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The Role of University in the Implementation of Eco-Innovation in Creative Industry Center of the Natural Stone Crafts

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Abstract: This study aimed to find out the influence of university role in the implementation of eco-innovation in the creative industry in the natural stone handicraft sector. The object of this research was the creative industry center of the marble and natural stone handicraft sub-sector in Tulungagung City, Indonesia. From the existing craftsmen population, 81 craftsmen as respondents were taken as samples. The research data was obtained by distributing questionnaires, then the data were tested, processed, and analyzed using Partial Least Square Consistent - Structural Equation Modeling (PLSc-SEM).
The results of this study stated that university's role in the implementation of eco-innovation in the industry center of natural stone handicraft in Tulungagung could significantly improve eco-organizational innovation, eco-process innovation, and eco-marketing innovation. However, it was not significant in improving eco-product innovation. In order to further improve the implementation of eco-product innovation, the university role in assisting to increase eco-marketing needed to improve because of its significant influence on eco-product innovation. Later, the results of the study were developed to explain the concept of triple helix, namely the role of university, industry, and government in the implementation of eco-innovation and the performance improvement of creative industrial centers of natural stone crafts in Tulungagung Indonesia.

Keywords: creative industry center, eco-innovation, PLS consistent, university

1. Introduction

The most popular area that produces marble and natural stone in Indonesia is Tulungagung, East Java, which is also being one of the oldest marble mines in Indonesia. The products produced, in addition to handicraft products for display, also produce functional items as a complement to the building's architecture. According to the request of the buyer, the products that are made a lot today are minimalist and rustic models. The continuity of this creative industry center will depend on the innovations made. Because the raw materials forthe products are non-renewable materials, the type of innovation that can improve business performance which is at the same time is more environmentally friendly is eco-innovation. This is a process to develop products and processes in order to reduce the negative impact of resource use [1].

In his research, Astuti et al. (2017) and Astuti et al. (2018) state that craftsmen in marble and natural stone handicraft industry center in the Tulungagung area are passive eco-innovators, namely implementing eco-innovation but there is no specific strategy for eco-innovation [2,3]. The implementation of eco-innovation in the center of the creative industries of natural stone crafts in Tulungagung Indonesia has a positive effect on its eco-innovative performance, where the eco-product innovation and the eco-organizational innovation have significant influence and

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the eco-marketing innovation and the eco-process innovation have less significant influence. The effectiveness of eco-innovation implementation is expected to be better if there are influential external factors. This study eexamined whether the influence of the university is significant enough on the eco-innovation implementation in this industrial center. In this context, the role of university is as a source of knowledge, research and development (R&D) and knowledge transfer to the industrial sector.

The paper consists of the introduction, brief review of the theoretical background from the relevant literature on eco-innovation and the role of university in the implementation of eco-innovation, the development of research hypotheses, and discussion of research methodology which includesthe samples and measurement. Next, it presents statistical analysis result, discussion of the results, and suggestions for further research.

1.1 Eco-Innovation and University Role

Eco-innovation is an attempt to develop the new processes and products to increase their value and significantly reduce the negative impacts on the environment [4]. OECD (2010) defines eco-innovation as the implementation of the new or significantly improved products (services and services), processes, marketing methods, organizational structures, and institutional arrangements which lead to environmental improvements compared to relevant alternative [5].

Eco-product innovation aims to reduce the resource use and the environmental impacts throughout the life cycle of the products [6]. The product innovation can be in the form of the improvements of the existing goods (or services) or the development of truly new goods [7].

Eco-process innovation occurs when a number of outputs (goods or services) can be produced with a minimum of input [1]. Marketing innovation is the implementation of the new marketing methods, which include the new product packaging design, the outlets to market the products, the promotions and also the arangement of new selling price. From an eco-innovation point of view, the eco-marketing innovation activities can take the form of adding environmental aspects to the product promotion, for example by putting the eco-labelling on the products. Therefore, the eco-marketing innovation will be related to the eco-product and the eco-process innovation [7].

According to Birkinshaw et al. [8], eco-organizational innovation refers to the improvement of organizational management processes through business practice new methods. Thus, eco-organizational innovation relates to the administrative efforts in order to renew the organizational routines, procedures, mechanisms, or the systems to produce eco-innovation [9].

