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RESEARCH ARTICLE

The Impact of Green Practices in Value Chain on Firm Performance in the Context of a Developing Country [version 1; peer review: 2 approved with reservations]

Jeen Wei Ong ¹, Gerald Guan Gan Goh ², Sally Hui Siang Yong³

¹Faculty of Management, Multimedia University, Cyberjaya, Selangor, 63100, Malaysia

²Faculty of Business, Multimedia University, Ayer Keroh, Melaka, 75450, Malaysia

³Power Logic (M) Sdn. Bhd., Puchong, Selangor, 47100, Malaysia

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Abstract

Background: Companies need to go green to remain relevant. Previous studies have confirmed that going green leads to superior performance for companies. However, research of green practices in a value chain requires further attention, especially in identifying the green value chain activities that lead to superior performance. A value chain analysis focuses on identifying competitive advantages of firms through five primary and four support activities.

Methods: This study extends from Ong et al. (2019), who developed and validated the instrument for the nine green value chain activities, to also examine their effect on firm performance. The 207 valid responses in this study are collected through a questionnaire survey of the sampling frame consisting of companies in Bursa Malaysia and the Federation of Malaysian Manufacturers Directory.

Results: The findings reveal that the companies' green practices in primary value chain activities are higher than in the supporting value chain activities. Technological development is the activity with the lowest green attention among the nine value chain activities. Our multiple regression analysis shows that 25% of the variation in firm performance can be significantly explained by the nine green value chain activities. In terms of the individual green value chain activities, green technology development is the only activity that can positively and significantly explain firm performance.

Conclusions: The findings of the study suggest that companies intending to build their green core competence need to engage in green technology development. Companies that go green for the purpose of complying to regulations and fulfilling minimum customers' demands can still embed green practices into their green value chain without compromising their performance.

Open Peer Review

Approval Status

	1	2
version 2		
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1. **Uchenna Cyril Eze** , BNU-HKBU United International College, Zhuhai, China
2. **Sumesh Nair** , Australian Institute of Business (AIB), Adelaide, Australia

Any reports and responses or comments on the article can be found at the end of the article.

Keywords

Green Practices, Value Chain, Firm Performance, Malaysian Corporations, Multilinear Regression Analysis

This article is included in the **Research Synergy** Foundation gateway.

Corresponding author: Jeen Wei Ong (jwong@mmu.edu.my)

Author roles: **Ong JW:** Conceptualization, Formal Analysis, Funding Acquisition, Investigation, Methodology, Project Administration, Supervision, Writing – Original Draft Preparation; **Goh GGG:** Conceptualization, Funding Acquisition, Investigation, Methodology, Supervision, Writing – Review & Editing; **Yong SHS:** Investigation, Methodology

Competing interests: No competing interests were disclosed.

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The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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Introduction

It is no longer a choice, but it is instead becoming necessary for companies to be environmentally friendly or greener in their business operations. Consumers, especially millennials, show a preference for environmentally friendly companies and products.¹ Companies need to embed an environmentally friendly approach completely into multiple dimensions of their business operations in order to capture the value created in the form of performance.¹ Various research findings have confirmed that green practices in businesses lead to greater performance (e.g., Refs. 2–4). However, there is still an opportunity to further study green practices from the value chain perspective. The value chain, introduced by Porter,⁵ provides a comprehensive analysis of the value creation activities within a company. Anchoring green research to businesses from the value chain perspective can provide further detail on the actual value creation activities that lead to superior performance.

In analysing the competitive advantage of a firm, Porter⁵ introduced value chain analysis to distill the value creation activities within a company into five primary and four support activities. The five primary activities are the inbound logistics, operations, outbound logistics, marketing, and sales and services, denoting the complete value creation process from materials to after-sales services to the customers.⁵ The procurement, firm infrastructure, technology development, and human resources management support the primary activities as the support activities in the value creation process.⁵ Studies by Handfield, Walton, Seegar, et al.⁶ and Hartman and Stafford⁷ are among the early researches that explore the idea of a green value chain. Subsequently, Ndubisi and Nair,⁸ Yong, Goh and Ong,⁹ Anthony Jnr¹⁰ and Ong et al.¹¹ are among the studies that consider the full value chain in the context of Porter (1985). Both Anthony Jnr¹⁰ and Ong et al.¹¹ have operationalized the value chain activities but neither of these studies examined the impact of the green value chain activities on firm performance. Anthony Jnr¹⁰ studies the impact of green value chain activities on the sustainable value chain practices while Ong et al.¹¹ focus on validating the instrument.

