GREEN SUPPLY CHAIN MANAGEMENT, ENVIRONMENTAL AND ECONOMIC PERFORMANCE: DOES QUALITY MANAGEMENT MATTER?

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Abstract— The prime objective of the current study is to investigate the link between green supply chain management (GSCM), quality management, economic performance, and environmental performance. In addition to that, the current study is also examining the moderating role of quality management in the relationship between GSCM and environmental performance and economic performance. The structural equation modeling which a two-step process i.e. inner model assessment and outer model assessment is used and is an upgraded version of multiple regression is used to answer the research questions. For several environmental programs, philosophy or principles of QM serves as a basic foundation. Presence of these philosophies are likely to improve GSCM operations and delivering considerable opportunities for performance achievement. Absence of these calls for implementing GSCM activities. The current study has used the AMOS to analyze the data collected from production managers of Indonesian manufacturing firms. The study will be helpful for policy makers in researcher in understanding the issues related to supply chain, its integration, flexibility, and internal performance.

Keywords: GSCM, Quality Management, Environment., Indonesia

1.0 Introduction

In a globalized scenario, especially after entering into World Trade Organization, Indonesian firms are facing increased pressures for enhancing their environmental performance (Setyadi, 2019). Sales and exporting to foreign countries are major driving forces to enhance environmental performance in Indonesia. Dunning (1993), suggested that multinational companies have been increasingly seeks to develop global networks with the suppliers. This growth in internationalization and connections can open ways for Indonesian manufacturers to avail potential exporting opportunities. Meyer and
Thaijongrak (2013), mentioned that it is important for an exporting firms to overcome and deal with green barriers, which could facilitate the firm in achieving competitive advantage. For instance, IBM, Xerox, Toyota, Bristol-Meyers, and GM have motivated their suppliers to incorporate system of environmental management which follows ISO 14001 standards.

Multinational companies operating in Indonesia have witnessed that foreign or external companies operating in Indonesia picking materials and components directly from home countries. On the other hand, other companies already operating in Indonesia left Indonesian based companies with limited customer-supplier association. Zhu and Geng, (2001), suggested that failing to satisfy environmental and quality requirements by foreign companies is the cause of this issue. According to Lang et al., (1999) recent research studies suggested that this situation is also prevailing as it is expected that in coming decades most of the global production will be concentrated in Asian region. Dasgupta et al. (2002), also stated that concentration of manufacturing in this region will arise considerable opportunities but will result in significant burden on environment. Therefore, Indonesia being a developing economy strives to achieve economic development.

According to Liu et al. (2002), economic development put pressure upon Indonesian production managers to manage competing requirements, while responsibly considering environmental burden. Since 1980s, Indonesia have been actively working for economic and industrial reforms that resulted in considerable environmental issues. Shultz and Holbrook (1999), stated that organizations are required to create balance in their environmental and economic performance, within community, regulatory and competitive pressures. According to Geng et al. (2007), for dealing with these issues the Indonesian government attempted to establish environmental management approaches, such as encouraging cleaner manufacturing and ISO 14001 standards, and constructing tight regulations.

Indonesia is presently focusing upon integrated and systematic construction of environmental management approaches, including green SCM to move closer towards cyclical or closed-loop industrial network, and industrial ecology (Geng & Côté, 2003). This paper aims to empirically assess environmental and economic association with the green SCM. Present research will facilitate in analyzing, if the implementation of environmental measures add value to organizations efforts for improving economic as well as environmental growth (Rawashdeh, 2018). Moreover, other company operations can moderate the relation among performance and green supply chain management operations (Henry, 2014; Adebambo., Ashari & Nordin, 2014; Zomorrodi & Zhou, 2017; Gideon, 2014; Luong, et.al. 2017; Basheer et al., 2019; Gilani et al., 2019). This paper particularly focuses to assess whether just in time practices and quality management can play moderating role for affecting association among performance and SC operations (Hafeez et al., 2018; Ojiaku et al., 2018; Biswas & Baz, 2018). The presence or absence of these moderating activities can facilitate or create obstacles in achieving performance.

