Building products and materials certification with ecolabel, the influence factor and best development strategy to be applied in Indonesia

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Abstract. In recent years, Indonesian people's awareness of environmentally friendly products has begun to increase. This could be indicated when in 2015 The Ministry of Environment and Forestry of Indonesia launched the SNI Ekolabel, a standard for environmentally friendly products based on the condition of Indonesia. Moreover, in late of 2017, some of the building experts launched Green Label Indonesia, an ecolabel that more focuses on building products and materials. These two standards are intended to bolster the Sustainable Development Goals (SDGs), especially number 12. The problem is the number of the products that has been certified is still low. Through this research, it will be seen what factors drive a company to register its products on Ecolabel certification scheme. Where will be examined through a literature review with related themes and formulated models for further analysis with the Structured Equation Model (SEM). Then the SEM results will be used for the strategies selection that is calculated using the TOPSIS and IPA methods. The results of this research could be concluded, the best strategies to increase the company that applies to Eco-label are the strategies that are related to how to get a better profit and company image with Ecolabel.

1. Introduction

The definition of eco-labeling is a voluntary method of environmental performance certification and labeling that is practiced around the world, and the definition of ecolabel is a marking or labeling that provides information and preference about the environmental friendliness of a product, based on consideration of its life cycle [1]. Ecolabel's popularity is increasing as a tool for a company to convey its environmentally friendly side to consumers, but by forcing a company to join the ecolabel criteria, there will be a disadvantaged party, in this case the consumer. Consumers will be disadvantaged in terms of product prices that will increase [2].

Ecolabel has several uses such as ecolabel is a good way to inform consumers that the product being sold is environmentally friendly. Second, eco-labeling is a cheaper method than government regulation, so that it benefits both companies and the government. Finally, ecolabel provides stimulants for the development of the new targeted markets and sustainable development of products and services [3].

Ecolabel is also useful for measuring and ensuring the environmental and social factors of a product. There are many types of ecolabels with their respective focus, so different ecolabels will have different effects both to the environment and to the ecolabel registering company. Because of these
differences there are also differences in price, credibility, and benefits that will be obtained by the company [4].

Sustainable Development Goals (SDGs) are a global action plan agreed by world leaders, including Indonesia, to end poverty, reduce inequality, and protect the environment. The SDGs contain 17 objective and 169 target which are expected to be achieved by 2030 [5].

SDGs number 12th, responsible production and consumption, is one of point in SDGs. This point is encouraging many companies, especially large-scale and multi-national companies to adopt and spread sustainable practices that are going to reduce their environmental impact and to assess the life cycle of its product.

In recent years, the number of research that focusses on ecolabel is increasing. Most of them are observing the main factor that makes consumers tend to spend their money on eco-labeled products or what is the main factor that makes customers eager to spend more on eco-labeled products and this type of research comes with many methods in many countries, developed to modern countries. One of the examples is the research from Rochikashvili and Bongaerts in 2018. They observe the potential solutions to raise the awareness of the professional users of wall paint to spend their project budget on eco-labeled products. The conclusion of this research is the transparency of LCA in eco-labeled products is the main factor that could help to raise the awareness of the professional wall paint users to spend their project budget on eco-labeled products [6]. Another example is the research that was conducted by Ceri, Testa, and Rizzi in 2017. They focus on what is the most crucial factor that going to foster the pro-environmental purchasing attitudes of green products in Italy. They could conclude that the consumer's attitude towards green products depends on the level of individual environmental concerns [7].

Nevertheless, it is still few that observe what is the main factor that drive a company to apply an ecolabel standard to their products. One the examples is the research conducted by Schulze and Spiller in 2010. This research focuses on observing the success factor of acceptance of the farmers on an organic farm certification scheme in Germany. This research uses partial least square method to observe the main internal and external success factors of an organic farm certification scheme and uses TAM model to see the behavioral model of the farmers. The conclusions of this research are to increase the communications to the farmers and the cost of the certification will be the crucial factors that determine the acceptance of the farmers on an organic farm certification scheme [8]. Lin, Persada, Nadiflaitin, Tsai and Chu conducted another research. This research focuses on exploring the influential factors of manufacturer’s initial intention in applying ecolabel in Taiwan. They build a research model to explore all of the internal factors that determine the manufacturer adopt the ecolabel and using SEM to analyze it. The result of this research is improving the verification documents stage is likely to increase the initial intention of manufacturers to apply the ecolabel standards in their products [9].

