

# The Impact of Green Product Innovation and Green Process Innovation on Firm Performance

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**Keywords:** Company's Performance, Green Process Innovation, Green Product Innovation.

**Abstract:** The aim of this research is to give empirical evidence regarding the influence of green product innovation and green process innovation on company performance. The population of this research is 435 manufacturing companies listed in the Indonesian Stock Exchange in 2014-2016. This research chooses sampling by using a purposive sample with 125 companies' data. This research uses multiple linear regression (SPSS 20.0) to investigate the research hypotheses. The results of this research prove that green product innovation has a negative but not significant influence on the company's performance, while green process innovation has a positive and significant influence on the company's performance.

## 1. INTRODUCTION

In the era of growing globalization, issues regarding climate change and global warming have been an ongoing subject of discussion by all countries around the world. Countries in different parts of the world are working hard to reduce activities that can aggravate environmental degradation. The various causes of such issues have been controlled by society in order to remain able to maintain environmental sustainability, and it is known that one of the biggest causes is derived from industrial enterprises. The existence of a company cannot be detached from the environment in which it is located. The operating activities of the company are potentially affecting the environment (Ulfah & Ikbal, 2012). The company is an organization that is in daily use of human resources and natural resources to bring in maximum profit for the sake of prosperity, which has become a major factor in the causes of the emergence of environmental damage (Susilo, 2012).

The company provides many benefits to the community as it provides jobs and produces products that meet the daily needs of the community, which also have a negative impact for society, especially for the environment. Not only products, the process to produce such products is also unfriendly toward the environment. Examples include the resulting product being unable to be

recycled, the production process causing waste hazardous to the environment, increased air pollution, water pollution, and other impacts. The company is required to provide solutions in dealing with the various environmental problems that are popping up (Muslim & Indriani, 2014). The company is expected to not only think of the acquisition of business profit but also to consider environmental impacts that can be caused in the implementation of operational activities (Ulfah & Ikbal, 2012).

All over the world, people are trying to find solutions to prevent occurrences of the impact of global warming on the environment. The various efforts undertaken by the community, was no exception by the company. Some companies around the world have participated and attempt to mitigate the effects of global warming. Some Asian countries, such as China, Japan, Korea, India, Thailand, Malaysia, and Singapore, are already much more responsive in addressing environmental issues. The government in neighboring countries implement green innovation undertaken by firms (Muslim & Indriani, 2014). In Indonesia, issues regarding global warming's impact on nature have been known for several years. The public are aware of the impact of global warming and take into account the impact on the environment of products they consume, as well as changing their lifestyles with a variety of efforts like saving electricity. Alternatively, they use the 'reduce, reuse, recycle'

approach, use eco-friendly products (green products) in daily activities, and other strategies. Related to the issue of global warming, companies in Indonesia are no longer less green aware than foreign companies. Domestic companies are also actively supporting lifestyle changes in society through products that they produce.

Many neighboring countries have implemented legislation concerning the protection of the environment to reduce the environmental impact of industrial companies (Kucukoglu & Pinar, 2015). The legislation of the Republic of Indonesia No.40 year 2007 regarding the limited liability company is one form of the government of Indonesia's efforts to reduce negative effects resulting from the operational activities of companies.

Indonesia has been in a phase of globalization since being a part of the world facing the challenges of the free market, namely the ASEAN Free Trade Area (AFTA) and the ASEAN Economic Community (MEA). The era of globalization has the meaning of being the era of the creation of a unified global society as well as interdependence with one another, so that the boundaries of a country are becoming increasingly narrow. The era of globalization is characterized by the existence of free competition and free trade. This raises concerns about the fate of the nation of Indonesia in the future. Minimal preparation in the face of AFTA and MEA led to the fear that it would result in domestic products becoming less attractive. Many of the foreign products that could access free entry to Indonesia will change people's interest toward domestic products. These problems mean that the products created by companies in the country must be able to compete with those of companies that are coming from outside the country, so the products generated by the companies in the country must be qualified in order to be able to create competitive advantage among their competitors.

The task of the company is becoming challenging as it is required to produce a product that is able to compete with foreign products as well as having to look at the environment in order not to cause a global warming-related impact that is even worse. The company must create a competitive advantage compared to foreign companies. Companies are expected to seek solutions to reduce raw material use and minimize energy use during the production process or recycle the materials used as well as reduce waste after the activity of the production process (Kucukoglu & Pinar, 2015).

