The Influence Of Business, Technology And HR Transformation Strategies On ESG (Environmental, Social & Governance) Performance In The Indonesian Energy Industry

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Abstract.

This study aims to investigate the influence of business transformation strategies, technology and HR on ESG (Environmental, Social & Governance) performance in the energy industry in Indonesia. With the background of awareness of the importance of maintaining long-term company stability, companies are now focusing on business actions that can coexist with the environment and provide positive social impacts. Through a quantitative approach, this study assesses the relationship between transformation strategies and ESG performance, as well as their impact on companies and stakeholders. This study uses secondary data with a research population of companies in the energy sector listed on the IDX. Sample selection was carried out using the purposive sampling judgment method. This approach uses the SEM research model using smartPLS software in data management. The results of the study indicate that the construct of the three transformation strategies, namely technology and HR, can improve ESG performance through the role of business transformation as a connecting moderator. By focusing on these three aspects, the company is expected to optimize ESG performance while simultaneously creating long-term positive impacts for the environment and society.

Keywords: *ESG, Business Transformation, Technology Transformation, Human Resource Transformation and Energi Industry.*

I. INTRODUCTION

Awareness of the importance of maintaining long-term corporate stability encourages energy companies to focus on business actions that are in line with the environment. Social issues are a major concern, so that investments in environmental, social, and governance (ESG) are increasingly popular to increase corporate value for stakeholders [1]. Energy companies that process natural resources into production have the potential to damage the environment, making ESG mitigation crucial to creating long-term value. The negative impacts of energy production, such as deforestation, land degradation, air pollution, and industrial waste, indicate the need for environmental impact mitigation [2;3]. The failure of energy companies such as ABM Investama Tbk and Prima Andalan Mandiri Tbk to reduce carbon emissions in 2022 is evidence of suboptimal ESG management. The global agreement on Sustainable Development Goals (SDGs) in 2015 gave birth to Indonesian government policies, including Presidential Decree Number 59 of 2017, which targets economic welfare, social sustainability, environmental quality, and inclusive governance. This encourages business actors to support the implementation of government policies. For companies listed on the stock exchange, ESG activities are a way to demonstrate operational transparency to stakeholders [4]. This transparency increases stakeholder trust, which in turn attracts investment interest [5]. Despite increasing the company's financial expenses, ESG activities create a positive image and drive stock value increases in response to market sentiment [6] Research shows that ESG activities have a positive effect on the market performance of companies in the energy sector, including oil and gas [7].

Strategically, ESG is important for companies listed on the stock exchange because of its relevance in meeting public and investor expectations. ESG activities include environmental impact mitigation, renewable energy-based programs, improving occupational safety and risk management, as well as implementing anti-corruption systems and strengthening cybersecurity. The energy sector, with its lucrative

prospects for investors, has seen an increase in domestic consumption and revenue, as reported by the Ministry of Energy and Mineral Resources in 2022. However, this increase in performance is accompanied by serious environmental impacts, including increasing carbon emissions due to the dominance of fossil fuels at 90% in the national energy mix [8]. Oil and gas exploration activities in East Java, for example, have increased waste that damages the ecosystem and reduces groundwater quality [9]. Transformation in technology, human resources (HR), and business structures are important strategies for improving ESG performance. Technological innovation enables operational efficiency and effectiveness, not only in financial savings, but also in the integration of faster and more accurate information flows [10].