In Indonesia, there is a research that conducted by Purwaningsih, Susanty, Wafa, Arvianto and Ariany in 2017. This study aims to determine what factors affects consumers in the process of adoption of eco-labeled fisheries products. The result indicated that the phase of completion of the adoption process, consumer buying intention and consumer experience is the moderator variable that crucial to influence to accelerate the completion of the adoption process [10]. Moreover, it less the research that observes this on a building products and materials companies.

Another problem comes when The President of Indonesia, Joko Widodo, launched two national-scale programs. The first program is the relocation of the capital city, from Jakarta to East Kalimantan. The second program is the million housing program which targets 3.9 million houses to be built until 2024. So logically, both programs will use a lot of materials and building products. While the industry is classified as an industry that consumes a lot of energy and uses many natural resources. Therefore, it could be interpreted that this industry will also have a large impact on the surrounding environment. This phenomenon is against the SDGs, especially number 12. That is why an Ecolabel that considers the life cycle assessment (LCA) that is based on the Indonesia environmental condition is important to be implemented by every building products and materials companies.
The term ecolabel in Indonesia firstly known when The Ministry of Environmental and Forestry of Indonesia launched SNI Ekolabel in 2006 [11]. Paper products and textile products are the first of the product standards they launched. Currently, there are 15 product standards and 15 companies that already certify their products with SNI Ekolabel. But among those standards, there are only 4 product standards that are related to building material and there is still no building products and materials company that has already certify their products to the SNI Ekolabel.

In the meantime, in late 2015, a group of building products and materials experts that have a big concern about the well-being of Indonesia environmental condition launched Green Product Council Indonesia, a non-governmental organization that focusses on certifying building products and material with environmentally friendly certification standards [12]. The name of the certificate is Green Label Indonesia. Until this time, this organization has developed 12 product standards and released more than 70 Green Label Indonesia certificate in less than 5 years.

However, there are still many building products and materials companies that have not adopted this standard. Many aspects allow this condition to happen, from both internal factors and external factors. However, that means there is still a big opportunity for this organization to develop a better strategy to make those companies adopt their standards. To put it simply, this research is conducted to answer this question: What is the factor that drives a company to register its products with environmentally friendly certification scheme. Also, the goals that would like to be achieved by this research are to seek at the factors that drive or hold a company from certifying its products to an environmentally friendly certification scheme.

This research will observe the main factors that drive building products and materials company in Indonesia to adopt and apply the local ecolabel standard. SEM method will be used to analyze all the factors, internal and external. After that, TOPSIS and IPA methods will be used to determine the best strategy from the SEM results. In addition, this strategy is expected to be applied by the Indonesian ecolabel organization.

2. Method

The model that is used in this study is the development of the Technology Acceptance Model (TAM), but also refers to the research model used by Schulze and Spiller in 2011 where his research describes the adaptation of farmers in Germany to the organic agricultural product certification scheme. Moreover, several other studies are used as references in the formulation of the hypotheses, variables, and indicators used, such as Xu, Karray, and Archimede in 2016 in which they examine ecolabels in European Union countries. As well as Lin et al in 2015 the GreenMark certification scheme, the ecolabel scheme applicable in the country of Taiwan. The research model that will be used is shown in Figure 1.

Every hypothesis in this research model is the adaptation of TAM model when the object of the research is a certification scheme, and also the modification from prior similar research. From H1, H2, H3, H4(a,b), H5 (a,b), H6 (a,b,c), and H7 (a,b,c,d,e,f) is also related to the actual condition of certification scheme. H1 was observed to see if the overall reputation of the certification scheme will be affected by the satisfaction of the company that will adopted or already adopted the product standards. H2, H3, H4 (a,b), and H5 (a,b) was observed to see what is the main factor that drives a company to adopt the standard of environmentally products and to see what is the main problem that the organization could fix and develop externally. Then H6 (a,b,c) and H7 (a,b,c,d,e,f) was observed to see what is the main problem that the organization could fix and develop internally. All of these hypotheses could be seen in the Table 1.

This research is conducted by spreading a questionnaire that consists of 23 questions that are going to be used to test 16 hypotheses. And there some limitations that applied to this research. The limitations are data collecting is only retrieved from any companies that produce and/or only sell building material and product, data collecting is only retrieved from any companies that have participated in any event or activity organized or conducted by Green Product Council Indonesia, these event or activity including the product(s) of this company has been certified with the Green
Label Indonesia certification scheme or the product(s) of this company is in the process of being certified with the Green Label Indonesia certification scheme or the product(s) of this company has been registered with the Green Label Indonesia certification scheme or the company has participated in the development of a rating tools for an environmentally friendly product category at least once (technical advisory group or/and national consensus).

