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The New Model: Green Innovation Modified to Moderate the Influence of Integrated Reporting, Green Intellectual Capital toward Green Competitive Advantage

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ABSTRACT

The purpose of this study is to analyze (1) The effect of integrated reporting and green intellectual capital on green competitive advantage, (2) Green innovation moderates integrated reporting and green intellectual capital on green competitive advantage. Quantitative research methods use secondary data, content analysis. The population in this study are companies that publish Annual Reports that have been audited by independent auditors and Sustainability Reports of companies listed on the Indonesia Stock Exchange in 2016-2020 and are taken from IDX-IC. Through purposive sampling method, panel data a combination of cross-section data and time series data, were obtained as many as 324 observations. Data processing using software eviews with Moderated Regression Analysis. The results of this study indicate that integrated reporting and intellectual capital have a significant positive effect on green competitive advantage. Green innovation significantly strengthens the effect of integrated reporting on green competitive advantage. However, green innovation weakens the effect of green intellectual capital on green competitive advantage. The green innovation modified variable which is the novelty of this study has more robustness than the model without novelty.

Keywords: Green Competitive Advantage, Integrated Reporting, Green Intellectual Capital, Green Innovation

JEL Classifications: M21, Q01, Q51, Q56

1. INTRODUCTION

Various impacts and consequences of climate change affect the quality of people's lives so that the government's attention quickly responds to this phenomenon through: Statement of the President of the Republic of Indonesia at the 26th Conference of Parties in Glasgow in October 2021, that the Indonesian committee in dealing with change in order to achieve Net Zero Emission by year 2050.

When the company starts fully sustainable will be the adverse effects of climate change, and the need to win the market with environmentally friendly products, as well as a sustainability business. So that companies need to adapt and mitigate through green innovation which is one way to prevent greater damage. Green innovation is defined as new processes and products or

those that can be used to avoid or reduce environmental damage (De Marchi, 2012).

Integrated reporting is the latest form of corporate reporting initiated by the International Integrated Reporting Committee (IIRC) together with Global Initiative Reporting in 2011, after going through the evolution of reports presented by companies. In Indonesia, the Financial Services Authority has issued regulation Number 16/SEOJK.04/2021 which explains that the sustainability report is an integral part of the annual report. Therefore, companies that issue integrated reporting voluntarily before 2021 are expected to be able to achieve a green competitive advantage because they carry out different strategies from other companies. IIRC (2013) explains that in integrated reporting there is an interaction of tangible and intangible capital. One of the intangible capitals is green intellectual

capital which is considered important because it can increase value creation in achieving green competitive advantage, increase capital market efficiency and labor market (Guthrie, 2001). Therefore, this study analyzes two integrated reporting variables with green intellectual capital as an independent variable.

Green intellectual capital, which is the development of intellectual capital, is a key component of a business model that focuses on knowledge and human resources as knowledge assets by paying attention to the environment. Green intellectual capital is recognized as a development company with an environmentally friendly concept. Therefore, a green competitive advantage can be achieved if management is able to manage green intellectual capital. Research conducted by Corbella et al. (2018) found that green intellectual capital encourages sustainable value creation by contributing to value creation through human, structural, and relational forms of capital.

Green competitive advantage is an advantage that is expected by stakeholders to be developed by the company. This is an important matter with the results of research Chuang et al. (2016) which states that green competitive advantage is a green competitive advantage for companies in improving sustainable financial performance. Green competitive advantage is defined by Chang and Chen (2012) as a condition where companies can carry out environmental protection and green innovations that cannot be imitated by competitors and make companies obtain sustainable financial performance.

The new thing in this research is running a tough business in the face of competition and the obligation to follow an environmentally friendly business. Therefore, companies must strive to achieve a green competitive advantage. As the results of research Song and Yu (2017) show that green innovation influences green competitive advantage. The weakness of measuring green innovation from this model is that it does not pay attention to more comprehensive aspects of innovation to maintain business. Green innovation only contains two dimensions, namely green process innovation and green product innovation. These two dimensions are difficult to face competition in the 4.0 era and environmental phenomena which are the focus of the world. In this regard, the measurement of green innovation according to Song and Yu (2017) needs to be considered by adding three dimensions, namely (a) green organizational culture contains four indicators, (b) green supply chain management contains four indicators, (c) green marketing contains two indicators. Therefore, green innovation is called the five dimensions and fourteen indicators, green innovation is modified.