This transformation can provide competitive advantages for energy companies through improved ESG performance.Nitlarp & Mayakul (10) found that technological transformation affects HR and business transformation, while business transformation significantly mediates the relationship between technological and HR transformation on ESG performance. Zhao et al. [11] showed that digital transformation strategies and platforms directly and through green innovation mediation improve ESG performance. Noviaristanti et al. (2023) emphasized that business process performance is a significant factor in the relationship between business process management and organizational performance, such as in BPJS Kesehatan. Peng et al. [12] stated that digital transformation improves ESG performance through HR optimization, operational efficiency, and environmentally friendly innovation, especially in capital-intensive and high-tech companies. Ren & Isa [13] found that technological transformation directly has no effect on ESG performance, but through green innovation mediation and operational efficiency has a positive impact, while information transparency and decision-making efficiency actually reduce ESG performance. Su et al. [14] showed that digital transformation improves ESG performance, which is strengthened by the mediation of dynamic capabilities such as environmentally friendly innovation, social responsibility, and operational management. This study will examine the impact of technology, HR, and business transformation strategies on ESG performance in the Indonesian energy sector, with the aim of understanding the relationship between the three transformations and their impact on effective ESG implementation.

II. METHODS

This study is a quantitative causality study that tests the causal relationship between independent, mediating, and dependent variables, while also testing the hypothesis. This approach is combined with descriptive analysis to describe the condition of the research variables based on corporate sustainability report data that has been transformed into a ratio scale. This data is then measured using a Likert scale (1-5) to obtain an average value that reflects the level of the variables studied [15; 16] The operational definition of the variables includes conceptualizing two independent variables, namely technological transformation (X1) and HR transformation (X2), one mediating variable, namely business transformation (M), and one dependent variable, namely ESG performance (Y). These variables are explained through specific indicators to systematically understand the relationship between variables [15]. This study uses a statistical approach to interpret quantitative data, both from sustainability reports and questionnaires that are analyzed mathematically, so as to provide objective results in answering research questions.

Table 1. Operationalization of Research Variables

Variable	Dimention	Indicator	Source of Data	Scale
Three Transformation Strategies (X1,X2,X3)	1. Business transformation X3	1. Expansion of the supply chain digitalization system. 2. Prioritize the use of digital communication systems for executives 3. Create a clear framework of business rules and regulations between divisions 4. Identify opportunities to strengthen collaboration and understanding of cooperation and build an economic platform		Ratio - Ordinal
	2. HR Transformation. X2	5. The company carries out planning related to banking activities and quarterly targets by implementing a digital system 6. Increasing the culture of innovation and technology adoption 7. Investing in HR and development programs based on increasing digitalization capabilities		
	3. Technology transformation X1	8. Development of an industrial architecture based on the internet of things designed to develop user capabilities 9. Building program management capabilities in improving technology and digital platforms. 10. Building a secure data sharing policy, and encouraging transparency of operational activities. 11. Placing policy makers, government, and society as an innovation development ecosystem through feedback activities from them		
ESG Y	*1. Environment*	12. Supporting environmental sustainability activities and reducing damage	*ESG Report, Sustainability Report, Annual Report* masing masing perusahaan yang di publikasi	Ratio - Ordinal
	2. Social	13. Employment support in terms of social protection that refers to the standard of living of employees		
	3. Governance	14. Increasing financial resource incentives for long-term investment, and strengthening company stability		

The study population consisted of 82 energy sector companies listed on the Indonesia Stock Exchange (IDX) (15). The sample was selected using purposive sampling judgment based on certain criteria, namely companies that publicly report their ESG practices through company websites, ESG reports, or sustainability reports for the past five years (2019-2023). Of the 82 companies, only 10 companies met the criteria for completeness of sustainability reports, namely PT ABM Investama Tbk. (ABMM), PT Adaro Energy Indonesia Tbk. (ADRO), PT Indo Tambangraya Megah Tbk. (ITMG), PT Bumi Resources Tbk. (BUMI), PT Perusahaan Gas Negara Tbk. (PGAS), PT AKR Coorindo Tbk. (AKRA), PT Medco Energi Internasional Tbk. (MEDC), PT Elnusa Tbk. (ELSA), PT Bukit Asam Tbk. (PTBA), and PT Indika Energy Tbk. (INDY). The research data were obtained from secondary sources, such as ESG reports, sustainability reports, and related literature [15]. Data processing was carried out using SmartPLS, a software that allows the analysis of variable relationships with an approach that is suitable for small sample sizes and without assuming a particular data distribution [17]. Thus, this study has a strong methodological basis to ensure the validity and reliability of the data.

