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THE LINK BETWEEN ECO-INNOVATION AND PERFORMANCE OF CREATIVE INDUSTRY OF MARBLE AND NATURAL STONE CRAFT

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ABSTRACT

This study investigates the effect of eco-innovation on creative industry production performance of marble and natural stone craft sector in Tulungagung, Indonesia. Mostly, the companies are in form of small and medium-sized enterprises (SMEs) which is 'passive eco-innovator' and their eco-innovation variables have not been investigated before in terms of their influence on their performance. The respondents were 81 craftsmen taken from the population. The data were collected through questionnaires which were tested, processed and analyzed by using consistent Partial Least Squares – Structural Equation Modeling (PLSc-SEM). From this study, it can be concluded that in creative industries center of marble and natural stone crafts in Tulungagung, eco-marketing innovation significantly influence on eco-process innovation, but not significantly influence on eco-product innovation. Implementation of eco-process innovation significantly influence on eco-product innovation. Eco-product innovation significantly influence on production performance but not significantly influence on market performance. Production performance significantly influence financial performance.

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INTRODUCTION

Tulungagung is known as the marble producer area in East Java and also known as its oldest marble mining in Indonesia. Tulungagung is also the biggest marble and natural stone craft industries center in Indonesia. Craftsmen in Tulungagung produce items that are functional as a complement to building architecture, such as marble for tiles, wall mosaic, overlay, sink, bathtub, whirlpool, bathroom material, park chair and table, dining table, park lamp, water wall, suiseki and etc. The biggest market of the product is exporting market in Europe, America, and Asia.

The creative industry sustainability will depend much on innovation. The innovation that can improve business performance and also cares about the environment is eco-innovation which is defined as a process to develop the products and the process to reduce the negative impact of using the resources [15]. The eco-innovation application does not only solve the serious global environmental problem but also to increase the competitive excellence of a company. It means that with the improvement of consumers' awareness about both products and production process more environmentally friendly, a company which applies eco-innovation will have better competitive excellence compared to other companies [29].

Marble and natural stone are non-renewable resources. Thus, their use should consider environmental aspect. In marble and natural stone crafts industries center in Tulungagung, the eco-innovation application is not declared formally and strategically. However, the global market demand has been forcing the craftsmen to apply eco-innovation practices. According to Kemp & Pearson [15], this kind of eco-innovation practices is called as 'passive eco-innovator' which are implementing eco-innovation without using a specific strategy to eco-innovate.

In order to develop an effective eco-innovation program, a decision maker should understand the interdependence relationship between different types of eco-innovation [4]. This study aims to provide a holistic analysis of the impact of eco-innovation by investigating the interrelationship between different types of eco-innovation and its impact on the production performance, market performance and financial performance of marble and natural stones crafts industries center.

There are four different terms which are used in every literature to describe the innovation which is able to reduce the negative impact on the environment, namely "green innovation", "eco-innovation", "environmental innovation" and "sustainable innovation" [6]. Related to "green", "eco" and "sustainable" innovation, Schiederig et al. [28] note that even though "sustainable innovation" becomes a dominant term at present, but the notion of "green innovation" and "eco-Innovation" become frequently used in scientific publications since 2005.

Horbach [14] and Triguero et al. [30] studied three types of eco-innovation: eco-process, eco-product, and eco-organizational innovation. According to Miedzinski et al. [21], eco-innovation means introducing new products or increasing significantly product/service's value, improving the process, organizational changing and new marketing solution which can minimize the use of natural resources (including material, energy, water and soil) and also reducing the release of dangerous substances throughout its life cycle [21]. MEI (Measuring Eco-Innovation) Project develops innovation definition from OECD Oslo Manual, namely product innovation, process innovation, marketing innovation and organizational innovation into the eco-innovation which is defined as a process towards sustainable development through theories and methodological approach to develop both product and process in order to reduce negative effect of the resources use [15]. There are three types of eco-innovation which are developed from OECD Oslo Manual that is analyzed in this study, that are eco-product innovation, eco-process innovation, and eco-marketing innovation.

Eco-product innovation is the introduction of new products or significant improvements of product's characteristics, such as improvements its technical components and materials [25]. The environment impact which is the focus of the eco-product innovation comes from the use and consumption of raw material, fuel and waste material from the production process. The product innovation can be in form of existing product or service improvement or new product development [21].