A company will certainly be able to survive if it is able to have harmonious relationships between

aspects of the economy, the environment, and have the ability to achieve high innovation. In other words, a company must be able to read business opportunity from every challenge that is around. Environmental issues are currently the main issue that must be faced by all circles, both among governments and the community. If the company is able to provide a solution to the problem of global warming by creating innovations to reduce environmental damage, then it is certain that the company will not only benefit in terms of economic advantage, but it will also comply with government regulations, maintaining environmental sustainability, and enhancing the company's image in the eyes of the community.

There is some tendency to innovate. First, pressure from the public or the consumer who has to care for the environment, which has an impact on the activity and being able to change habits for the sake of the environment. Second, the existence of environmental problems from pollution, global warming, climate change and the depletion of the ozone layer. Third, government regulation concerning reduction of the carbon footprint (Qamarullah & Widowati, 2015). The company hopes that, after making the innovation, it will achieve a higher profit and gain improved performance.

The company's performance is one of the benchmarks in its success. According to Sucipto (2003), the performance of the company determines the specific measurements that can measure the success a company has achieved in generating profits. So that it can boost earnings along with the pressure from several parties, the company needs to improve its performance by innovating.

The company provides a solution by starting to make eco-friendly innovations (green innovation). The application of green innovation can help increase your company's competitive advantage in dealing with the challenges in the global market (Jipeng et al., 2016). Green innovation can be categorized into three types in accordance with the method of application. The first type is green innovation that lowers the environmental impact of companies, such as recycling or reuse; both of these are green innovations that have solved environmental issues for companies such as a drop in the use of materials and components that are harmful to the environment. and the third is a green innovation (Kucukoglu & Pinar, 2015). Sustainable innovation can be an important strategy to cope with the pressure from consumers, competitors and the government. According to the OECD Oslo Manual

(2005, p. 47), there are four dimensions of innovation: product innovation, process innovation, marketing innovation, and organizational innovation. This special examines the research on green product innovation and green process innovation. According to Ar (2012), green innovation can be done in two ways: the results of eco-friendly products (green product innovation); and an environmentally friendly production process (green process innovation).

Green product innovation is the creation of new products by companies that consider environmental aspects throughout the product's life cycle, starting from the raw materials used, the production process, transport, at the moment of use and up to after the product is no longer in use, so that minimal impact to the environment is caused (Pemayun & Suprapti, 2016). To create green product innovation is not an easy thing, because it requires research and development aimed at producing a new product innovation that is competitive, and the company should be able to improve the productivity but also must be able to adjust the purchasing power of the community.

Costs that should be incurred to produce the company's green product innovation include costs for the exploration of the idea of innovation, the cost to get the raw materials, the cost of the company's workers, the cost of safety certification to guarantee product safety for the consumer, and so on. Thus, it requires information that is accurate, detailed, and relevant to the management in terms of taking the best decision.

Green product innovation can be very beneficial to the environment, such as by reducing energy consumption, lowering CO<sub>2</sub> emissions, and enhancing biodiversity, as well as reducing pollution (Dereli, 2015). Products are designed to minimize environmental impacts during the life cycle of these products, such as avoiding materials that contain chemicals and toxins, the use of minimal resources, and other factors. When green product innovation created by the company succeeds in minimizing the use of resources, then the company can create efficiency in the allocation of its operating expenses. The decline in operating expenses would be reduced, so the company will generate increased profits, which would be expected to improve the company's performance.

According to previous research by Ar (2012), green product innovation has a positive effect on the performance of the company. Such research gives empirical evidence that regulatory policy changes could affect the company's green product

innovation, which then impacts on company performance. Yu Ke (2013) provides empirical evidence that the relationship between green product innovation and company performance is non-linear. The research proves that when a company wanted to improve its performance with green product innovation, it should begin by checking the level of its performance in advance.

Green process innovation is the deployment of an innovative idea for adoption into the activities of the production process, as well as the practice of the company carried out by noting the ecological environment as well as the economic impact (Qamarullah & Widowati, 2015). The use of various technologies on green process innovation makes firms try to reach the target of lowering pollution, and managing waste, water and raw materials for production efficiency.

Green process innovation aimed at reducing environmental impact with innovation development is currently achieved by way of adding to the production facilities or adding some new processes in the production process (Kucukoglu & Pinar, 2015). Green process innovation is an important activity of the company, carried out in order to run the activities of green innovation. Green process innovation can be said to be successful if, in the design of the production process, the company takes into account the environmental aspects appropriately. Green process innovation is a process whereby industrial companies have concern for the environment in the implementation of their production, as did the energy savings, resources, waste, as well as the impact of the resulting ecological (Tzu et al., 2011). When the efforts of green process innovation are run, this means the company has to minimize energy use. If energy is used only a little, then the company has successfully lowered operating costs so that an increase in profits and an increase in the company's performance is likely.