In the context of the triple helix network, university (academic) is a center of excellence through research and development-based academic activities [10]. Belderbos et al. (2004) found that collaboration with academic institutions in Netherlands was the most effective way to achieve innovation [11]. In his research, Martinez et al. (2014) states that strategic partnerships between policy makers, businesses, universities, and communities are the keys to developing and implementing eco-innovation [12]. The potential for the economic development in the future is expanding in universities because the universities have students who can be the sources of the always updated new ideas.

1.2. Hypotheses Development

Dzisah and Eitzkowitz (2008) state that many universities have been involving in the knowledge transfer with incubators with the aim of instilling innovation [13]. Ranga et al. (2008) found that universities are not only important in relation to R&D, but also very important to generate new idea, which can lead to the development of innovation [14]. In the implantation of eco-innovation, a university can play a central role in creating a viable alternative model to encourage environmental sustainability [15]. Student can also be trained and encouraged to become entrepreneurs and inspired to take on new roles as company founders in a society that lacks a strong entrepreneurial tradition such as in Brazil or to help creating new companies like in Sweden [15]. The universities have a significant role in supporting the growth of creativity because the academicians contribute positively to the development of creativity and in the process of knowledge transfer to business people in the creative industries [15]. Based on the literature study, the following hypotheses were formulated:

H1. There was a positive relationship between university and eco-organizational innovation.

H2. There was a positive relationship between university and eco-marketing innovation.

H3. There was a positive relationship between university and eco-process innovation.

H4. There was a positive relationship between university and eco-product innovation.

According to Murphy & Gouldson (2000), eco-organizational innovation generally does not reduce environmental impacts directly, but facilitates the application of eco-marketing, eco-processes, and eco-product innovation [16]. Therefore, the following hypothesises were formulated:

H5. There was a positive relationship between eco-organizational innovation and eco-marketing innovation.

H6. There was a positive relationship between eco-organizational innovation and eco-process innovation.

H7. There was a positive relationship between eco-organizational innovation and eco-product innovation.

In the Oslo Manual (OECD, 2005) [18], it is stated that marketing innovation is closely related to pricing strategy, product packaging design, product distribution activity along the line of product, price, promotion, and place, introduced by Kotler et al. (2013) [17]. This means that the marketing innovation will affect the production process and the distribution process. Therefore, the following hypothese were formulated:

H8. There was a positive relationship between eco-marketing innovation and eco-process innovation.

H9. There was a positive relationship between eco-marketing innovation and eco-product innovation.

Astuti, in her research (2018), states that Ettlie & M. Reza (1992) suggest that various process innovation activities such as using new equipment, redefining task specifications, and improving information flow could facilitate the new products development [3,19]. Thus, increasing eco-process innovation is the driving force for eco-product innovation. Therefore, hypothesis 10 for this study was formulated as follows:

H10. There was a positive relationship between eco-process innovation and eco-product innovation.

The conceptual model and the research hypotheses are illustrated in Figure 1.

