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**GREEN PRODUCT COMPETITIVENESS AND GREEN PRODUCT SUCCESS.
WHY AND HOW DOES MEDIATING AFFECT GREEN INNOVATION PERFORMANCE?***

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Abstract. Among the global warming issue and production process using machinery and modern technology, these Batik SMEs still strongly exist. This research aims at empirically proving the influence of green product competitiveness and green product success on green product innovation performance through green product competitiveness and green product success as the mediating variable. This research employs a survey approach and questionnaire to collect information related to the research samples. The quantitative approach in this research is conducted by testing the research hypotheses. 223 respondents consisting of Batik SMEs' owners/ managers in Yogyakarta, Indonesia are taken as the samples with a purposive sampling method. The hypotheses test results show positive and significant correlation between green product innovation and green product competitiveness and green product success. Green process innovation positively, significantly influences green product competitiveness and green product success. Green product competitiveness positively, significantly influences green innovation performance. Green process success positively, significantly influences green innovation performance.

Keywords: green product competitiveness; green product success; green product innovation performance; green product competitiveness

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JEL Classifications: M21, M31, Q01, Q56

1. Introduction

Issues of business sustainability oriented to environmentally friendly operational activity become an interesting topic of research discussion among the business dynamics and escalating competitive advantage (Wang 2019; Soewarno et al. 2019; Huang and Li 2018). Some other research issues also explain that the use of materials which may directly affect global warming (Dougherty and Dunne 2011), use of carbon and utilization of non-environmentally friendly technology (Shane and Ulrich 2004) also become an interesting research study which needs further study. From customers' perspective, customers currently tend to prefer natural and environmentally friendly products, so that such products will have a good image to the customers' satisfaction (Chen 2010).

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Corporate role becomes very important in creating innovative products which respond to customers' expectation by creating peculiar, excellent and environmentally friendly products (green product innovation), so that they become company's distinctive identity (Lee et al. 2013).

Researches on green innovation have also become an interesting subject matter in measurement of green innovation performance (Chang and Chen 2013; Cao and Chen 2018; Zhang and Zheng 2018; Soewarno et al. 2019). Green product innovation performance becomes corporate strategy to attract customers by adopting the issue of environmentally friendly production material utilization. Chang's study (2011) explains how important a business organization's corporate environmental priority in achieving competitive advantage through green innovation process is. Moreover, some literatures and other empirical studies have recorded the correlation between innovation and environmental issue (Lin et al. 2014), economic activity and environmental sustainability (Lavrinenko et al. 2019).

Other literature states that the correlation between green innovation and green performance presents research results which remain a debate among researchers. Some previous study results find the importance of green innovation in improving corporate profitability and reducing risk, like the study conducted by (Lin et al. 2013; Soewarno et al. 2019; Tariq et al. 2019). However, some other studies find that green product innovation does not affect performance (Testa and D'Amato 2017; Trumpp and Guenther 2015). Based on the findings, the correlation between green innovation and corporate performance remains a debate and requires further research. This study attempts to give an answer to the inconsistent findings of the results of previous studies on the effect of green innovation on business performance by building an empirical research model through mediating role of green product competitiveness and green product success in improving of green innovation performance.

Some other studies state that green innovation may be implemented through three green innovation activities, which are green product innovation, green process innovation and green technological innovation (Lin et al. 2013; Chen et al. 2006a; Norberg-Bohm 1999). This research attempts to empirically prove the role of green product innovation and green process innovation in improvement of product innovation performance, particularly with SMEs. The role of green innovation in improving product innovation performance in this research is tested to the scope of SMEs. Another research also explains that creation of product advantage and improvement of SMEs networking and green marketing activity need to be developed to improve innovation performance (Chahal et al. 2014; Mellett and Kelliher 2018). Moreover, another study states that the existence of SMEs may make an important contribution to economy advancement (Buzavaitė et al. 2019).

Factors which may affect green product innovation performance are, among others, green product competitiveness and green product success (Wong 2012a). Moreover, the study conducted by (Wong 2012a) finds that it is important for a company to create green product competitive advantage and green product success. Green innovation activity may be performed in corporate environment through innovation policy implemented (Foreman-Peck 2013).

This research focuses on Batik SMEs in Indonesia that uses natural materials in their production process. Among the global warming issue and production processing using machinery and modern technology, these Batik SMEs still strongly exist.

This research makes an important contribution to the body of knowledge of how SMEs optimize their internal resources capabilities and through empirical testing of important mediating role aiming for green product competitiveness and green product success in completing the gap research of the role green innovation in green product innovation performance that remains a debate to previous researchers. Green product competitiveness and green product success in this study serve as the construct of consequence of green product innovation and green process innovation which serve as the mediating variable of correlation between green product innovation and green process innovation in green innovation performance. This study used a quantitative approach. Statistical

testing using the SEM structural equation modeling method tested the effect of green product innovation and green process innovation on green product competitiveness, green product success, and green innovation performance.

2. Literature Review and Hypotheses Development

2.1. Green Product Innovation and Green Product Competitiveness

Green product innovation becomes an important factor of business in innovation collaborative activity (Chen and Hung 2014), green organizational identity (Chang and Chen 2013), achieving SMEs' competitive advantage and performance (Lin et al. 2013). Green product innovation may be defined as organization's effort to develop its business by maintaining environmental function and response to market demand which may affect corporate long-term strategic orientation in realizing corporate performance (Lin et al. 2013). Meanwhile, Ar (2012) states that green innovation as related business activity focuses on eco-innovation concept and various areas related to business environment. Furthermore, it is explained that the green concept has three dimensions, which are green product innovation, green process innovation and green managerial innovation. This study emphasizes green product innovation and green process innovation.

Dangelico and Pujari (2010) state that green product innovation is acknowledged as an important factor to achieve business growth, environmental sustainability, and better quality of life from utilizing business environmental elements. Furthermore, it is stated that company must understand green product innovation as part of business interaction in maintaining sustainability and make it corporate strategy. Meanwhile, another study developed by Huang et al. (2016) finds that adoption of green product innovation developed by company is determined by internal green capabilities, R&D intensity and company size factors. This requires a thorough understanding of internal factor in developing green product innovation. It is also important for organization to build green product innovation and green process innovation in achieving their product advantage and success in market competition (Kam and Wong 2012).