The research objectives are to analyze empirically as follows: (1) The effect of integrated reporting and green intellectual capital on green competitive advantage, (2) Green innovation modifies the effect of integrated reporting and green intellectual capital on green competitive advantage.

2. REVIEW OF LITERATURE

2.1. Hypothesis Development

Deegan (2002) states that stakeholder theory is a theory which states that all stakeholders have the right to obtain information about company activities that can influence decision making.

The findings show that integrated reporting improves the quality of disclosure, which in turn improves the decision-making process and has a positive effect on green competitive advantage (Rabaya and Saleh, 2021). This supports research Amirrudin et al. (2021) that by meeting stakeholder expectations, integrated reporting affects green competitive advantage. Albitar et al. (2020) shows the results that integrated reporting has proven to be able to create a green competitive advantage. Based on the description above, the following hypothesis is proposed:

H₁: There is a positive effect of integrated reporting on green competitive advantage.

Resources-based theory is a theory developed to analyze the competitive advantage of a company that emphasizes the superiority of knowledge or intangible assets. In today's competition, companies are required to have a better competitive advantage than other companies, but not all companies have it. In order to have a competitive advantage from its resources, the company needs to conduct research and development so that existing products can be developed into a product which has a higher value than its competitors in the long term (Barney, 2008).

Research Muisyo et al. (2022) and Astuti and Datrini (2021), using research samples on managers of production, marketing, and environmental protection departments, concluded that human capital, relational capital, structural capital are strongly related to green competitive advantage. Chen (2008) argues that green intellectual capital shows a significant effect on green competitive advantage. Based on the description above, the following hypothesis is proposed:

H₂: There is a positive effect of green intellectual capital on green competitive advantage.

Based on the sustainability concept stated this concept is simple but complex, so the notion of sustainability is very multi-dimensional and multi-interpreted. The understanding of green innovation modified is the result of the interaction between innovation and the concept of sustainability (Dangelico and Pujari, 2010). According to research Amirrudin et al. (2021) by meeting stakeholder expectations, integrated reporting influences green competitive advantage. Meanwhile, research Chen et al. (2006) on the effect of green innovation on green competitive advantage concludes that product innovation and process innovation are positively related to green competitive advantage. Green innovation is an important factor in the company's strategy to achieve green competitive advantage, meet market and stakeholder needs and sustainable development (Soewarno et al., 2019). Environmental responsibility is one way to increase green competitive advantage and investor confidence (Okpala and Iredele, 2019). Therefore, the proposed hypothesis is as follows:

H₃: Green innovation modified strengthens the effect of integrated reporting on green competitive advantage.

Research Chen (2008) on the effect of green intellectual capital consisting of human capital, relational capital, structural capital on green competitive advantage concludes that human capital, relational capital, and structural capital are strongly related to green competitive advantage. Meanwhile, research conducted Chen et al.

(2006) on the effect of green innovation on corporate excellence in Taiwan concluded that product innovation and process innovation are positively related to competitive advantage. Green innovation is an important factor in the company's strategy to achieve green competitive advantage, meet market needs, stakeholders and sustainable development (Soewarno et al., 2019). Environmental responsibility is one way to increase the company's competitive advantage and investor confidence (Okpala and Iredele, 2019). Therefore, the proposed hypothesis is as follows:

H₄: Green Innovation modified strengthens the effect of green intellectual capital on green competitive advantage.

3. RESEARCH METHODOLOGY

3.1. Research Design

The population in this study are companies listed on the Indonesia Stock Exchange in 2016-2020. The research sample was taken by purposive sampling, namely sampling using certain considerations and criteria.