Methods

The survey instrument for the nine activities of the green value chain was developed using responses from semi-structured interviews with 35 companies across different business sectors. The interviewees from these companies were in managerial positions and were asked to list the important green activities under each of the nine value chain activities suggested by Porter.⁵ Findings from these interviews were compiled and formulated into the survey instrument. There are a total of 99 items for the nine green value chain activities. On the other hand, the instrument to measure the firm performance is adopted from Ong¹² and consists of seven items. All the items are measured using the seven-point itemized rating scale with one indicating strongly disagree and seven indicating strongly agree.

The survey form also consisted of a cover letter and an informed consent statement. These documents communicated the purpose of the study, and detailed the research sponsor and researchers, the research procedure, the voluntary nature of the study, the possible risks and benefits of participating in the research, and the confidentiality of the respondents' identity. The respondents were informed that by returning the survey form, they indicated their consent to participate in the research but that they could withdraw their participation by informing the researchers.

A census method was used to contact all 1,150 companies listed in the main market and ACE market of Bursa Malaysia and the Federation of Malaysian Manufacturers Directory with complete mailing information. Letters were sent out to all. Fourteen letters were returned due to inaccurate mailing information. By the end of the survey, 207 valid responses were received. The assurance of confidentiality of the identity of respondents and the absence of fixed or expected responses in the survey aimed to ease the possible issue of common method variance.¹³

The data collected was analysed using SPSS version 26 (IBM SPSS Statistics, RRID:SCR_019096). Alternatively, GNU PSPP is a free open-source software that can be used to perform similar functions. The results are presented in the next section, starting with the presentation of a brief profile of the responding companies, followed by the reliability and validity analysis and mean analysis for all the variables. Lastly, the impact of the nine green value chain activities on firm performance is tested using multiple linear regression analysis.

Results

The demographic profile of the companies, in terms of the company size, years of operation, and status of ownership, are presented in Table 1. The statistical results show that more than half of the companies have 1,000 or fewer employees. In terms of years of operation, close to half of them have operated for 10 years and lesser. A vast majority of them are locally owned.

We performed exploratory factor analysis on all the items for the nine green value chain activities and the firm performance. Results show that the Kaiser-Meyer-Olkin (KMO) is higher than 0.80 and the Bartlett's test of sphericity is significant at the 95% confidence level. Two items, one each for Operations and Services were removed due to cross

Table 1. Profile of responding companies.

Variable	Attribute	Frequency	Percentage
Company size (No of employees)	500 and lesser	52	25.10
	501 to 1,000	65	31.40
	1,001 to 1,500	35	16.90
	1,500 to 2,000	21	10.10
	2,001 and more	34	16.40
Years of operation	10 years and below	91	44.00
	11 to 20 years	72	34.80
	21 to 30 years	22	10.60
	31 years and above	22	10.60
Status of ownership	Local	173	83.60
	Foreign	34	16.40

Table 2. The validity, reliability and mean analysis.

Variable	# of items	Cronbach's alpha	Mean	Standard deviation
Inbound Logistics	15	0.958	4.67	1.26
Operations	16	0.974	5.00	1.02
Outbound Logistics	9	0.968	5.23	1.00
Marketing and Sales	10	0.966	5.26	1.11
Services	11	0.941	5.66	1.03
Procurement	7	0.966	5.00	0.85
Technology Development	9	0.974	3.68	1.44
Human Resource Management	10	0.952	4.00	1.12
Corporate Infrastructure	10	0.960	4.66	0.93
Firm Performance	7	0.941	4.91	0.96

loading. The rule of thumb used was that the loading must be above 0.40 in one factor only.¹⁴ The inter-item consistency for all individual variables was tested using Cronbach's Alpha, with results indicating a satisfactory level of inter-item consistency for all variables. The details are presented in Table 2.

