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FACTORS INFLUENCING OPTIMIZATION PERFORMANCE OF HIGH-TECH INDUSTRY FROM THE SDGs PERSPECTIVE

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Abstract

Purpose: Every company has a role and obligation to participate in achieving the Sustainable Development Goals (SDGs) while remaining focused on the company's competitiveness. The research aims to identify factors influencing the performance of high-tech industry from the SDGs perspective.

Method: This research uses an in-depth literature review method on reputable publications indexed in the Scopus database, by applying keywords that are relevant to the research topic. This research managed to find the role of SDGs and ESG elements in the development of high-tech industries.

Results: The literature study concluded that a company's ESG (Environmental, Social, Governance) policies covering the environmental aspects, social aspects, and governance aspects, greatly influence the company's SDGs achievement. By improving ESG performance, companies indirectly play a role in SDGs goals. This study is expected to offer input and recommendations for high-tech industry as well as the government in formulating policies and practices that support firm performance in meeting SDGs targets.

Keywords: Firm Performance, High-Tech Industry, Sustainable Development Goals

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1. INTRODUCTION

In the last two decades, companies have developed sustainability-based performance reports which reflect company various stakeholders' awareness in sustainability issues. As part of the reporting process, guidance was also issued to support the company's Sustainable Development Goals (SDGs) commitment (Kücükgül et al., 2022). SDGs implementation requires (Bizarrias, 2024) plenty of planning and resource allocation. However, questions on availability of resources, ways to cope with existing gap, future adjustments and requirements as consequences of SDGs adoption remained unaddressed (Leal Filho et al., 2022). The crucial role of companies in achieving SDGs is overshadowed by the interconnected and systemic challenge of implementing sustainable development in the world (Souza & Lima, 2020). It is imperative for companies to focus efforts on assuring that their strategy effectively contributes to sustainable development (van Zanten & van Tulder, 2021). Industries from all around the world with various economics and institutional background show different paths, priorities, strategies and progress in their SDGs implementation (Cheng et al., 2021).

High-tech industry is identified as industries that based its economic activities on the use of high-tech process and inputs, such as employ Science, Technology, Engineering, Mathematic (STEM) educated workers, perform research and development activities, apply high-tech method of production, or manufacture high-tech products as outputs (Goldschlag & Miranda, 2020). United Nations Industrial Development Organization (UNIDO) as a UN body overseeing industrial development in developing countries categorized high-tech industries into medium-high technology and high technology. The groupings are based on the technology intensity outlined in International Standard Industrial Classification (ISIC), where the high-tech industry consists of chemicals and chemical products industry, pharmaceuticals industry, computer electronic and optical products industry, electrical equipment industry, machinery and equipment industry, motor vehicles, trailers and semi-trailers industry, and other transport equipment except ships and boats industry (UNIDO, n.d.).

High-tech industry is also the focus of the government's roadmap Making Indonesia 4.0 to prepare the country's entrance to the era of Industrial Revolution 4.0. The roadmap highlights five main sectors: automotive, chemicals, electronics, food and beverage, textile and apparel; three sectors of which (automotive, chemicals, electronics) are classified as high-tech industry. The importance of the role of high-tech industry is also demonstrated through the policy of the central bank, Bank Indonesia (BI). To encourage the growth of manufacturing industry, BI set up program to support and evaluate the performance of manufacturing industry by strengthening the medium-high technology industry's product to boost export (Central Bank of Indonesia, 2020).

Technological progress and industrial innovation of the high-tech industry and its relations to environmental issues have attracted the attention of both environmental scholars and decision-makers in developed and developing countries (Shahzad et al., 2022). In Indonesia, environmental research related to the aspect of industry's technology intensity is still very limited. The same challenge also applies to a more developed country such as China, where the efforts to push the growth of high-tech industry had been accosted by the call to mitigate the negative impacts to environment, as the industry's role in reducing environmental pollution is deemed insignificant (Shahzad et al., 2022). In developed and developing countries alike, the quality of the environment is dependent on globalization, income level, contribution of high-tech industry, and other factors (Martí et al., 2015; Usman & Hammar, 2021; Zafar et al., 2019).