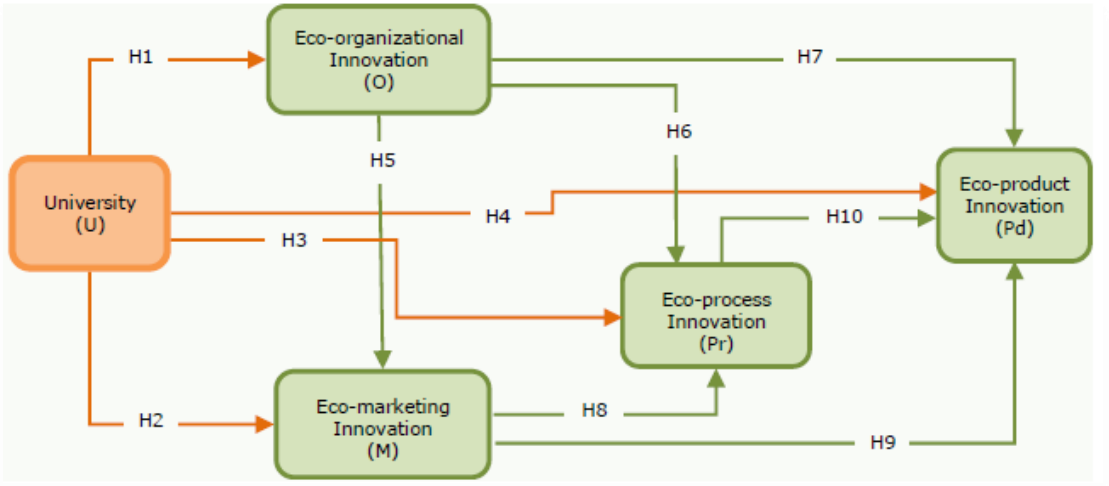

Fig. 1. Conceptual model and the research hypotheses

2. The Research Methods

2.1 The Measurement Development

Data collection for the role of university in eco-innovation implementation was done by asking questions that were related to 4 university-indicators. Respondents were asked to mark on 1-5 Likert scale to answer how often university activities that were related to the implementation of eco-innovation were introduced and implemented in their businesses in the last 3 years. Answer 1 shows never, 2 = ever but rarely, 3 = quite often, 4 = often, and 5 = always. Meanwhile, for the questions which were related to the implementation of eco-innovation, the respondents were asked to mark on the 1-5 Likert scale to answer the extent of which applications and practices of each eco-innovation indicator that had been implemented in their businesses in the last 3 years. Answer 1 = not implemented, 2 = only imitated what was implemented at the national market, 3 = only imitated what was implemented at the international market, 4 = developed the innovation which was being implemented and 5 = implemented an extremely new innovation. There were 4 types of eco-innovations to study, namely eco-organizational innovation with 6 indicators, eco-marketing innovation with 4 indicators, eco-process innovation with 5 indicators, and eco-product innovation with 6 indicators.

Questions in the questionnaire related to each indicator of eco-innovation and university were developed based on the previous studies [3,7, 20-22].

2.2. The Sample and Data Collection

The research sample was taken from marble and natural stone handicraft businesses in Tulungagung regency, Indonesia. There were around 150 craftsmen registered in Tulungagung regency. Questionnaires were distributed to small and medium-sized industry in Tulungagung. The study was conducted in September 2017 to April 2018. From the distributed questionnaires, 81 data could be obtained.

Furthermore, based on the conceptual model that had been made, an analysis was done with Partial Least Square - Structural Equation Modeling (PLS-SEM). The number of samples could be considered sufficient to be processed and analyzed by PLS-SEM because the number was already 10 times the size of the most formative indicators used to measure 1 latent variable, or 10 times the number of most structural paths addressed to certain latent variables in the structural model or between 30-100 data [23].

3. Statistical Analysis

The conceptual model was analyzed by consistent Partial Least Squares (PLSc) technique using the SmartPLS 3.2.7 software [24]. The analysis of data was started by making a path diagram based on the conceptual model. The next process was to test the measurement model and followed by an examination of the structural model [24.The significance of the path coefficients was tested by a bootstrapping method with 5000 resamples [24].

3.1 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). In order to assess the measurement model, two types of construct validity were being examined –the convergent validity and the discriminant validity.

3.2 The Convergent Validity

The 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). From the result (see Table 1), it can be seen that indicators' group of all constructs fulfills 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 (Henseler et al., 2016)

Table 1 -Convergent validity and composite reliability

Model Construct	Mean	Stddev	Indicators	Outer Loadings	Cronbach's Alpha	ρ_A	CR	AVE
University = (U)	2.287	0.672	U1	0.839	0.907	0.912	0.906	0.709
			U2	0.747				
			U3	0.838				
			U4	0.934				
Eco-organizational innovation = (O)	1.388	0.606	O1	0.816	0.939	0.943	0.939	0.721
			O2	0.858				
			O3	0.888				
			O4	0.753				
			O5	0.950				
			O6	0.818				
Eco-marketing innovation = (M)	2.892	0.592	M1	0.719	0.902	0.911	0.903	0.702
			M2	0.813				
			M3	0.871				
			M4	0.934				
Eco-process innovation = (Pr)	3.346	0.720	Pr1	0.744	0.882	0.884	0.883	0.603
			Pr2	0.772				
			Pr3	0.830				
			Pr4	0.769				
			Pr6	0.765				
Eco-product innovation = (Pd)	3.337	0.707	Pd1	0.831	0.924	0.926	0.924	0.671
			Pd2	0.852				
			Pd3	0.885				
			Pd4	0.800				
			Pd5	0.760				
			Pd6	0.780				

3.3 Discriminant Validity

Henseler*et al.* (2016) have suggested an approach to assess discriminant validity by using heterotrait-monotrait (HTMT) correlation ratios. If the HTMT value is smaller than 1, there is no problem with discriminant validity [25]. All HTMT values shown in Table 2 indicate that the discriminant validity requirements have been met.