The data analysis technique was carried out using the Structural Equation Modeling (SEM) approach with Partial Least Square (PLS). The model fit test was carried out with a maximum estimate of ≤ 300

iterations to ensure the feasibility of the model [17]. Validity was tested using convergent validity with the condition that AVE ≥ 0.5 and CR> 0.6 to ensure that the indicators used reflect the variables being measured [18]. Reliability was tested with Cronbach's alpha which must be more than 0.6 to ensure the consistency of the measuring instrument [19]. Hypothesis testing measures the direct influence of independent variables on dependent variables, as well as indirect influences through mediating variables, with significant criteria if t count ≥ 1.96 or p ≤ 0.05 (19). In addition, a mediation test was conducted to assess the role of business transformation (M) in linking technological transformation (X1) and HR transformation (X2) with ESG performance (Y), using the Sobel test with the condition that t count > 1.96 on the mediation path. With this approach, this study is able to produce a valid and reliable model to identify factors that influence ESG performance in energy sector companies [20].

III. RESULT AND DISCUSSION

Outer Loading test results

Table 2. Iteration – Outer Loading Test

Matrix	B1	B2	B3	B4	E	G	P1	P2	P3	S	T1	T2	T3	T4
Iteration 0	0.284	0.284	0.284	0.284	0.376	0.376	0.366	0.366	0.366	0.376	0.294	0.294	0.294	0.294
Iteration 1	0.297	0.268	0.301	0.265	0.341	0.392	0.390	0.302	0.408	0.394	0.284	0.285	0.301	0.306
Iteration 2	0.296	0.267	0.302	0.266	0.341	0.391	0.390	0.300	0.409	0.395	0.284	0.285	0.301	0.307
Iteration 3	0.296	0.267	0.302	0.266	0.341	0.391	0.390	0.300	0.409	0.395	0.284	0.285	0.301	0.307
Iteration 4	0.296	0.267	0.302	0.266	0.341	0.391	0.390	0.300	0.409	0.395	0.284	0.285	0.301	0.307
Iteration 5	0.296	0.267	0.302	0.266	0.341	0.391	0.390	0.300	0.409	0.395	0.284	0.285	0.301	0.307
Iteration 6	0.296	0.267	0.302	0.266	0.341	0.391	0.390	0.300	0.409	0.395	0.284	0.285	0.301	0.307

Source: SmartPLS 2024 data testing

Based on the data processing carried out, it is known that the iteration algorithm obtained in data processing stops at the 6th data repetition activity (iteration 6), so based on this it is concluded that the data used in the data analysis passes the data normality test, the adequacy of the number of data samples, and is free from data that deviates from the average (outliers). Then this test is also related to the eligibility requirements of the instrument used in measuring the research variables/dimensions, where the requirements are that the outer loading/loading factor must be above 0.6 and the higher the value (maximum 0.99) the better the instrument represents the research dimensions, and the data must be gathered in the same group. The following are the results of the outer loading test to test the instrument in this study.

Table 3. Loading factor – Outer Loading Test

INS	B.T	ESG	P.T	T.T
S		0.906		
E		0.881		
G		0.873		
B1	0.906			
B2	0.861			
B3	0.935			
B4	0.824			
P1			0.901	
P2			0.904	
P3			0.923	
T1				0.848
T2				0.825
T3				0.863
T4				0.862

Source: SmartPLS 2024 data testing

The results of the loading factor data in the outer loading test show that all data indicators have a value greater than 0.6, and all research instrument data are grouped in the same quadrant, such as instruments regarding ESG which are grouped in the second quadrant, then business transformation which is grouped in

quadrant one, HR transformation which is grouped in quadrant three, and technology transformation which is grouped in quadrant four, where all data in each instrument has a value that meets the requirements. So based on these results, the data instrument is considered capable of measuring its research variables-dimensions well.