Other researchers also state that green innovation becomes an important strategy for organization to create their unique product in customers' market (Dangelico and Pujari 2010; Lin et al. 2013). Product with certain unique value and environmentally friendly product advantage (green product innovation) becomes company's special bargaining value to customers, thus it has advantage over competitor's product. There is even a close correlation between the market orientation of a company which develops green environment and company's strategy in adopting environmental issue in environmental product quality advantage (Chen et al. 2015). Another study developed by Nuryakin and Ardyan (2018) explain that SMEs had an essential role in developing market expansion and marketing performance. Hence, the hypothesized model in this study will be:

H1a. Green Product Innovation has a positive effect on green product competitiveness.

2.2. Green Product Innovation and Green Product Success

SMEs need to strengthen their product lines in order to survive in competitive market through innovation creation in encountering rapid and unavoidable change process (Simpson 2004). SMEs also has potential to develop product pursuant to market potential by building product differentiation through market resources allocation strategy in view of product creation potential for customers (Bradley and Sean 2001). One of the strategies in creating product differentiation for customers is to build green innovation which is able to respond market demand. The study conducted by Zhang and Zheng (2018) emphasizes green innovation activity consisting of input process in product creation with proportionally degradable material, and also a small material fraction benefitting the business.

Another study states that market demand of green product is business's important key to achieve the degree of strongly green product innovation (Lin et al. 2014). It is further explained that market demand of green product becomes corporate power to perform a strategy of and adaptation response to environmental changes and issues. Chen and Hung (2014) even state that organization, in the process of creating green product innovation, needs to build their relational social capital with their business network, so that a product with added value in customers' domain may be created, thus their competitive advantage will be realized through networking collaboration (Nuryakin et al., 2018).

The study conducted by Chang and Chen (2013) explains that green organizational identity may also determine SMEs' green innovation success. Moreover, it is stated that green organizational identity makes positive contribution to encouraging green innovation directly through organization's real commitment to protecting SMEs' environment. Other researchers also find that it is important for organization to build long-term business by prioritizing environmental factor and green product success (Wong 2012b; Ar 2012; Dangelico and Pujari 2010). Organization's concern about environmental aspect will affect company's reputation and, thus, maintain its performance in customers' market (Chen 2008a). Hence, the hypothesized model in this study will be:

H1b. Green Product Innovation has a positive effect on green product success.

2.3. Green Process Innovation and Green Product Competitiveness

Competitive advantage refers to company's superior position in the market to competitors (Porter 1985). It is important for company to build unique strategy in business competition among environmental uncertainty and competitive pressure. Company needs to strengthen and have resources based view as reflected in their internal capabilities in order to have higher advantage over competitors (Clulow et al. 2003). Other researchers explain that resources based view emphasizes the importance of internal resources optimization to achieve competitive advantage in controlling market aspects (Barney 1991; Caldeira and Ward 2003; Fahy and Smithee 1999). The resources are deemed rare, difficult to imitate and irreplaceable, thus they will achieve competitive advantage for the organization. This study empirically proves the role of green process innovation in achieving competitive advantage. Green process innovation is part of corporate internal capabilities in achieving competitive advantage, making the organization hardly imitated and replaced.

The research conducted by Chew et al. (2008) emphasizes the importance of core capabilities for SMEs to achieve their performance and competitive strategy advantage. Core capability is the key for SMEs to achieve their uniqueness by utilizing internal resources through innovation capability, market capability and production capability activities. Meanwhile, Chen (2008c) in his study finds that the three forms of green intellectual capitals - green human capital, green structural capital, and green relational capital - affect corporate competitive advantage. The result of the same research conducted by Pujari (2006) finds that greening process innovation needs to be performed by organization to achieve the degree of new product development and product success in the market. Organization will have their competitive advantage and reputation if they perform greening process innovation activity. Competitive advantage in the scope of SMEs is also determined with product launching (Ledwith and O'Dwyer 2008). Furthermore, it is also explained that product launching affects new product performance. Hence, the hypothesized model in this study will be:

H2a. Green Process Innovation has a positive effect on green product competitiveness.

2.4. Green Process Innovation and Green Product Success

Innovation, marketing focus and organizational learning developed by company determine their success in product creation (Lertpachin et al. 2013). It is further explained that a company which focuses on and invests in innovation activity will achieve competitive advantage in the market which gets more open and fuller of competition dynamics. Meanwhile, open innovation in some companies is the duty of R & D department, thus it requires coordination between lines in organization (Suh and Kim 2012). The success of green product launch is company's activity in view of green product potential developed by the company in their operational process.

Company even needs to design their innovation so that the product created will achieve success in the market (Fernández-Mesa et al. 2013).

Green manufacturing positively affects green product success (Sezen and Çankaya 2013). It is further explained that organization's production processes is the influence of green manufacturing on corporate sustainability performance (economic, environmental, and social). It is through eco-process innovation that company achieves corporate sustainability as reflected with product success in the market. Meanwhile, Soewarno et al. (2019) prove and build green innovation strategy reflected in the form of green organizational identity in achieving environmental organization legitimacy and achieving a better green innovation performance degree and improvement. Organization which builds green innovation strategy will find it easy to achieve its identity by handling environmental issue which leads to long-term business strategy success. Value creation process in green innovation activity may also be performed through supply chain developed by company's managers (Shamah 2012).

This study focuses on green process innovation as in the previous literature reviews conducted by (Chen et al. 2006b; Wong 2012). This study is conducted with SMEs which develop Green process innovation concept in creation of company's product. The study conducted by Enzing et al. (2011) finds that innovation affects product success in the market. Moreover, other literature reviews also state that innovation is very helpful for organization to achieve product position against competitors (Bakar and Ahmad 2010; Chen 2008b; Salavou and Avlonitis 2008). Hence, the hypothesized model in this study will be:

H2b. Green Process Innovation has a positive effect on green product success

2.5. Green Product Competitiveness and Green Product Innovation Performance

Strategy at business level in creation of competitive advantage among business competition is highly affected by business environment and competition dynamics (Nandakumar et al. 2010). Organization which adapts to business environment will find it easy to hold down its operational costs and create product differentiation. Meanwhile, Jamsa et al. (2011) state that in the scope of SMEs, organization sustainability is also determined with utilization of networks as a source of opportunities and utilization of resources and their networks. Organization also needs to provide services and respond to customers for change towards sustainability (Buzavaitė et al. 2019).