In addition, Table 2 presents the mean and standard deviation for each variable. The mean for the nine green value chain activities ranged from 3.68 to 5.66 on the seven-point scale. The activity with the highest mean score was services, with a mean of 5.66 and a standard deviation of 1.03. On the other hand, technology development had the lowest mean with a score of 3.68 and a standard deviation of 1.44. Firm performance had a mean score of 4.91 and standard deviation of 0.96 on the seven-point scale.

Table 3 shows the results of the multiple linear regression analysis. This analysis was used to test the effect of the nine green value chain activities on firm performance. The correlation coefficient, R, was 0.500 and the R-squared was 0.250 ($F = 7.282$; $p < 0.05$). This shows that 25% of variation in the firm performance is explained by the nine green value chain activities. Among the nine green value chain activities, only technology development was found to have a significant impact on firm performance ($Beta = 0.257$; $t\text{-value} = 2.815$; $p < 0.05$).

Discussion

The general profile of the sample companies in the study is relatively small and young with more than half of them having employee numbers below 1,000 and near to half of them having been established for less than 10 years. In terms of the value chain activities, these companies embed green practices into the primary value chain better than the support activities, except for the inbound logistics. The smaller size of suppliers could contribute to lesser enforcement of green practices in this primary value chain activity. A worrying observation is that the green practices in the four support

Table 3. Multiple linear regression analysis for effect of green value chain activities on firm performance.

R	0.500		
R Square	0.250		
F	7.282		
Sign	0.000		
Variables	Beta	t-value	Sig.
Inbound Logistics	0.109	1.365	0.174
Operations	-0.036	-0.385	0.701
Outbound Logistics	0.040	0.481	0.631
Marketing and Sales	-0.048	-0.561	0.576
Services	0.077	1.023	0.308
Procurement	-0.027	-0.345	0.730
Technology Development	0.257	2.815	0.005
Human Resource Management	0.109	1.215	0.226
Corporate Infrastructure	0.156	1.727	0.086

activities are low. Without the right technology, infrastructure, procurement processes, and human resources, the effectiveness and sustainability of the green practices in the primary activities remain questionable. Our findings suggest that the companies need to strengthen their green practices in technology development to achieve better performance. Unfortunately, technology development has the fewest elements of green practices among the nine value chain activities.

Our findings suggest that the involvement of companies in the research and development of green technologies is crucial for companies to gain superior performance. This signifies the importance of proprietary green technology to firm performance. The visibility of a companies' involvement in green technology development could be a contributor, especially for those involved in the business-to-business sector. The capability and experience in green proprietary technology development is vital to gain superior performance from going green. In the case of Malaysia, based on this study, the worrying situation is the lack of involvement of the companies in green technology development. On the other hand, there is no evidence to show that involvement in green practices inversely affects firm performance.

Companies have to make a strategic decision in going green. They could decide to take a strategic move to create core competency by developing the green technology to gain superior performance. On the other hand, companies can decide to use the compliance model by fulfilling the minimum regulatory or customer requirements in going green. They can build their core competency elsewhere. There is no evidence from this study that the latter model could cost their performance. The findings from the green practices in primary and support value chain activities, show that most of the companies could be using the latter model.

Conclusions

The study extends from Ong et al.¹¹ to further analyse the impact of green value chain activities on firm performance. Our findings support the notion that companies involved in green activities can gain superior performance. There is no evidence suggesting that embedding green practices in the value chain can have a negative impact on firm performance. Companies need to have the correct business model and strategy in approaching the trend of increasing demand to be environmentally friendly. Nonetheless, future research could further validate the instruments used in this study. Future research could also study the existence of mediators or moderators that cause the insignificance of all the primary green value chain activities in explaining the superior firm performance.

Data availability

Figshare: <https://doi.org/10.6084/m9.figshare.14883240.v1>¹⁵

This project contains the following underlying data:

- GVC_Dataset_Share.sav (The dataset was collected through a questionnaire)

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](#) (CC-BY 4.0).

Ethical approval and consent

The consent form was attached to the survey form and sent to the respondents as a letter. The form included the research purpose, research sponsor, research procedures, a statement of voluntary participation, confidentiality of the respondents and the company's identity, risks and benefits of participating in the study and a statement on consent agreement. The consent agreement clearly spelled out that completing and returning the completed survey form indicated the respondent's consent to participate in the research.

Ethical approval was granted by the Research Ethics Committee (REC) of Multimedia University. The committee granted the approval after reviewing the self-declared form submitted by the researchers.