Table 2 - Discriminant validity

Construct	Heterotrait-Monotrait (HTMT) Ratio				
	M	**O**	**Pr**	**Pd**	**U**
M	-	-	-	-	-
O	0.722	-	-	-	-
Pr	0.697	0.766	-	-	-
Pd	0.789	0.717	0.749	-	-
U	0.635	0.708	0.717	0.709	-

Based on the test result of convergent validity and discriminant validity, it can be seen that indicator used to measure a latent variable (construct) was already valid and reliable.

3.4 The Evaluation of the Structural Model (Inner Model)

3.4.1 The Confirmatory Composite or the Factor Analysis and the Evaluation Model Fit

To evaluate the confirmatory composite or factor analysis and model fit, data were tested by examining the standardized root mean square residual (SRMR), unweighted least squares discrepancy (d_ULS) and geodesic discrepancy (d_G) for saturated model and estimated model [26]. The NFI (Normed Fit Index) represents an incremental fit measure. The closer the NFI to 1, the better the fit. Table 3 presents that the model has a good fit.

Table 3 -Confirmatory composite and model fit

	Saturated Model	**Criterion**	**Estimated Model**	**Criterion**
SRMR	0,060	< 0.08 < HI95 of SRMR	0.060	< 0.08 < HI95 of SRMR
d_ULS	1.174	< HI95 of d_ULS	1.174	< HI95 of d_ULS
d_G1	1.636	< HI95 of d_G1	2.513	< HI95 of d_G1
d_G2	1.443	< HI95 of d_G2	2.210	< HI95 of d_G2
NFI	0.748 ~ 1		0.748 ~ 1	

3.4.2 The Inner Model Measurement

An inner model measurement aims to test the relevance of the research model. The test was done by looking at R^2 value (results from running bootstrapping) or measurement of predictive relevance $Q^{2.}$ (results from running blindfolding). A model is said to be relevant (feasible to use) if the result of $Q^{2.} > 0$. R^2 values which is higher than 0.2 indicate a good explanatory power of the endogenous variables of the model [27].

Table 4- R^2 and Q^2 tabulation for endogenous variable

Construct	**R^2**	**Q^2**
University	-	-
Eco-organization Innovation	0.510	0.310
Eco-marketing Innovation	0.553	0.335
Eco-process Innovation	0.672	0.360
Eco-product Innovation	0.725	0.429

Based on the calculation of R^2 and Q^2 in Table 4, it can be seen that the designed model had been feasible to use. Therefore, the study hypothesis test could be conducted.

3.4.3. Hypotheses testing

To assess the structural model, the R^2 and the corresponding t-values via a bootstrapping procedure with a resample of 5000 (see Figure 3) [24].

The hypotheses test was conducted by comparing the T-statistic value with the T-table value. At significance

