

# The Composition and Role of Human Capital: A Descriptive Analysis of High-Tech Industry in Indonesia

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**Abstract.** This research aims to assess the state of human capital in companies in Indonesia's high-tech industry. The high-tech industry is important in Indonesia because it is a pillar of national development, but research in this field is still very limited. The descriptive approach is used in the research methodology, with the population or all components of the research subject serving as a data source. The population is drawn from the Indonesian Central Bureau of Statistics (CBS) manufacturing industry statistical dataset for manufacturing industries classified as high-tech in 2019. The findings show that Indonesia's high-tech industry is technologically advanced but still heavily reliant on financial resources. Many workers in this industry demonstrate the importance of human resources. With characteristics such as STEM-based human resources, high-tech production processes, or the production of high-tech products, the condition of workers in this industry is primarily absorbed in the production department. The average foreign worker in the production sector is 0.31%, while the average foreign worker in the office sector is 1.05%. More research is needed to determine the impact of these workers' composition on company performance in the high-tech industry.

## 1 Introduction

The resources owned by the company as a factor affecting Firm Performance are related to Resource-based Theory. According to Resource-based Theory (RBT), a company must be able to manage its resources properly to compete with other companies for competitive advantage [1]. Therefore, to improve company performance and maintain high competitiveness, companies must focus on managing company resources, including human capital, in accordance with Resource-based Theory. Resources are important because they are related to firm performance in all industries, including high-tech companies.

High-tech industries are industries with a classification of economic activities based on the use of high-tech processes for inputs such as labor on a STEM (Science, Technology, Engineering, Mathematics) basis, R&D activities, and the use of high-tech production methods or producing high-tech products as outputs [2]. Research on High-Tech Industry has been conducted in many developed and developing countries such as China, Malaysia, Taiwan, and other countries [3–7]. However, it is still very limited in Indonesia [8].

Human capital becomes highly important in supporting the company's competitiveness as the company's intellectual capital, which plays a key part in developing innovation that is realized in the ability to do a job so as to produce economic value. Previous research discovered that human capital, particularly in the R&D department, plays an essential role in generating

innovation to increase firm performance by emphasizing the necessity of internal capabilities to use external knowledge assets [9]. Furthermore, other research indicates that human capital has a positive and significant effect on organizational innovation, organizational innovation on firm performance, and human capital on firm performance [10]. Based on this context, this research aimed to assess the state of human capital in companies in Indonesia's High-Tech Industry.

## 2 Methodology

This study employs descriptive analysis. Descriptive research is carried out to obtain a comprehensive picture of the conditions in each variable, which includes the composition of male and female workers, the composition of production workers and office workers, the percentage of foreign workers in the High-Tech Industry - Production, and the percentage of foreign workers in the High-Tech Industry - Office.

The study uses the population or all components of the research subject as a data source. The population is drawn from the Indonesian Central Bureau of Statistics (CBS) manufacturing industry statistics dataset for manufacturing industries classified as high-tech industries in 2019. According to CBS data, 4,520 companies are classified as high-tech industries.

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### 3 Literature Review

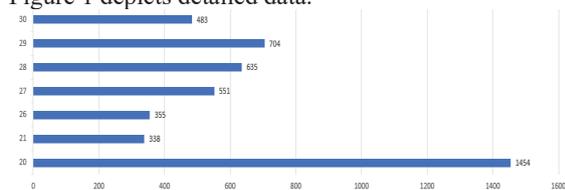
The world is currently entering an era of knowledge-based economic globalization. Knowledge, rather than capital, land, or labor, is the most important resource for industrial growth in this era. As a result, knowledge workers are critical in today's business activities. Workers with knowledge become human capital, which is extremely valuable to businesses [10]. According to recent research, human capital capacity, knowledge, and skills all play an important role in driving company performance [11].

The importance of the role of human capital is also evident in research that states that human capital strongly influences performance when these human resource capabilities are not easily found in the labor market and when researchers use performance measurement rather than solely measuring profits. This research recommends that companies need to invest in programs that can improve and maintain the company's human capital [12]. Human capital can also be viewed as a unique resource of the company that cannot be replicated. Research related to the Resource-based view (RBV) and strategic human resources (HR) or human capital (HC) shows that the RBV has a major influence on strategic HR or HC research and provides a framework for human resource management [13].