Validity Test Results

The instrument is considered valid if it meets the following requirements: AVE > 0.5, indicator reliability (square loading factor) > 0.4, CR > 0.6, and the value of 1 - square loading factor is smaller than the square loading factor. The results of data processing indicate the feasibility of the instrument based on these criteria.

Table 4. *Validity Test*

Instrument	Load F	Load F^2	1-Load F^2	CR	AVE
S	0.906	0.820836	0.179164	0.916947	0.786375
E	0.881	0.776161	0.223839		
G	0.873	0.762129	0.237871		
B1	0.906	0.820836	0.179164	0.933572	0.77884
B2	0.861	0.741321	0.258679		
B3	0.935	0.874225	0.125775		
B4	0.824	0.678976	0.321024		
P1	0.901	0.811801	0.188199	0.934801	0.826982
P2	0.904	0.817216	0.182784		
P3	0.923	0.851929	0.148071		
T1	0.848	0.719104	0.280896	0.91212	0.77884
T2	0.825	0.680625	0.319375		
T3	0.863	0.744769	0.255231		
T4	0.862	0.743044	0.256956		

Source: SmartPLS 2024 data testing

The results of data processing in table 4 show that the AVE value in all dimensions-research variables meet the criteria for passing the validity test because the value is in the range of values above zero point five (AVE > 0.5), then the requirement that the squared value of the loading factor > 0.4 is met; the overall CR value is > 0.6, and the squared value of the loading factor > 1-squared value of the loading factor, so that based on the fulfillment of these criteria, the data is considered to have passed the validity test.

Reliability Test Results

The reliability testing of this research generally meets the requirements, because the data results based on the Croanbac's alpha test approach show that all dimensions - research variables have a Croanbac's alpha value > 0.6, so based on this, the data passes the test as seen in the following table.

Table 5. *Reliability Test*

Dimension-Variable	*Cronbach's Alpha*	Criteria	Conclusion
Business_Transf	0.905	Cronbach Alpha >0,6	Reliable
ESG	0.865	Cronbach Alpha >0,6	Reliable
People Transf	0.896	Cronbach Alpha >0,6	Reliable
Technology_Transf	0.872	Cronbach Alpha >0,6	Reliable

Source: SmartPLS 2024 data testing

Furthermore, data that has passed the reliability test and is considered to be able to represent the research variables is subjected to further data processing in a path analysis test to obtain conclusions from the research results.

Hypothesis Test Results

Next is the t-test hypothesis testing which aims to answer the research hypothesis regarding the construct of the influence of technological transformation on human resources and business transformation, then the influence of human resource transformation on business transformation, and the role of business

transformation as a mediating variable, where the answer to the hypothesis can be seen through the following data test results image.