Indonesia is very keen in adopting SDGs to achieve the sustainable development. In order to attain this goal, the government passes the Regulation of the President of Republic of Indonesia (*Peraturan Presiden, Perpres*) 59/2017 and Regulation of the President of Republic of Indonesia 111/2022 on the Implementation of the Sustainable Development Goals (*Pelaksanaan Pencapaian Tujuan Pembangunan Berkelanjutan*). The Presidential Regulations outlined government efforts involving all level of state apparatus from the central government to civil socety organization in achieving sustainable development goals. It is also stated that the state institutions will plan, execute, monitor, and evaluate the achievements of sustainable development goals (Guimarães, Severo & Dorion, 2023) in accordance to their duties, functions, and authorities.

Among the tangible steps taken by the government to fulfill one of the SDGs target is the launching of National Health Insurance (*Jaminan Kesehatan Nasional, JKN*) program. Through the program, government obligated companies, business entities and legal entities to register all employees and their family members to the Social Security Administrator (*Badan Penyelenggara Jaminan Sosial, BPJS*) program. The scheme is intended to promote and safeguard the company's provision of social security towards its employees as well as increasing the employees welfare.

Another effort by the government to reduce electronic waste is through the Regulation of the Minister of Industry and Trade 229/1997 Article 3 which restricts companies to import second-hand electronic goods. Moreover, the government also controlled and issued a standard, Indonesia's National Standard (*Standar Nasional Indonesia, SNI*) for companies that produced electronics so that the products meet certain qualification and do not generate more environmental waste [37].

Based on the introduction, the objective of this research is to identify factors that influence the performance of high-technology industry from the SDGs perspective. It is expected that companies would be able to use this study in further developing their businesses while simultaneously achieving the SDGs. The research also aims to provide

constructive inputs towards government policy in facilitating companies to thrive in their business while attaining the SDGs targets at the same time.

2. RESEARCH METHODOLOGY

This research uses an in-depth literature review of previous studies. The data used in this research was taken from the Scopus journal website. We searched for and studied journals related to the research topic by using relevant keywords. The keywords used are Sustainable Development Goals (SDGs) and high-tech industry. The main aim of this research is to review previous studies in the field of high-tech industry and SDGs.

The stages of the literature review carried out are described as follows:

Figure 1. Stages of Research Methodology

3. RESULT AND DISCUSSION

1. Previous Research in High-Tech Industry

Review of previous literature indicated that research related to the performance of high-tech industries and non-high-tech industries had mixed results. industries. Table 1 illustrates how the high-tech industry's role and interpretations change depending on the viewpoint.

Table 1 Previous Research in High-Tech Industry

No	Finding(s) from Previous Research	References
1	This study finds that applying information technology such as ERP in high-tech companies can aid the achievement of SDGs because ERP implementation boosts productivity and operational performance. In addition, foreign ownership can support companies in achieving the SDGs.	(Kharunnisa et al., 2023)
2	Companies identified as high-tech industries implemented various strategy to win business competition. Strategy applied by companies to increase firm performance and competitiveness needs to consider organization's external environment. Components of the organizational environment are: Administrative/legal, Technology, Political, Economic, Ecological, Stakeholders, Socio-Cultural.	(Lusthaus, 2002)
3	This research provides measures of job creation and destruction, entry and exit in High-Tech industries by several relevant firm characteristics, including firm age and firm size. High-Tech is increasingly dominated by older and smaller firms. This is because employment is shifting away from large firms. The average size of establishments for the largest High-Tech firms has declined significantly.	(Goldschlag & Miranda, 2020)
4	The research elaborates the influence of interfirm network, innovation capability, and export on firm's performance. It observes impact between interfirm network and innovation capability relation. The interfirm network found to be the most influential factor in increasing firm performance compared to innovation capabilities and export.	(Noerlina et al., 2022)
5	Findings of this study demonstrate that royalty expenses have different impacts across industry. The chemical and pharmaceutical industries have fared better than the average high-tech companies in Indonesia while keeping their royalty expenses below average. In contrast, the performance level of royalty expenses in the machine vehicle and electronic equipment industries, as well as for trailers and semi-trailers, is directly correlated with the business's performance. This demonstrates the high absorption capability of some high-tech Indonesian companies.	(Mursitama et al., 2023)
6	Findings of this study stated that industrial agglomeration and collaboration between company and university have significant positive impact for innovation performance of high-tech industries.	(Sun et al., 2020)
7	The research shows the influence of emission of CO2 used by high-tech company towards its innovation intensity.	(Yang et al., 2020)
8	The study shows that government's financial assistance does not have an impact on the development of Technological Innovation Efficiency (TIE) of High-Tech Industry (HTI). On the other hand, government's policy on environmental pollution significantly influences the development and trade volume of import and export of HTI, which improves TIE.	(Li et al., 2019)
9	The research argues that determinants of firm performance vary depending on the variable used to measure the performance. The findings can be explained by several circumstances. The size of firm was not found to be significant determinant of firms´ performance.	(Bobenič Hintošová et al., 2020)
10	The research argues on the impact of both business strategy and spiritual capital on environmental sustainability performance. These includes: (1) Implementing and developing green business strategies improve environmental sustainability performance; (2) Aligning green business strategies with environmentally friendly management and business processes optimize their effectiveness; (3) Increasing the level of spiritual capital in terms of moral awareness on environmental protection, serves as critical element to help boost sustainability through the high moral intelligence; (4) Ensuring spiritual capital as an integral part of internal business processes helps strengthen the stakeholders groups' trust in the firm; (5) Adopting a more ethical approach to business practices.	("Optimizing the Impact on Environmental Sustainability: Factors That Influence Firm Performance," 2023)

