Green Human Resources Management, Green Environmental: Influence on Sustainability Performance Mediated by Digital Metaverse Technology in the Industry 4.0 Era

Retno Purwani Setyaningrum (✉) and Anna Wulandari

Department of Magister Management, Universitas Pelita Bangsa, Indonesia
`retno.purwani.setyaningrum@pelitabangsa.ac.id`

Abstract. In the current Metaverse 4.0 digital technology era, many companies have utilized Metaverse technology and non-fungible tokens (NFT) to maintain performance sustainability (PS) through Digital Metaverse Technology to a higher level. This requires Green Human Resources Management (GHRM) Practices as well as involving green environmental (GE). This study examines Digital marketing as mediated Green Human Resources Management and Green Environmental its influence on Sustainability Performance. The research was conducted at an oil and gas company in Indonesia which has used metaverse technology in its scope of work with a sample of 53 employees involved in metaverse technology. The research method uses SEM PLS by measuring the significance of GHRM on SP mediated by TDM and the effect of GHRM on GE and GE on SP. The results of his research stated that GHRM was not directly related to SP, therefore it required TDM as mediation, GHRM had an effect on GE, and GE had an effect on SP.

Keywords: Green Human Resources Management, Green Environmental, Business Sustainability, Technology Digital Metaverse.

1   Introduction

Indonesia is currently entering the era of globalization which has resulted in many industries starting to develop and many foreign investors coming to Indonesia. Increasing investment is believed to contribute to boosting the economic development of a nation, including the sustainable investment team, which has provided an evaluation of the company's performance going forward and trajectory on sustainability issues. Fig 1 states that in order for the company's sustainability to be sustainable, it must pay attention to Economics, Environment and Social which requires long-term value by considering how an organization operates in an ecological, social and economic environment. Sustainability is built on the assumption that developing such a strategy promotes company longevity [1].
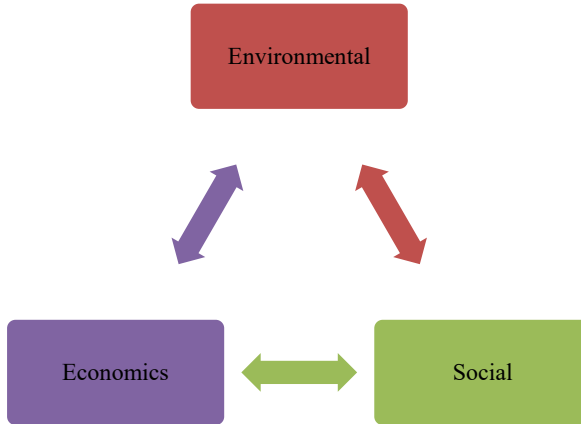
Fig. 1. Sustainability System Source [1]

Fluence economics, environment, and social. This shows that oil and gas companies that are sustainable pay attention to economics, environment, and social, meaning that the economics attracts investors. Investors, therefore, will need to take note on their human resource and their green environment when using metaverse digitalization.

This is interesting to study considering that social issues have a significant role in sustainability factors and exposures, so that human resources, occupational health and safety, green environment and digital technology 4.0 which are currently being discussed in the business world are interesting to study, given that currently is the era of digital technology 4.0. Many industrial companies use digital technology and even metaverse technology, such as artificial intelligence, cloud computing, and the internet of things, as tools to assist their daily activities [2]. Especially in the era of the Covid 19 pandemic, which has occurred for more than two years, climate change and pressure from the public have resulted in the oil and gas industry facing unparalleled challenges. This research was conducted at oil and gas companies in Indonesia, where oil and gas companies continue to adapt to find creative solutions to new obstacles, starting from collection regulations, lockdown restrictions, and emission targets. However, with the unprecedented trial period of the Covid 19 pandemic, there is an extraordinary opportunity for the oil and gas industry to drive sustainable, efficient and long-lasting change through digital adoption, even what is currently very well known for its digital technology metaverse (TDM) which incorporates a combination of various technological elements, including virtual reality, augmented reality, and video. The human resource of oil and gas companies need to pay attention to the skill of their employees through metaverse. The employees, therefore, will feel certain about being in a risk-free platform where mistakes will not cause disaster when they are rehearsing in active rigs.

