The level of preparedness of trained labor in marine and fisheries sectors towards globalization

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Abstract. Building the quality of the workforce in the marine and fisheries sector through formal education is a strategic step to improve the quality of human resources to support the national economy. Workers with skills and competency are capital in increasing economic growth. This study aims to examine the readiness of trained workforces in the marine and fisheries sector in the globalization era, especially in Industry Era 4.0. This study employs qualitative analysis with a case study approach and is represented descriptively. The results show that almost all graduates of marine and fisheries vocational schools were employed. However, some findings are discovered: 1) lack of practice facilities in vocational schools; 2) lack of ability of graduates of foreign language vocational schools; 3) the internship program for prospective trained workers, especially in foreign industries, has not been facilitated by the government. Some recommendations should be considered: 1) allocate a higher budget to add or improve facilities and infrastructure, 2) increase hours of study on foreign language skills or invite professional native teachers to improve foreign language skills, and 3) promote cooperation with foreign industry to manage internship programs abroad before entering the industry.

1. Introduction

One of the current labor market issues is the role of technology in the production process will affect the labor market, especially in the context of replacing human workers with machines. Technology growth and development are important for labor development because humans are moving forward over time. Labor is people engaged in a specific activity that produces goods and/or services (both to meet their own needs and for the community) [1]. Currently, the increasing demand for quality labor is not compensated with job vacancies. Governments have been improving the quality of human resources [2] on facing the industrial revolution 4.0. This may improve speed-flexibility on production, service, and revenue.

Industrial revolution 4.0 is characterized by rapid technological and workforce changes, so the education system must keep up with these changes [3]. These potential benefits may have a positive impact on the economy. Intensive changes and digital penetration in recent years have forced the governments to implement vocational education that links and matches the needs of the industrial era; nevertheless, this effort has not been optimal. A study from the Institute for Management Development shows that the competitiveness of the Indonesian workforce is behind Thailand, Malaysia, and Singapore (ranked 37 out of 64 countries). Indonesia has challenges in improving the workforce such as a low level of formal education and the mismatch between education and work [4].

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Another concern that needs to be considered is the competition between Indonesian laborers with the foreign workers in the fishing industry sector. The Indonesian government has issued a policy regarding the employment of Foreign Workers through Presidential Regulation 20/2018. This regulation aims to provide business certainty in Indonesia and to expedite licensing services for foreign workers, as well as improve competitiveness [5]. The entrance of foreign workers is a notice for Indonesian human resources to improve their capabilities and competency. Improving the competence of the Indonesian workforce in the marine and fisheries sector is important due to extensive marine resources. In addition, the marine and fisheries industry is one of the sectors affected by the improvement of digital technology.

Intensive technology improvements require workers with certain skills to change from manual to an automatic and integrated working system. At present, the Indonesian workforce has limited skills and expertise in digital technology. Consequently, educational institutions in the marine and fisheries sectors have roles in preparing the workforce to adapt to changes. A significant change in learning and thinking is an urgent need in the consumer society era. Previously, similar notable researches have been conducted by Kaufman B E (2015) and Novakova L (2020), in which both found out that increasingly fierce business competition in this globalization era requires companies to use their human resources more effectively by implementing high work practices [6,7]. Therefore, this study aims to provide recommendations to the government in creating a trained workforce in the marine and fisheries sector to be able to compete globally.

2. Data and Methods

2.1. Time and Location
This research was conducted in 2019 with loci in Jakarta and Pasuruan (East Java) as a research area and in 2021 with loci in Tegal City (Central Java) and Sukabumi Regency (West Java). Pasuruan and Jakarta were chosen because both areas represent the fish capture and processing industry which absorb a large workforce in the marine and fisheries sector. Tegal was chosen due to its educational and training institution at Fisheries Training and Extension Center under the Ministry of Marine Affairs and Fisheries (MMAF). Sukabumi was chosen as a research area because it also has formal education at the Vocational School level, in which most graduates were being fishing vessel crews.

2.2. Data and Analysis
The types of data used in this study were primary and secondary. Primary data focuses on extracting information from those who know about the skills development of an educated and industrial workforce that absorbs human resources in the field of capture and processing. Secondary data sources are written information (online news), scientific research, and secondary legal materials related to the discussion. Data collection techniques are carried out through:

2.3. Interview method using the data topic with the key informant (8 informants).
In-depth interviews using the data topic were conducted to: 1) Official of the Directorate General of Capture Fisheries (MMAF-Jakarta); 2) Official of the Center for Education-Research Agency and Human Resources for Marine and Fisheries-Jakarta; 3) Official of the Indonesian Migrant Worker Protection Agency-Jakarta; 4) Head of Tegal Fisheries Training and Extension Center-MMAF; 5) Official of the Marine and Fishery Service-Sukabumi Regency; 6) Teaching staff of the Fisheries Vocational School-Sukabumi Regency; 7) Entrepreneur of processing industry-Pasuruan; 8) Entrepreneur of the fish catching industry-Jakarta.