Based on the studies shown in Table 1, it can be concluded that the factors that influence industrial performance, both high-tech and non-high-tech, are technology used, foreign ownership, administrative/legal, political, economic, ecological, stakeholders, socio-cultural, job creation, firm age, firm size, interfirm network, innovation capability, exports, royalty expenses, industrial agglomeration, collaboration, CO2 gas emissions, government environmental regulation, green business strategies, environmentally-friendly management and business processes, spiritual capital, and ethical approach to business practices.

2. Factors frequency in High-Tech Industry

A bibliometric study of papers indexed in the Scopus.com database was done to identify variables that frequently show up in research about the performance of high-tech industrial companies. The keywords "Firm Performance" and "High-Tech Industry" were used in this search to find the elements that affect Firm Performance in the High-Tech Industry; and the keywords "High-Tech Industry" and "Sustainable Development Goals" to see previous research linking SDGs to Firm Performance. The publication reference source is Scopus.com, and data was processed using VOSviewer software.

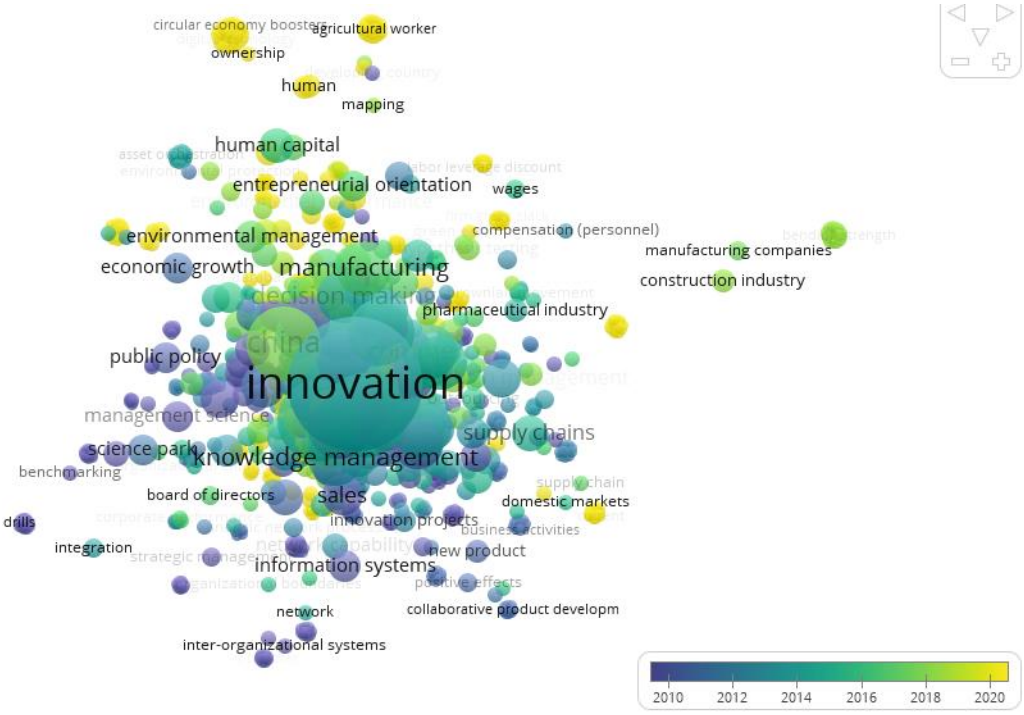

Figure 2 Factors from Previous Research on Firm Performance in High-Tech Industry

