Stakeholder engagement for effective implementation of environmental practices

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Abstract
Although the sustainability literature has consistently highlighted the role of stakeholders (e.g., suppliers, employees, customers) for the effective implementation of environmental practices, empirical studies to date have largely overlooked this important factor. To fill this gap, we connected the natural resource-based view with stakeholder theory to explore how stakeholder engagement may affect the environmental practice-performance relationships. We used data from about 300 manufacturing plants worldwide to test whether environmental practices have different performance implications in different configurations of stakeholder engagement. Overall, our results provide partial support for our hypothesis.

Keywords: Green supply chain management, Sustainability, Stakeholder engagement

Introduction
A growing number of companies have adopted environmental practices to reduce the negative impact of their production activities on the natural environment. Such practices are fundamental to addressing the global challenges of climate change, resource depletion, and environment pollution. While it is relatively easy for manufacturers to implement certain practices, the real challenge is to go beyond low-hanging fruits such as water/energy saving and to reap substantial benefits from these investments (Golicic and Smith, 2013). Theoretical development (Hart, 1995; Porter and Van der Linde, 1995) in the sustainability literature has consistently highlighted the role of stakeholders such as employees, suppliers, and customers for the effective implementation of environmental practices, because these stakeholders can integrate environmental practices into operations and supply chain processes to generate substantial effects. However, empirical studies to date have largely overlooked this important factor, i.e., stakeholder engagement, in the search of moderators and mediators of the environmental practice-performance relationships (Grewatsch and Kleindienst, 2017), though several studies have analyzed the effect of stakeholder pressures for motivating firms to contribute to sustainable development. To fill this gap, in this study we connect

the natural resource-based view (NRBV) (Hart, 1995) with stakeholder theory (Hannan, Freeman, 1984) to explore how stakeholder engagement may affect the environmental practice-performance relationships.

Stakeholder engagement for environmental performance

Environmental practices come in three main forms: pollution prevention, product stewardship, and sustainable development (Hart, 1995; Vachon and Klassen, 2008). First, manufacturers can improve product and process design to reduce the generation and emission of pollutants. Pollution prevention shares the same philosophy of total quality management and it requires extensive employee involvement and continuous improvement of pollutant abatement, rather than reliance on expensive "end-of-pipe" pollution-control technology. Investments in pollution prevention can also realize substantial cost savings by increasing productivity and resource efficiency. Second, besides improving the extant products and production processes, manufacturers also need to listen to the voices of a larger scope of stakeholders. That is, product stewardship entails more advanced and fundamental changes in product and process designs. A common feature of such practices is the use of some of life-cycle analysis to assess the environmental burden created by a product system from "cradle to grave". Product stewardship entails engaging more stakeholders, including customers, employees, tier-one suppliers, and even further upstream suppliers. Reducing emissions is the fundamental aim of pollution prevention, whereas product stewardship guides the selection of raw materials and disciplines product design with the objective of minimizing the environmental impact of product systems. However, these practices are merely making extant supply chains less unsustainable, rather than creating "truly sustainable supply chains" (Pagell and Shevchenko, 2014). To achieve this ultimate goal, manufacturers need to make more radical changes and innovations, and stakeholder engagement is indispensable to achieving this goal.

Improving environmental performance entails engaging stakeholders, including suppliers, employees, and customers. Through engaging suppliers in product and process design, focal companies can better understand the sources of pollutions in the supply chain, and more importantly, sources of performance improvement in the supply chain (Vachon and Klassen, 2008). As suppliers generally have technical expertise in specific component supplies, they can provide effective input for pollution prevention, product stewardship, and even sustainable development. Therefore, close collaboration with key suppliers can facilitate the implementation of environmental practices. Similarly, engaging downstream customer companies can also contribute to the effective implementation of environmental practices. The main rationale is that customer companies generally source from multiple suppliers for the same component or service. Through buyer-supplier interactions, customer companies can accumulate much knowledge on the component supply. As such, when a manufacturer works closely with downstream customer companies, it can access product- and process-related knowledge that is generated by its competitors. Last but not least, engaging employees is crucial for the effective implementation of environmental practices. Shop-floor employees are the ones that have to apply the environmental practices and principles in daily operations. Therefore, they are also the ones who can identify the effectiveness of these practices, and to come up with suggestions for further tailoring and improvement.