Eco-process innovation is modifying the organization's operational processes and systems, decreases unit costs of production, produces new or significantly improved eco-products and reduces environmental impacts [22]. Eco-process innovation happens if some output (product and service) can be produced with input as minimum as possible [15].

Marketing innovation is the implementation of a new marketing method which includes new packaging designs of a product, the new outlet to display the products, promotion and new pricing. From the eco-innovation perspective, the activity of eco-marketing innovation can be in form of adding the environmental aspect in the product promotion such as putting eco-labeling on the product. Therefore, eco-marketing innovation will be related to eco-product innovation and eco-process innovation [21].

METHOD

Hypotheses Formulation

A study conducted by Bigliardi & Dormion [3]; Raymond & St-Pierre [27]; Maine et al. [20] supports the idea that process innovation with new techniques will increase an ability to add new features on the products to meet the market demand. Hence, Hypothesis 1 for this study is formulated as follows:

H1. There is a positive relationship between eco-process innovation and eco- product innovation.

In Oslo Manual [23], it is said that marketing innovation relates tightly with pricing strategy, product packaging design, and products distribution introduced by Kotler et al. [16]. Thus, marketing innovation will influence both production and distribution process. Hence, its hypotheses are formulated as follows:

H2. There is a positive relationship between eco-marketing innovation and eco-process innovation.

H3. There is a positive relationship between eco-marketing innovation and eco-product innovation.

Liu et al. [19] confirm in their empirical study on the positive relationship between operational flexibility and the success of the new products. Meanwhile, Peters [24] states that not all the innovation process promote cost saving and they enable a company to sell a product with competitive price. Hence, its hypotheses are formulated as follows:

H4. There is a positive relationship between eco-product innovation and market performance.

H5. There is a positive relationship between eco-product innovation and production performance.

Production performance as a result of organizational success in increasing speed, quality, flexibility, and doing cost efficiency in daily operation logically may improve marketing position and financial benefit [9]. Good

production performance such as high productivity and fast delivery will increase costumers' satisfaction [18]. Therefore, the hypotheses are can be formulated as follows:

H6. There is a positive relationship between production performance and market performance.

H7. There is a positive relationship between production performance and financial performance.

A good ability in product marketing will increase financial benefit [17]. For this reason, a hypothesis is formulated as follows:

H8. There is a positive relationship between market performance and financial performance.

The conceptual model and hypotheses in this study are illustrated in Figure 1.

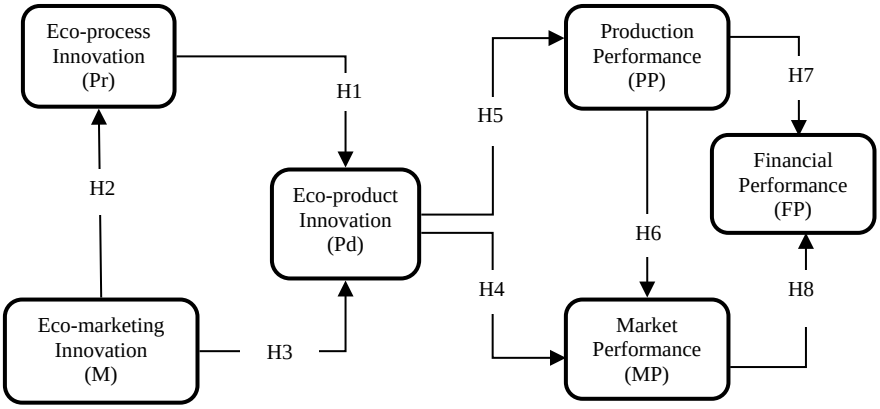

Figure 1. Conceptual model and study hypotheses

Measurement development

The data for eco-innovation were collected by asking questions that were related to indicators of each kind of eco-innovation. Respondents were asked to indicate in Likert scale 1-5 how far the application and the practice of indicators of each eco-innovation related to whether they had implemented them in their business in the last three years. There were 3 kinds of eco-innovation that were investigated. They are the eco-marketing innovation with 3 indicators, eco-process innovation with 4 indicators and eco-product innovation with 3 indicators. In terms of the question on the company performance, the respondents were asked to answer questions related to performance indicators with 5 points of Likert Scale. There are 3 types of company performances, which are the market performance with 3 indicators, product performance with 3 indicators and financial performance with 3 indicators.