Technology Digital Metaverse (TDM) provides new, never-before-seen values for both industry and society. In the current stage of the industrial revolution 4.0, the disruption of digital technology is increasingly massive. Human resources development (HRD) who do not follow the digital era will lose many opportunities to

develop. The role of Green Human Resource Management (GHRM) is very important in the digital 4.0 metaverse. TDM is a virtual reality (VR) space that utilizes the internet and augmented reality (AR) through avatars and software agents [3], [4].

Professionally the HR manager will recruit employees by providing training for the effective use of the VR kit, especially if this is the first time introducing TDM. Once employees have gone through the initial onboarding process, they will be able to complete their VR activities effectively. VR is a technology that can make interactions with a 3D environment as close as possible to the real world [5]. In the era of industry 4.0, in several companies, HRM practices are facing pressure to adopt environmentally friendly business practices, where it becomes important to identify green practices in human resources that encourage sustainable performance (SP), and this has been researched by [6] which states that the implementation of green human resource management practices has a positive role in increasing SP. Employees tend to adopt GHRM practices for larger purposes that affect sustainability performance [7], [8] which are supported by [9], [10], [8]. However, some researchers state that GHRM has no direct effect on SP [11], [12], therefore mediation is needed so that GHRM has a direct effect on SP.

As TDM redesigns the way it works, there may be major implications for GHRM that should drive this transformation [13]. TDM has the potential to shape many aspects, so the role of GHRM is indispensable in TDM. Some companies believe that the existence of GHRM which encourages TDM can increase the productivity of HR work. HR will be trained and collaborate in a virtual workplace environment [14].

TDM is often used for large businesses making it easy to host conferences in cyberspace, and can save time as well as huge costs for security and travel [15]. TDM is used by oil & gas companies for work safety because oil & gas is a high-risk industry, so employee safety is the most important and this will have an impact on SP [8], so that TDM has an effect on SP.

In recent years [16] found that green organizations have a positive impact on green innovation and proper GHRM practices are able to emphasize a green environment [17]. Companies are more interested in adopting GHRM as an important strategy for implementing green practices that improve environmental performance and achieve sustainability performance [18], [19], [20]. The concept of GHRM and sustainability in Green Building has an impact on sustainability performance [21].

2   Method

The research approach used in this study is a quantitative approach. The use of a quantitative approach will make it easier to check pre-detailed concepts, hypotheses and provide arithmetic data to better demonstrate research results [22]. Sampling was carried out using a non-probability sampling procedure, in which the study population was the same as the sample and 53 employees were selected by researchers whose work was related to digital technology metaverse (TDM). Sampling was carried out through an online questionnaire using the website www.googledocs.com. The Likert measurement scale from 1 to 5 was used in the distributed questionnaires. The categories of each scale follow [23] namely:

Score 5 represents strongly agree

Score 4 represents agree
Score 3 represents quite agree
Score 2 represents disagree
Score 1 represents strongly disagree

After the questionnaires were distributed, data analysis was carried out using SEM analysis techniques with the Partial Least Square method to determine the relationship between the variables to be tested. The sources and number of indicators for each variable are as follows:

a. Green Human Resources Management (GHRM) has 4 indicators modified from [24],[25], namely transparent and well known, skill variety, task identity, task significance.
b. Technology Digital Metaverse (TDM) has 3 indicators modified from [4], [3], namely VR headsets utilities, blockchain technology, internet utilities.
c. Green Environment (GE) has 3 indicators modified from [26], [27], namely production process, quality of new product, and innovation improves
d. Sustainability Performance (SP) has 4 indicators modified from [28], [29], namely demand increases, performance increases, supply balance increase, and reinforce the practice of GSCM

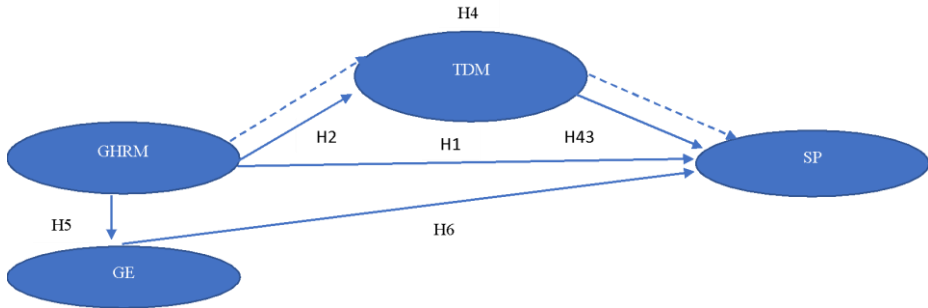The design model in this study can be seen in the image below (Fig 2):