Research on SMEs' constraints in developing competitive advantage among industry competition is likely to remain an interesting discussion (Simpson 2004; Singh and Garg 2008; Jamsa et al. 2011). SMEs need to build their uniqueness through creation of product which may attract their customers and, thus, improve their product success in customers' market. One of which is to create environmentally friendly product (Karlsson and Olsson 1998). It is even clearly stated that green product innovation makes an important contribution in improvement of competitive advantage SMEs and product creation success. Hence, the hypothesized model in this study will be:

H3: Green product competitiveness has a positive effect on green product innovation performance

2.6. Green Product success and Green Product Innovation Performance

Product success in acquiring market share is influenced by how successful the product launch is (Ledwith and O'Dwyer 2008). Moreover, it is stated that product launch is one characteristic of product advantage developed by a company in performing innovation process. The success of new product or new service is an important concern to organization since innovation activity is performed by company, thus it significantly encourages organization to adapt to changes in the market, technology and competition, including through creation of green product (Simpson 2004). Meanwhile, Nuryakin (2018) in his study finds that product innovation makes an important contribution to company in achieving competitive advantage.

In line with the opinion, Yu et al. (2018) in his study emphasizes how important organization’s operational capability and productivity in achieving performance through response to the increasingly dynamic environment is. A business organization also needs to focus on its organizational culture in achieving green innovation process and green performance (Wang 2019; Bombiak 2019). It is even explained that organizational green culture formation makes a big contribution to achieving green performance and competitive advantage. Moreover, the study explains that green innovation has completely positive effect on green performance and competitiveness under environmental pressure.

Green product innovation is also determined by how successful a company in developing its innovation, response to market demand, achieving potential market and product innovation launch timing is, particularly for SMEs and medium industries (Lin et al. 2013; Sezen and Çankaya 2013; The green tinge of success: How green innovation can give micro-firms a competitive edge 2019; Tariq et al. 2019). Hence, the hypothesized model in this study will be:

H4: Green product success has a positive effect on green product innovation performance

This study investigates the influence of green innovation (green product innovation, green process innovation) on green product innovation performance relationship. This research also investigates the mediating effect of green product competitiveness and green product success. This study contributes to the body of knowledge of resource-based view theory and explores how green innovation’s effect on green product innovation performance is when it is subject to the mediating role of green product competitiveness and green product success in the scope of SMEs. Based on literature review and previous studies, we have developed the research model in Figure 1. Figure 1 shows the empirical research framework below.

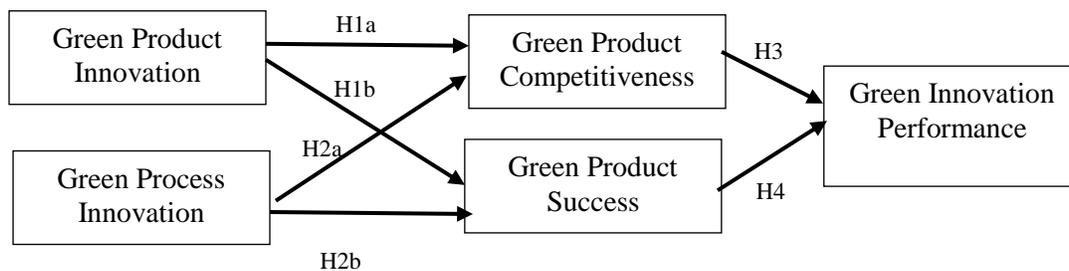


Figure 1. Empirical Research Model

3. Methodology

3.1. Research Design

To test this research’s four hypotheses, the data are collected through a survey conducted with Batik SMEs in Yogyakarta, Indonesia which use natural materials. The reasons to choose Yogyakarta are, first, in the Region, there are business players of Batik SMEs that use natural production process using local raw materials. Second, the region has very good economy growth as reflected with increasing growth of Batik SMEs with natural materials. Third, regional government’s support to developing SMEs developing zone drives the economy growth of its surrounding. This research employs a survey approach with questionnaire to collect information of research samples. The quantitative approach is employed in this research to test the hypotheses.

3.2. Sample and Data Collection

This research aims at empirically proving the effect of independent variable on dependent variable. This study also tests the mediating role in the relationship between research variables. This research takes SMEs which operate in Batik manufacturing with natural materials and develop a production system using environmentally friendly materials as its samples. There are 223 respondents consisting of Batik SMEs owners/ managers in

Yogyakarta, Indonesia. The sample of 223 respondents in this study was part of 638 populations of natural-based batik industry owners in Yogyakarta and surrounding areas. The sample used in this study was 223 samples with the reason that the number had met the criteria for the number of sample adequacy recommended for the maximum likelihood estimation (MLE). Average variance extracted of indicator (AVE) standards with a minimum sample size of up to 150 with the standardized loading requirement was estimated to be less than 0.7, and the value of communality was 0.5 (Hair et al., 2006). The data are collected by distributing questionnaires to the samples. The samples are taken with a purposive sampling method in consideration of the scope of SMEs which use natural materials in their production process.

3.3. Measurement of Construct

This study employs a quantitative research design to test the hypotheses and empirical model. It generally lacks of methodology to analyze the mediating role of variables in this study on the topic of green product innovation and green process innovation. A literature review is conducted to identify the validity and reliability of and measure the five related constructs, such as green product innovation, green process innovation, green product competitiveness, green product success and green innovation performance as described below with SME samples. The five constructs are measured with a seven-point Likert scale (1 strongly disagree – 7 strongly agree).