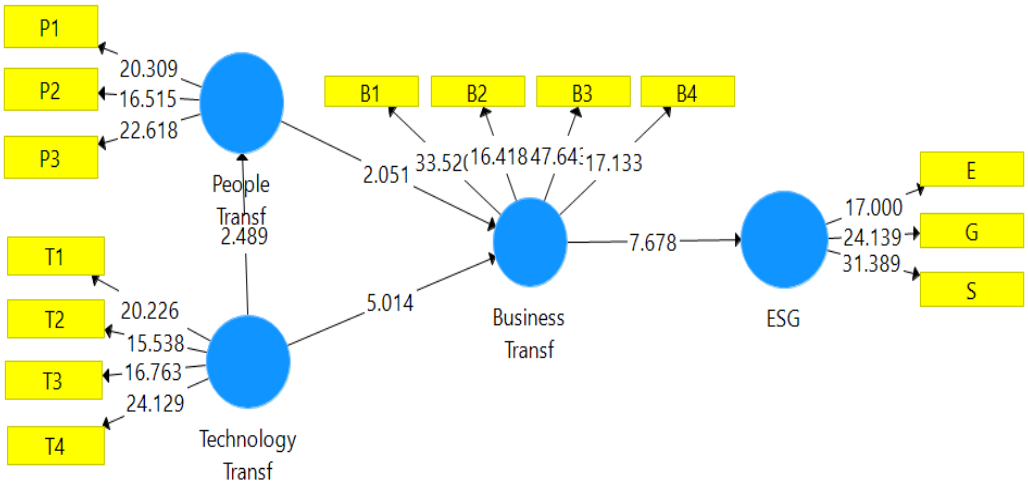

Fig 2. Hypothesis Testing Model

Table 6. *Hypothesis Test*

Model	T Statistics (|O/STDEV|)	P Values	Decision
Business_Transf -> ESG	7.678	0.000	H_4. Accepted
People Transf -> Business_Transf	2.051	0.040	H_3. Accepted
Technology_Transf -> Business_Transf	5.014	0.000	H_2. Accepted
Technology_Transf -> People Transf	2.489	0.015	H_1. Accepted

Source: SmartPLS 2024 data testing

The image and table results above provide the implementation of the research results that the calculated t value in the model of the influence of the technological transformation variable on HR transformation is 2.489. This value is greater than the standard t table value of 1.96 (at alpha 5%), so that the results lead to the rejection of the null hypothesis, and the acceptance of the alternative hypothesis one (H1), which states that technological transformation has a positive effect on changes in HR transformation at a research error rate of 5%. The next hypothesis is testing the model of the influence of technological transformation on business transformation, where the results of this test indicate that technological transformation has a role in positively influencing changes in the business transformation variable. This is known from the calculated t value obtained of 5.01, which is greater than the standard t table value of 1.96, so that the results lead to the acceptance of the alternative hypothesis two (H2) and the rejection of the null hypothesis.

The t-test for the hypothesis of the influence of HR transformation on business transformation shows a t-value of 2.051, which is higher than the standard t-table used of 1.96, so it is stated that the null hypothesis is rejected, and the third alternative hypothesis (H3) is accepted. This provides an interpretation that HR transformation positively influences changes in business transformation with a research error rate of 5%. Finally, testing the hypothesis between business transformation and ESG performance shows that this variable also has a role as a mediating variable. The t-test shows that the t-value of business transformation is 7.678, which is greater than the t-table of 1.96, so based on this it is stated that the fourth alternative hypothesis (H4) is accepted, and the null hypothesis is rejected. Acceptance of the fourth alternative hypothesis illustrates that business transformation has a positive influence on changes in ESG performance, so based on this it is indicated that this variable can be a good mediating variable in the research model.

Mediation Test Results

The next test is a mediation test, in which case business transformation acts as a variable that mediates the influence model between technology transformation on ESG performance, and mediates the influence model between HR transformation on performance, where the approach that can be taken to

confirm the results of the mediation model is to conduct a Sobel test. The following are the results of the Sobel test carried out.

Table 7. *Coefficients Result*

Model	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Business_Transf -> ESG	0.693	0.689	0.091	7.636	0.000
People Transf -> Business_Transf	0.277	0.277	0.135	2.058	0.043
Technology_Transf -> Business_Transf	0.522	0.526	0.104	5.027	0.000
Technology_Transf -> People Transf	0.400	0.407	0.164	2.442	0.015

Source: SmartPLS 2024 data testing

The process in the Sobel test is based on observing the values in the coefficient table above, where the constant estimate value (Original Sample) and the standard error value (Standard Deviation) are tested using the Sobel test calculator to determine the decision based on the model mediation test as shown in the following image..