![Research model diagram](image)

**Figure 1.** Research model.

**Table 1.** List of hypotheses.

| Hypothesis number | Hypothesis | Hypothesis number | Hypothesis number | Hypothesis |
|-------------------|------------|-------------------|-------------------|------------|
| H1                | The company’s satisfaction is related to certificate’s reputation. | H4 (a,b) | Intention to be Certified | Actual Certificate Use |
| H2                | Actual certificate use is related to company’s satisfaction. | H5 (a,b) | | |
| H6b               | The laboratory cost to be paid is related to the company’s satisfaction. | H6c | The amount of documents to be submitted are related to the company’s satisfaction. | |
The certification cost to be paid is related to the company’s eagerness to achieve a better reputation from environmentally friendly building material.

The laboratory cost to be paid is related to the company’s eagerness to achieve a better reputation from environmentally friendly building material.

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After all the data collected, it will be analyzed using the Structured Equation Model method. The calculations using the SEM method are divided into 2 stages, namely a pilot study that aims to see whether the research model used is feasible to use and the second step is to calculate the overall data obtained. SEM could be used to discover which factor has the most influence to the company to certify their product with eco-label. Then, the best strategies to increase the amount of applicants could be developed from the best factor. Then finally these strategies could be applied to the eco-label certification scheme [13].

Then, the method that is going to be used to choose the best strategies is the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) method and the Importance Performance Analysis (IPA) method. These two methods used a different questionnaire from the previous one. This questionnaire is made to gather any suggestion from the experts that are related about the best strategies that is going to be applied by the eco-label organization. There are 7 experts that are going to answer this questionnaire, with their own working experience and expertise in eco-label.

The TOPSIS method is going to be used to sort all these strategy from the most important to the least important. And The IPA method is going to be used to which strategy that should be prioritizes to be executed by the organization. The result of IPA calculation will be divided into four quadrants with its own category. The categories for each quadrant are Quadrant 1 (Concentrate Here), Quadrant 2 (Keep Up The Good Work), Quadrant 3 (Low Priority) and Quadrant 4 (Possibly Overkill) [14].

Both methods will use a rating scale of 1 - 5 depending on what is measured. In TOPSIS, the parameters measured are the estimated number of HR needed estimated costs, estimated time, and how much benefit will be received by the Eco label organization from each proposed strategy choice.
Furthermore, in the calculation of the IPA method, what is measured is the level of importance of a strategy, which will be abbreviated as TK, and the level of performance, which will be abbreviated as TP, from the application of the choice of strategy by the issuing organization of the Eco label.

3. Results and discussion
More than 70 building products and materials companies became the respondent of this research. Many of the respondents are local companies that have little information about ecolabel. Nevertheless, there are also a few of multi-national companies that became the respondent of this research. The complete company respondent percentage is shown in Figure 2.

The results of initial data processing or pilot studies show that the model used is valid and has good reliability. However, during the collinearity test, there were results that exceeded the threshold value, namely indicators CC1 and CC2. Therefore, it is necessary to eliminate one of them, where the choice fell on CC2 to be eliminated.

Furthermore, the final calculation results using all data obtained show the same results. In the sense that the model is declared valid and has adequate reliability. In the collinearity test, nothing exceeds the threshold value. And the result of calculating the coefficient of determination of each variable and the value of predictive relevance is sufficient so that each variable is considered to have a strong construct value. The last calculation is calculating the value of the path coefficient which aims to see the relationship between variables. The result is that almost all path coefficients are positive, which means that the two related variables will have the same increase in value. Except for the relationship between the variable certification cost and the company satisfaction variable, this has a negative value. Where this means that if the price of certification increases then it will reduce company satisfaction, and vice versa.

![Figure 2. Company respondent percentage.](image-url)
There are 16 hypotheses put forward in this research that has been described in the previous chapter. These hypotheses were tested by looking at the T-statistic and p-value values of the data obtained through a questionnaire that has been distributed to the company. the hypothesis will be accepted if the T-statistic values are greater than 1.96 and the p-value is less than 0.05. The following Table 2 is the results of the statistical test.