3.4. Dependent Variable

There are two endogenous constructs in this research: green product innovation and green process innovation. Although the two constructs are of the dimension of green innovation, but each has different definition. Green product innovation in this research is defined as environmental utilization and management in product innovation activity while protecting the environment (Chen et al. 2006a) and measured with 5 enquiring items, which are: (1) Utilization of environmentally friendly material in production process, (2) utilization of environmentally friendly packaging, (3) Utilization of degradable material, (4) Concern for environmental sustainability, and (5) Utilization of natural materials in new product.

Green process innovation is environmental utilization and management in innovation process activity with a concern for long-term oriented protection and utilization of environmental elements (Chen et al. 2006a). Green process innovation in this study is measured with 4 enquiring items, which are: (1) Utilization of human capital in production, (2) Use of degradable materials in production, (3) Utilization of environmentally friendly natural technology, and (4) Concern for energy saving in production process.

3.5. Independent Variable

Green innovation performance refers to the study conducted by Chang and Chen (2013) which explains green innovation performance as the result of green innovation activity by utilizing materials which do not lead to air pollution, is energy saving, is effective to reduce emission, and uses degradable materials. Green product innovation in this study is developed with 5 enquiring items, which are: (1) Advantageous performance in creation of new product with unique value, (2) Attempt to create something new with local unique materials in creation of product which may attract customers, (3) Creation of new product with unique design fancied by customers, (4) Product motive to be adapted to local value, and (5) Continuous development for new product.

3.6. Mediating Variable

Green product competitiveness is product's uniqueness developed by company hardly imitated by competitor (Chang 2011). Green product competitiveness in this research is measured using 5 enquiring items, which are: (1) Unique (different) product design compared to that of competitor, (2) High product quality, (3) Product created is superior to that of competitor, (4) Product has added value compared to that of competitor, and (5) Advantageous method of production process compared to that of competitor.

Green product success is defined as company’s focus in developing environmentally friendly product which leads to financial and environmental success (Wong 2012a). Green product success in this research is measured using 5 enquiring items, which are: (1) New product satisfies customers’/market expectation, (2) Product conforms to customers’ current trend/desire, (3) Product results in more income, (4) New product provides higher profit than that of competitor, and (5) Product success in the market.

4. Result

4.1. Screening and trimming data

Data screening and trimming in the research is conducted before thorough advanced analysis to ensure data feasibility. The data are screened by testing the consistency of each respondent’s answer by observing extreme standard deviation, and are trimmed by observing the consistency of respondent’s closed answer to open answer. From the results of data screening and trimming with 223 samples, only 193 respondents are ready for further data analysis. The questionnaires are distributed with letter cover to 223 business players of Batik SMEs that use natural materials for 3 months.

4.2. Descriptive statistics and correlations

Table 3 explains the descriptive statistics and matrix correlation of all research variables. Table III also shows the mean value, standard deviation and correlation in support of testing of models H1 to H4. The statistic test in this research does not find any multicollinearity symptom in the research model testing. The results of calculation of each of mean value, standard deviation, and matrix correlation are given in Table 1. Table 1 explains positive correlation between green product innovation, green process innovation, green product competitiveness, green product success, and green innovation performance.

Table 1. Mean, Standard Deviation and Correlation of the Construct

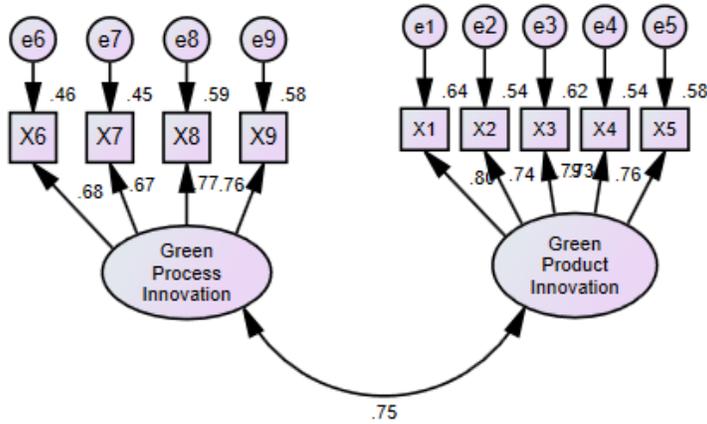
Construct	Mean	Standard Deviation	1	2	3	4	5
Green product innovation	5.449	.587	1.000				
Green process innovation	5.156	.598	.632**	1.000			
Green product competitiveness	5.111	.555	.564**	.518**	1.000		
Green product success	5.273	.532	.561**	.504**	.528**	1.000	
Green innovation performance	5.090	.628	.585**	.650**	.571**	.559**	1.000

*p <0.05, **p<0.01.

4.3. Validity and Reliability Tests

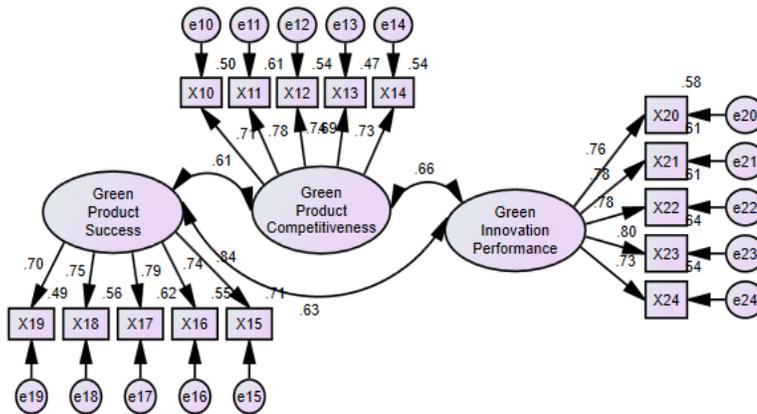
We employ the confirmatory factor analysis to test the validity and reliability of the research instruments and prove the empirical models. The construct reliability is tested by observing the Critical Ratio (CR) value. Further test is conducted to determine the Construct Reliability (CR), Average Variance Extract (AVE) and Discriminant Validity (DV) values of the exogenous and endogenous constructs. The CR value of all constructs ranges from 0.809 to 0.897, thus the test is statistically valid and reliable (Wang 2019).