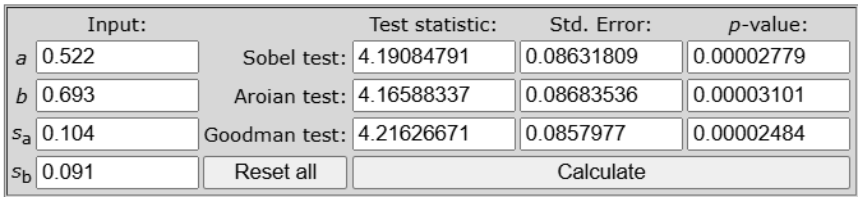

Fig 3. Sobel Test of Technology Transformation Mediation on ESG Performance

Based on the Sobel test, it is known that the Sobel statistical test value obtained a value of 4.190, which is greater than the standard t table of 1.96 and or the sig. p-value of 0.000 <0.05 (research error rate of 5%). Based on this, it is stated that business transformation is able to mediate the influence between technological transformation and ESG performance, so that an increase in technological transformation activities will indirectly increase ESG performance through an increase in business transformation.Next is the testing of the role of the mediation model between HR transformation and ESG performance which can be seen based on the following Sobel test results.

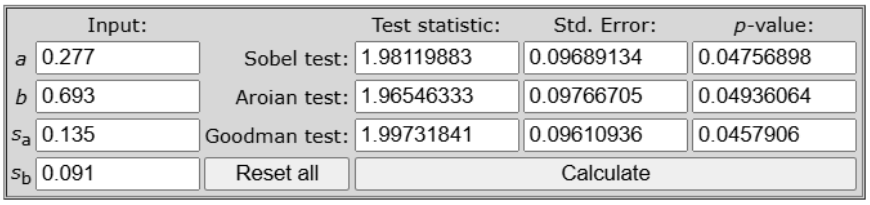

Fig 4. Sobel Test of HR Transformation Mediation on ESG Performance

Fig di atas dapat memberikan kesimpulan hasil bahwa transformasi bisnis dapat menjadi variabel yang memediasi pengaruh antara transformasi SDM terhadap peningkatan kinerja ESG secara positif. Kesimpulan tersebut diperoleh dari hasil uji sobel yang menunjukan nilai test statistik sobel sebesar 1,981 > t Table 1,96, dan atau *nilai sig.p-value* 0,047 < 0,05 (tingkat kesalahan penelitian 5%). Maka hal tersebut dapat diartikan bahwa peningkatan yang terjadi pada peningkatan transformasi SDM akan meningkatkan kinerja ESG melalui peningkatan variabel transformasi bisnis.Model mediasi selanjutnya yang terbentuk berdasarkan model penelitian ini adalah peran transformasi SDM dalam memediasi pengaruh antara transformasi teknologi terhadap transformasi bisnis, yang mana hasilnya dapat diketahui berdasarkan Fig tes sobel berikut.

Input:			Test statistic:	Std. Error:	*p*-value:
a	0.400	Sobel test:	1.57013875	0.07056701	0.11638284
b	0.277	Aroian test:	1.49813431	0.07395866	0.13409836
s_a	0.164	Goodman test:	1.65363491	0.06700391	0.09820172
s_b	0.135	Reset all		Calculate	

Fig 5. Sobel Test of Technology Transformation Mediation on Business Transformation

Based on the test results, the Sobel statistical test value shows a value of 1.570 < t table 1.96 and or sig.p-value 0.116> 0.05 (research error rate of 5%). Based on the results of the assessment, it is known that the research error rate in this model is above 5%, so the assumption that HR transformation as a variable mediating the influence between technological transformation on increasing business transformation is rejected, which based on this it can be stated that increasing business transformation activities will increase better if based on the direct influence of increasing business transformation, when compared to adding the role of HR transformation as a moderating variable.

Testing for Magnitude of Influence

The next test is a test that aims to determine the extent of the contribution of influence given by a variable to another variable. The following are the test results regarding the test of contribution of influence.