The approval number is EA2312021.

Author contributions

Ong, J. W. involves in data collection and data analysis and completing the first draft of write-up for this article.

Goh, G. G. G. contributes in the items development and editing the final version of this article.

Yong, H. S. S. involves in early stage interviews that subsequently leads to the measurement items development. She assists also in data collection.

Acknowledgements

The authors would like to thanks all the individuals and organisations that participated in contributing to this research.

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Version 1

Reviewer Report 11 April 2022

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Sumesh Nair

Australian Institute of Business (AIB), Adelaide, SA, Australia

"The Impact of Green Practices in Value Chain on Firm Performance in the Context of a Developing Country" is an interesting read. The introduction portrays the literature gap rather briefly. A brief literature review section would have benefited the paper in terms of elaborating the extant literature's contributions and identifying the gaps in the literature.

The methods section would have been a little more detailed with some discussion around the semi-structured interviews. What questions were asked, and how did these responses contribute to the construction of the survey instrument? I am wondering why no hypotheses were used in the study.

In a few instances of the discussion section, the researchers used the word 'worrying', it is not clear why some findings worry the researchers. The use of a more neutral language would be ideal in these instances. It would have been great to discuss the implications of the study findings in a separate section of the paper.

Overall, the paper presents a very interesting analysis and findings but minimally. I am not sure this is due to any word count requirements of the journal.

I wish the authors good luck with this publication.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Green/environmental marketing and Ethical Marketing.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 25 May 2022

Jeen Wei Ong, Multimedia University, Cyberjaya, Malaysia

Dear reviewer,

Thank you very much for your reviews and suggestions to improve the article. We have revised the article based on your suggestions. The amendments are summarised below.

1. The literature review is part of the introduction section. More literature review is added to strengthen the argument on the existence of the research gap in terms of insufficient empirical evidence linking the green value chain to the firm performance.
2. More information on the semi-structured interviews is provided, including verifying the capacity of the respondents to provide a valid response, the questions asked during the interviews and the process of converting the findings into the questionnaire item.
3. The research framework and hypotheses are added to the article.
4. We take note on the inappropriate use of the term "worrying" in the article and have replaced the term with a neutral word.
5. The implications of the study are moved to a separate paragraph and implications for policymakers are added. To comply with the format of the article, a separate section is not created.
6. More discussion of the findings is added, especially in comparing the findings of our study with the previous studies and the suggestion to the policymakers.

Competing Interests: No competing interests were disclosed.

Reviewer Report 24 March 2022

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Uchenna Cyril Eze

Division of Business and Management, BNU-HKBU United International College, Zhuhai, China

The manuscript titled "The impact of green practices in the value chain on firm performance in the context of a developing country" appears well-written and provides insights in the domain of study, which although extremely important for industry operation, is rarely researched in the context presented. The objectives were clearly outlined and the findings appear valid. This manuscript, however, could have benefited from more clarity in the research method, more context in how the findings were presented, and some editing to remove obvious writing errors.

There should be more details on how the semi-structured interview was conducted. For example, what were the positions of these managers for this reader to get a sense of the capability of the participants to provide reliable information? How much time elapsed between the interview and the survey, and how did this time affect the design of the survey questionnaire, if any?

Provide more context in the discussion of the findings. How do the findings in this manuscript compare to the findings of prior studies in related area?

Please check the overall manuscript to remove obvious grammar and typographical errors.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Mindful consumption, e-business, knowledge management, sustainability in business, green marketing, strategy

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 25 May 2022

Jeen Wei Ong, Multimedia University, Cyberjaya, Malaysia

Dear Reviewer,

Thank you very much for your constructive review of this article. We have made the amendments as the following based on your suggestions.

1. For your suggestion about the respondents, we added the description that the respondents are holding managerial positions in different business functions. We verify their capability to provide a reliable response by asking them to describe the company and their experience with the company.
2. We also compare our results with the available results from previous studies. In general, our finding is consistent with the previous studies that green practices lead to greater performance. However, compared to the previous study that uses a dependent variable that comprises the triple bottom line, a discrepancy in the results is observed.
3. We also recheck the article for obvious grammatical and typographical errors.

Competing Interests: No competing interests were disclosed.

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