The calculation results of construct validity, average variance extract, and discriminant validity are presented in Table 1. Based on Table 1, we may conclude that the constructs of green process innovation, green product innovation, green product competitiveness, green product success and green product innovation performance fulfill the criteria, that construct reliability value is higher than 0.7, average variance extract value is higher than 0.5, and discriminant validity value is higher than 0.7. Below is the calculation results conducted using AMOS Program of the validity and reliability using the confirmatory factor analysis (CFA) in figure 2 and figure 3.



Chi-square=41.663;Probability=.027;DF=26;CMIN/DF=1.602;GFI=.955;AGFI=.921;CFI=.980;TLI=.973;RMSEA=.056

Figure 2. Confirmatory factor analysis Eksogen Construct



Chi-square=100.147;Probability=.159;DF=87;CMIN/DF=1.151;GFI=.939;AGFI=.916;CFI=.991;TLI=.989;RMSEA=.028

Figure 3. Confirmatory factor analysis Endogen Construct

In brief, the results of validity and reliability tests in figure 1 and figure 2 explaining the loading factor value of exogenous construct and endogenous construct are presented in table 2.

Table 2. Construct Reliability, Variance Extract, and Discriminant Validity Construct

Construct	Label	Loading Factor	CR	VE	DV
Green Product Innovation	X1	0.797	0.875	0.567	0.753
	X2	0.738			
	X3	0.785			
	X4	0.733			
	X5	0.763			
Green Process Innovation	X6	0.676	0.812	0.580	0.762
	X7	0.672			
	X8	0.769			
	X9	0.762			
Green product competitiveness	X10	0.708	0.851	0.578	0.760
	X11	0.782			
	X12	0.736			
	X13	0.689			
	X14	0.733			
Green product success	X15	0.843	0.875	0.566	0.752
	X16	0.743			
	X17	0.786			
	X18	0.746			
	X19	0.699			
Green Innovation Performance	X20	0.762	0.880	0.564	0.751
	X21	0.783			
	X22	0.782			
	X23	0.798			
	X24	0.733			

According to the calculation results of construct validity in Table 1 above, we may conclude that the constructs of green product innovation, green process innovation, green product competitiveness, green product success and green innovation performance fulfill the criteria, that the loading factor value is higher than 0.6, thus the five constructs are statistically valid (Hair et al, 2006).

4.4. Hypotheses Test

This research utilizes Structural Equation Modeling to analyze the research design and test the hypotheses using AMOS 21.0. The Structural Equation Modeling of this research examines the two categories of data analysis, the measurement research model and the structure research model. The results of this study are given below. Table 2 shows the results of structural model test in this research. Overall, model fit measurement with structural equation modeling indicates that the model fit values are good, which are (GFI = 0.873, AGFI = 0.844, RMSEA = 0.046, CFI = 0.958, TLI = 0.953). Overall, the paths estimated test shows that all the hypotheses significantly show results which support the hypotheses test. The results of the path analysis test in this test show >1,980 and the significance value for each path <0.05, so the results are statistically significant.

The results of full model test in this research are shown in figure 4. The four hypotheses developed in this research, after the test, show positive and significant results, that green product innovation positively,

significantly influences green product competitiveness and green product success. Green process innovation positively, significantly influences green product competitiveness and green product success. Green product competitiveness positively, significantly influences green innovation performance. Green process success positively, significantly influences green innovation performance.

The results of each hypothesis test are explained in the table 3 below.

Table 3. The testing of Hypothesis Model

Hyphotesis	Proposed effect	Path Coefficient	Sig	Result
h1a	Positive	3.446**	0.000	h1a is supported
h1b	Positive	3.688**	0.000	h1b is supported
h2a	Positive	2.961**	0.003	h2a is supported
h2b	Positive	2.335*	0.020	h2b is supported
h3	Positive	5.461**	0.000	h3 is supported
h4	Positive	4.812**	0.000	h4 is supported

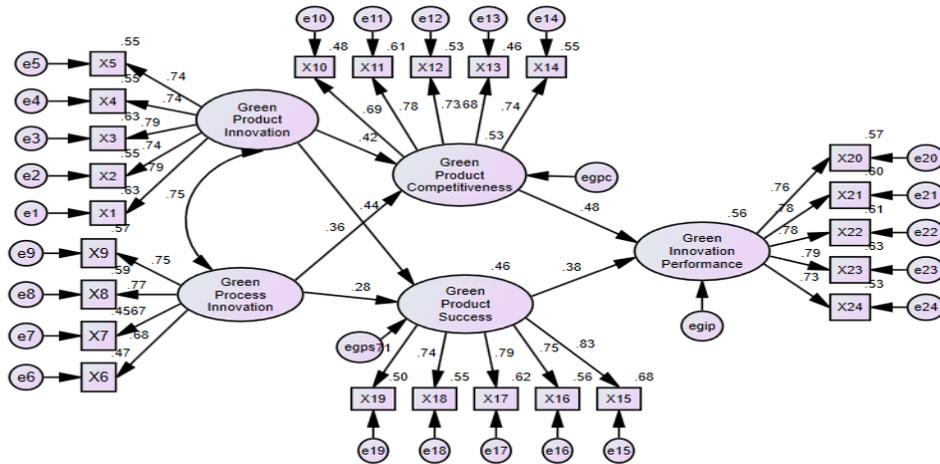
*p <0.05, **p<0.01.

Table 2 explains the standardized path coefficient value in the test of each exogenous construct with the endogenous construct. The test results empirically prove what forms the 4 hypotheses. The hypotheses developed in this research are the correlation between green product innovation, green process innovation, green product competitiveness, green product success and green innovation performance.

The statistic test h1a finds the path coefficient value of 3.446 and significance value of 0.000, showing that green product innovation positively, significantly influences green product competitiveness. The statistic test h1b finds the path coefficient value of 3.688 and significance value of 0.000, showing that green product innovation positively, significantly influences green product success.

The statistic test h2a finds the path coefficient value of 2.961 and significance value of 0.003, showing that green process innovation positively, significantly influences green product competitiveness. The statistic test h2b finds the path coefficient value of 2.335 and significance value of 0.000, showing that green process innovation positively, significantly influences green product success.