According to the earlier research of Ikbah Ulfa (2012), green process innovation has a positive effect on the company's performance. Such research gives empirical evidence that a green process innovation that puts shades of "green" in the production process positively influences an improvement in the performance of the company. Ching's (2011) hypotheses on test results provide empirical evidence that green process innovation has no effect on the company's performance. This is because the resulting product does not look how businesses companies in the processing of products by means of green process innovation, so there is no

positive relationship between green process innovation and an improved performance of the company.

Based on the previous explanation, the researcher is interested in seeing more about the influence of green product innovation and green process innovation as well as its impact on the company's performance. The target population of the research was manufacturing companies listed on the Indonesian Stock Exchange (IDX) during the period 2014-2016. The selection of the manufacturing company as a research target is because the manufacturing company is a company producing products that can cause damage to the environment, as well as a production process to create products generating waste that has a negative influence on the environment and society. Therefore, manufacturing companies are required to create green product innovation as well as green process innovation for the sake of maintaining the sustainability of the environment. The period 2014-2016 was selected as the observation period because Indonesia was facing the prospect of free trade in ASEAN by the year 2015, and this made it easy for foreign companies to market their products to Indonesia. The arrival of foreign products to Indonesia is a threat to domestic companies, which are not only required to remain superior in competition but must pay attention to their impact on the environment.

Based on the introduction above, the questions in this research are:

1. Does *green product innovation* have a positive effect on company performance?
2. Does *green process innovation* have a positive effect on company performance?

## 2 LITERATURE REVIEW

### 2.1 Legitimacy Theory

According to O'Donovan (2002), "Legitimacy theory is the idea that in order for an organization to continue operating successfully, it must act in a manner that society deems socially acceptable". The theory of legitimacy is a theory that explains that firms should continually ensure that they are operating within the norms prevailing in society and ensure that their activities are acceptable to outsiders.

Deegan (2002) defines the theory of legitimacy as "a condition or status that exists when the entity value system is congruent with the wider community

value system in which society becomes its part. When a difference, whether real or potential, exists between the two value systems, there will be a threat to the legitimacy of the company."

### 2.2 Stakeholder Theory

According to Freeman (1984), stakeholders are interpreted as a group of people or individuals who can affect a company's activities or can be influenced by the activities of the company. Gray et al. (1995) state that the survival of a company depends on the support from stakeholders, and such support should be sought; hence, the company's activity is to seek that support. The company's effort to create green product innovation and green process innovation is expected to keep the stakeholder's interest, so stakeholders will give mutual return to the company such as buying the product, etc. The stakeholder support will benefit the company.

### 2.3 The Influence of Green Product Innovation and Green Process Innovation on Company Performance

Green product innovation created by the company is expected to be the company's effort to gain legitimacy from the community. The company creates green product innovation as proof to the public that it has created the product by keeping an eye on the surrounding environment and is concerned with its benefits to the community, while keeping in mind the prevailing norms in society. Environmental issues, products that are not environmentally friendly, and pressure from various parties mean that the company must pay attention to the interests of stakeholders in its production. In creating green product innovation, companies must pay attention and gain support from stakeholders. If the company creates a green product innovation that is fully supported by stakeholders, then the stakeholders will like and buy the product, which will further benefit the company.

Research by Ar (2012), Ching (2011), Wong (2012), and Kucukoglu and Pinar (2012) provides empirical evidence that green product innovation has a positive effect on the company's performance, while Yu and Ke (2013) and Fitriani (2015) provide empirical evidence that green product innovation negatively affects the company's performance. Green process innovation conducted by the company is expected to be an effort to get the company's legitimacy from the community. The company

undertakes green process innovation as proof to the community that it has been operating its production process while keeping a close eye on the surrounding environment, and its benefits to the community, while taking into account the prevailing norms in the community. These efforts will provide a positive value of society to the company, so the company gets the legitimacy of the community.

Environmental issues and pressure from various parties make the company, in the production process, pay attention to the interests of stakeholders, so in green process innovation, companies must pay attention and get support from stakeholders. If the company undertakes a green process innovation that is fully supported by stakeholders, then in the eyes of stakeholders the company has got a positive value, and stakeholders will be interested to buy and use the company's products; hence, it will benefit the company.

Research conducted by Wong (2012), Fitriani (2015), and Kucukoglu and Pinar (2015) provides empirical evidence that green process innovation has a positive effect on company performance. In contrast, research by Ching (2011) provides empirical evidence that green process innovation negatively affects the company's performance.