Fig. 2. Thinking Frame Design

Hypothesis:

H1: It is suspected that there is an influence of Green Human Resources Management (GHRM) on Sustainability Performance (SP)
H2: It is suspected that there is an influence of Green Human Resources Management (GHRM) on the Technology Digital Metaverse (TDM)
H3: It is suspected that there is an influence of Technology Digital Metaverse (TDM) on Sustainability Performance (SP)
H4: It is suspected that there is an influence of Green Human Resources Management (GHRM) on Sustainability Performance (SP) mediated by Technology Digital Metaverse
H5: It is suspected that there is an influence of Green Human Resources Management (GHRM) on Green Environment (GE)

H6: It is suspected that there is an influence of Green Environment (GE) on Sustainability Performance (SP)

3   Result and Discussion

Convergent validity, discriminant validity, and reliability tests were used in this study to conduct an instrument feasibility test. The convergent validity test was carried out by evaluating the outer loading value of each item used. Items will be considered convergently valid when they have an outer loading value of $\geq$ 0.5. The results of the convergent validity test stated that all items used in this study were convergently valid. Testing the inner model as a structural model was carried out using R_2 and estimated coefficients. Cut off for endogenous latent variable is $R_2 > 0.2$. Testing the flow relationships in the structural model used standard estimates with a cut-off p-value <0.05. The results of the outer test used to test the validity and reliability are presented in Table 1.

Table 1. Outer Model

Variable/Indicator	Outer Loading	Cronbach's Alpha	Composite Reliability	Result
Green Human Resource Management	0.785	0.869	0.911	Reliable
- Transparent & well known				Valid
- Skill variety	0.862			Valid
- Task identity				Valid
- Task significance	0.910			Valid
	0.832			
Technology Digital Metaverse		0.808	0.887	Reliable
- Utilities VR headsets	0.828			Valid
- Blockchain technology	0.840			Valid
- Utilities internet	0.883			Valid
Green Environment		0.834	0.900	Reliable
- Production process	0.844			Valid
- Quality of new product	0.872			Valid
- Innovation improves	0.882			Valid
Sustainable Performance		0.870	0.911	Reliable
- Demand increases	0.868			Valid
- Performance increases	0.891			Valid
- Supply balance increase	0.774			Valid
- Reinforce the practice of GSCM	0.858			Valid

Source: Processing Result, 2022

All indicators for each variable are valid because the outer loading is greater than 0.7. All variables are also reliable because they have met the cut off used in this study (Cronbach's alpha Green Human Resource Management 0.869; Technology Digital Metaverse 0.808; Green Environment 0.834 and Sustainable Performance 0.870 is

greater than 0.7 while the composite reliability of Green Human Resource Management is 0.911; Technology Digital Metaverse 0.887; Green Environment 0.900 and Sustainable Performance 0.911 is greater than 0.8) (Table 2).

Table 2. Model Testing Index

Endogenous Variable	Cut of Value	Analysis Result	Model Evaluation
R2			
- TDM	≥ 0.2	0.722	Fit
- GE	≥ 0.2	0.668	Fit
- SP	≥ 0.2	0.807	Fit