The statistic test h3 finds the path coefficient value of 5.461 and significance value of 0.000, showing that green product competitiveness positively, significantly influences green innovation performance. The statistic test h4 finds the path coefficient value of 4.812 and significance value of 0.000, showing that green product success positively, significantly influences green innovation performance. The results of each hypothesis model test are given in figure 4 below.



Chi-square=346.831;Probability=.000;DF=245;CMIN/DF=1.416;GFI=.873;AGFI=.844;CFI=.958;TLI=.953;RMSEA=.046

Figure 4. Full Model of the relationship between green product innovation, green process innovation, green product competitiveness, green product success and green innovation performance

5. Discussion

The interesting findings in this research empirically prove that all hypotheses tested are evidently significant. This indicates that, empirically, the studies conducted by previous researchers support the results of this research. This study seeks to prove the influence of green product innovation and green process innovation on green product competitiveness, green product success, and green innovation performance empirically.

The test of hypothesis which explains that green product innovation positively influences green product competitiveness is significantly proven. This research result conforms to previous study conducted by Dangelico and Pujari (2010) which finds that green product innovation is an important factor to achieve business growth, environmental sustainability, and better quality of life from utilizing business environmental elements. Another study which conforms to this study is conducted by Huang et al. (2016), which finds that adoption of green product innovation developed by company is determined with internal green capabilities, R&D intensity and company size factors. Green innovation is also important for organization in building green product innovation and green process innovation to achieve product advantage and success in market competition (Kam and Wong 2012).

The test of green product innovation’s influence on green product success shows positive influence. This research result conforms to previous research’s finding that market demand for green product is business’s important key to achieving strong green product innovation (Lin et al. 2014). Chen and Hung (2014) in their study also state that in green product innovation creation process, social relational capital needs to be built with business networks in order to create product with added value in customers’ domain, so as to realize competitive advantage. This study result also supports the finding of study conducted by Chang and Chen (2013) on green organizational identity which may determine SMEs’ green innovation success.

Green process innovation positively, significantly influences green product competitiveness. This study result conforms to previous research conducted by Pujari (2006) that organization needs to make greening process innovation to achieve new product development and product success in the market. Another study also explains how important competitive advantage in the scope of SMEs is, which is also influenced by product launch (Ledwith and O’Dwyer 2008).

Green process innovation positively, significantly influences green product success. This study result support previous study's finding which explains that company needs to design their innovation so for their created product's success in the market (Fernández-Mesa et al. 2013). Another study also support this research result, which finds that green manufacturing positively influences green product success (Sezen and Çankaya 2013). This finding also supports the study conducted by Soewarno et al. (2019) which explains that organization needs to build green innovation strategy reflected in the form of green organizational identity in achieving environmental organization legitimacy and achieving a better degree and improvement of green innovation performance.

Green product competitiveness positively, significantly influences green innovation performance. This study result supports the previous research conducted by Jamsa et al. (2011) which finds that organization sustainability is determined by utilization of networks as a source of opportunities and utilization of resources and their networks to provide service and respond customers for change towards sustainability. Another research also supports this study, stating that company's uniqueness through product creation may improve product success in customers' market through creation of environmentally friendly product (Karlsson and Olsson 1998).

Green product success positively, significantly influences green innovation performance. This study also supports previous research which finds that product success in acquiring market share is influenced by product launch success (Ledwith and O'Dwyer 2008). The success of a new product or a new service becomes organization's important concern since the innovation activity that company performs, so as to encourage organization to adapt to market change, including through creating green product (Simpson 2004). In line with this finding, the study conducted by Yu et al. (2018) emphasizes organization's operational capability and productivity in achieving performance through response to increasingly dynamic environment.

The results of this study also found that green product compatibility and green product success mediate the relationship between green product innovation and green process innovation on green innovation performance. The findings of this study supported previous research by Sezen and Çankaya (2013). They explain the green process manufacturing effect on the success of green products. The results of other studies also reveal that green innovation strategy in the form of a green organizational identity can achieve the legitimacy of environmental organizations and achieve the degree and increase in green innovation performance (Soewarno et al. 2019). Other studies also support the findings of this study, which explain the process of value creation in green innovation capable of achieving innovation performance (Shamah 2012).

6. Implication and Limitation

Environmental research issue remains an interesting research topic which rises in early 1990s, stimulated by customers' awareness to choose environmentally friendly product. Consequently, green innovation becomes an important strategy for company to reach its customers. Green innovation also becomes an important strategy when a company develops new product innovation and is going through production process. Moreover, green innovation is believed, by some researchers, to be company's new long-term breakthrough while maintaining competitive advantage and environmental sustainability (Li et al. 2018; Pujari 2006; Ar 2012). To enhance reputation and access to customers and more wider new market, green innovation is developed in corporate strategy, particularly by adopting environmentally friendly technology and resources (Low and Shang Gao 2015). Although the green innovation study remains a debate among previous researchers, but this issue is an interesting study in this research, where we develop and order to fill this research gap of green innovation. This study proposes two constructs of mediating variable: green product competitiveness and green product success to be solution to the research gap. This research also develops a research framework and empirical research model to discuss further their relationship.

This paper summarizes the literature review on green product innovation and green process innovation into a new implication research. The empirical research shows the effect of green product innovation, green process innovation, green product competitiveness, green product success and green innovation performance. All of the hypotheses are supported in this study. Therefore, this study suggests that an organization should allocate more internal resource capability in enhancing green product innovation, green process innovation, green product competitiveness, green product success and green innovation performance.

7. Contribution to the Body of knowledge

This research makes at least three important contributions to the body of knowledge. The first contribution is the method to optimize SMEs' internal resource capability, particularly with regard to innovation capability. The second contribution is, through empirical test, making a mediating role to empirically prove that green product competitiveness and green product success fill the gap of green innovation's role in green product innovation performance which remains a debate to previous researchers. Third, green product competitiveness and green product success in this study serve to be the mediating variable for the relationship between green product innovation and green process innovation in green innovation performance.