The questions related to each indicator of eco-innovation and performance were developed based on the study conducted by [10] and Cheng et al. [4] and reference from Miedzinski et al. [21].

Sample and data collection

The study sample was taken from the marble and natural stone handicraft business center in Tulungagung, Indonesia which is the oldest and the biggest marble and natural stone industries center in Indonesia. There are 100 craftsmen listed in Tulungagung district. Questionnaires were distributed to owners of small to medium enterprises that are there. The study was conducted in April 2017 until June 2017. From all of the distributed questionnaires, there were 81 of data that could be processed. Next, based on the conceptual model, the analysis was conducted with Partial Least Square − Structural Equation Modeling (PLS-SEM). In this study, we made use of SmartPLS 3 [26] software for our path modeling of the research constructs, but more specifically a more consistent and asymptotically algorithm of variance-based SEM often denoted as the Consistent PLS or PLSc [7].

Statistical analysis

Analysis of Structural Equation Modeling with Partial Least Square approach was used to investigate a predictive relationship between latent variables and also between the latent variable and its construct indicator [11]; [26]. PLS-SEM is more suitable for small sample size, and therefore strongly assumed to be robust to

multivariate nonnormality [11]. With PLS-SEM, a test could be done by neglecting some assumptions because of their non-parametric characteristic. Specifically, we made use of a more robust methodological consistent PLS algorithm or the PLSc for analysis of confirmatory [7].

To analyze the conceptual model we used the consistent Partial Least Squares (PLSc) technique using the SmartPLS 3.0 software [26]. Following the recommended two-stage analytical procedures by Anderson and Gerbing [1], we tested the measurement model (validity and reliability of the measures) followed by an examination of the structural model or testing the hypothesized relationship [11]. Besides, to test the significance of the path coefficients and the loadings a bootstrapping method with 5000 resamples, was used [11].

The evaluation of measurement model (outer model)

The outer model analysis was conducted to ensure that the indicators used were feasible to be the measurement tool (valid and reliable). To assess the measurement model two types of validity were being examined - first the convergent validity and then the discriminant validity.

Convergent validity

Validity test in PLS was calculated using convergent validity which was defined as the correlation between reflective indicator score and its latent variable score by referring to outer loading score, average variance extracted (AVE) and also the composite reliability (CR). The outer loading score, Cronbach's Alpha, CR, and AVE of each indicator can be seen in Table 1.

Table 1. Convergent Validity

Model Construct	Indicators	Outer Loadings	Cronbach's Alpha	ρ_A	Composite Reliability	AVE
Eco-marketing innovation = (M)	M2	0,845	0.872	0,872	0,872	0,694
	M3	0,802				
	M4	0,851				
Eco-process nnovation = (Pr)	Pr2	0,705	0,833	0,832	0,831	0,552
	Pr3	0,765				
	Pr4	0,723				
	Pr6	0,777				
Eco-product innovation = (Pd)	Pd1	0,747	0,786	0,787	0,787	0,552
	Pd2	0,751				
	Pd6	0,731				
Production Performance = (PP)	PP1	0,848	0,878	0,879	0,878	0,706
	PP2	0,862				
	PP3	0,810				
Market Performance = (MP)	MP1	0,900	0,871	0,873	0,869	0,689
	MP2	0,772				
	MP3	0,813				
Financial Performance = (FP)	FP1	0,923	0,880	0,891	0,883	0,718
	FP2	0,855				
	FP3	0,755				

From the result of the tabulation in Table 1, it can be seen that indicators' group of all constructs had fulfilled the convergent validity because the outer loading score of all indicators was > 0.7; and the score of Cronbach's Alpha, ρA, CR and AVE of each construct was ≥ 0.5 [12].

Discriminant validity

Discriminant validity can be known by referring to Fornell and Larker's Criterion. If the square root of AVE of a construct is greater than the correlation of that construct with all other constructs, it can be said that the construct has good discriminant validity [8].

There has been a recent criticism of that the Fornell-Larcker criterion do not reliably detect the lack of discriminant validity in common research situations, Henseler et al. [12] have suggested an alternative approach, based on the multitrait-multimethod matrix, to assess discriminant validity in the form of heterotrait-monotrait ratio of correlations. If the HTMT value is lower than 1 [12], then there is not a problem of discriminant validity. All the values of HTMT that shown in Table 2, indicating that discriminant validity has been ascertained.