### 4 Result and Discussion

According to the National Medium-Term Development Plan (RPJMN 2020-2024), the high-tech industry in Indonesia is one of the industries that is the mainstay of economic growth and the focus of development. With ever-increasing global competition, Indonesia must implement a strategy oriented toward the formation of technology-intensive industries (high-tech industries) supported by its resources, including human resources.

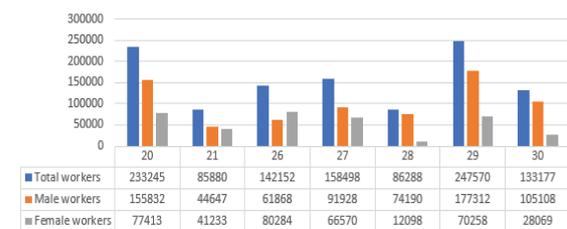
According to the Central Statistics Agency (BPS), there were 4520 companies in Indonesia's High-Tech Industry category in 2019. Chemicals and Chemical Products (ISIC 20), Pharmaceutical Industry (ISIC 21), Computers, Electronic and Optical Goods (ISIC 26), Electrical Equipment Industry (ISIC 27), Machinery and Equipment Industry (ISIC 28), Motor Vehicles, Trailers and Semi-Trailers Industry (ISIC 29), and Other Transportation Equipment Industry Except for Ships and Boats (ISIC 30) comprised the High-Tech Industry category. The Chemicals and Chemical Products industry has the most companies, with 1454 companies, accounting for 32% of all companies in the high-tech industry. While the Pharmaceuticals industry has the fewest companies (338, or 7.5%), it is the most diverse. Figure 1 depicts detailed data.



**Fig. 1.** Number of High-Tech Companies in Indonesia in 2019  
 Source: Indonesian Central Bureau of Statistics (CBS)

The industry of motor vehicles, trailers, and semi-trailers employs the most people, with 247,570 people, or 23% of all workers in the high-tech industry. When the number of workers is compared to the number of companies in this industry, it is clear that this industry in Indonesia is still heavily reliant on human resources to run its operations. According to the data, the number of companies in the Motor vehicles, trailers, and semi-trailers industry is only 50% (704 companies) of the Chemicals and Chemical Products industry (1454 companies). However, the number of workers in the Motor vehicles, trailers, and semi-trailers industry is higher.

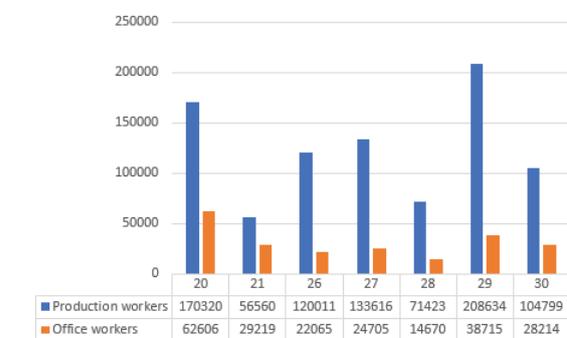
The ratio of male to female workers demonstrates that male workers dominate most industries. Male workers account for approximately 65% of all workers in the high-tech industry. A different phenomenon can be seen in the computer, electronic, and optical products industry, where women outnumber men by 56%. This demonstrates that female workers in Indonesia are more advanced and competent, allowing them to compete for the same jobs as male workers. Figure 2 depicts detailed data.



**Fig. 2.** Composition of Male workers versus Female workers.

Source: Indonesian Central Bureau of Statistics (CBS)

Regarding the composition of production workers versus office workers, most workers in the high-tech industry (80%) are production workers. This indicates the company's growth, as the greater the market demand for high-tech industry companies' products, the more production workers are required. Because of the importance of having skilled production workers, businesses must focus on transforming quality human resources (HR). Figure 3 depicts detailed data.



**Fig. 3.** Composition of Production workers versus office workers

Source: Indonesian Central Bureau of Statistics (CBS)

Regulations regarding foreign workers in Indonesia are expected to promote technology and knowledge transfer. However, companies have so far objected due to the high cost of processing applications and permits for using foreign workers. On the other hand, foreign workers, in addition to improving technological capabilities through external sources, can improve the company's technological capabilities [14, 15].

