

Green Innovation Drivers and their Impact on Competitive Advantage, Operational and Environmental Performance in the Malaysian Automotive Industry

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Abstract: In recent years, environmental crises have been perceived by businesses as significant threats to their operations and long-term sustainability, forcing many businesses to adapt and incorporate environmentally friendly approaches. Due to the increasing importance of environmental issues and demand for environmentally friendly methods, green innovation has emerged as a pivotal strategy for companies to achieve sustainable growth and boost their business's sustainability efforts. The term 'green supply chain management' or 'supply chain environmental management' has only recently gained recognition from numerous companies; thus, only a few studies have been done on the relationship between greening the supply chain, green innovation, competitive advantage, operational, and environmental performance. The paper aims to bridge the significant gap by providing empirical evidence, which will allow the industrial implementation of green supply chains and green innovation to gain a competitive advantage in the global market. Through the findings, it will then improve operational and environmental efficiency. The information was gathered from 240 Malaysian companies in the automotive industry sector through a questionnaire survey. Structural equation modelling was utilized to analyze the data, and through the results, it is evident that greening the supplier through green innovation has a major impact on environmental performance. The results will contribute to facilitating automotive industry professionals in building a systematic blueprint to control and maximize the implemented green innovation practices towards increasing the overall productivity.

Keywords: *Green innovation, automotive industry, competitive advantage, performance, green supply chain management*

1. Introduction and Background

Green Supply Chain Management (GSCM) refers to the integration of environmental principles and practices into conventional supply chain management (SCM). It represents an evolution of traditional SCM by placing greater emphasis on environmentally responsible strategies. SCM involves the interconnected processes that manage the flow of goods and services from their origin to the end consumer (Mentzer et al., 2001; Mukhamedjanova, 2020). In contrast, GSCM expands this function by aligning economic, environmental, and social objectives through the systematic coordination of key inter-organizational business activities, ultimately enhancing the long-term performance of both the organization and its partners (Ageron et al., 2012). GSCM is recognized as a strategic initiative that not only promotes ecological practices but also improves environmental and operational outcomes across all management levels (Zhu et al., 2006). Furthermore, GSCM incorporates environmental considerations into various stages of the supply chain, including product and service design, procurement, manufacturing, distribution, and end-of-life product management, thereby contributing to sustainable competitive advantages (Srivastava, 2007).

The growing importance of Green Supply Chain Management (GSCM) is increasingly evident, particularly in response to mounting environmental pressures such as global warming and industrial pollution. GSCM offers substantial benefits to organizations, aligning with corporate social responsibility (CSR) objectives. Beyond fostering eco-friendly practices, GSCM also enhances stakeholders' environmental consciousness. At its core, GSCM aims to minimize waste by maximizing efficiency. According to Carter and Rogers (2008), effective management of resources and suppliers can reduce production costs, encourage recycling, and support the reuse of raw materials. As a progressive and increasingly adopted practice, GSCM is particularly prevalent among companies striving to elevate their environmental performance. Businesses are integrating GSCM not only to gain a competitive edge but also as a strategic response to the growing emphasis on global sustainability.

Therefore, it is reasonable to assert that GSCM contributes meaningfully to environmental preservation by promoting more sustainable and adaptable industrial practices. Additionally, GSCM presents opportunities for local industries to enhance their competitiveness within the sector, especially in comparison with other developing nations. Nevertheless, concerns remain regarding the direct impact of GSCM on Malaysian manufacturers, particularly if the structural and quality standards required for effective implementation are not adequately met.