## 2.4 Method And Analysis

The type of research used is quantitative with an explanatory approach. The total population is manufacturing companies listed on the Indonesian Stock Exchange in 2014-2016, with data from 435 companies. Sampling uses a purposive sampling method with sample data from 125 companies.

### 2.4.1 Definition of operational variables

The performance of the company is a measure of the success of operational activities and corporate finances in a certain period. One of the ratios commonly used as a measure of a company's performance is Return on Assets (ROA):

$$\text{ROA} = \text{Net Profit} / \text{Total Asset} \quad (1)$$

Green product innovation is a company's new product innovation that is safe for the environment and does not have a negative impact on the environment, dating from when the product is made, through when the product is consumed, and until the product can no longer be used. According to Peters (2005), the company's effort to create green product innovation must see how the company's ability of

cash availability owned by the company in order to create a new product innovation. Green product innovation in this research uses an approach by Peters (2005) with the following formula:

$$\text{Green Product Innovation} = \text{Operating cash flow (it)} - \text{Operating cash flow (it-1)} / \text{Sales(it-1)} \quad (2)$$

Green process innovation is a production process that seeks to minimize the negative impact of that process on the environment. According to Peters (2005), the company's effort to create green process innovation can be seen from how the company performs the efficiency of its operational process from minimizing the use of operational expenses such as raw materials and energy load. Green process innovation in this research uses an approach by Peters (2005) with the following formula:

$$\text{Green Process Innovation} = (\text{Energy expense} + \text{material expense})_{it} - (\text{energy expense} + \text{material expense})_{it-1} / (\text{sales})_{it} \quad (3)$$

The age of the company is the time when the company first started operations until the time of the research. By knowing the age of the company, we can know to what extent it can stay afloat.

According to Saputro (2013), the age of the company is used as a control variable in order to know how experienced the company is in carrying out operational activities, so that it understands its well-being potential, including the company's potential to innovate.

The company's age in this study used an approach taken by Saputro (2013), which is calculated from the company's date of operation until the end of the research year. Company size is a measure of assets owned by the company. According to Fachrudin (2011), company size is used as a control variable to determine the company's ability to use all resources owned to create new innovations. According to Fachrudin, company size is calculated using the formula:

$$\text{Company Size} = \text{Ln (Total Asset)}$$

The analysis tool used in this research is multiple linear regression with the consideration that this tool can be used as a prediction model to the dependent variable that is: company performance with some independent variable that is green product innovation and green process innovation.

### 3 RESULT

The result of the normality test is that the Kolmogorov-Smirnov value equals 0.731 with a significant value of 0.658, so it can be concluded that residual data for the regression model built has been normally distributed.

Table 1: Multicollinearity Test Results

Model	Collinearity Statistics	
	Tolerance	VIF
Product	0.996	1.004
Process	0.941	1.063
Size	0.991	1.009
Age	0.941	1.063

Source: processed data, 2017

The regression model built does not have multicollinearity problems. This can be seen from the tolerance value in Table 3 that is greater than 0.1 and the VIF value less than 10.

Table 2: Heteroscedasticity Test Results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
	(Constant)	-.102	.078		
Product	-.013	.020	-.057	-.642	.522
Process	.038	.024	.141	1.546	.125
Size	.005	.003	.174	1.952	.053
Age	5.024E-005	.000	.021	.229	.820

Source: processed data, 2017

The significant value of count (Sig.) of all variables used in the study showed a value >0.05, so it can be concluded that the research data did not experience symptoms of heteroscedasticity.

Multiple linear regression analysis was done to test the influence of the independent variable, which is the influence of green product innovation and green process innovation on company performance.

Table 3 :Results of Multiple Linear Regression Analysis

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.139	.129		-1.075	.284
Product	-.007	.034	-.019	-.217	.828
Process	.086	.040	.192	2.138	.035
Size	.006	.005	.112	1.273	.206
Age	.001	.000	.135	1.498	.137

Source: processed data, 2017

Based on the result of the multiple linear regression model test, a regression equation can be compiled as follows:

$$ROA = -0.139 - 0.007 \text{ PRODUCT} + 0.086 \text{ PROCESS} + 0.006 \text{ SIZE} + 0.001 \text{ AGE} + e \quad (4)$$

The multiple linear regression equation presents how much each independent variable influences the company's performance. The effect of each variable on the basis of the multiple linear regression equation can be explained as follows:

- a) Constant value of -0.139, indicating that if all independent variables used did not change, then the value of ROA will decrease by 0.139 times and impact to decrease company performance equal to 0.139 times, with the

assumption that the other independent variables are considered constant.