Regarding foreign workers, conditions in the high-tech industry show that an average of 0.31% of production workers are foreign workers. Meanwhile, the average number of foreign workers among office workers is 1.05%. According to this data, the high-tech industry has not employed many foreign workers. However, some industries improve their technological capabilities by attending direct training at the parent company and bringing the technology back to Indonesia. And some other companies, such as Hitachi, do technology transfer with a limited number of foreign workers, and learning is done remotely because it is considered effective for technology transfer. Tables 1 and 2 show the percentage of high-tech industry foreign workers from both the business's production and administrative sides.

**Table 1.** Percentage of foreign workers in High-Tech Industry - Production

ISIC	Indonesian production workers	Foreign production workers	% foreign workers
20	169756	564	0.33%
21	56487	73	0.13%
26	118726	1285	1.07%
27	133222	394	0.29%
28	71304	119	0.17%
29	208447	187	0.09%
30	104719	80	0.08%

**Table 2.** Percentage of foreign workers in High-Tech Industry - Office

ISIC	Indonesian office workers	Foreign office workers	% foreign workers
20	61987	619	0.99%
21	29205	14	0.05%
26	21702	363	1.65%
27	24388	317	1.28%
28	14459	211	1.44%
29	38305	410	1.06%
30	27959	255	0.90%

Foreign workers may be present due to foreign investors in the company. Foreign investors enable the company to connect with international networks, potentially increasing its export margin [16]. Thus, foreign workers can have a positive impact due to technology transfer, and foreign investors can also have a positive impact because they expand international networks [8, 17]. Thus, companies need to have a

governance strategy within the firms' ownership structure within the company [18, 19] noting that a high concentration of ownership in one party will hinder the innovative and proactive development of top managers, as the largest shareholders are often risk averse in the internationalization of the company [20].

The regulations set in Indonesia regarding foreign workers are expected to bring technology transfer and knowledge transfer. However, the significant cost of processing applications and permits for using foreign workers has caused objections from companies. Of course, the current mechanism is time and money intensive. The ministry's bureaucracy is viewed negatively by businesses. The obstacles encountered by entrepreneurs seeking permission to hire foreign workers are highlighted, particularly for the ministry responsible for manpower to improve its performance in providing services, particularly granting permission to hire foreign workers to develop the company's technological capabilities. Furthermore, the applicable regulations require companies to appoint Indonesian workers as assistants to foreign workers for technology transfer and expertise transfer from foreign workers. This regulation makes no provisions for determining the effectiveness and efficiency of this mentoring program. Government Regulation Number 34 of 2021, Concerning the Use of Foreign Workers, governs this.

Foreign labor, in addition to improving the company's technological capabilities through external sources, can also improve the company's technological capabilities, namely through Foreign Ownership. Foreign investment is typically accompanied by technology transfer, capital goods mobility, and skilled labor mobility. This is known as technology advancement from within (Internalization). In addition, foreign ownership will bring new technological knowledge to Indonesia, which will eventually be developed in Indonesia (Ministry of Investment / BKPM).

## 5 Conclusion

Companies must focus on managing company resources, including human capital, to improve company performance and compete effectively, in line with Resource-based Theory. Human capital is important in supporting the company's competitiveness because it fosters creativity, manifested in the ability to do a job to generate economic value. The high-tech industry in Indonesia is a technology-intensive industry. However, it is still heavily reliant on human resources, as evidenced by the large number of workers in this industry. With characteristics such as STEM-based human resources, high-tech production processes, or the production of high-tech products, the condition of workers in this industry is mostly absorbed in the production section.

The majority of workers in this industry are Indonesians. In terms of foreign workers, conditions in the high-tech industry show that an average of 0.31% of production workers are foreign workers. Meanwhile, office workers have 1.05% foreign workers on average.

Although previous research indicates that the presence of foreigners in the company affects technology transfer, the High-Tech Industry in Indonesia employs a different strategy to obtain the necessary technology transfer. Therefore, future research should look into how worker composition affects company performance in the high-tech industry.

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