Green innovation has recently gained the supposed attention and momentum, albeit with several challenges that can be seen as hindering factors in adopting the innovation into the local automotive production landscape. Local automotive manufacturers often have difficulties in embracing green innovation approaches due to limited environmental awareness, inadequate technical expertise in this area, and unwillingness to adapt or be afraid of changes, especially among companies with a traditional approach tendency. According to Abdullah et al. (2016), the internal barriers, including knowledge barriers and inflexibility to adapt and adopt, have significantly affected the green innovation initiative in the local industry. The limited availability of sustainable materials and insufficient charging stations for electric vehicles are some of the examples that become a hindering element for Malaysia's transition into a more environmentally friendly nation. Thus, integration of green practices across the supply chain can increase the overall performance quality in the Malaysian automotive sector (Khairani et al., 2017).

The study will help to ascertain whether adopting these environmental measures towards automotive-related suppliers can be considered worthwhile for automotive-related suppliers, in the context of environmental and economic considerations. The relationship between GSCM practice in both economic and environmental performances may be moderated by other organizational practices. The fact that enthusiasm for green manufacturing is expanding tremendously within research and industrial communities shall be highlighted.

2. Literature Review

Through literature findings, it was proven that there is a positive relationship between GSCM, competitive advantage, and environmental performance. The study then extends the GSCM framework to include 'operational performance' to the new GSCM framework. According to Azavedo et al (2011), the green supply chain influenced three crucial elements: economic (competitive advantage), environmental, and operational. As the current study attempts to see the influence of GSCM in triggering more competitive dynamics in the local automotive industry, operational performance, as mentioned by Azavedo et al (2011), is influenced by the supply chain framework. In addition, Wang et al (2014) in their study also included 'operational performance' in the supply chain framework, to see whether green innovation influences not only economic and environmental performance, but the overall operational performance of the companies.

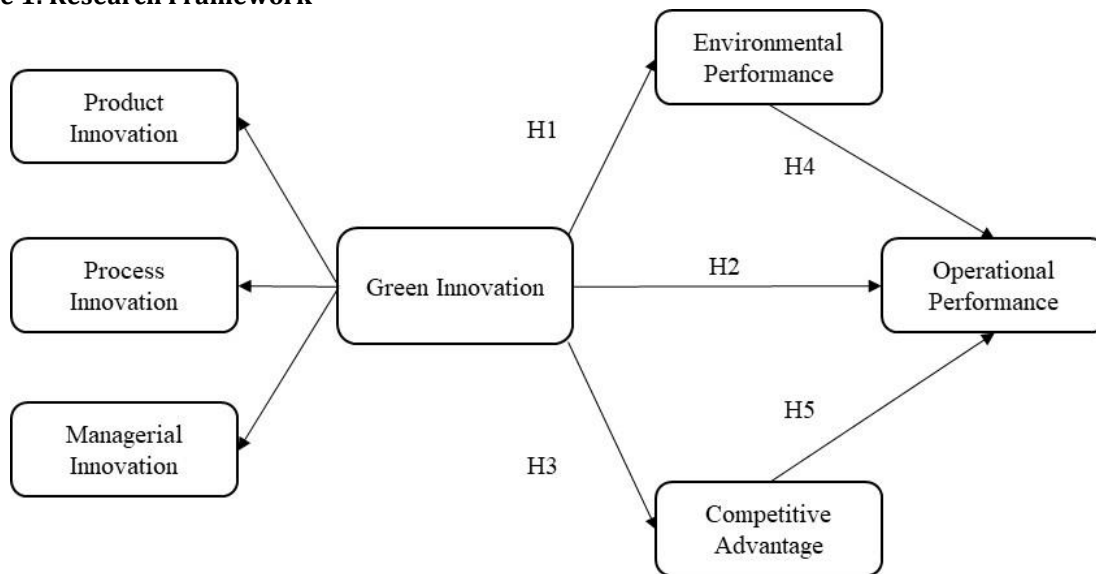
Despite the impressive contribution made by the approach focusing on GSCM, the effort is still in vain, as it tends to be overlooked in the operational context. There is no evidence that shows the association between GSCM and operational; however, can GSCM possibly make a positive contribution towards the operational process? Answering the critical question would pave a path or way to identify significant implications that are heavily bound by the concern of companies that operate in rapidly changing contexts, as they prefer a flexible working approach rather than an efficiency-focused approach (Fisher, 1997; Christopher & Towill, 2000). For example, a company that values flexibility would avail itself to a substantial increase in revenue by providing a necessary quantity of green products to the market.

