

Environmental Management Competitive Pressure Effect on SME Environmental Innovation Activities: A Green Supply Chain Perspective

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Abstract. The idea of assimilating green supply chain is to integrate and establish environmental management into the supply chain practices. The study aims to explore how environmental management competitive pressure influences a SME company in Malaysia to incorporate green supply chain integration, which is an efficient platform to develop environmental innovation. This study further advances green supply chain management research in Malaysia by using the method of quantitative analysis to analyze the model developed which data will be collected based on a sample of SMEs in Malaysia in manufacturing sector. The model developed in this study illustrates how environmental management competitive pressure from main competitors affects three fundamental dimensions of green supply chain integration. The research findings suggest that environmental management competitive pressure is a vital driving force for a SME company to incorporate internal and external collaboration in developing green product innovation. From the analysis conducted, the study strongly demonstrated that the best way for a company to counteract competitor's environmental management success is to first implement strong internal green product development process then move to incorporate external environmental management innovation between their suppliers and customers. The findings also show that internal integration of green product innovation fully mediates the relationship of environmental management competitive pressure and the external integration of green product innovation.

1. Introduction

Supply chain is a cumulative network of multiple business companies which involved in upstream and downstream effort to produce and deliver products or services to the customer. Environmental innovations and development in these supply chain are crucial to maximize performance and develop sustainable competitive advantage. Development of environmental management is indispensable for an organization in order to accomplish a particular end goal, which is to gain competitive advantage in marketplace. Small and medium sized enterprises (SMEs) in Malaysia is among the major contributor to the economic growth and play an important role in the Malaysia's overall production network [1]. Increasingly, SMEs present key roles in supply chain management and provide significant impact on the supply chain processes.

This project aims to examine how environmental management competitive pressure from main competitors affects and influences an SME to produce new environmental innovations and implement



green supply chain through its environmental management. This project applies Schumpeterian perspective of competition as theoretical frameworks and research model. The Schumpeterian perspective is an out and out theoretical view that is used to provide vital information on why firms engage in competitive behaviors [2]. By using the Schumpeterian perspective of competition as guidelines, the study investigates how rivalry with main competitors influences an SME organization to engage in environmental innovation activities.

2. Experimental procedures

The hypotheses will cover the internal and external integration of green product innovation and also green supply chain integration. It is vital for a company to always observe its' competitor's practices and strategies in the market. A company will gain competitive advantage based on Schumpeterian view on competition by taking action as counteract against its' main competitor. Developing green product innovation is one of the main act of countermove in respond to main competitor's green success. The green product development in this case will involve information sharing process in real-time within the company itself. The integration inside the company will involve product design, procurement, production, sales and distribution. Thus hypothesis number one is:

H1: Environmental management competitive pressure from main competitors positively influence a company internal integration of green product innovation.

H2a: A company internal integration of green product innovation will have positive influence on the company's customer integration of green product innovation.

H2b: A company internal integration of green product innovation will have positive influence on the company's supplier integration of green product innovation.

A company that has implemented internal integration of green innovation will have the ability to create strong external integration of green innovation. The strong level of coordination in internal integration will also be demonstrated in external integration. According to Hillebrand & Biemans [4] internal integration is vital and essential part in external integration. In order to form strong external collaboration, efficient internal functions is needed [5].

Target population: SMEs in Malaysia are mainly divided into 5 major sectors. They are services, manufacturing, construction, agriculture, mining & quarrying. However, this research will only focus on SMEs in the manufacturing sector. The research concentrates on SMEs with 20 to 200 employees with turnover from RM5 million to RM 200 million which satisfies the definition of SME provided by SME Corporation Malaysia [1]. Less than that number will be considered insufficient to produce desirable result for the study; and anything larger than that is considered as large enterprise and does not fall into SME definition in Malaysia.