2.4. Literature review
The literature review is a survey of books, scientific articles, and other sources relevant to a specific issue, area of study, or theory, which in doing so can provide a description, summary, and critical evaluation of these works concerning them with research problems that are being carried out.
The analysis was carried out qualitatively with a case study approach and described descriptively. The purpose of selecting these analytical method, is to explain the readiness of an educated workforce in the marine and fisheries sector in facing job competition in the era of globalization.

3. Results and Discussions

3.1. Overview of Trained Labor force in the Marine and Fisheries Sector in the Industrial Era 4.0

Information technology has a profound effect on human resource processes and practices [8]. The trend of digitization, automation, and increased use of information technology are the main concepts in the industrial revolution 4.0 [9]. Currently, the government has been developing programs to improve the quality of Indonesian human resources to able to compete with other countries in the industrial era 4.0. Indonesia needs million digitally literate workforces to achieve the target where 30% for the manufacturing industry and 70% for supporting industries. Had these been achieved, it has a potential contribution to the Indonesian economy for about USD 150B [10].

Human resource development programs can improve the competence and welfare of the workforce [11]. Building human resources must be supported by a good political and economic environment. These supporting conditions are needed to produce good laborers to become hardworking, dynamic, skilled and science/technology literate. The economic development of a country can be seen from the products exported and the demand for its trading partners [12]. The fisheries sector is a labor-intensive industry that absorbs a lot of labor; thus, positive impacts on income distribution and multiplier effects would be significant. However, Indonesian laborers are low qualifications for formal education whereas job opportunities require high workforce quality.

Education is a requirement to win the opportunities, especially workforce education preparedness to obtain job opportunities. On the other side, providing job opportunities is the main challenge because it depends on demands from industry players. The ability to work will have implications for competency-based career management [13]. Labor demands would be high when economic condition is good. The government has a role in implementing measures that can increase the economic benefits of the fisheries sector [14].

The number of the workforce according to formal education level from the Survey of National Labor Force can be seen in Table 1.

| Education Completed       | Number of Labor Force | 2008     | 2013     | 2018     |
|---------------------------|-----------------------|----------|----------|----------|
| No Education              |                       | 5,571,336| 5,534,073| 3,393,206|
| Unfinished Primary School |                       | 13,552,663| 16,349,608| 16,163,189|
| Primary School            |                       | 38,856,921| 33,846,338| 32,158,979|
| Junior High School        |                       | 21,013,179| 22,251,828| 23,555,942|
| High School               |                       | 16,800,257| 19,801,905| 24,226,876|
| Vocational High School    |                       | 8,165,461 | 11,226,511| 15,413,273|
| Diploma                   |                       | 3,234,551 | 3,113,371 | 3,671,473 |
| University                |                       | 4,752,897 | 8,048,369 | 12,382,703|

Table 1, shows that labor absorption is not determined by the improvement in education level. Frankly, level of education is not the only important factor but other elements may also influence such as their competency and capabilities that compatible with their jobs. In 2019, MMAF has allocated IDR 469.4 billion on vocational development especially for High School for Fisheries, Marine and Fisheries Polytechnic, and Fisheries College. Linking and matching programs between education and industry are carried out to enhance human resource competency [16].

The head of Tegal Fisheries Training and Extension Center-MMAF, explained that the number of Vocational High Schools in the marine and fisheries sector reached 667 schools and those spread across...
various regions in Indonesia. At the University level, 52 departments organize marine and fisheries programs. MMAF also has 20 units of Vocational High Schools and University level. MMAF provides trained workforce graduates from Vocational High Schools, Polytechnics, and Fisheries colleges. Learning focus of fisheries catching science includes fish catching, fisheries mechanics, fishery machinery, and equipment; while fish processing science is focused on fish product processing techniques and fisheries agribusiness (interview, 09/04/2021).

According to official of the Center for Education-Research Agency and Human Resources for Marine and Fisheries-Jakarta, the availability of graduates from Fisheries High Schools, Polytechnics and Fisheries Colleges are 800-1,900 annually (with an average of 1,500 graduates per year) (interview, 03/12/2019). The graduates from marine and fisheries education units in fish catching and processing have now been working locally and abroad, 45% and 23% respectively [17]. Entrepreneur of processing industry-Pasuruan, stated that the number of graduates from fishing fields under MMAF education units is higher than those from the fish processing industry (interview, 12/11/2019). Vocational schools reduce the risk of mismatching qualifications to labor market needs [18].