Stakeholders are not separated from each other. Any project or practice for improving environmental performance entails engaging suppliers, customers, as well as employees. Collaborations and interactions among different groups of stakeholders can

facilitate knowledge sharing and creation, which can facilitate the effective implementation of environmental practices. Therefore, this study follows the configurational approach (Meyer et al., 1993) to explore the impact of stakeholder engagement on the environmental practice-performance relationship.

Hypothesis: In different configurations of stakeholder engagement, environmental practices will have different performance implications.

Methodology and findings

Sample and data gathering

This study uses data from the fourth round of the High Performance Manufacturing (HPM) project. HPM project includes data from about 300 manufacturing plants operating in the machinery, transportation and electronics sectors, and located worldwide (Brazil, China, Finland, Germany, Israel, Italy, Japan, Korea, Spain, Sweden, Taiwan, United Kingdom and Vietnam).

Data was gathered by an international team of researchers. Within each selected country, a group of researchers and a person in charge of plant selection process and data gathering were identified. The plants were randomly selected from a master list of manufacturing plants (i.e., using Dun's Industrial Guide, Jetro data base, etc.). Each plant received 13 different questionnaires. Each questionnaire (except one including only objective data) was administered to two respondents within a plant, selected considering who were the best informed about the topic of each questionnaire.

The items used in this study are a subset of the whole HPM survey. We use six different HPM questionnaires, all administered to two respondents. The constructs of interest are all measured with multi-item scales. All the items were developed from Likert-scaled items.

Environmental practices are addressed in a first questionnaire and include various initiatives for environmental management at organizational and supply chain levels (e.g., pollution emission reduction, encouraging suppliers to improve the environmental performance of their processes) (e.g., Golicic and Smith, 2013; Matthews et al., 2016). *Environmental performance* belongs to the same questionnaire and concerns the overall environmental performance of a plan (e.g., Golicic and Smith, 2013).

Stakeholder involvement concerns employee involvement, customer involvement and supplier involvement, and is addressed by five other questionnaires. Employee involvement includes three multi-item constructs (i.e., employee engagement in product development, employee suggestion, and cross-functional integration) and measures engagement in product and process performance improvement through suggestions (e.g., Hart, 1995).

Customer involvement and supplier involvement include two multi-item constructs each (i.e., supplier engagement in product development, supplier engagement in operational processes, and customer engagement in product development, customer engagement in operational processes) and consider their involvement in various activities, from new product development to production process management (e.g., Hart, 1995).

It is worth noting that our approach to test the sustainability practice-performance relationship specifically addresses some methodological issues commonly found in prior sustainability-related studies, such as single-respondent bias (Golicic and Smith, 2013; Matthews et al., 2016).

Measurement properties

We used SPSS to perform an Exploratory Factor Analysis (EFA) and identify the factors of sustainability practices. Principal component analysis was used to extract the factors. The factor matrix was rotated using the orthogonal, Varimax, rotation. Two environmental practices were identified: *internal environmental practices* and *external environmental practices.* All factor loadings are statistically significant and above 0.5. In addition, we run a reliability tests for both factors using Cronbach's alpha. Reliability of both factors is assured, as all composite reliability values are greater than the threshold limit of 0.7.

All the seven constructs used to operationalize the *stakeholder engagement* were published in past research (e.g., Mishra and Shah, 2009; Turkulainen and Ketokivi, 2012). We used LISREL 8.80 to perform a Confirmatory Factor Analysis (CFA) to ensure the reliability, convergent validity and discriminant validity of the scales used in this paper. Reliability of each construct is assured as all composite reliability values are greater than 0.7. The CFA confirmed also convergent validity as factor loadings are statistically significant and above 0.5 and fit indexes are acceptable. Finally, we tested discriminant validity by comparing $\chi 2$ values of constrained and unconstrained CFA models for each pair of constructs. All delta $\chi 2$ tests provide statistical evidence of discriminant validity.

Data analysis and findings

This study takes the configurational approach (Meyer et al., 1993) to understand the roles of suppliers, customers and employees in sustainability management. This approach allows us to take a relatively comprehensive perspective to uncover the synergies among supplier, customer and employee engagement in enabling the functioning of sustainability practices.

We first used SPSS to conduct a *cluster analysis* to identify the configurations of stakeholder engagement. We followed Hair et al. (1998) two-step cluster approach: (1) hierarchical clustering procedures determined the number of clusters that should be formed and (2) non-hierarchical clustering was applied to identify the final clusters of stakeholder engagement. This procedure results in the four clusters reported in Table 1.