Table 2. Heterotrait-Monotrait (HTMT) Ratio

Construct	Heterotrait-Monotrait (HTMT) Ratio of Correlations					
	M	Pr	Pd	FP	MP	PP
M	-					
Pr	0,762	-				
Pd	0,754	0,819	-			
FP	0,459	0,364	0,435	-		
MP	0,533	0,497	0,587	0,680	-	
PP	0,500	0,533	0,597	0,747	0,778	-

It can be seen that indicator used to measure the construct was already valid and reliable. Next, descriptive statistic value of each construct was calculated and the result is displayed in Table 3.

Table 3. Descriptive statistics

Construct	Item	Mean	Standard deviation
Eco-marketing Innovation	3	2,749	0,567
Eco-process Innovation	4	3,333	0,634
Eco-product Innovation	3	3,228	0,636
Production Performance	3	3,045	0,492
Market Performance	3	2,938	0,596
Financial Performance	3	2,457	0,663

Evaluation of structural models (inner model)

Evaluation Model Fit

To evaluation model, we tested model fit by using three model fitting parameters: the Standardized Root Mean Square Residual (SRMR), the Normed Fit Index (NFI) and the exact model fit (bootstrapped based statistical inference). From Table 4 , indicating that data fits the model is well

Table 4. Model fit

SRMR	0,066	<	0,08 [12]
d'ULS	0,839	<	bootstrapped HI 95% of *d*ULS [7]
d'G	0,706	<	bootstrapped HI 95% of *dG* [7]
NFI	0,792	<	0.90 [2]

Inner model measurement

Inner model measurement aims to test the relevance of research model. The test is done by looking at R-square (R^2) score or measurement of predictive relevance Q-square (Q^2) and Goodness of Fit of a model. A Model is said to be relevant (feasible to use) if the result of $Q^2 > 0$. Q^2 is calculated using formula as follows [5]:

$$Q^2 = 1 - (1 - R^2_1)(1 - R^2_2) \dots (1 - R^2_X) \quad (1)$$

The Goodness of Fit of a model is calculated using a formula:

$$GoF = \sqrt{\overline{R^2} * \overline{AVE}} \quad (2)$$

Table 5. Q^2 and GoF tabulation for endogen variable

Construct	R^2	Q^2	GoF
Eco-marketing Innovation	-	0,888	0,611

Eco-process Innovation	0,582
Eco-product Innovation	0,714
Production Performance	0,581
Market Performance	0,635
Financial Performance	0,354

Based on the calculation of Q^2 and GoF in Table 5, it can be seen that the designed model had been feasible to use. Therefore, the study hypothesis test could be conducted.

Hypothesis Testing

To assess the structural model, Hair et al. [11] suggested looking at the R^2 and the corresponding t-values via a bootstrapping procedure with a resample of 5000 (see Figure 2).