**Table 2. Hypotheses test results.**

| Hypothesis | Original sample (O) | Sample mean (M) | Standard deviation (STDEV) | T Statistics (O/STDEV) | P Values | Accepted |
|------------|---------------------|----------------|----------------------------|------------------------|----------|----------|
| Actual Certificate Use Company's Satisfaction | 0.389 | 0.383 | 0.119 | 3.279 | 0.001 | Yes |
| Certification Cost Company's Reputation | 0.077 | 0.075 | 0.12 | 0.645 | 0.519 | No |
| Certification Cost Company's Satisfaction | -0.002 | 0.004 | 0.101 | 0.017 | 0.987 | No |
| Certification Cost New Demand & Profit Company's Reputation Company's Satisfaction | 0.09 | 0.062 | 0.128 | 0.7 | 0.484 | No |
| Company's Reputation Intention to be Certified | 0.093 | 0.1 | 0.112 | 0.828 | 0.408 | No |
| Company's Satisfaction Certificate's Reputation | 0.65 | 0.643 | 0.072 | 9.047 | 0 | Yes |
| Intention to be Certified Actual Certificate Use | 0.472 | 0.482 | 0.087 | 5.408 | 0 | Yes |
| Laboratory Cost Company's Reputation | 0.664 | 0.663 | 0.069 | 9.633 | 0 | Yes |
| Laboratory Cost Company's Satisfaction | 0.304 | 0.296 | 0.165 | 1.842 | 0.066 | No |
| Laboratory Cost New Demand & Profit | 0.027 | 0.041 | 0.171 | 0.16 | 0.873 | No |
| New Demand & Profit Company's Satisfaction | 0.063 | 0.08 | 0.205 | 0.307 | 0.759 | No |
| New Demand & Profit Intention to be Certified | 0.282 | 0.274 | 0.108 | 2.597 | 0.01 | Yes |
| Required Documents Company's Reputation | 0.142 | 0.152 | 0.095 | 1.499 | 0.134 | No |
| Required Documents Company's Satisfaction | 0.175 | 0.183 | 0.174 | 1.007 | 0.314 | No |
| Required Documents New Demand & Profit | 0.043 | 0.027 | 0.179 | 0.24 | 0.81 | No |
| Required Documents New Demand & Profit | 0.126 | 0.121 | 0.207 | 0.611 | 0.542 | No |
This result is matched with Lin et al stated in 2015 [9] that most of the factors that influence the intention of a company to register an Eco label are external factors. Which New Demand & Profit and also the Company’s Reputation are the external factors that came from outside the process of the Eco label certification scheme. Although according to Schulze and Spiller in 2010 [8], a difficult bureaucratic process in the certification scheme greatly influences the applicant's desire to certify his products with eco-labeling.

These results can be described as follows. Companies need Eco labeling to boost the company's reputation in the eyes of their customers. Where this aims to get better profits, where the profits come from products that have been certified with Eco labels.

The strategy choices are calculated using the TOPSIS and IPA methods, where all proposed strategies are based on accepted hypotheses. Some of the strategies proposed are conceptual strategies, however another strategy proposed could be implemented or even already done by the ecolabel organizations. In addition, the development of these strategies is not limited to these two variables. But also added from other variables, namely variable certification costs, laboratory costs, and required documents. All strategies with the results of TOPSIS and IPA calculation can be seen in Figure 3 and Table 3.

**Figure 3.** IPA diagram results.

**Table 3.** Strategy recommendation.

| Variable              | Strategy                                                                 | TOPSIS results | IPA results |
|-----------------------|--------------------------------------------------------------------------|----------------|-------------|
| New Demand & Profit   | S1: Introduce all products that have been eco-labelled at international exhibitions. | 5              | Quadrant 4  |
|                       | S2: Establish cooperation with the Directorate General of Taxes to provide tax reductions for companies that have received Eco labelling. | 1              | Quadrant 4  |
|                       | S3: Establish cooperation with the Directorate General of Taxes to provide tax reductions for companies that have received Eco labelling. | 2              | Quadrant 4  |
|                       | S4: Establish cooperation with the Regional Water Company to provide a reduction in water usage bills for companies that have received Eco labelling. | 3              | Quadrant 4  |
|                       | S5: Introduce all products that have been eco-labelled at national exhibitions. | 4              | Quadrant 1  |
Based on the results of calculations using the TOPSIS and IPA methods, it can be seen that all experts want ecolabel publishing organizations to be more recognized by companies, especially companies that produce and/or sell building materials and products. This is evidenced by the selection of a strategy that matches the results of the questionnaire from the company. Where the results of determining the strategies chosen are strategies 1, 2, 3 and 4 where these strategies come from variable “new demands and profit” and “company reputation”.

Although the seven experts come from different professions and educational backgrounds, the seven people realize that ecolabel is an important thing to implement, because it will distinguish which products are environmentally friendly and which products are not environmentally friendly. Besides that, producing products that are environmentally friendly and do not cause side effects to its users is no less important. Where the end goal is for all related parties to realize that environmentally friendly products are not only good for the environment but also good for humans, the economy and the country where the ecolabel publishing organization is located [10].