GSCM can also be labelled as a key organizational capability in supporting effective operational strategies. Klassen and Angell (1998) examined the relationship between manufacturing flexibility and managing the environment; however, flexibility was treated as an amalgamated construct. In another study by Liu et al. (2016), the study delved into the association between GSCM and operational performance in the automotive sector, but like the previously mentioned study, GSCM was viewed as a single integrated construct. The multi-dimensions of GSCM may be concluded as how the roles played by GSCM are changing according to the adoption of a specific operational performance. Hence, the current need to investigate was whether GSCM will efficiently contribute to the operational process, especially taking into consideration the GSCM multi-dimensional nature. The current study will address the gap guided by the primary research question: What is the role played by the

GSCM in the operational performance's successful adoption?

The impact of GSCM antecedents is operationally diverse, perhaps due to different manufacturing processes, raw materials, conversion processes, product characteristics, and reverse logistics activities (Routroy, 2009). The following production process characteristics were identified to the elements that determine the greening of supply chain: (i) the process's capacity to make use of certain materials; (ii) the possibility of putting together reusable or remanufactured components into the system; and (iii) the design for waste minimization (energy, water, raw materials and non-product output) (Sarkis, 2003). Therefore, the effect of green practices on operational performance must be assessed to have information about the competitive priorities related to a company's operations. Zhu and Sarkis (2004,2006) further added, it is pivotal to do an economic performance review, as the review is the 'trigger that pulled' the business to look forward in the effort to implement environmental management practices. For that reason, it is, again, crucial to have sufficient details about costs, efficiency, environmental costs, and revenues.

Figure 1: Research Framework



- Hypothesis 1: Green innovation has a positive influence on environmental performance
- Hypothesis 2: Green innovation has a positive influence on operational performance
- Hypothesis 3: Green innovation has a positive influence on competitive advantage
- Hypothesis 4: Environmental performance has a positive influence on competitive advantage.
- Hypothesis 5: Operational performance has a positive influence on competitive advantage

3. Research Methodology

Measures and data collection procedure

The data were collected from 240 automotive companies utilizing a structured survey questionnaire. The design of the questionnaire is based on the established constructs from prior studies in the related context, tailored specifically to the automotive industry. It includes a mix of closed-ended and Likert-scale questions to measure various dimensions, such as company profile such including size, years in operation, type of business, operational and strategic practices, as well as employee and organizational factors. Before the main data collection, a pilot test was conducted with a sample of 20 professionals from the automotive sector, and the pilot test sample was then excluded from the final sample. The purpose of the pilot test was to assess the clarity and relevance of the questionnaire, as well as to estimate the estimation of time to complete the overall set of questions. Through the pilot test, the feedback received includes minor revisions such as to improve wording and eliminate redundancy. The purposive sampling method only includes companies based on their relevance to the automotive sector and their willingness to participate in the study. Individuals with managerial positions and department heads are the main target sample as the key respondents due to their expertise and knowledge

of organizational practices. The survey was done both through an online platform and physically, depending on the companies' preferences within the stipulated times. Calls and follow-up were made to ensure the smoothness of the collection process and improve the response rate. Ethical considerations such as informed consent, voluntary participation, and confidentiality were strictly observed and done throughout the data collection process. This is to ensure the collection of reliable and validity of data, suitability for further analysis. Demographic data were also collected to enable subgroup analysis and enhance the generalizability of findings. The sample data will serve as the foundation for the analysis of key constructs such as innovation, performance, digital transformation, and organizational practices within the automotive industry.