According to information from entrepreneur of the fish catching industry-Jakarta, the availability of labor can be measured by the difficulties in hiring a workforce. The need for trained workforces in the Indonesian fishing industry has not been met because graduates generally choose to work abroad. The compensation offered from abroad work is greater (interview, 27/11/2019). The workforce as a key element of industry needs to be improved to increase their productivities. These conditions are needed to address: 1) high demand for certified workers from foreign industries; 2) limited ability of the fishing sector to provide compensation according to international standards; 3) licensing simplification for foreign workers to work in Indonesia.

3.2. Readiness of Trained Workforces in Marine and Fisheries Sector for Globalisation Era

3.2.1. Fishing Industry

Indonesia has a comparative advantage in the marine and fisheries sectors in the globalization era due to the combination of its natural and human resources. However, human resource needs to be prepared to compete in the industrial era 4.0. Teacher professional development is very important to improve school quality and student achievement [19]. Industries that are able to develop human resource competencies appropriately will be able to face various problems in business [20]. Competent human resources that suit the industry needs with supports from government policies would improve the growth of the fisheries industry. Optimization of vocational education and competency certification are keys to the growth of the fishing and processing industry.

Teaching staff of the Fisheries Vocational School-Sukabumi Regency, claimed that generally, national companies in the fishing industry trust the operation of the fishing vessels to the skipper, including the recruitment of fishing crews (interview, 23/04/2021). According to information from entrepreneur of the fish catching industry-Jakarta, the recruitment is entrusted to the skipper because legal agents or agencies are not available for providing domestic crews for the fishing industry. Official of the Indonesian Migrant Worker Protection Agency-Jakarta, emphasized that the recruitment process for abroad fishing industry is carried out by Indonesian manning agents to distribute them to agents located abroad. Currently, the regulation regarding the recruitment and placement of Indonesian migrant workers for fishing vessel crews is under the authority of the Ministry of Labor and the Ministry of Transportation (interview, 20/04/2021).

In general, Indonesian fishing crews are only graduated from primary school. Yet, formal education is not required by the fishing industry for the qualifications/skills of fishing crews. Digital skills possessed by a workforce can be used as a benchmark to see competence and correlate with the income received [21]. The head of Tegal Fisheries Training and Extension Center-MMAF, explained that the competence of fishing crews can be assessed by the Indonesian National Qualifications Framework. The skills and competency of fishing crews are capital to bargain their salaries. However, vocational school graduates are barely employed by national fishing vessels (interview, 09/04/2021).
Hence, the competitiveness of the national fishing industry may be low due to the low employment of trained fishing crews. Low quality of fishing crews may be caused by: 1) environmental and technological challenges; 2) supply orientation on designing fishing crew provision without considering the needs of the fishing industry; 3) lack of government roles in improving the quality of fishing crews; 4) on the job training still occurs; 5) globalization leads vocational graduates to work abroad. The condition must be changed to attract graduates to work in the national industry and current crews may enhance their skills and competency; thus, the competitiveness of the national fishing industry would improve.

Furthermore, the government must improve vocational school programs to generate productive and professional workforces to meet national and international markets. Official of the Marine and Fishery Service-Sukabumi Regency, said that graduates from marine and fisheries vocational schools indeed have skills and competence which can increase competitiveness. Nonetheless, those advantages are not led to adequate compensation; hence, those graduates are not interested in working in the national fishing industry. Working abroad is not interesting either even though it offers higher compensation (interview, 22/04/2021). Competency development will lead to career success and one's work ability [22].

Official of the Directorate General of Capture Fisheries (MMAF-Jakarta), stated that the problem must be immediately resolved to boost state revenues. The Fisheries College in Jakarta currently provides Fishing Technology and Fisheries Engineering Departments (interview, 29/03/2021). Both majors are highly demanded by male students since those require physical strength with high risks. Interest in a major will affect a person's potential to develop professionally and apply the acquired knowledge/skills to be applied to work [23]. According to an official from The Center for Education-Agency of Research and Human Resources for Marine and Fisheries, most graduates of vocational fishing schools under the authority of MMAF are working in domestic/overseas industries, public servants and become entrepreneurs, and some of them continue their education to the next level (interview, 10/12/2019).

Teaching staff of the Fisheries Vocational School-Sukabumi Regency, state that it was necessary to provide programs on foreign languages and collaborate with the foreign fishing industry to carry out an internship program before entering the industry (interview, 23/04/2021). Fishery management in the context of global sustainable development does not only include the dimensions of ecosystems, socio-economic systems, and institutions, but is also related to actors and the role of business strategies in the industry [24]. Therefore, success is not only measured by the amount of income generated but way more about the effectiveness, efficiency, fast, and quality to increase business productivity.