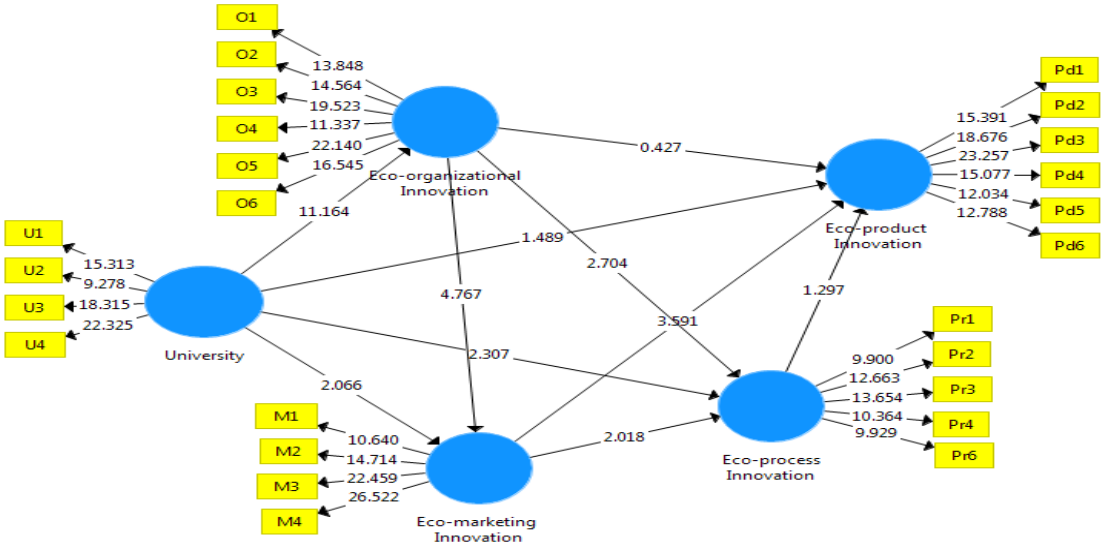

Fig. 2. Bootstrapping results

level of α = 5%, T-table value was = 1.96. A hypothesis is accepted if the T-statistic value is greater than the T-table value or p-value is smaller than 0,1 [24]. The result of the hypotheses testing tabulation is displayed in Table 5.

Table 5- Results of the hypotheses testing

Hypothesis	Relation	T-statistics	p-values	Decision
H1	U→O	11.164	0.000	supported
H2	U→M	2.066	0.039	supported
H3	U→Pr	2.307	0.021	supported
H4	U→Pd	1.489	0.136	not supported
H5	O→M	4.767	0.000	supported
H6	O→Pr	2.704	0.007	supported
H7	O→Pd	0.427	0.669	not supported
H8	M→Pr	2.018	0.044	supported
H9	M→Pd	3.591	0.000	supported
H10	Pr→Pd	1.297	0.195	not supported

4. Discussions

Based on the results of statistics description in Table 1, it was proved that there were rarely activities held by universities that were related to the eco-innovation implementation in the natural stone craft industry center. The average level of implementation of each eco-innovation was as follows: 1.388 eco-organizational innovations meant that they almost never did eco-organizational innovation, 2.892 eco-marketing innovation meant that they were still imitating the implementation of eco-marketing innovation that was appliedat the national or international market, 3.346 eco-process innovation meant that even though theywere still imitating the implementation of innovation eco-process applied at the international market but they had begun to innovate itself by developing an existing process, eco-product innovation of 3.337 meant that even though they were still imitating the implementation of eco-product innovation applied at the international market, they had begun to innovate by developing existing types of the products. The average implementation level of the four types of eco-innovation was 2.75 which meant that the craftsmen in the industrial center were still imitating the implementation of eco-innovation applied at the national or international market.

Based on the statistical hypotheses testing results, it can be seen that the influence of the university variable on the implementation of eco-organizational innovation, eco-marketing innovation, and eco-process innovation is significant. these results are in line with the results of Dzisah and Etzkowitz (2008), Ranga et al. (2008), and Etzkowitz et al. (2007) [13-15]. The role of universities in the form of business management and e-commerce training can actually improve eco-organizational implementation, eco-marketing, and eco-process innovation. In line with the results of Ueasangkomsate and Jangkot (2017) research, the influence of university variables on eco-product innovation is insignificant [22]. This is due to the lack of activities from universities that are related to the implementation of eco-

product innovation there. In addition, because the product innovation in the industrial center is more determined by the buyers' request.

Based on the result of the study, the influence of eco-organizational innovation was not significant to eco-product innovation. This was due to the lack of role of the company management or the Tulungagung marble craftsmen organization in disseminating the eco-innovative products to the craftsmen and the significant influence of eco-organizational innovation on eco-marketing innovation and eco-process innovation. Eco-organizational innovation that has been implemented in the form of sharing information about how to promote and market through online media is also cheaper and the more efficient production process tools can improve the level of implementation of eco-marketing and eco-process innovation. This result is in line with the results of the study Gunday et al. (2011) [20] and Cheng et al. (2014) [21].