3.2. Definition and Measurement of Variables

Measurement of variables with content analysis in the annual report and sustainability report by giving a value of 1 (one) for companies disclose indicators and a value of 0 (zero) if they do not disclose. The variables used in this study are as follows:

3.3. Independent Variable

3.3.1. Integrated reporting (IR)

According to the International Integrated Reporting Council IIRC, (2013) describes integrated reporting as a concise and clear communication process related to strategy, governance, performance, and company prospects in achieving short-, medium- and long-term corporate value. Measurements using elements from IIRC, (2013) consist of 9 dimensions. With the following index:

$$IR = \frac{\text{Total items disclosed in each element}}{\text{The total number of items in each element}} \times 100\%$$

3.3.2. Green intellectual capital (GIC)

According to Chen (2008) Green intellectual capital is the total of all types of intangible assets, knowledge, abilities, and relationships regarding environmental protection or green innovation, both at the individual and organizational level within a company. This variable is measured by the formula developed by Yusoff et al. (2019) as follows:

$$GIC = \frac{\text{Total items disclosed in each element}}{\text{The total number of items in each element}} \times 100\%$$

3.4. Dependent Variable

3.4.1. Green competitive advantage (GCA)

According to Chen (2011) Green competitive advantage is a condition in which the company occupies several positions regarding green innovation. where competitors cannot replicate their successful environmental strategies and can derive sustainable benefits from successful environmental strategies. Measurements refer to Muisyo et al. (2022) and Chen (2011) which contain eight indicators with the following indices:

$$GCA = \frac{\text{Total items disclosed in each element}}{\text{The total number of items in each element}} \times 100\%$$

3.5. Moderating Variables

3.5.1. Green innovation modified (GI)

Green innovation is measured by using the formula Song and Yu (2017) Initially consisting of: 2 dimensions, namely green process innovation and green product innovation and added 3 dimensions, namely green organizational culture, green supply chain management, and green marketing. Therefore, green innovation is modified into 5 (five) dimensions. With the following index:

$$GI = \frac{\text{Total items disclosed in each element}}{\text{The total number of items in each element}} \times 100\%$$

3.6. Control Variables

3.6.1. Environmental organizational culture (EOC)

According to Chen (2011), environmental organizational culture contains information about environmental innovation culture. This variable is measured by six indicators with the following index:

$$EOC = \frac{\text{Total items disclosed in each element}}{\text{The total number of items in each element}} \times 100\%$$

3.6.2. Environmental leadership (EL)

Chen (2011) defined environmental leadership as a dynamic process in which one individual influences another individual to contribute to the achievement of environmental management. This variable can be measured by four indicators with the following index:

$$EL = \frac{\text{Total items disclosed in each element}}{\text{The total number of items in each element}} \times 100\%$$

3.6.3. Environmental capability (EC)

Environmental capability is defined as the company's ability to integrate, coordinate, build, and reconfigure its competencies and resources to achieve environmental management and environmental innovation (Chang Chen, 2012). This variable can be measured by four indicators with the following index:

$$EC = \frac{\text{Total items disclosed in each element}}{\text{The total number of items in each element}}$$

3.7. Data Analysis Method

In testing the hypothesis using panel data regression test, which is a combination of cross-section data and time series data using E-views. There are 2 test models, namely:

Model 1 is testing with novelty while model 2 is testing without novelty, with the following formula:

$$GCA_{it} = \alpha_0 + \alpha_1 IR_{it} + \alpha_2 GIC_{it} + \alpha_3 IR_{it} * GI_{it} + \alpha_4 GIC_{it} * GI_{it} + \alpha_5 EOC_{it} + \alpha_6 EL_{it} + \alpha_7 EC_{it} + e_{it}$$

4. RESULTS AND DISCUSSION

Research sample consists of companies listed on the IDX for the 2016-2020 period (IDX-IC) totaling 713, min 286 companies

that publish annual reports but do not publish sustainability reports. Financial companies (Banks, Insurance, Financing Services, Investment Services) are reduced because there are 103 different types of products. So the number of observations of the sample companies are companies that publish annual reports and sustainability reports in a row, totaling 324 observations. The following is presented descriptive statistics:

The descriptive statistics in Table 1 can be explained that the average has a standard deviation value that is smaller than the mean value, meaning that the data is homogeneous, that is, the distribution of the data does not vary, which means that the average data has a low deviation rate. Integrated reporting shows a minimum value of 0.255, meaning that all companies disclose indicators of variables the maximum value of 0.982 means that no company discloses all indicators in the annual report and sustainability report.