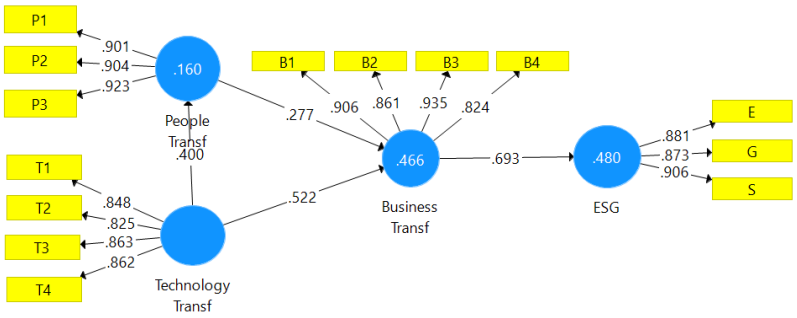

Fig 6. Influence Contribution Model

Previous hypothesis testing obtained results that all hypotheses in this study were accepted, where the technology transformation variable was considered to have a positive and significant effect on HR transformation (H1), technology transformation was considered to have a positive and significant effect on business transformation (H2), HR transformation was considered to have a positive and significant effect on business transformation (H3), and business transformation was considered to have a positive and significant effect on ESG performance (H4), then it was found that the business transformation variable was able to mediate the effect between technology transformation and HR transformation on ESG performance to be better. The contribution of the effect of changes in the technology transformation variable on increasing HR transformation (H1) was 0.40; the contribution of technology transformation to increasing business transformation (H2) was 0.522; the contribution of the effect between HR transformation and increasing business transformation (H3) was 0.277; and the contribution of the effect of business transformation on ESG performance (H4) was 0.693.

Based on the dominant influence, it is also known based on the image above that the largest dominant influence contribution is shown by business transformation on improving ESG performance with the dominant business transformation instrument considered the most representative, namely instrument B3 (loading factor 0.935) and instrument B1 (loading factor 0.906). Then the next largest influence contribution is technology transformation on business transformation with the technology transformation instrument considered the most dominant representative, namely T3 (loading factor 0.863) and T4 (loading factor 0.862). The third largest influence contribution is the influence between technology transformation on HR transformation, and the last largest influence contribution (fourth) is the influence of HR transformation on business transformation with the HR transformation instrument considered the most dominant representative, namely instrument P3 (loading factor 0.923) and P2 (loading factor 0.904).

Business Transformation and ESG Performance

The results show that business transformation is the most dominant variable construct and has a high influence on positive ESG changes, so that based on this study, increasing activities on this variable will have a significant impact on improving ESG performance in the Indonesian energy industry. The results of data descriptions based on business transformation instruments show that actions related to this instrument are on average quite good and/or have high intensity, including strengthening the regulatory framework that has been carried out very well (very high in quantitative assessment), which is also a dominant instrument considered as a driver of the business transformation model variable. Supply chain expansion and digitalization as well as collaborative activities for understanding cooperation received high ratings, indicating that these activities have been carried out quite well by Indonesian energy sector companies, and the last instrument that requires improvement is the executive communication system improvement priority instrument which is translated through various executive competency improvement actions that are still considered to have low activity.

Increasing all activities on these instruments can improve ESG performance, so it is important for Indonesian energy sector companies to remain committed to developing and improving business transformation activities related to the supply chain, executive competency improvement priorities, strengthening regulatory systems, and collaboration and cooperation through various company programs. This is in line with and supports the research results of Nitlarp & Mayakul [10]; Zhao et al. [11], which states that increasing business transformation practices that lead to the adaptation of the role of digitalization as technology support in various activities such as supply chain efficiency and effectiveness, strengthening the framework of rules and regulations through the role of information systems, building a collaboration ecosystem with various stakeholders, and strengthening executive competence through information technology facilities, will direct companies to act more efficiently in their operational activities, so that company activities are more focused on the use of resources to improve their role in the social environment, focus on the growth and welfare of employees and the environment, and create openness in the company's management system by utilizing technological developments.