In line with the Oslo Manual, OECD (2005), eco-marketing innovation has a significant influence on eco-product innovation and eco-process innovation [18]. Training on e-commerce and how to sell through online media provided by several universities has influenced eco-marketing innovation in this industrial center [27, 28]. Eco-marketing innovation implemented by utilizing online media has succeeded to reach a wider market, even penetrating the global market. The demand of the global market which is more environmentally conscious has influenced the product design to be more natural and minimalist like the products nowadays [29]. This means that the eco-marketing innovation introduced by the university has succeeded to influence the eco-product innovation. Eco-product innovation implemented with more minimalist design requires more efficient and simple production process in order to affect eco-process innovation.

Unlike the results of the previous research, in this study, eco-process innovation has no significant effect on eco-product innovation. This is because the eco-product innovation in this industrial center is more determined by the requests from buyers rather than the process capabilities of the craftsmen.

5. Conclusions

From the results of the study, it can be concluded that the role of university in the implementation of eco-innovation in natural stone handicraft industry center in Tulungagung is significant in improving eco-organizational innovation, eco-process innovation, and eco-marketing innovation, but not significant in improving eco-product innovation.

Improving eco-organizational innovation will affect the improvement of eco-marketing and eco-process innovation but does not affect eco-product innovation. Increasing eco-marketing innovation will improve eco-process and eco-product innovation. Meanwhile, eco-process innovation does not affect eco-product innovation. Increasing eco-product innovation can be done by increasing eco-marketing innovation. This means that in order to further improve the implementation of eco-innovation in natural stone handicraft industry center, the role of the university in helping to increase the eco-marketing needs to be improved. This is hoped to increase the implementation of eco-product innovation.

6. The Limitation and The Suggestions for Future Research

The research on the role of universities in the implementation of eco-innovation in creative industry center of the natural stone handicraft sub-sector is part of the collaboration of the triple hélix concept in the implementation of eco-innovation. Thus, the collaboration between industry, government, and university is needed to study the eco-innovative performance of this creative industry. Besides that, eco-innovation is an interesting issue to study further, especially in Indonesia, where the basis of industrial development which has been applied so far has relied more on natural resources. Moreover, there has not been much research on eco-innovation in Indonesia. Therefore, it is necessary to develop further research on eco-innovation in other industrial sectors.

If the universities can provide business management and e-commerce training, it is hoped that they can play active role in helping to improve the technology of production processes and product design.

In addition, universities can collaborate with the local government to design this industrial center to become educational tourism in marble and natural stone crafts in order to increase sales of handicraft products, while at the same time increasing the local economy. By making this industrial center a place for educational tourism, hopefully the working environment can be cleaner and more organized. This is a form of social engineering effort to make craftsmen be more productive and environmentally aware.

References

[1] Kemp, R., & Pearson, P. (2007). Final report MEI project about measuring eco-innovation. UM Merit Maastricht, 32(3), 121–124.