For several environmental programs, philosophy or principles of QM serves as a basic foundation. Presence of these philosophies are likely to improve GSCM operations and delivering considerable opportunities for performance achievement (Rahmandoust & Soltani, 2019). Absence of these calls for implementing GSCM activities (Dhull & Narwal, 2016). The effect of just in time moderator is quite complex because external and internal activities are responsible for arising environmental consequences (Chaudhary & Chanda, 2015). However, JIT’s dimension of lean manufacturing emphasizes
upon internal practices, that could help in enhancing financial or environmental performance through practices of green supply chain management. External JIT dimensions of company relations and its emphasis on shifting of materials can cause damage on the integration of practices. Incorporating these programs can replace environmental productivity in order to enhance persistent deliveries and performance in operations.

For the purpose of analysis, current study includes literature about GSCM general operations and its application in Indonesia. Section II of this paper includes research designing and developing hypotheses for the study. Section III involves data collecting techniques and estimation process. Section IV contains methodology and findings. While section V involves discussion about the findings along with the practical implications, and paper is summarized in section VI followed by suggestions proposed for future research studies.

2.0. Literature Review

2.1. GSCM practices and enterprises’ environmental performance

According to Nawrocka (2008), managers are considered responsible for environmental performance because of contractual as well as regulatory compliance, competitive advantage and public perception. Modern literature researches by Handfield, and Bechtel, (2002), provide sheer understanding about relational potential designing of supply chains in order to enhance environmental growth. Infusing such programs as well as steering firms to act responsibly towards environment is somewhat great, although implementing such practices do not ensure environmental performance. Due to this reason it is important to have an insight in the relation among environmental performance and practices of GSCM. It is even more important in case of companies that operate in Indonesia, which is expected to create a balance of environmental protection and economic growth (Handfield et al., 2002; Zomorrodí & Zhou, 2016; Danbaba et al., 2016; Ekpung, 2014; Marshal, 2017; Mušić, 2017; Elshamy & Ahmed, 2017; Chen, et al., 2018).

A basic rationale for incorporating GSCM operations is the fact that, it helps enhancing environmental productivity (Handfield & Nichols, 2002). Thus, the supporting literature is comparatively powerful. For instance, integration of inter-firm that is assisted by proximity can result in environmental performance improvement (Darnall et al., 2008). However, closer customer-supplier integration is a leading trend in production because superior firms require these close bonding along their suppliers, for the purpose of implementing strategies related to management, including total quality management and JIT (Florida, 1996). In addition, these close relations also help in achieving cleaner manufacturing.

In 2000, Geffen and Rothenberg proposed that firm-supplier relationship helps in establishing and implementing innovative technologies for environment. Furthermore, customer-supplier integration, mutual R&D, and partnership agreements can result in enhanced environmental achievement (Zhu et al., 2013; Leitão, 2013; Al-Mashailie & Al-Karraz, 2015; Muñoz, 2017). Therefore, first proposed hypothesis attempts to assess whether intuitions or forecasting in case of manufacturing in Indonesia is somehow valid.

Hypothesis 1: Higher GSCM practice implementation results in enhanced environmental performance in enterprises.

2.2. GSCM practices and enterprises’ economic performance

For developing economies like Indonesia, economic performance is considered as an essential driver for companies who seeks for the implementation of environmental
practices. According to Zhu et al. (2010), effectiveness in remitting environmental problems presents more chances for competing and adding value in business programs. Several authors have argued on the issue that inter-organizational relations advance informal as well as formal means for minimizing risk and promoting sense of trust that would result in increased profitability and innovation (Dyer & Singh, 1998).

Economic performance cannot be achieved through sales performance and short-term enhancement of profitability (von-Hippel, 1998). Evidence has also indicated that GSCM mechanism enable firms to achieve long-term operational performance, which can be attained by developing core competencies and increasing environmental risk management. Positive association is found to exist among economic performance of a firm and GSCM Dodgson, and Hinze (2000), stated that activities for environmental protection are deep rooted in business functions and firms can borne benefits from this, in the form of improvement in firm’s reputation.