Technology Transformation, Business Transformation and Human Resources Transformation

The results of the hypothesis show that technological transformation has a significant role in increasing business transformation and also HR transformation in the Indonesian energy industry, so that various activities that are attempted to increase technology development activities in energy companies in Indonesia will lead to the creation of accelerated business transformation and HR transformation with a digitalization and information technology approach as an adaptation instrument. In practice, based on the results of data descriptions on Indonesian energy sector companies, the adaptation of technology use in their technological transformation efforts has not been carried out optimally. The instruments used to measure the level of technological transformation are achieved at a low level.

Energy sector companies have not been able to build a business system architecture based on the internet of things, then the standardization program in technology management and digitalization has not been achieved at a high level, as well as related to data security guarantees and policies and the ecosystem for developing the company's innovation ecosystem and the environment has not been achieved optimally and needs to be improved. Increasing technological transformation in companies based on various studies Zhao et al. [11]; Peng et al. [12]; Ren & Isa [13]; Su et al. [14]; Nitlarp & Mayakul [10] which shows that technological transformation and digitalization can lead to various positive changes, such as increasing operational efficiency, productivity, changing conventional business models to technology-based and innovation in green system innovation, which leads to increasing companies to be more sensitive to environmental sustainability issues, as well as the use of technology that is considered to be able to more easily improve planning in HR transformation to improve their competence by using a technology base. Therefore, it is very important for companies to improve the transformation aspect to support the ESG ecosystem in a chain through HR and business transformation.

HR Transformation and Business Transformation

The results of quantitative research show that the role and relationship of HR transformation with the use of technology and digitalization can lead to a significant increase in business transformation activities or actions. All parameters in this study related to HR transformation show high dominance in measuring HR transformation variables, so that improvements in instruments consisting of the use of digitalization technology in order to achieve company targets, increasing innovation culture and HR investment in the context of technology will significantly increase business transformation. This is consistent with the results of research conducted by Zhao et al. [11]; Peng et al. [12]; Nitlarp & Mayakul [10] which show that human transformation regarding technology adaptation and digitalization leads to an increase in technology-based business transformation, so improvements in this aspect also need to be a major concern in addition to emphasizing technological transformation [21]. The descriptive approach in this study shows that Indonesian energy sector companies have not been able to maximize HR transformation activities in the context of technology adaptation and digitalization efforts, such as target planning and evaluation instruments with digital systems, innovation culture and technology adoption, and investment in HR which overall are at a low level of achievement, so it is necessary to make improvements and improvements in these aspects [22].

ESG (Environmental, Social and Governance)

The main outcome of this study is that the achievement of this aspect in energy sector companies is at a moderate value, where two social instruments show high performance, governance instruments show moderate performance, and environmental instruments show low performance. Therefore, efforts to improve the driving factors for the creation of ESG stimulus such as technology-based business transformation and digitalization need to be pursued.

IV. CONCLUSION

The conclusion of this study shows that business transformation has the largest significant positive effect on ESG performance and serves as a mediator between technology transformation, HR, and ESG performance. Technology transformation contributes significantly to business and HR transformation, which has a direct impact on ESG performance. However, technology transformation in Indonesian energy sector companies is still low, so it needs to be increased in technology investment. HR transformation has a small effect on business transformation, but still contributes to improving business and ESG performance. Overall ESG performance is quite high, with the best social aspects, moderate governance, and low environmental, indicating the need for more focus on environmental sustainability.

The implementation of technology and HR development are still challenges that need to be addressed immediately to encourage further sustainability. The suggestions from this study include several important things to improve sustainability performance (ESG) in energy sector companies. First, companies need to invest in technology infrastructure and data security, and support green technology with incentives from the government. Second, to strengthen HR transformation, companies must create a culture of innovation and increase investment in technology training. Third, optimization of business transformation can be done by strengthening regulations and collaboration between units, and building strategic partnerships. Fourth, companies need to improve environmental performance with initiatives such as emission reduction and renewable energy use, and maintain social and governance aspects with strong sustainability policies. Finally, implementing strategies based on business, technology, and human resource transformation will strengthen the competitiveness and sustainability of energy sector companies.

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