The results of the conducted bibliometric analysis on the variables affecting Firm Performance show that Innovation is regarded by many prior studies as being crucial to Firm Performance. The findings are further complimented by the identification of a number of other significant variables, including Supply Chains, Knowledge Management, and Research and Development. The more recent studies on the performance of high-tech companies focus a great deal on Circular Economy, Ownership, human/worker, and Environmental Management as observed factors.

3. SDGs in High-Tech Industry

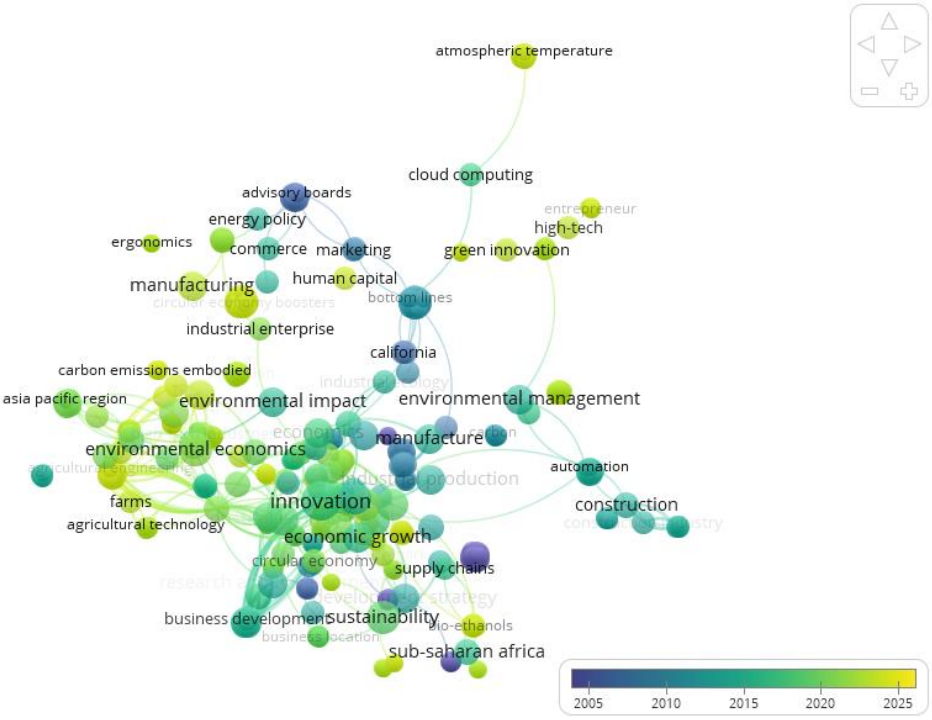

Figure 3. Factors on SDGs Research in High-Tech Industry

Examples of factors being discussed in the research observing linkages of SDGs in high-tech industry are innovation, environmental economics, environmental protection, technology, environmental management, energy efficiency, energy policy, environmental technology, and environmental organization. Recent research elaborated more about the importance of environmental economics, environmental management, atmosphere temperature, and green innovation.

Based on the identification of factors affecting high-tech industry from the SDGs perspective, this study grouped the factors into three criteria which are Environment, Social dan Governance. The relationship between SDGs and ESG can be explained as, whereas the SDGs are global goals set by the United Nations, the ESG is a ranking system used by companies to measure credentials in the environmental, social and governance fields of organizations.