4. Results and Discussion

Table 1: Respondents' profile

Company Profile	Frequency	Percentage (%)
<i>Establishment Period</i>		
Under 10 years	15	6.3
Between 10-20 years	82	34.2
Between 21-30 years	83	34.6
Between 31-40 years	31	12.9
Over 40 years	29	12.1
<i>Number of employees</i>		
100 - 300	6	2.5
Between 301 and 500	81	33.8
Between 501-800	71	29.6
Between 801-1000	53	22.1
1000 and above	29	12.1
<i>ISO Certification</i>		
Yes	234	97.5
No	6	2.5
<i>Local Input</i>		
Low quality	9	3.8
High price of local material when available	79	32.9
Non-availability of local materials	122	50.8
Insufficient local materials	14	5.8
Disappointment in delivery time	16	6.7
Others	0	0

Common Method Bias

The distortion of results caused by utilizing the same method to measure multiple constructs, potentially due to both inflating and deflating the relationship between variables. To address the risk of the common bias method, the current study applied several procedural and statistical approaches. The questionnaire was designed to reduce ambiguity by avoiding leading or loaded questions. To ensure the anonymity of the respondents the minimize the likelihood of social desirability responses. The questionnaire constructs were separated to reduce priming effects, with the scale formats varied to be used in any appropriate circumstances to limit response patterns. Harman's single-factor test was conducted as a post-hoc technique to assess the presence of bias. Through the test, all items' measurements were loaded into an exploratory factor analysis. The result then showed that no single factor accounted for most of the variance, indicating that common method bias was not a significant concern for the current study. By combining both procedural and statistical approaches, it helped to ensure the observed relationships between variables were not heavily influenced by methodological artifacts.

Measurement Model

The measurement model is assessed by evaluating construct and discriminant validity. In detail, construct reliability is assessed by using indicator reliability, Cronbach's alpha, composite reliability, and AVE. Meanwhile, discriminant validity will be examined by checking cross-loading and Fornell-Larcker. Table 2 presents the results of the measurement model assessment for both first-order and second-order constructs.

The model includes six key constructs, with all constructs demonstrating acceptable levels of composite reliability (CR). The values of the constructs range from 0.86 to 0.95, exceeding the recommended threshold of 0.70, indicating good internal consistency. AVE values ranged from 0.85 to 0.95, surpassing the minimum acceptable level of 0.50, which confirms the convergent validity of the constructs. The factor loadings for the constructs ranged from 0.54 to 0.87. Although most factor loadings were above the acceptable level of 0.60, a few were slightly lower, such as Managerial Innovation at 0.54 and Product Innovation at 0.56, but were retained due to the theoretical relevance and acceptable overall construct reliability and AVE. The results confirm that the measurement model is both reliable and valid, thus providing a strong foundation for the structural model analysis. The high AVE and CR values suggest that the constructs are measured accurately and consistently, enabling meaningful interpretation of relationships among constructs in subsequent analyses of the current study.

Table 2: Measurement Model

<i>First-Order</i>	<i>Second-order</i>	<i>Item</i>	<i>Description</i>	<i>Loadings</i>	<i>AVE</i>	<i>CR</i>
		CAV	Competitive Advantage		0.65	0.85
		ENV	Environmental Performance		0.87	0.95
		MANA	Managerial Innovation		0.54	0.89
		OPER	Operational		0.68	0.86
		PROC	Process Innovation		0.69	0.90
		PROD	Product Innovation		0.56	0.90

Evaluating the PLS SEM findings involves completing two crucial stages: the first includes evaluating the reflective measurement model and formative measurement models, or both. The evaluation of reflective models incorporates testing for indicator reliability, internal consistency, reliability, convergent validity, and discriminant validity (Hair et al., 2017). However, formative models incorporate two-level stage testing where the first stage tests for convergent validity, collinearity, significance, and relevance of indicator weights, while the second stage incorporates evaluation criteria relating to collinearity, R^2 , predictive relevance, f^2 , and Q^2 effect size, significance, and relevance of path coefficient (Hair et al., 2017). The formative construct refers to the index of the weighted sum of variables (Kenny, 2016). Furthermore, Kenny (2016) suggests that in some instances, the indicators are triggered by a construct, while in conventional latent variables (reflective constructs), the indicators can be attributed to latent variables. Similarly, Freeze & Raschke (2007) note that reflective measures are caused by latent constructs. Hence, in the context of the study, the items used by the researcher are reflective. Reflective measure simply means that the group of indicators measuring the same concepts is intercorrelated.