We named cluster 1 “external engagement”, because it has an average engagement of external stakeholders, but an average to lower engagement of employees. Cluster 2 presents opposite values of engagement compared to cluster 1, with a lower engagement of external stakeholders, and average to lower engagement of employees. We named it “internal engagement”.

Overall, clusters 3 and 4 have higher stakeholder engagement compared to clusters 1 and 2, which embrace all stakeholders. However, clusters 3 and 4 differ in terms of the kinds of process in which stakeholders are engaged. Engagement is focused to operational coordination in case of cluster 3, named “stakeholder engagement with an operational orientation”, while it is more oriented to product development in case of cluster 4, named “stakeholder engagement with a product development orientation”.

Table 1 – Stakeholder engagement differences among clusters and cluster sizes

Clusters	Supplier engagement		Employee engagement			Customer engagement		n
	Product develop.	Operatio-nal	Product develop.	Suggestion	Cross-functional	Product develop.	Operatio-nal	
Cluster 1	Medium 3.70	Medium 3.15	Medium 3.51	Low 3.36	Low 3.40	Medium 3.90	Medium 3.10	62
Cluster 2	Low 3.23	Low 2.42	Low 3.24	Medium 3.93	Medium 3.87	Low 3.45	Low 2.67	89
Cluster 3	Medium 3.54	High 3.62	Medium 3.58	High 4.22	Medium 4.07	Medium 3.99	High 3.55	79
Cluster 4	High 4.53	Medium 3.34	High 4.35	Medium 4.07	High 4.29	High 4.56	High 3.46	69

After splitting our sample using the four clusters, we used SPSS to run a *regression analysis* and contrasting the environmental practice-performance link for the four groups and testing our hypothesis. Table 2 summarizes the results of our analysis. Specifically, we found that internal environmental practices are linked to environmental performance in all the clusters, with no apparent variation. Instead, there are differences among clusters in case of external environmental practices, with a significant effect on environmental performance in clusters 1, 2 and 4, but not in cluster 3.

Arguably, having a high stakeholder engagement in operational activities without an equal integration of product development activities significantly precludes the effectiveness of external environmental practices (cluster 3). Instead, it may worth investing in developing the engagement of all suppliers, employees and customers when product development activities are included in the cooperation (cluster 4). Alternatively, a selective approach towards either internal (clusters 2) or external (clusters 1) stakeholders seems to also support the effectiveness of external environmental practices.

Overall, our results provide partial support for our hypothesis.

Table 2 – Impact of environmental practices on environmental performance

Clusters	Environmental practices	Standardized Coefficients Beta	Sig.
Cluster 1	Internal environmental practices	0.435	0.000
	External environmental practices	0.298	0.011
Cluster 2	Internal environmental practices	0.331	0.008
	External environmental practices	0.111	0.029
Cluster 3	Internal environmental practices	0.347	0.007
	External environmental practices	0.141	0.259
Cluster 4	Internal environmental practices	0.409	0.002
	External environmental practices	0.262	0.043

Conclusions

Academic contributions

Overall, our results suggest that environmental practices can have different performance implications in different configurations of stakeholder engagement. Therefore, our research provides empirical support of previous theoretical studies in the sustainability literature that highlighted the role of stakeholders such as employees, suppliers, and customers for the effective implementation of environmental practices (e.g., Hart 1995, Porter and Van der Linde, 1995).

This study for the first time connects NRBV with stakeholder theory to explore how supplier, employee and customer engagement in a manufacturer's operational and product development processes may affect the effective functioning of sustainability practices. This is a novel contribution to sustainability literature as it provides a more nuanced and precise insights into the sustainability practice–performance link (Schmidt et al., 2017).

Finally, this study takes a configurational approach to understand the role of stakeholder involvement in sustainability management, which goes beyond the individual effects of supplier, customer, and employee involvement to capture the synergies through involving these stakeholders in sustainability management.

Limitations and future research

It is important to note some limitations of our study. First, for what concern the research setting, plants in our sample operate in machinery, electronic and transportation components industries, and this can limit the generalizability of our findings. It might be that other sectors may show different results. Therefore, future research should replicate and extend our model to samples drawn from other industries.

Second, environmental performance has been measured with a single item.

Third, the comparison of the four clusters highlighted differences in the environmental practice-performance link (effect vs. no effect). We plan to use the multi-group analysis method (Sorbom, 1974) to further develop our results.

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