References:

- Ar, I. M. (2012). The Impact of Green Product Innovation on Firm Performance and Competitive Capability: The Moderating Role of Managerial Environmental Concern. *Procedia - Social and Behavioral Sciences*, 62, 854-864. <https://doi.org/10.1016/j.sbspro.2012.09.144>
- Bombiak, E. (2019). Green human resource management – the latest trend or strategic necessity? *Entrepreneurship and Sustainability Issues*, 6(4), 1647-1662. [http://doi.org/10.9770/jesi.2019.6.4\(7\)](http://doi.org/10.9770/jesi.2019.6.4(7))
- Bradley, F., & Sean, O. R. (2001). Deriving international competitive advantage in SMEs through. *Irish Journal of Management*, 22, 2-19.
- Buzavaitė, M., Sceulovs, D., & Korsakiene, R. (2019). Theoretical Approach to the Internationalization of SMEs: Future Research Prospects Based On Bibliometric Analysis. *Entrepreneurship and Sustainability Issue*, 6(3), 1497. [https://doi.org/10.9770/jesi.2019.6.3\(31\)](https://doi.org/10.9770/jesi.2019.6.3(31))
- Chahal, H., Dangwal, R., & Raina, S. (2014). Conceptualisation, development and validation of green marketing orientation (GMO) of SMEs in India: A case of electric sector. *Journal of Global Responsibility*, 5(2), 312-337. <https://doi.org/10.1108/JGR-02-2014-0005>
- Chang, C.-H. (2011). The Influence of Corporate Environmental Ethics on Competitive Advantage: The Mediation Role of Green Innovation *Journal of Business Ethics*, 104(3), 361-370.
- Chang, C. H., & Chen, Y. S. (2013). Green organizational identity and green innovation *Management Decision*, 51(5), 1056-1070. <https://doi.org/10.1108/MD-09-2011-0314>
- Chen, P.-C., & Hung, S.-W. (2014). Collaborative green innovation in emerging countries: a social capital perspective, *International Journal of Operations & Production Management*, 34(3), 347-363. <https://doi.org/10.1108/IJOPM-06-2012-0222>
- Chen, Y.-S. (2008a). The Driver of Green Innovation and Green Image: Green Core Competence. *Journal of Business Ethics*, 81(3).
- Chen, Y.-S. (2008b). The Positive Effect of Green Intellectual Capital on Competitive Advantages of Firms. *Journal of Business Ethics*, 77(3), 271-286. <https://doi.org/10.1007/s10551-006-9349-1>
- Chen, Y.-S. (2010). The Drivers of Green Brand Equity: Green Brand Image, Green Satisfaction, and Green Trust *Journal of business ethics*, 93(2), 307-309. <https://doi.org/10.1007/s10551-009-0223-9>
- Chen, Y.-S., Lai, S.-B., & Wen, C.-T. (2006). The Influence of Green Innovation Performance on Corporate Advantage in Taiwan *Journal of business ethics*, 67(4), 331-339.

- Chen, Y., Tang, G., Jin, J., Li, J., & Paillé, P. (2015). Linking Market Orientation and Environmental Performance: The Influence of Environmental Strategy, Employee's Environmental Involvement, and Environmental Product Quality *Journal of Business Ethics*, 127(2), 479-500. <https://doi.org/10.1007/s>
- Chew, D. A. S., Yan, S., & Cheah, C. Y. J. (2008). Core capability and competitive strategy for construction SMEs in China. *Chinese Management Studies*, 2(3), 203-214. <https://doi.org/10.1108/17506140810895898>
- Clulow, V., Gerstman, J., & Barry, C. (2003). The resource-based view and sustainable competitive advantage: The case of a financial services firm. *Journal of European Industrial Training*, 27(5), 220.
- Dangelico, R. M., & Pujari, D. (2010). Mainstreaming Green Product Innovation: Why and How Companies Integrate Environmental Sustainability *Journal of Business Ethics*, 95(3), 471-486.
- Dougherty, D., & Dunne, D. D. (2011). Organizing Ecologies of Complex Innovation. *Organization Sciences*, 22(5), 1214-1223.
- Enzing, C. M., Batterink, M. H., Janszen, F. H. A., & Omta, S. W. F. O. (2011). Where innovation processes make a difference in products' short and long-term market success. *British Food Journal*, 113(7), 812-837. <https://doi.org/10.1108/00070701111148379>
- Fernández-Mesa, A., Alegre-Vidal, J., Chiva-Gómez, R., & Gutiérrez-Gracia, A. (2013). Design management capability and product innovation in SMEs. *Management Decision*, 51(3), 547-565. <https://doi.org/10.1108/00251741311309652>
- Foreman-Peck, J. (2013). Effectiveness and efficiency of SME innovation policy. *Small Business Economics*, 41(1), 55-70.
- Huang, Y.-C., Yang, M.-L., & Wong, Y.-J. (2016). The effect of internal factors and family influence on firms' adoption of green product innovation. *Management Research Review*, 39(10), 1167-1198. <https://doi.org/10.1108/MRR-02-2015-0031>
- Hair, J. F., W. C. Black, B. J. Babin, R. E. Anderson, and R. L. Tatham. 2006. *Multivariate data analysis 6th Edition*. Pearson Prentice Hall. New Jersey. *Humans : Critique and reformulation. Journal of Abnormal Psychology*, 87, 49-74.
- Jamsa, P., Tahtinen, J., Ryan, A., & Pallari, M. (2011). Sustainable SMEs network utilization: the case of food enterprises. *Journal of Small Business and Enterprise Development*, 18(1), 141-156. <https://doi.org/10.1108/14626001111106479>
- Kam, S., & Wong, S. (2012). The influence of green product competitiveness on the success of green product innovation. *European Journal of Innovation Management Decision*, 15(4), 468-490. <https://doi.org/10.1108/14601061211272385>
- Karlsson, C., & Olsson, O. (1998). Product Innovation in Small and Large Enterprises *Small Business Economics*, 10(1), 31-46.
- Lavrinenko, O., Ignatjeva, S., Ohotina, A., Rybalkin, O., & Lazdans, D. (2019). The Role of Green Economy in Sustainable Development (Case Study: The EU States). *Entrepreneurship and Sustainability Issues*, 6(3), 1113-1126. [http://doi.org/10.9770/jesi.2019.6.3\(4\)](http://doi.org/10.9770/jesi.2019.6.3(4))
- Ledwith, A., & O'Dwyer, M. (2008). Product launch, product advantage and market orientation in SMEs. *Journal of Small Business and Enterprise Development*, 15(1), 96-110. <https://doi.org/10.1108/14626000810850865>
- Lee, E.-J., Kwon, G., Shin, H. J., Yang, S., Lee, S., & Suh, M. (2013). The Spell of Green: Can Frontal EEG Activations Identify Green Consumers? *Journal of Business Ethics*, 122(3), 511-521. <https://doi.org/10.1007/s10551-013-1775-2>
- Lertpachin, C., Wingwon, B., & Noithonglek, T. (2013). The effect of marketing focus, innovation and learning organization on the building of competitive advantages: empirical evidence from ISO 9000 certified companies. *Journal of Strategic Marketing*, p. 1-8. <https://doi.org/10.1080/0965254X.2013.790469>
- Lin, R.-J., Chen, R.-H., & Huang, F.-H. (2014). Green innovation in the automobile industry. *Industrial Management & Data Systems*, 11(6). <https://doi.org/10.1108/IMDS-11-2013-0482>
- Lin, R. J., Tan, K. H., & Geng, Y. (2013). Market demand, green product innovation, and firm performance: evidence from Vietnam motorcycle industry. *Journal of Cleaner Production*, 40, 101-107. <https://doi.org/10.1016/j.jclepro.2012.01.001>
- Low, S. P., & Shang Gao, W. L. T. (2015). Comparative study of project management and critical success factors of greening new and existing buildings in Singapore. *Structural Survey*, 32(5), 413-433. <https://doi.org/10.1108/SS-12-2013-0040>