[2] Astuti, M., Pratikto, P., Irawan, Y. S., &Sugiono, S. (2017). The link between eco-innovation and performance of creative. In Proceeding of International Conference on Green Technology, Malang, Indonesia.
[3] Astuti, M., Prawoto, P., Irawan, Y. S., &Sugiono, S. (2018). The eco-innovation variables which influencethe performance of creative industries center of natural stonecrafts. Journal of EcologicalEngineering, 19(1).
[4] O'Hare, Jamie Alexander, McAloone, Tim C., Pigosso, D. C. A., & Howard, T. J. (2014). Eco-Innovation Manual: Working version for Pilot Application. United Nations Environment Programme. Retrieved from http://orbit.dtu.dk/files/103602469/Eco_Innovation_Manual.pdf
[5] OECD. (2010). Eco-Innovation in Industry Enabling Green Growth: Enabling Green Growth. OECD Publishing.
[6] Christensen, T. B. (2011). Modularised eco-innovation in the auto industry. Journal of Cleaner Production, 19, 212–220.
[7] Miedzinski, M., Doranova, A., Castel, J., Roman, L., & Charter, M. (2013). A guide to eco-innovation for SMEs and business coaches. Brussels.
[8] Birkinshaw, J., Hamel, G., & Mol, M. J. (2008). Management Innovation. Academy of Management Review, 33, 825–845
[9] Barin-Cruz, L., Pedrozo, E.A. &Estivalete, V.F.B. (2006). Towards sustainable development strategies: a complex view following the contribution of Edgar Morin. Management Decision, 44 (7), 871-91.
[10] Zheng, C., & Hu, M.C. (2018). An exploration of the application of universities as artificial institutional entreprenuers: The case of China. Journal of Public Affairs, 18, 1-10.
[11] Belderbos, R., Carree, M., Diederen, B., Lokshin, B., &Veugelers, R. (2004). Heterogenity in R&D co-operation strategies. International Journal of Industrial Organization, 22 (8-9), 1237-1263.
[12] Martínez, Sáez , Francisco Jose, González-Moreno, Angela and Hogan, Teresa. (2014). The Role of the university in eco-entrepreneurship: evidence from the euro barometer survey on attitudes of European entrepreneurs towards eco-innovation. Environmental Engineering and Management Journal, 13 (10), 2541-2549.
[13] Dzisah, James, &Etzkowitz, Henry. (2008). Triple helix circulation: the heart of innovation and development. International Journal of Technology Management & Sustainable Development, 7(2) 101–115.
[14] Ranga, L. M., Miedema, J., &Jorna, R. (2008). Enhancing the innovative capacity of small firms through triple helix interactions: Challenges and opportunities. Technology Analysis & Strategic Management, 20(6), 697–716
[15] Etzkowitz, H., Dzisah, J., Ranga, M., & Zhou, C. (2007). The triple helix model of innovation: University-industry-government interaction. Tech Monitor.
[16] Murphy, J., & Gouldson, A. (2000). Environmental policy and industrial innovation: integrating environment and economy through ecological modernisation. Geoforum. 31, 33–44
[17] Kotler, P., Wong, V., Saunders, A. J., & Armstrong, G. (2013). Principles of Marketing. Pearson education, 53
[18] OECD. (2005). Oslo Manual - Inglês - Terceira Edição. Communities (Vol. Third edit)
[19] Ettlie, J. E., &M.Reza, E. (1992). Organizational Integration and Process Innovation. Academy of Management Journal, 35(4), 795–827.
[20] Gunday, G., Ulusoy, G., Kilic, K., &Alpkan, L. (2011). Effects of innovation types on firm performance. International Journal of Production Economics, 133(2), 662–676.
[21] Cheng, C. C. J., Yang, C. L., &Sheu, C. (2014). The link between eco-innovation and business performance: A Taiwanese industry context. Journal of Cleaner Production, 64 81–90.
[22] Ueasangkomsate, P., &Jangkot, A. (2017). Enhancing the innovation of small and medium enterprises in food manufacturing through Triple Helix Agents. Kasetsart Journal of Social Science.
[23] Chin, W. W., &Newsted, P. R. (1999). Structural Equation Modeling Analysis with Small Samples Using Partial Least Square.
[24] Hair, J. F., Hult, G. T. M., Ringle, C. M., &Sarstedt, M. (2017). A Primer on Partial Least Squares Structural Equation Modeling. 2nd Ed. Thousand Oaks: Sage
[25] Henseler, J., Ringle, C. M., &Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modelling. Journal of the Academy of Marketing Science, 43(1), 115-13
[26] Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: updated guidelines. Industrial Management & Data Systems, 116 (1), 2-20.
[27] Abdellah, R.H., Masrom, M.A.N. (2018). Exploring the Barriers of Net Zero Energy Buildings (NZEBS) Implementation in Malaysia: Perception of Malaysian Construction Practitioners. International Journal of Integrated Engineering: Special Issue 2018: Innovations in Civil Engineering, 10, 11-16.
[28] Putranto, L.S., Putri, D.A. (2018). Satisfaction Level of the Blind on Urban Transportation System in Greater Jakarta. International Journal of Integrated Engineering, Special Issue 2018: Civil & Environmental Engineering, 10, 37-42.
[29] Lim,B.T.H., Zhang, W., Oo, B.L. (2018). International Journal of Integrated Engineering, Special Issue 2018: Civil & Environmental Engineering, 10, 1-6.