4.1. Hypothesis Test

The test uses moderated regression analysis with the assumption that green innovation is the pure moderator. The argument is that the application of green innovation requires other variables to achieve a green competitive advantage. So that green innovation modified cannot stand alone as an independent variable and only functions when interacting with the independent variables, namely integrated reporting and green intellectual capital (Sharma et al., 1981).

The test results for model 1 (with novelty) and model 2 (without novelty) are as shown in Table 2:

$$GCAit = \alpha_0 + \alpha_1 IRit + \alpha_2 GICit + \alpha_3 IRit * GIit + \alpha_4 GICit * GIit + \alpha_5 EOit + \alpha_6 ELit + \alpha_7 ECit + eit$$

4.2. Explanatory

Model 1 (with novelty) gives better results than model 2 (without novelty). As follows: (a) Model 1 has Adj. R Squared is higher (0.029) than Model 2 (0.026) meaning that the variables in model 1 better describe their effect on green competitive advantage. (b) Model 1 is better than model 2 with a higher F Stat value (2.411) or lower Prob-F (0.020) than model 2 (0.029). This means that the influence of variables in model 1 is stronger than model 2 because of the lower probability value. (c) Neither model 1 nor model 2 provides a consistent direction and model 1 is more robust. This means that green innovation modified (novelty) is proven to have benefits, especially in green organizational culture and green

Table 1: Descriptive statistics

Variabel	N	Min	Max	Mean	Std. Dev
GCA	324	0.000	1.000	0.610	0.234
IR	324	0.255	0.982	0.744	0.124
GIC	324	0.063	1.000	0.523	0.187
GI	324	0.071	1.000	0.641	0.160
EC	324	0.000	1.000	0.624	0.333
EL	324	0.000	1.000	0.771	0.254
EOC	324	0.000	1.000	0.839	0.273

GCA: Green Competitive Advantage, IR: Integrated Reporting, GIC: Green Intellectual Capital, GI: Green Innovation modified; EC: Environmental Capability, EL: Environmental Leadership, EOC: Environmental Organizational Culture

supply chain management. Green innovation is an important factor in the company’s strategy to achieve a green competitive advantage (Chen et al., 2006).

5. DISCUSSION

5.1. Integrated Reporting has a Significant Positive Effect on Green Competitive Advantage

The results are consistent with Rabaya and Saleh, (2021) and Amirrudin et al. (2021). This means that integrated reporting improves the quality of information and company transparency regarding business sustainability by showing the relationship between financial performance and sustainability reports consisting of environmental, social, and governance, in one annual report or separately, can improve reputation and achieve a green competitive advantage (Zhang et al., 2018). The results of the study support stakeholder theory, namely integrated reporting acts as a business mechanism for stakeholders regarding value creation activities so that companies can be sustainable and contribute to a green competitive advantage Freeman et al. (2017). When related to the analysis of the dimensions of integrated reporting disclosed by the company in the annual report and sustainability report, namely (1) Business Model, (2) Organizational Overview and External Environment, (3) Governance. This shows that these three dimensions are seen as the main foundation for long-term company sustainability.

5.2. Green Intellectual Green has a Positive Effect on Green Competitive Advantage

Research results are consistent with studies Cahyono and Hakim (2019), Astuti and Datrini (2021), and (Firmansyah, 2017). This means that green intellectual capital as useful and shaped information is used to produce higher value assets. Therefore, the application of green intellectual capital can increase the green competitive advantage, because it has reliable human resources. The results of the study support the resource-based theory that the ability of human resources can provide a competitive advantage for the company and satisfy stakeholders. If it is related to the disclosure of green intellectual capital which has three dimensions,

Table 2: T test results (Individual)