Table 3: Discriminant validity

	Green innovation	Environmental performance	Operational performance	Competitive advantage
Green innovation	0.53	0.65	0.84	0.46
Environmental performance	0.62	0.95	0.58	0.62
Operational performance	0.66	0.68	0.43	0.89
Competitive advantage	0.91	0.73	0.53	0.69

Discriminant validity assesses the extent to which a construct is truly distinct from other constructs in a model. In the current study, discriminant validity was evaluated using the Fornell–Larcker criterion, which compares the square root of the Average Variance Extracted (AVE) for each construct with the correlations between that construct and others in the model. Based on Table 3, the square root of the AVE for each construct (as displayed on the diagonal) is greater than the corresponding inter-construct correlations (off-diagonal values). For example, the square root of the AVE for Green Innovation is 0.73, which is higher than its correlations with the Environmental Performance (0.65), Operational Performance (0.84), and Competitive Advantage (0.46). The

square root of the AVE for Environmental Performance is 0.97, which exceeds its correlations with all other constructs, such as Operational Performance (0.58) and Competitive Advantage (0.62). The pattern shown is consistent across all constructs, indicating that each construct shares more variance with its indicators than with other constructs. Thus, the results confirm that discriminant validity is established, and the constructs used in the model are empirically distinct from each other.

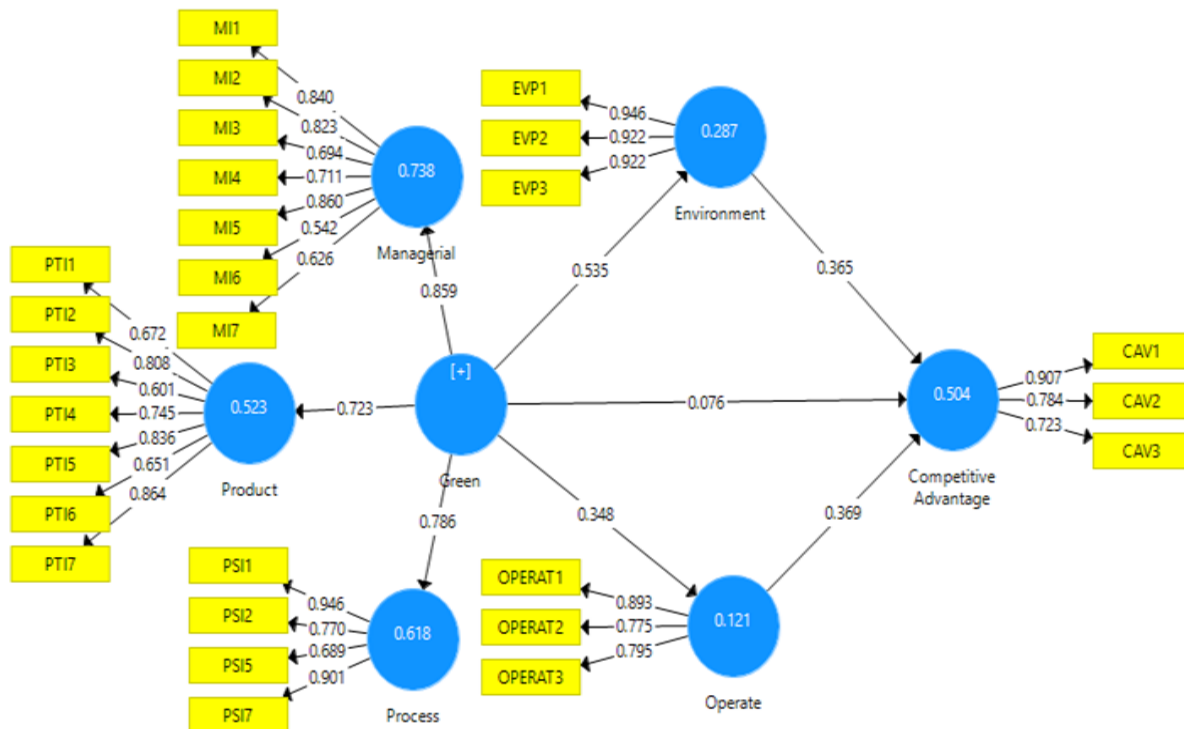
Furthermore, the structural model is examined by using collinearity, R-squared blindfolding, and path coefficient. The Cronbach's Alpha of each item is more than 0.9 and less than 1.0 ($0.9 < \text{Cronbach's Alpha} < 1.0$), which means that the questionnaire has high reliability and consistency. In terms of composite reliability, the values for all constructs are greater than the recommended value of 0.7. That means the measures of the constructs are highly reliable in terms of their internal consistency. In addition, the AVE values for the variables are all greater than the recommended value of, which means that those (indicator) variables in the questionnaire have been understood.