- Mellet, S., & Kelliher, F. (2018). Network-facilitated green innovation capability development in micro-firms. *Journal of Small Business and Enterprise Development*, 50(3), 368-398. <https://doi.org/10.1108/JSBED-11-2017-0363>
- Nandakumar, M. K., Ghobadian, A., & O'Regan, N. (2010). Business-level strategy and performance. The moderating effects of environment and structure. *Management Decision*, 48(6), 907-939. <https://doi.org/10.1108/00251741011053460>
- Nuryakin. (2018). Competitive Advantage and Product Innovation: Key Success of Batik Smes Marketing Performance In Indonesia. *Academy of Strategic Management Journal*, 17(2), 1-17.
- Nuryakin, and E. Ardyan. (2018). SMEs' marketing performance: the mediating role of market entry capability. *Journal of Research in Marketing and Entrepreneurship*, 20(2), 122-146. <https://doi.org/10.1108/JRME-03-2016-0005>
- Nuryakin, R. Widowati, and I. Fatmawati. (2018). Network Advantage: Mediating Effect on Business Performance. *Scientific Annals of Economics and Business*, 65(4), 443-457. <https://doi.org/10.2478/saeb-2018-0026>
- Porter, M. E. (1985). *Competitive Strategy*. The Free Press, New York. 557p.
- Pujari, D. (2006). Eco-innovation and new product development: understanding the influences on market performance. *Technovation*, 26(1), 76-85. <https://doi.org/10.1016/j.technovation.2004.07.006>
- Sezen, B., & Çankaya, S. Y. (2013). Effects of Green Manufacturing and Eco-innovation on Sustainability Performance. *Procedia - Social and Behavioral Sciences*, 99, 154-163. <https://doi.org/10.1016/j.sbspro.2013.10.481>
- Shamah, R. A. M. (2012). Innovation within green service supply chains for a value creation. *Journal of Modelling in Management*, Vol. 7(3), 357-374. <https://doi.org/10.1108/17465661211283313>
- Shane, S. A., & Ulrich, K. T. (2004). 50th Anniversary Article: Technological Innovation, Product Development, and Entrepreneurship in Management Science. *Management Science*, 50(2), 133-144. <https://doi.org/10.1287/mnsc.1040.0204>
- Simpson, M. (2004). Competitive Advantage in SMEs Organising for Innovation and Change. *Journal of Small Business and Enterprise Development*, 11, 263-269.
- Soewarno, N., Tjahjadi, B., & Fithrianti, F. (2019). Green innovation strategy and green innovation: The roles of green organizational identity and environmental organizational legitimacy. *Management Decision*. <https://doi.org/10.1108/MD-05-2018-0563>
- Suh, Y., & Kim, M. S. (2012). Effects of SME collaboration on R&D in the service sector in open innovation. *Innovation: Management, Policy & Practice*, 14, 349-362.
- Trumpp, C., & Guenther, T. (2015). Too little or too much? Exploring U-shaped relationships between corporate environmental performance and corporate financial performance. *Business Strategy and the Environment*, 26(1).
- Testa, Mario, and Antonio D'Amato. 2017. Corporate environmental responsibility and financial performance: Does bidirectional causality work? Empirical evidence from the manufacturing industry." *Social Responsibility Journal* 13(2), 221-234. <https://doi.org/10.1108/SRJ-02-2016-0031>
- Wang, C.-H. (2019). How organizational green culture influences green performance and competitive advantage. *Journal of Manufacturing Technology Management*, 30(4), 666-683. <https://doi.org/10.1108/jmtm-09-2018-0314>
- Wong, S. K.-S. (2012). The influence of green product competitiveness on the success of green product innovation: Empirical evidence from the Chinese electrical and electronics industry *European Journal of Innovation Management*, 15(4), 468-490. <https://doi.org/10.1108/14601061211272385>
- Yu, W., Ramanathan, R., & Xingyu Wang, J. Y. (2018). Operations capability, productivity and business performance: The moderating effect of environmental dynamism. *Industrial Management & Data Systems*, 118(1), 126-143. <https://doi.org/10.1108/IMDS-02-2017-0064>
- Zhang, Z., & Zheng, X. (2018). Global supply chain integration, financing restrictions, and green innovation: Analysis based on 222,773 samples. *Kybernetes*, 29(2), 539-554. <https://doi.org/10.1108/K-06-2018-0339>

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