efforts of the Education Office towards secondary education, especially vocational schools, are still insufficient. This can be seen from the ratio vocational schools to high schools in Gresik that is 23:77. Whereas the National Education Office (central) expects the ratio of vocational school to high school should be 60:40. This is because the National Education Office maintains that vocational schools can reduce the unemployment rate provided that vocational school graduates have the required skills to enter existing workforce or create their own jobs.

Dual System Education (DSE) that is not Running Well

The respondents argued that the DSE system factor was the cause of the incompatibility of vocational schools with the priority sector in Gresik Regency. The DSE system is an effort by educational institutions to carry out learning activities in schools and outside of school (in work placements). With the DSE system, there should be co-operation between the industry and vocational schools both in terms of being a place of learning (place of practice), as well as in terms of determining expertise programmes, so that they are fully aligned with the needs of the work market [11]. But in reality, this co-operation is only limited to offering a place of practice (internship) by the industry.

Educators who have Difficulty Predicting the Needs of Future Work

The respondents argued that educators who had difficulty predicting the needs of the work market were the cause of the incompatibility of vocational schools with the priority sector in Gresik Regency. Predicting the needs of the work market is very difficult, because along with technological advances, new professions/jobs emerge. However, this difficulty can be minimised by co-operating with industry. Through co-operation the types of skills that are really needed could be identified and the knowledge about the technology applied in the industry acquired [12].

Lack of Co-operation between Vocational Schools and Industry

The respondents argued that the co-operation of vocational schools with industry is an indispensable factor for the success of vocational education. But in fact, in Gresik Regency, not all vocational schools can co-operate with industry. There are obstacles to this co-operation because the industry still does not believe in the quality of vocational school

students and is reluctant to co-operate with vocational schools included in the *lower middle level*. Especially, for vocational schools that are still new, establishing co-operation with industry is quite difficult.

The Development of Science and Technology that is Advancing Rapidly

The respondents argued that the rapid development of science and technology would have an impact on the emergence of new skills that would be needed as well. Schools that are open to technological developments, would definitely innovate the expertise programmes, but in schools that are more conservative, technological developments will not be taken into account. This is one of the reasons why the existing expertise programmes are not suitable for the needs of the work market.

CONCLUSIONS

From the results of key sectors analysis of Gresik Regency, it can be concluded that the vocational school is incompatible with its potential. The reasons (factors) of this incompatibility are as follows: low community interest, full capacity of existing expertise programmes insufficient availability of facilities and infrastructure, not adequate competence of vocational school students, insufficient practical activities in vocational schools, government policy not fully implemented, DSE system not functioning well, educators who have difficulty predicting the needs of future work market needs, insufficient co-operation with industry, and rapid development of science and technology not always reflected in the curricula. The results of this study may provide information on how to increase the employability of vocational high school graduates. Furthermore, this study addresses the link-and-match issue between vocational schools and industries in Indonesia.

The recommendations from this study are as follows:

1) the negatively valued relationship between vocational schools and the manufacture sector needs to be given more attention;
2) changes in the expertise programme in accordance with the sector of excellence need to be carried out;
3) further research is suggested to analyse the effect of the relationship between vocational schools and the manufacture sector on the unemployment rate.

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