Table 4: Hypothesis testing

<i>Hypothesis</i>	<i>Beta</i>	<i>Std. Err.</i>	<i>t-value</i>	<i>Decision</i>
H1 Green innovation → environmental performance	0.54	0.54	10.03	0.00 (Accept)
H2 Green innovation → operational performance	0.35	0.35	5.24	0.00 (Accept)
H3 Green innovation → competitive advantage	0.08	0.08	1.59	0.11 (Reject)
H4 Environmental performance → competitive advantage	0.36	0.36	4.21	0.00 (Accept)
H5 Operational performance → competitive advantage	0.37	0.37	3.79	0.00 (Accept)

Notes: ** $p < 0.01$; * $p < 0.05$

Figure 2: PLS structural results



As a conclusion, the study discussed the influence of green innovation on operational performance, environmental performance, and competitive advantage among automotive-related suppliers. The result showed that green innovation in terms of managerial, product, and process had a significant influence on operational and environmental performance. Unfortunately, green innovation did not influence the competitive advantage of the automotive-related suppliers in this study. It means, greening the suppliers did not have a significant effect on the competitive advantage of the companies. All the variables showed significant values as well as a positive relationship among constructions, as expected in the table, except for the competitive advantage.

5. Conclusion and Recommendations

As per the discussion, it is worth noting the influence of green innovation on operational performance, environmental performance, and competitive advantage among automotive-related suppliers. The findings indicate that green innovation in terms of managerial, product, and process had a significant influence on operational and environmental performance. However, green innovation did not influence the competitive advantage of the automotive-related suppliers in this study context. The relevance of the statement can be seen from the greening the suppliers did not have a significant effect on the competitive advantage of the companies. All of the variables showed significant values as well as a positive relationship among constructions, as expected in the table below, except for the competitive advantage.