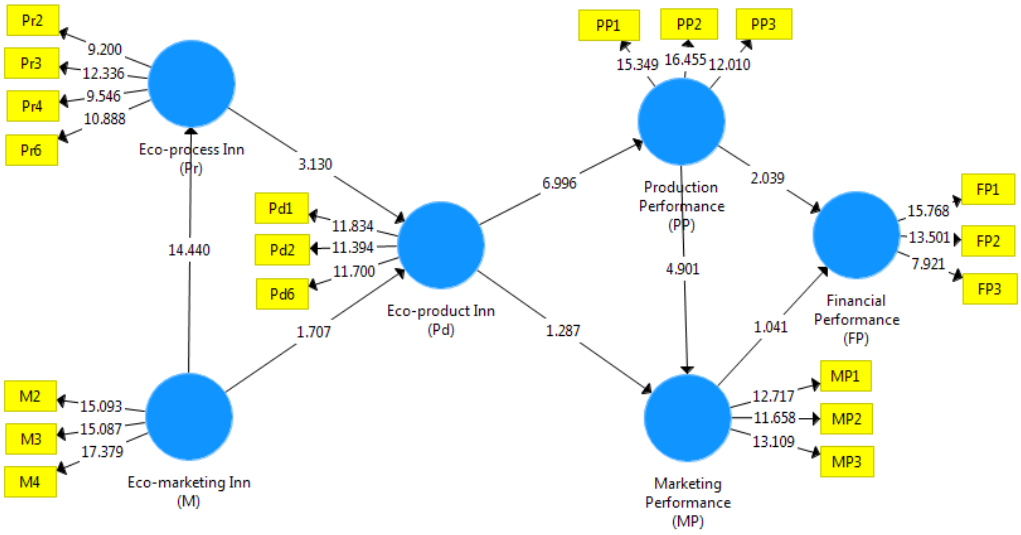

Figure 2. Bootstrapping Results

The hypothesis test was conducted by comparing the T-statistic value with the T-table value. At significance level of $\alpha = 5\%$, T-table value was = 1.96. A hypothesis is accepted if the T-statistic value is greater than the T-table value [5]. The result of the hypothesis testing tabulation is displayed in Table 6.

Table 6. Results of the hypothesis testing

Hypothesis	Relation	T-statistics	P values	Decision
H1	Pr→Pd	3,130	0,002	supported
H2	M→Pr	14,440	0,000	supported
H3	M→Pd	1,707	0,088	not supported
H4	Pd→MP	1,287	0,198	not supported
H5	Pd→PP	6,996	0,000	supported
H6	PP→MP	4,901	0,000	supported
H7	PP→FP	2,039	0,041	supported
H8	MP→FP	1,041	0,298	not supported

.

RESULTS AND ANALYSIS

From this study, it can be concluded that in creative industries center of marble and natural stone crafts in Tulungagung, eco-marketing innovation significantly influence on eco-process innovation, but not significantly influence on significantly influence on eco-product innovation. Implementation of eco-process innovation significantly influence on eco-product innovation. In line with the findings of the study conducted by Bigliardi & Dormion [3]; Raymond & St-Pierre [27]; Maine et al. [20], Gunday et al. [10] and Cheng et al. [4], eco-process innovation have significant positive effect on eco-product innovation. With the increase of craftsmen's ability to create their own simpler and cost-safe new machining tools, the type of product that can be made becomes more varied according to the buyer's demand.

Eco-product innovation has the significant effect on production performance. The types of product produced in creative industries center of marble and natural stone mostly depend on buyers' request. The global market demand which is more eco-innovative has been successfully pushing the craftsmen to create eco-innovative products. The craftsmen's ability in the production process has been increasing the products' amount and variation which finally can improve production performance. This finding is in line with the finding of the study conducted by Gunday et al. [10].

A bit different with the study conducted by Liu et al. [19], Peters [24] and Gunday et al. [10], eco-product innovation variable have not significant positive influence on market performance, but have significant positive influence on production performance. The eco-product innovation improvement which is measured by increased of new products apparently is able to improve production performance (product quality improvement, ability in providing products amount based on consumers' demand, production speed and product delivery), but not increased of market performance (the increase of costumers' satisfaction, total sales and market).

In this study, the production performance has significant positive influence on financial performance (return on sales, return on assets and general profit) or support the study hypothesis. This finding is in line with the findings of the study conducted by González-Benito [9], Li [18] and Li [17]. But different from previous research, in this study, market performance has not significant positive influence on financial performance. Based on the respondents' opinion, the average rate of successful financial performance over the last 3 years is considered to be less successful even though improvement of the market performance and production performance are quite successful. This is because the price and expenses on the raw material are getting high while the sale price is stable and some even decrease.

4. CONCLUSION

From this study, it can be concluded that in creative industries center of marble and natural stone crafts in Tulungagung, eco-marketing innovation significantly influence on eco-process innovation, but not significantly influence on significantly influence on eco-product innovation. Implementation of eco-process innovation significantly influence on eco-product innovation.

Eco-product innovation significantly influences on production performance but not significantly influence on market performance. Production performance significantly influences financial performance. Market performance variable not significantly influences financial performance.

Thus, performance in creative industries center of marble and natural stone in Tulungagung will increase if the implementation level of eco-marketing innovation, and eco-product innovation are improved. Improving the implementation of eco-marketing innovation even though it does not directly improve eco-product innovation, but through the improvement of eco-process innovation will be able to improve eco-product innovation. Improvement of eco-product innovation will significantly improve production performance and ultimately will improve financial performance.

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