4. Conclusion
This study investigates the influence factors of a company to certify its products with ecolabels and recommendations for ecolabel organizations to be more widely known. The initial data from the company are processed by the SEM method, then the methodology that is used for the selection of strategies is the TOPSIS and IPA methods.

The results of the SEM calculation show that the company is motivated because they want to get a better reputation and hence aims to get a better profit from eco-labeled products. As for the results of the strategy selection, it is found that strategies 1, 2, 3, and 4 are the best choice of strategies that should be applied by the ecolabel organization so that more companies can register their products to an eco-label certification scheme. However, with the current situation (Covid-19 pandemic), it will be impossible to apply strategies number 2, 3 and 4. Therefore, the most possible strategy to be applied by the ecolabel organizations is strategy number 1, which is “Introduce all products that have been eco-labelled at international exhibitions”. This strategy not only will help to raise a better company image, but also make a bigger possibility to have a better profit for the building products and materials companies.
After this research was conducted, it was realized that there were still many shortcomings in many ways. Therefore, some things are recommended to be done in the future if similar research will be conducted. The number of respondents and participants included certainly can be increased. Besides, the respondents who participate could be more diverse or vice versa so that respondents who are included can come from homogeneous backgrounds. And no less important is that similar research can be carried out with different research objects or products, in addition to building materials and products.

Acknowledgements
This research was funded by Hibah PUTI Prosiding, Directorate of Research and Community Engagement (DRPM) Universitas Indonesia (Grant Number: NKB-1172/UN2.RST/HKP.05.00/2020). All data were collected and processed in the Department of Industrial Engineering, Faculty Engineering Universitas Indonesia and the Main Office of Green Product Council Indonesia.

References
[1] GEN, “What is eco labelling?”, https://www.globalecolabelling.net/what-is-eco-labelling/
[2] K. Muralki, M. K. Lim, and N. C. Petruzzii, “The Effects of Ecolabels and Environmental Regulation on Green Product Development,” Manuf. & Serv. Ops. Manage., pp. 1–17, 2018.
[3] D. Xu, H. Karray, and B. Archimede, “Towards an Interoperable Decision Support Platform for Eco-Labeling Process,” Int. Conf. on Inter. for Ent. Sys. and App., no. 8, pp. 239-248, 2016.
[4] A. Yenipazargli, “The Economics of Eco-Labeling: Standards, Cost and Prices,” Int. Jour. Prod. Eco., vol. 170, pp. 275-286, 2015.
[5] UNDP, “Goal 12: Responsible consumption and production,” https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-12-responsible-consumption-and-production.html, 2015.
[6] M. Rochikashvili, and J. C. Bongaerts, “How Eco-labelling Influences Environmentally Conscious Consumption of Construction Products,” Sust, vol. 10, no. 351, 2018.
[7] J. Ceri, F. Testa, and F. Rizzi, “The more I care, the less I will listen to you: How information, environmental concern and ethical influence consumer’s attitudes and purchasing of sustainable products,” Jour. of Clean. Prod., vol. 175, pp. 343–353, 2018.
[8] H. Schulze, and A. Spiler, “Farmer’s Acceptance of The Organic Certification System in Germany: A Partial Least Squares Model,” Jour. of Int. Food & Agri. Market., vol. 22, pp. 7-36, 2010.
[9] S. C. Lin, S. F. Persada, R. Nadlifatin, H. Tsai, and C. Chu, “Exploring the Influential Factors of Manufacturers Initial Intention in Applying for the Green mark Ecolabel in Taiwan,” Int. Jour. of Prec. Eng. and Manuf.-Green Tech., vol. 2, no. 4, pp. 359-364, 2015.
[10] R. Purwaningsih, A. Susanty, A. Khaita, A. Arvianto, and Z. Ariany, “Identification of Factors Influence to Completion of Adoption Process of Ecolabel in Fisheries Product,” MATEC Web of Cong., vol. 177, 2018.
[11] MEF, “Kriteria Ekolabel,” http://standarisi.menlhk.go.id/index.php/daftar-standar-nasional/sni/produk/kriteria-ekolabel/
[12] GPCI, “About Green Product Council Indonesia,” http://greenproductcouncilindonesia.org/web/about-gpci/
[13] B. Chekima, S. A. W. S. K. Wafa, O. A. Igau, S. Chekima, S. L. Sondoh Jr., “Examining Green Consumerism Motivational Drivers: Does Premium Price and Demographics Matter to Green Purchasing?,” Jour. of Clean. Prod., vol. 112, pp. 3436-3450, 2016.
[14] A. Ishizaka, and P. Nemery, Multi-Criteria Decision Analysis(1st edition). John Wiley & Sons, Ltd, 2013.