The result showed “operational” significantly included in the GSCM framework, as well as supported by Azavedo et al. (2011) and Wang et al. (2014). Competitive advantage showed an incongruous implication from the previous literature by Porter & Linden (1995), where the scholars contend that stringent environmental regulation, which forces the adoption of clean technology, will yield greater innovation. A higher innovation level will contribute to higher efficiency, hence making companies compete more. It means green practices have zero impact on competitive advantage in this study. This situation is supported by several studies with conflicting evidence, revealing that the integration could only revolve around poor performance. The findings have their relevance in Malaysia due to our country's approach of not being dependent on direct investment in the automotive manufacturer industry, as it intends to promote the local suppliers' development programs. This indicates that when there is no openness in the economy, Malaysia does not become competitive with other players in the global automotive industry. Based on the Malaysian automotive policy, which sheds more light on domestic capabilities and participation by continuously developing activities for better quality and added value among domestic players. The findings would help companies to become more productive in terms of green innovation in the automotive industry performance in Malaysia. GSCM could also become the guideline for the industry, so they could improve the air quality. For preserving the environment, the government should implement a revised version of the environmental law and regulation by having more frequent inspections, organising more programs and campaigns, and establishing a comprehensive guideline and standard. As a conclusion, this study echoes well the 11th Malaysia Plan (2018-2020), promoting green growth initiatives to achieve by protecting the environment, reducing the amount of greenhouse gases, and spearheading a low-carbon and resource-efficient economy.

The study shows that encouraging green suppliers to lead to internal green products, processes, and managerial innovation will further increase the dynamic and competitive advantages. The researcher implied, through the findings, that the companies should closely work and integrate their business process with their upstream and downstream supplier to achieve significant environmental goals. In addition, it can also relieve the pressure on the purchasers' requirements. Moreover, by utilizing the green approach, more opportunities will be generated by local businesses compared to their competitors in the global market. Implementing an environmental management approach will involve capital outlay, which is a valuable investment for the future. Businesses should continue to invest more capital and effort in GSCM, specifically in greening the supply chain and green innovation, to be able to meet and keep up with the ever-evolving environmental regulations and maintain a sustainable presence in the global market.

GSCM research in the future should focus more on integrating digital technologies, such as blockchain and AI. The benefits of digital technologies, such as enhancing transparency and sustainability in supply chains, particularly within the automotive sector, have yet to be proven in the local context. In addition, the recent

National Automotive Policy (NAP) 2020 effectiveness needs to be evaluated; thus, future research could provide beneficial insights into the regulatory impacts on green innovation practices. Moreover, there is an increasing need to explore the circular economy models, particularly in end-of-life (ELV) management, to reduce waste and promote efficiency in resource management. As small and medium enterprises (SMEs) are the backbone of the supply chain, a study on barriers and enablers of GSCM adoption among the SMEs requires attention. Other than that, consumers play a crucial role in influencing corporate sustainability strategies. For that, the development of Malaysia-specific context performance metrics seeks to be produced, to assist and guide the development of local policy and business decision-making.