Variabel	Prediction	Model 1 (with novelty)		Model 2 (without novelty)	
		Coefficient	Sig.	Coefficient	Prob.
C		0.299	0.000	0.297	0.000*
IR	+	0.241	0.006*	0.193	0.002*
GIC	+	0.414	0.000*	0.127	0.081**
IR*GI	+	0.320	0.014*	0.125	0.073**
GIC*GI	+	-0.485	0.005*	-0.133	0.043 *
EC		-0.026	0.235	0.107	0.067**
EL		0.021	0.370	-0.021	0.331
EOC		0.109	0.059**	0.020	0.377
R-squared			0.050		0.047
Adjusted R-squared			0.029		0.026
F-statistic			2.411		2.263
Prob (F-statistic)			0.020		0.029

*Significant 5%, **Significance 10%, Note: GCA: Green Competitive Advantage, IR: Integrated Reporting, GIC: Green Intellectual Capital, GI: Green Innovation modified; EC: Environmental Capability, EL: Environmental Leadership, EOC: Environmental Organizational Culture

namely green human capital, green structural capital, green relation capital, it has been explained that it is balanced and comprehensive so that it supports a green competitive advantage.

5.3. Green Innovation Modified Strengthens the Effect of Integrated Reporting on Green Competitive Advantage

Green innovation increases product diversification and reduces costs, increasing green competitive advantage (Zameer et al., 2021). Meanwhile, integrated reporting is the practice of reporting financial, economic, and social performance together that is disclosed by the company. Sustainability issues are increasingly important for all industries as the key to business competitiveness. So, the company is obliged to submit integrated reporting to stakeholders (Horbach et al., 2012). In this regard, this study proves that the application of modified green innovation strengthens the effect of integrated reporting on green competitive advantage. This shows that the delivery of integrated reporting supported by the application of modified green innovation has proven to have a complementary effect or complement each other in achieving a green competitive advantage. The results of this study support the theory Sharma et al. (1981), that the assumption of green innovation modified as a pure moderator is proven. This means that when the moderating variable is green innovation modified which has five dimensions, it can affect the green competitive advantage variable, only when it interacts with the integrated reporting variable which includes nine dimensions.

If it is associated with the implementation of the green innovation modified dimension, it is possible that the company has not reported the green innovation modified dimension comprehensively, only focusing on (a) green organizational culture, (b) green supply chain management. While the other three dimensions have not been fully disclosed, namely (a) green marketing, (b) process innovation and (c) product innovation because there is no mandatory regulation from the financial services authority. Possibility of at least green marketing disclosure items, because not all sectors require massive marketing, for example the agricultural sector. Few items of product innovation and process innovation are disclosed because packaging using recycling requires more high costs, especially in the consumer goods industry sector. Another possibility is that the industry uses old technology machines that are inefficient and even cause high levels of waste or pollution. Meanwhile, the shift to green factory equipment that pays attention to the environment requires high costs.

Furthermore, to achieve a green competitive advantage, the company has implemented a modified green innovation that focuses on the environment. At the same time, the company also revealed that integrated reporting focuses more on dimensions outside the environment. Therefore, green innovation modified can strengthen the effect of integrated reporting on green competitive advantage.

5.4. Green Innovation Modified Weakens the Positive Influence of Green Intellectual Capital on Green Competitive Advantage

When companies develop intangible assets, namely green intellectual capital that focuses on the environment, it will provide opportunities for companies to increase their green competitive advantage (Yusoff et al., 2019). Meanwhile, Chen

et al., (2006) green innovation (product innovation and process innovation) is positively related to green competitive advantage. Therefore, when a company wants to develop an intangible asset, namely green intellectual capital as an effort to achieve a green competitive advantage, the company must implement a modified green innovation as a complement to the realization of a green competitive advantage. This is in line with the opinion of Sharma et al. (1981), that the assumption of green innovation modified acting as a pure moderator is proven. When the moderating variable is green innovation modified which has five dimensions, it can affect the green competitive advantage variable only when it interacts with the green intellectual capital variable which includes three dimensions.