- b) The value of the green product innovation regression coefficient of -0.007 indicates that if green product innovation increased 1%, then the value of ROA will decrease by 0.007% and impact to decrease company performance equal to 0.007%, with the assumption that the other independent variables are considered constant.
- c) The value of the green process innovation regression coefficient is 0.086. It shows that if the green process innovation increases 1%, then ROA will increase by 0.086% and impact on the company performance improvement by 0.086%, assuming other independent variables are considered constant.
- d) The value of the regression coefficient of company size is 0.006. This shows that if company size increases 1%, then ROA value will increase by 0.006% and impact to increase company performance equal to 0.006%, assuming the other independent variables are considered constant.
- e) The value of the regression coefficient of the company's age of 0.001. This indicates that if the age of the firm increased 1%, then the value of ROA will increase by 0.001% and impact on the increase in company performance by 0.001%, assuming the other independent variables are considered constant.

### 3.1 Coefficient of Determination Test Results

The influence of each independent variable on the company performance variable can be shown from the result of the coefficient determination test. The coefficient of determination test is seen on the basis of the adjusted R<sup>2</sup> value generated on the regression model built. The coefficient of determination (adjusted R<sup>2</sup>) for the constructed model is 5.5%, indicating that 5.5% of company performance can be explained by green product innovation and green process innovation, while the other 94.5% can be explained by other variables that are not explored in this study.

## 3.2 Verification of Hypothesis

### 3.2.1 The Influence of Green Product Innovation on Company Performance

Hypothesis 1 (one) states that *green product innovation* has a negative but not significant effect on the performance of the company. This can be seen from the significance value count (0.828) > significant level (0.05). The results showed that the company's business innovation through *green product innovation* cannot exert influence directly against an increase in the profit of the company. This is caused by *green product innovation* raising the costs of expenses, resulting in declining company profits. However, the existence of a *green product innovation* gives advantages for companies to improve their performance. This caused performance improvements from the increasing volume of product sales of the new product produced. The existence of two views associated with *green product innovation* in an attempt to improve the company's performance resulted in the absence of a strong influence of *green product innovation* against the financial performance.

Based on the theory of legitimacy, the company must know that the limitations are emphasized by social norms, which encourages companies to look at the environment. *Green product innovation* is expected to help a company in its attempts to obtain legitimacy from the community. The company created *green product innovation* as a proof to the people that it has created products with a consciousness of its surroundings as well as looking at the benefits to the community by noting the prevailing norms of society. However, with products created based on an understanding of the environment, it takes a long time for people to feel the positive impact.

The results of this research are consistent with research conducted by Fitriani (2015), which prove empirically that *green product innovation* negatively affects the company's performance. Results of the study prove that the use of environmentally friendly raw materials for product innovation have no effect against the increase in the company's performance. Along with the research of Fitriani (2015), this research provides empirical evidence that *green product innovation* undertaken by the company cannot be perceived to benefit the company directly. This is because it takes a long time for innovation to be beneficial to the improvement of the performance of the company.

### 3.2.2 The influence of *Green Process Innovation* against the performance of the company

Hypothesis 2 (two) states that *green process innovation* has a positive and significant effect on the performance of the company. This is shown from the significance value count  $(0.035) < \text{significant level } (0.05)$ . The results showed that the existence of a relationship between energy saving as well as raw materials for the production process turns out to be able to reduce the burden of the company to the extent that it can increase the profits of the company. *Green process innovation* is the key to improve the company's idea of new innovations that can help improve the performance of the company as well as helping companies to compete with their competitors. With the efficiency of the production costs, companies will then experience a decrease in load to the production process. With a decrease in the load, the company will earn high profits, which will then improve the company's performance.

This is in line with the results of the research study conducted by Wong (2012) that prove empirically that *green process innovation* has a positive effect against an increase in the company's performance. The study explains that this can give a good signal to management that innovating a new production process could raise the company's performance.

## 4 CONCLUSION AND IMPLICATION

### 4.1 Conclusion

Empirically, the results of the study prove that:

1. Green product innovation has a negative but not significant effect on company performance. Innovation takes a long time to provide benefits for improving company performance.
2. Green process innovation has a positive and significant effect on company performance. The existence of the relationship between energy savings and raw materials during the production process was able to reduce the company's expenses so as to increase its profit.

### 4.2 Implication

The following are the implications of this study:

1. Green product innovation and green process innovation are important for management as activities to improve company performance, but they are not the only activities that could be used, because this research proves empirically that green product innovation has a negative effect on company performance.
2. The creation of green product innovation and green process innovation will improve the company's positive image in the eyes of all stakeholders, which is expected to be useful to achieve the company's goals.

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