Source: Processing Result, 2022

The model is acceptable because all endogenous variables have an R square value greater than 0.2. The endogenous variable Technology Digital Metaverse has an R squared value of 0.722 in the good category, Green Environment has an R squared value of 0.668 in the good category, while the endogenous Sustainable Performance variable has an R squared value of 0.807 in the good category.
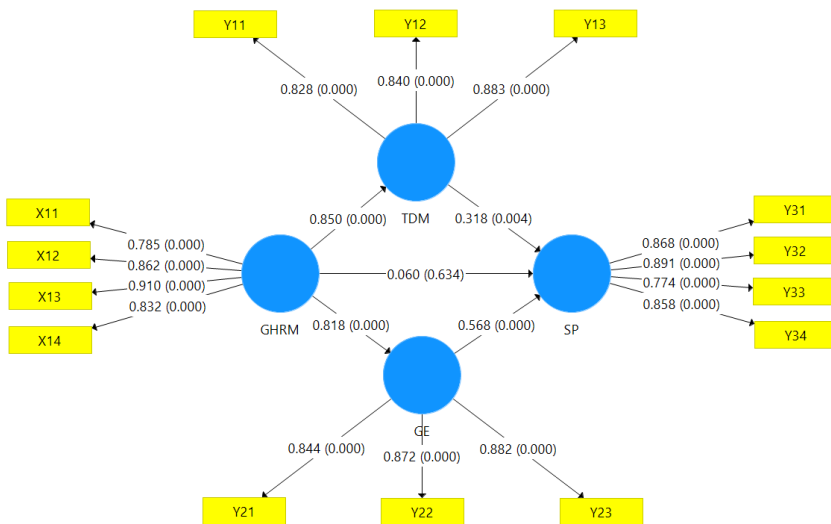

Fig. 3. Analysis Result Source: Processed Result Data, 2022

Fig 3 shows the estimates from the indicators to the variables and the interrelationships between the variables. All indicators have contributed to form their respective variables. Indicator X13 is the main indicator for forming Green Human Resource Management, Y13 is the main indicator for the Technology Digital Metaverse, Y23 is the main indicator for Green Environment, and Y32 is the main indicator for Sustainable Performance.

Table 3. Estimation

Flow	Type	Std. Estimates	P-Value	Result
GHRM ☺SP	Direct	0.060	0.634	Not significant
GHRM ☺TDM	Direct	0.850	0.000	Significant
TDM ☺ SP	Direct	0.318	0.004	Significant
GHRM ☺GE	Direct	0.818	0.000	Significant
GE ☺SP	Direct	0.568	0.000	Significant
GHRM ☺TDM ☺SP	Indirect	0.270	0.005	Significant
GHRM ☺GE ☺SP	Indirect	0.464	0.000	Significant

Source: Processed research data, 2022

Table 3 shows the flow of influence between variables in the model. Green Human Resource Management has no direct effect on Sustainable Performance. Green Human Resource Management influences the Technology Digital Metaverse, and Technology Digital Metaverse influences Sustainable Performance. GHRM does not directly affect SP, but GHRM has an indirect effect on SP through TDM where in total its influence is getting stronger. Green Human Resource Management Influences Green Environment, and Green Environment influences Sustainable Performance. GHRM does not directly affect SP, but GHRM has an indirect effect on SP through GE where in total its influence is getting stronger.

4   Result and Discussion

4.1   Test Result

This study used the partial least squares technique, where to find out the relationship between research variables was done through p-values. Based on the tests that have been carried out, it is known that GHRM does not have a significant effect on SP directly, where a p-value of 0.634 is obtained. GHRM has a significant influence on SP indirectly through TDM and GE, where the p-value of GHRM-TDM-SP is 0.005 and the p-value of GHRM-GE-SP is 0.000.

The results of the statistical analysis show that good GHRM practices such as transparent and well known, skill variety, task identity and the right task significance cannot directly make employees have high performance so as to be able to maintain sustainable performance. The results of this study are also supported by [30], [6].

However, the presence of TDM as mediation can strengthen the relationship between GHRM and SP, considering that GHRM influences TDM in GHRM, especially so that human resources who are able to adopt digital technology metaverse are given support in the utilization of VR headsets, internet utilities, even block chain technology. The p-value obtained is 0.005 even with HR who master TDM has an effect on SP which is supported by researchers [4], [13].

GHRM is also able to influence GE, where GHRM which is better managed will have an impact on the production process, quality of new products and human resources, which will improve innovation and commitment to environmental practices, which has been supported by research by [27], [19]. GE even greatly influences sustainability which has an impact on increasing demand, increasing

supply balance and strengthening the practice of GSCM which is corroborated by research [28], [29].

5   Conclusion

Green Human Resource Management (GHRM) has no direct effect on Sustainable Performance (SP). The role of Technology Digital Metaverse (TDM) and Green Environment (GE) is very important in mediating the influence of Green Human Resource Management (GHRM) On Sustainable Performance (SP). Good GHRM practices can make employees have high and sustainable performance only if the employee masters The Digital Technology Metaverse (TDM) and Gets a Green Environment (GE) at work.

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