However, the implementation of green innovation modified in Indonesia based on this sample weakens the effect of green intellectual capital on green competitive advantage. This is because managers in green-oriented companies still face challenges to run a profitable and environmentally friendly business (Gabler et al., 2015). On the other hand, companies that implement green innovation must restructure business practices to be able to excel in green competitive advantage is not easy (Ghisetti et al., 2015).

Therefore, green intellectual capital which includes green human capital, green structural capital, and green relation capital is strong enough to achieve a green competitive advantage independently so that if the company implements a modified green innovation, it weakens the influence of green intellectual capital on green competitive advantage. It can be said that green intellectual capital and green innovation modified have a substitution relationship or replace each other in achieving a green competitive advantage. This means that when the company implements green human capital, it has carried out the activities that exist in the modified green innovation, for example the green organizational culture dimension, which is an indicator of the company making efforts to make employees understand environmental conservation. Likewise, when the company implements green relations capital, the company also implements a modified green innovation, in the dimensions of green supply chain management, through indicators of close relationships with suppliers.

From the similarity of activities carried out by the company through green innovation modified and green intellectual capital, green intellectual capital still has advantages, namely it has implemented green structural capital (capital attached to the company such as: patents, trademarks, hardware, software, databases) which is not available. On the green innovation modified dimension. So that green competitive advantage is more dominantly influenced by green intellectual capital. Therefore, green innovation modified weakens the positive effect or does not strengthen the effect of green intellectual capital on green competitive advantage.

6. CONCLUSION

- (1) Integrated reporting has a significant positive effect on green competitive advantage,
- (2) Green intellectual capital has a significant positive effect on green competitive advantage.
- (3) Green innovation modified significantly strengthens the effect

of integrated reporting on green competitive advantage. (4) Green innovation modified weakens the positive influence of green intellectual capital on green competitive advantage. (5) The green innovation modified variable which is the novelty of this study has more robustness than the model without novelty (Song and Yu, 2017). (6) The control variable that has an influence on green competitive advantage is environmental organizational culture.

6.1. Implications

6.1.1. For regulators

Integrated reporting has an influence on the green competitive advantage to support the Financial Services Authority regarding the obligation to submit annual reports and sustainability reports for all issuers starting in 2021. As well as efforts to support the Presidential Regulation of the Republic of Indonesia No. 98 of 2021, implementation of carbon economic value to achieve national targets and control greenhouse gas emissions. Therefore, the company must consider green innovation modified in its business strategy.

6.1.2. For companies

Contribute to the need for companies to present integrated reporting and the application of green innovation together to achieve a green competitive advantage. The addition of the modified green innovation dimension into novelty, namely green organizational culture, and green supply chain management, as well as green marketing contributes very well to green competitive advantage. So that in the future, companies must pay attention to aspects of green innovation modified with more comprehensive indicators. This encourages companies to pay attention to the environment, social and economy in operational activities.

6.1.3. For investors

Used as a consideration so that investors pay attention to companies that have applied the green concept to determine the investment made. Because it is proven that there are variables that affect green competitive advantage, namely integrated reporting, green intellectual capital, and modified green innovation, which are important for stakeholders.

6.2. Limitations and Future Research

6.2.1. Limitations

1. Determination of the indicator score of the integrated reporting index, green intellectual capital, green competitive advantage, environmental organizational culture, environmental leadership, environmental capability is subjective, so that each researcher can have a different perspective. This can allow for missing certain items that are disclosed by the company.
2. There is no direct verification to the companies that are the research sample.

6.2.2. Suggestion

1. The use of dummy 0 has no disclosure and 1 there is disclosure in the index calculation because integrated reporting is still voluntary. However, if integrated reporting or annual reports are mandatory starting in 2021. It is recommended that further research no longer uses dummy 0 and 1 but is developed by

reading in detail the disclosures. Therefore, the determination of the index can use weighting with more than 2.

2. Efforts to overcome the subjectivity of data collection using content analysis require re-checking from other parties.
3. The management must support and establish a green organizational culture that involves various values of green organizational culture to achieve green innovation. For example, management must cultivate environmentally friendly values to spread knowledge among organizational members by stating the importance of green culture for green competitive advantage.

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