3.2.2. Fish Processing Industry
Trained workers need to be prepared to build their competency to compete in the Industry Era 4.0. The roles of trained workforces are not only needed in the fishing industry but also in the fish processing plant industry. Technology currently functions as a means of promotion, exchange of information and knowledge which is very important for fisheries development [25]. The fish processing industry contributed an important role to national economic growth in the globalization era. Competency standards of laborers in the fish processing industry are very important in increasing productivity, especially in fish freezing and fish canning enterprises.

The government has set Indonesian National Work Competency Standards (INWCS) to follow the competency standards of workers. INWCS is a set of national standards developed to measure the minimum of knowledge, skills, and work attitudes a worker must have to apply for certain a position. Entrepreneur of processing industry-Pasuruan, stated that the selection of workforce competencies was only carried out for Quality Control (QC) position. QC person must be certified with Hazard Analysis and Critical Control Point (HACCP) and Fish Processing Certification, while other positions only require formal education (minimum graduated from high school) (interview, 12/11/2019).

Human resources and the achievement of their performance, have an important relationship to maintain the company strategy that has been set [26]. The head of Tegal Fisheries Training and Extension Center-MMAF, explained that government increases the roles of vocational schools in
creating skilled and competent human resources to meet the INWCS standard for the fish processing industry (interview, 09/04/2021). Official of the Center for Education-Research Agency and Human Resources for Marine and Fisheries-Jakarta, stated that creating a Department of Product Processing Technology at Fisheries College in Jakarta is an effort to increase these roles. Graduates of this department are expected to understand, develop and apply post-harvest technology in terms of handling, preserving, controlling quality, and processing of fish products. (interview, 03/12/2019).

Work practice is an effort to encourage innovative behavior that allows for efficiency without losing the emphasis on the creativity of a trained workforce [27]. The head of Tegal Fisheries Training and Extension Center-MMAF, explained that Marine and Fisheries Polytechnic in Sidoarjo has established the Department of Fish Processing Technology to strengthen human resources to be part of the fish processing industry. This program applies the teaching factory-based vocational education (TEFA) with a 30% theory framework and 70% practices. The learning method applied in this program is the block system (integrated, complete, and thorough), and applies a drop-out system every semester based on the academic value and personality of the students (interview, 09/04/2021). The block system is the arrangement of school time by applying the provisions for longer time in class [28].

Official of the Center for Education-Research Agency and Human Resources for Marine and Fisheries-Jakarta, explained that every graduate of this program has some qualifications: 1) HACCP certificate; 2) Fish Processing Certificate issued by the Agency of Fish Quarantine and Quality Control-Directorate General of Strengthening the Competitiveness of Marine and Fisheries Products; 3) British Retail Consortium (BRC). The students also have to pass the Test of English as a Foreign Language (TOEFL) with a minimum score of 450. Those qualifications are required to prepare graduates to compete in the industry (interview, 03/12/2019). A trained workforce is expected to be able to develop skills and competencies that will enable them to adapt and respond to work [29].

From interviews with entrepreneur of processing industry-Pasuruan, found some information that educated workers from vocational schools often change jobs or companies to find better compensation (interview, 12/11/2019). Education is very important in increasing human capacity to feel, understand, create change, and collaborate with technological advances [30]. Design on education for preparing workforces requires a rethinking towards directions and approaches with contextual learning. Thus, it is also needed to re-oriented on the educational system, not only on adjustment to adapt to invalid work system. A new approach is needed in responding to emerging standards to address the latest challenges, as well as preparing the workforces to engage with the pressures of the work environment [31]. Cooperation with foreign (overseas) processing industries for vocational school students to practice abroad should be considered; hence, the graduates are better prepared to enter the industry.

4. Conclusion
The technical skills and competency of graduates from vocational school to improve the competitiveness of national fishing and processing industries is sufficient but still lacking in foreign language skills. However, the facilities provided by the vocational schools for fishing science are inadequate which may impend the readiness level of graduates to work in the industrial era 4.0 is still low. Apprentice programs in foreign countries should be established through bilateral cooperation. Improving the quality of the workforce is required to enhance the competitiveness of fishing and fish processing industries in the globalization era, especially industry 4.0. Some recommendations to be considered to absorb educated workers with high competency: a) allocating a higher budget to add or improve facilities and infrastructure, b) increasing hours of studying foreign language skills or inviting professional native teachers to improve foreign language skills, and c) promoting cooperation with foreign industry to manage internship programs abroad before entering the industry.

Acknowledgment
The authors would like to express their utmost gratitude towards the Research Center for Marine and Fisheries Socio-Economics for its full support and funding.
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