Convergent validity exists if a group of measures that are theoretically related to each other are proven to be related or they measure one common factor. Convergent validity is assessed by ensuring that the statistical significance of the loadings. For the minimum level of item loadings, value of 0.7 is used as suggested by [6]. For the Composite reliability (CR), all items are well above 0.70 and the average variance extracted (AVE) for all construct is also above 0.50. Hence, convergent validity is proven for the measurement model. Discriminant validity for the constructs was tested assessing the inter-correlation between the constructs. The inter-correlation between the constructs is less than 0.70 which means the constructs have less than their variance in common [7]. The discriminant validity was also tested by comparing the average variance extracted (AVE) for each construct with the maximum square of correlation among all possible pair of constructs [8]. table shows that AVE for all cases is greater than maximum square of the correlation between all possible pairs of constructs.

Table 1. Convergent Validity and Realibility.

| | CR | AVE | MSV | 1 | 2 | 3 | 4 |
|---|-------|-------|-------|--------------|-------|-------|-------|
| 1. Environmental managemet competitive pressure from main competitors | 0.786 | 0.647 | 0.635 | 0.805 | | | |
| 2. Internal integration of green product innovation. | 0.815 | 0.688 | 0.635 | 0.797 | 0.830 | | |
| 3. Supplier Integration of green product innovation | 0.841 | 0.727 | 0.375 | 0.612 | 0.541 | 0.852 | |
| 4. Customer integration of green product innovation | 0.740 | 0.590 | 0.370 | 0.608 | 0.568 | 0.568 | 0.768 |

Common method bias is demonstrated when the variations in the survey responses is caused by the measurement instrument rather than the actual disposition of the respondents the instrument trying to measure. To test potential effects of the common method bias, Harman's single factor test was applied [9]. Using exploratory factor analysis, all factors are loaded onto a single factor. The factors are also constrained to make sure there is no rotation. This factor is introduced solely for the analysis. The table shows that the single factor explains 45.031% of the total variance which is below 50% cutoff value [10] where common method bias exist. Hence, common method bias is mitigated based on this test.

Table 2. Harman's Single Factor test.

| Factor | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|--------|---------------------|---------------|--------------|-------------------------------------|---------------|--------------|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 4.146 | 51.825 | 51.825 | 3.603 | 45.031 | 45.031 |
| 2 | .983 | 12.289 | 64.114 | | | |
| 3 | .926 | 11.569 | 75.683 | | | |
| 4 | .615 | 7.681 | 83.365 | | | |
| 5 | .464 | 5.806 | 89.171 | | | |
| 6 | .365 | 4.563 | 93.733 | | | |
| 7 | .256 | 3.195 | 96.928 | | | |
| 8 | .246 | 3.072 | 100.000 | | | |

3.Result and Analysis

Global and local test are two type of classification of the hypotheses tested. The first step to test the hypotheses is to conduct the global test of model fit. The fit indices of the research model meet the cut-off values suggested by Hooper et.al [11]. This demonstrates that the model has good fit. Next, the researcher tests the local test of regression squared and significant p-values.

Table 3: Model Fit Measures.

| Measure | Estimate | Threshold | Interpretation |
|---------|----------|-----------------|----------------|
| CMIN | 19.313 | -- | -- |
| DF | 17 | -- | -- |
| CMIN/DF | 1.136 | Between 1 and 3 | Excellent |
| CFI | 0.992 | >0.95 | Excellent |

| | | | |
|--------|-------|-------|-----------|
| SRMR | 0.052 | <0.08 | Excellent |
| RMSEA | 0.040 | <0.06 | Excellent |
| PClose | 0.534 | >0.05 | Excellent |

Environmental management competitive pressure from main competitors positively influence ($\beta=0.861$, $p<0.001$) a company internal integration of green product innovation (H1). A company internal integration of green product innovation positively influences ($\beta=0.651$, $p<0.001$) the company's customer integration of green product innovation (H2a). Finally, a company internal integration of green product innovation also positively related ($\beta=0.737$, $p<0.001$) with the company's supplier integration of green product innovation (H2b).