Briefly, present literature characterizes advantages that are borne from eliminating issues through corporate strategy (Bowe et al., 2001). These benefits involve increased market share, improved firm’s efficiency, moving forward from legislation and competitors, improvement in product quality, new market exposure, better public relations, increased employee satisfaction and motivation, and acquiring financial support Beaumont (1993), and Guimaraes and Liska, (1995) ,mentioned that along other obstacles in the implementation of GSCM practices, cost related issues and economic reasons can also emerge as intervening factors.

Enforcing restrictions on firms regarding application of GSCM activities in the form of eco-design cooperation and principle, arises as a result of adoption of internal procedures and adherence with existing regulations i.e. following the rule to produce certain item in a specified way. Moreover, Beaumont, (1993) and Cordeiro and Sarkis, (1997), stated that adherence of external and internal techniques postulates several numbers of restrictions upon firm’s opportunistic behavior, and their operational cost, thus negatively influencing financial performance of firms.

Corporate environmental performance provides positive as well as negative potential for economic performance as a whole. The relation among financial performance of firm and corporate environmental management provides supporting affirmation about this underlying finding. As a few studies Judge, and Douglas, (1998), have reported a positive association among environmental strategies and financial performance, while other researchers Worrell (1995), Cordeiro and Sarkis (1997) have witnessed negative association.

These varying outcomes arise either because of data that is employed for investigation or due to operational definition for performance. In present research, we mentioned benefits obtained from implementing GSCM practices as productive economic improvement, such as reduced energy consumption cost, reduced cost for purchasing materials, reduction of environmental accidents’ fines, and reduction in waste discharge and its treatment fee. In addition, negative economic progress is defined as an increased cost of operations, increased nature-friendly materials purchasing cost, and growth in investment.

The current data emphasizes more upon operational level financial and economic measures of performance rather than on market share, shared price, return of equity and assets i.e. on combined corporate performance. As several practices of green supply chain management and measures of economic progress are operationally focused. Following set of hypotheses are postulated for the current study.
Hypothesis 2: Higher degree implementation of GSCM operations results in positive and improved economic performance.

2.3. Moderating effects

The hypotheses states that practices of GSCM are useful to incorporate for economic and environmental performance. Moreover, it is postulated that improvement of performance to some extent is dependent upon implementation of further two factors i.e. JIT and QM. Terziovski and Samson (1999), were of the view that operational management techniques can contribute in enhancing determining factors of performance such as quality, service, and efficiency. But incorporating techniques of operational management does not specify any association to environmental handling.

Vachon and Klassen (2008), suggested that preventing pollution in order to protect environment has been already associated with the operational as well as productive functions of a manufacturing firm. The literature review has presented direct correlation among the operational management techniques and environmental or economic outcomes. This paper aims to investigate whether operational management programs act as moderators in the relation among performance and GSCM activities. Thus, for this purpose, JIT and QM are taken as moderators.

2.3.1. Quality management as a moderator

Quality management is a broader concept and is further classified into two activities for this paper. These activities are ISO 9000 certification and total quality management. In terms of environment, Kitazawa and Sarkis (2000) mentioned that ISO 14000 and total quality environmental management follows the principles of ISO 9000 certification and TQM. They also reported the outcomes of a case study, that firms are required to implement number of principles and programs of JIT and QM for taking full benefit of ISO 14000 and other programs. Enterprises are increasingly seeking for ISO 9000 standards in order to improve their competitive position as well as internal operations. Firms who incorporate standards for quality management usually tend to implement environmental management standards as well (King & Lenox, 2001). The studies which inspected the association among economic performance and QM were quite limited and contradictory.