The grouping of the factors identified above into ESG element categories is carried out based on the following definition (Shaid, 2023) :

1. Environment: This criteria in ESG discuss how companies consider the impact of business operations on the environment and the company's role as a guardian of the

environment. Included in this criterion are the use of environmentally friendly energy or renewable energy, waste management, participation in the conservation of non-renewable natural resources, fair and ethical treatment of animals, effective implementation of environmental risk management system, and other actions related to climate change.

2. Social: The social criteria focus on how the company considers its relationship and reputation with the stakeholders and how the company develops its stakeholders (employees, suppliers, consumers, society, community, and other related parties). The social element consists of selection of suppliers which implements ESG policies and practices, company's involvement in community development either by allocating percentage of profits or through performing voluntary work for the community, ensuring a healthy and safe work environment for employees, and ensuring that stakeholder input and expectations towards the organization are considered.
3. Governance: Governance criteria discuss how a company has a good and sustainable governance system internally. The aspect concerns with corporate leadership, executive salaries, audits, internal controls, and shareholder rights. The governance elements in ESG observe the application of standardized accounting and other methods, the guarantee that all parties are provided the opportunity to be involved and give vote on important decisions, the guarantee of no political bias leading to preferential treatment, and the guarantee that the company will not be involved in illegal activities.

Table 2 SDGs and ESG mapping

SDGs	ESG
alternative energy; atmospheric pollution; atmospheric temperature; carbon emission; electronic waste; energy efficiency; environmental economics; environmental education; environmental footprints; environmental law; environmental management; environmental ownership; environmental protection; environmental quality; environmental technology; green environment; industrial emission; industrial pollution; green innovation; natural resource; patent environment related technology; pollution control; reuse and recycling; renewable energies; risk management	Environment
circular economy; eco-innovation; green economies; green patents; resource efficiencies; social networking; social sustainability; socio-economic development; sustainable supply chain management; waste management	Social
advanced manufacturing techniques; advanced technology; emergency management; foreign direct investment; global value chain; governance structure; innovation; human capital; ownership;	Governance

The mapping above shows the factors identified on the conducted bibliometric analysis using the keywords "High-Tech Industry" and "Sustainable Development Goals" with the aim of examining the relationship between SDGs in achieving firm performance

from high-tech industry. It can be highlighted that the high-tech industry, production process of which is highly dependent on technology with high-tech product as its output, needs to pay attention to energy, pollution, temperature, emissions, and other elements as important factors of the ESG environmental aspect. For the social aspect, companies in the high-tech industry need to pay attention to circular economy, efficiency issues in its use of resources, supply chains, waste management, as well as other factors in maintaining the company's relationships and reputation with its stakeholders. As for the governance aspect, companies need to consider advanced manufacturing techniques, emergency management, value chains and other factors to maintain good and sustainable processes in the company's governance.

4. CONCLUSION

The research illustrates factors affecting performance of high-tech and non-high-tech industries comprised of both general factors and SDGs related factors. However, when the literature review is focused on high-tech industry with regard to the SDGs perspective, it can be seen that SDGs factors related to environmental aspects in ESG prominently stand out in previous research; especially due to the characteristics of the high-tech industry, the economic activities of which involve extensive application of high-tech processes and R&D activities, and production of high-tech outputs. This is further confirmed by the bibliometric analysis which shows environmental aspects as the factors that appear most often in the results. This corroborates the finding that there is a link between the characteristics of this industry and the research focus from an SDGs perspective.

There are several limitations of this research. The limited number of available references used in this study showcased that studies linking high-tech industry with SDGs are still very few. The study could also be improved by conducting empirical research. Future research can benefit from expanding the literature database, so that research results can be more comprehensive and produce wider usage. The results of SDGs factors in high-tech industry identification can also be compiled into a research model that can be proven empirically, so that the study results can serve as a guidance for high-tech companies as well as for other stakeholders in running their business, particularly in aspects related to the three ESG criteria.

Authors' Contributions

Noerlina and Tirta Nugraha Mursitama conceived of the presented idea. Noerlina developed the concept and performed the literature review. Christopher Vincent Gunawan, Mario Martin Hartanto, and Silvya Ikhari Kiswandari conducted a search for

supporting references. Aninda Rahmasari proofread the manuscript. Tirta Nugraha Mursitama encouraged Noerlina to investigate this topic and supervised the findings of this work. All authors discussed the results and contributed to the final manuscript.

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