References

- Abdullah, M., Zailani, S., Iranmanesh, M., & Jayaraman, K. (2016). Barriers to green innovation initiatives among manufacturers: the Malaysian case. *Review of Managerial Science*, 10, 683-709.
- Ageron, B., Gunasekaran, A., & Spalanzani, A. (2012). Sustainable supply management: An empirical study. *International journal of production economics*, 140(1), 168-182.
- Azevedo, S. G., Carvalho, H., & Machado, V. C. (2011). The influence of green practices on supply chain performance: A case study approach. *Transportation research part E: logistics and transportation review*, 47(6), 850-871.
- Carter, C. R., & Rogers, D. S. (2008). A framework of sustainable supply chain management: moving toward a new theory. *International journal of physical distribution & logistics management*.
- Chen, Y.-S., Lai, S.-B., & Wen, C.-T., (2006). The influence of green innovation performance on corporate advantage in Taiwan. *Journal of Business Ethics* 67 (4), 331-339.
- Christopher, M., & Towill, D. R. (2000). Supply chain migration from lean and functional to agile and customized. *Supply Chain Management: An International Journal*, 5(4), 206-213.
- Fisher, C.A. (1996). The Conceptual Underpinning of the Contingent Valuation Method in Contingent Valuation of Environmental Resources, (eds.) Bjornstad, D.J., & J.R. Khan. Edward Edgar, Cheltenham, 19-37.
- Fisher, M. L. (1997). What is the right supply chain for your product?. *Harvard business review*, 75, 105-117.
- Freeze, R. D., & Raschke, R. L. (2007, June). An Assessment of Formative and Reflective Constructs in IS Research. *In ECIS* (pp. 1481-1492).
- Hair Jr, J. F., & Lukas, B. (2014). *Marketing research* (Vol. 2): McGraw-Hill Education Australia.
- Hair Jr, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2017). Advanced issues in partial least squares structural equation modelling. Sage Publications
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed, a silver bullet. *Journal of Marketing Theory and Practice*, 19(2), 139-152.
- Kenny, A. (2016). *The Aristotelian Ethics: A study of the relationship between the Eudemian and Nicomachean ethics of Aristotle*. Oxford University Press.
- Khairani, N. S., Kasim, E. S., Rajamanoharan, I. D., & Misman, F. N. (2017). Green supply chain management in the Malaysian automotive industry: A systems thinking perspective. *International Journal of Supply Chain Management*, 6(2), 38-48.
- Klassen, R. D., & Angell, L. C. (1998). An international comparison of environmental management in operations: the impact of manufacturing flexibility in the US and Germany. *Journal of Operations Management*, 16(2-3), 177-194.
- Klassen, R.D., & Whybank, D.C. (1999). The impact of environmental technologies on manufacturing performance. *Academy of Management Journal* 42 (6), 599-615.
- Liu, J., & Diamond, J. (2005). China's environment in a globalizing world. *Nature*, 435(7046), 1179-1186.
- Liu, Z. (2016). China's Carbon Emissions Report 2016.
- Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D., & Zacharia, Z. G. (2001). Defining supply chain management. *Journal of Business Logistics*, 22(2), 1-25.
- Mukhamedjanova, K. A. (2020). Concept of supply chain management. *Journal of Critical Reviews*, 7(2), 759-766.
- Porter, M.E., & van der Linde, (1995). Green and competitive. *Harvard Business Review* 73 (5), 120-134.
- Rao, K. S., Gunter, R. L., White, J. R., & Hosker, R. P. (2002). Turbulence and dispersion modelling near highways. *Atmospheric Environment*, 36(27), 4337-4346.
- Rao, P. (2002). Greening the supply chain: a new initiative in South East Asia. *International Journal of Operations & Production Management*, 22(6), 632-655.

- Rao, P., & Holt, D. (2005). Do green supply chains lead to competitiveness and economic performance? *International Journal of Operations & Production Management* 25 (9), 898–916.
- Routroy, S. (2009). Selection of a third-party logistics provider in the supply chain. *International Journal of Services Technology and Management*, 12(1), 23-34.
- Sarkis, J. (2003). A strategic decision framework for green supply chain management. *Journal of Cleaner Production*, 11(4), 397-409.
- Shrivastava, P. (1995). Environmental technologies and competitive advantage. *Strategic Management Journal* 16 (S1), 183–200.
- Srivastava, S. K. (2007). Green supply-chain management: a state-of-the-art literature review. *International journal of management reviews*, 9(1), 53-80.
- Tukker, A., Eder, P., IPTS, Charter, M., Haag, E., Vercalsteren, A., & Wiedmann, T., (2001). Eco-design: the state of implementation in Europe – conclusions of a state-of-the-art study for IPTS. *The Journal of Sustainable Product Design* 1 (3), 171–181.
- Wang, S., Fan, J., Zhao, D., & Yang, S. (2014). Predicting consumers' intention to adopt hybrid electric vehicles : using an extended version of the theory of planned behavior model. <https://doi.org/10.1007/s11116-014-9567-9>.
- Zhu, Q. & Sarkis, J. (2006). An inter-sectoral comparison of green supply chain management in China: drivers and practices. *Journal of Cleaner Production*, 14(5), 472-486.
- Zhu, Q. & Sarkis, J. (2004). Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of Operations Management* 22 (3), 265–289.