Next, the researcher assessed the mediating effects of internal integration of green product innovation on the relationship between environmental management competitive pressure from main competitors on customer integration of green product innovation and also on the relationship between environmental management competitive pressure from main competitors and supplier integration of green product innovation. To examine mediation within this model, the researcher incorporated the approach suggested by [11]. Two SEM models is incorporated in order to conduct this analysis. The first model (Model 1) examines the direct relationship between the independent variable (environmental management competitive pressure from main competitors) and the dependent variables (customer and supplier integration of green product innovation). The second model (Model 2) introduces mediator variable, internal integration of green product innovation.

The results listed in table 4 shows that in Model 1, the direct effect of independent variable (environmental management competitive pressure from main competitors) on dependent variables (customer and supplier integration of green product innovation) is positively significant. In Model 2, independent variable (environmental management competitive pressure from main competitors) significantly influence the mediator variable (internal integration of green product innovation). The results also show that the mediator also has a positive and significant effect on dependent variables (customer and supplier integration of green product innovation). To analyze the type of mediation, the researcher examines the direct effect of the independent variable and dependent variables in Model 2. The results show that after the effects of mediator is controlled, the influence of environmental management competitive pressure from main competitors on customer and supplier integration of green product innovation is not statistically significant. This advocate that internal integration of green product innovation has full mediation effect on the dependent variables (customer and supplier integration of green product innovation).

Table 4: Mediation Analysis.

| Paths | Model 1 | Model 2 |
|--|----------------|----------------|
| Competitive pressure to customer integration | 0.705*** | 0.428 |
| Competitive pressure to supplier integration | 0.732*** | 0.429 |
| Competitive pressure to internal integration | | 0.809*** |
| Internal integration to customer integration | | 0.224*** |
| Internal integration to supplier integration | | 0.317*** |

4. Conclusion

The model developed in this study illustrates how environmental management competitive pressure from main competitors affects three fundamental dimensions of green supply chain integration. This research suggests that environmental management competitive pressure is a vital driving force for a SME company to incorporate internal and external collaboration in developing green product innovation. Furthermore, the research findings demonstrated that internal integration of green product innovation fully mediates the relationship of environmental management competitive pressure and the external integration of green product innovation. The findings can also provide guidelines for SME companies managers how to react to their competitor's environmental management competitive pressure success.

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References

- [1] SME Corp Malaysia. 2016. *SME Profile and Importance to the Economy*. Retrieved from SME Corp Malaysia
- [2] C M Grimm, H Lee and K G Smith 2006 *Strategy as action: Competitive dynamics and competitive advantage*
- [3] B Hillebrand and W G Biemans 2004 *Journal Production Innovation Management* **vol 21** no 2 pp. 110–122
- [4] W G Biemans 1991 *Technovation* **vol. 11** no. 3 pp 163–182
- [5] D Westen and R Rosenthal 2003 *J. Pers. Soc. Psychol.* **vol. 84** no. 3 pp. 608–618
- [6] D Alarcón, J A Sánchez and U P De Olavide 2015 *Assessing convergent and discriminant validity in the ADHD-R IV rating scale: User-written commands for Average Variance Extracted (AVE), Composite Reliability (CR), and Heterotrait- Monotrait ratio of correlations (HTMT).*, pp. 1–39
- [7] J Henseler, C M Ringle and M Sarstedt 2014 *J. Acad. Mark. Sci.* **vol. 43** no. 1 pp. 115–135
- [8] J F Hair, W C Black, B J Babin and R E Anderson 2010 *Multivariate Data Analysis, Vectors*. p. 816
- [9] B R Eichhorn 2014 *Midwest SAS Users Gr.* pp. 1–11
- [10] P M Podsakoff, S B MacKenzie and N P Podsakoff 2012 *Annu. Rev. Psychol.* **vol. 63** pp. 539–69
- [11] D Hooper J Coughlan and M R Mullen 2008 *Structural Equation Modelling: Guidelines for Determining Model Fit* **vol. 6** no. 1 pp. 53–60
- [11] D P MacKinnon, A J Fairchild and M S Fritz 2007 *Mediation analysis.*, *Annu. Rev. Psychol.* **vol. 58** pp. 593–614