Empirical researches have presented that ISO 9000 standards has insignificant as well as limited influence over organizational or financial performance (Wayhan et al., 2002). Results of exploratory research study for 126 companies from electronics industry have reported that differentiation of ISO 9000 non-registered and registered firms’ performance depicted, that companies that are registered show profitable results, keeping size of the firm under control .Next couple of hypotheses are proposed based on this literature

Hypothesis 3: Firms that incorporate higher management practices are likely to show positive association among environmental performance and GSCM activities, as compared to firms that do not incorporate these practices.

Hypothesis 4: Firms that incorporate higher quality management activities are likely to show positive association among economic performance and GSCM activities, as compared to firms that incorporate lower quality management activities.
3.0. Methodology

This section includes methodology that is employed for functioning of factors and variables, as well as data gathering and assessing the validity of factors. For testing of hypotheses, hierarchical regression analysis is employed. A survey is employed as an instrument, for making careful decision regarding which factors to be incorporated in hypotheses. Questionnaire is designed containing 36 items, out of which 21 items are designed for targeting GSCM practices while 15 items are added for measuring performance. Questions that targeted GSCM activities were added into the questionnaire based on the literature obtained from the industrial experts. Zsidisin, and Hendrick (1998), attempted to investigate about the purchasing managers from the UK, Germany and USA. Findings of the study indicated hazardous materials, product design, relations in SC, and investment recovery as the main determining factors of environmental purchasing. The questionnaire for the present study is designed in a way as first 4-items target external practices of GSCM, three questions for targeting investment recovery, followed by three questions for eco-design.

Zirger, and Maidique (1990), presented environmental supplier evaluation criteria, through investigation of five firms from the furniture industry. Two items were selected from the list of ten criteria, after consultation with Bureau of Environmental Protection and managers assigned for environmental protection. The two selected items include eco-friendly practices evaluation by second-tier supplier and ISO 14001 standards of suppliers. Another important dimension in cooperative SCM is the cooperation with end users, which is also added into the survey. In addition, two other items i.e. support of middle and top management and five more items are also added after consulting with governmental agencies, academic experts and Indonesian companies. Likert scale is used for answering the questions, starting from 1 representing the option of not considering, to 5 indicating fully carrying out.

Total 15 questions regarding GSCM performance were developed, that target operational financial and environmental performance. These questions went through prior testing by the researchers through taking responses from the environmental managers of firms. Responses regarding performance outcomes after applying GSCM practices came out in the form of Likert scale i.e. 1 indicating not at all, 2 shows little bit, 3 indicates to some degree, 4 indicates relatively significant, while 5 shows significant.

3.1. Data and sample characteristics

Data for this study is gathered through questionnaires from managers, belonging to the processing and manufacturing industries in Indonesia. The industries are chosen as they have a considerable and direct influence over Indonesia environment. The questionnaires were administered using technique of
convenience sampling. Carter et al. (2000), stated that executive MBA samples from the audience and convenience sampling is generally employed in case of problems of collecting responses. From 281 questionnaires, that were delivered to representatives and companies, only 186 usable responses were received back. The targeted respondents were the higher or middle management experts. Other research studies Simmons and White (1999), have already incorporated these level respondents and suggested that managers of middle level are generally find reluctant to assist in implementation of environmental practices. However, similar responses were obtained during interviewing at extensive corporate level.

The incorporated the responses of middle managers in an attempt to investigate the positive association among GSCM and perception of middle managers about corporate eco-proactiveness. In another study, it is reported that more advance the perception of middle managers about corporate environmental issues regarding regulation and legislation, higher will be the probability of adopting GSCM practices by a firm (Bowe et al., 2001).

Respondents were targeted from three enterprises in Indonesia, in order to refrain from biasness and narrowing targets of research. These enterprises include suppliers of products, FDI enterprises, and heavy polluter enterprises including chemicals, petroleum refineries, metallurgical and textile industry etc. For instance, FDI enterprises that have exported goods are free to choose any foreign firm as supplier in Indonesia. Few FDI firms function in industries that are heavily polluted, Wayhan et al. (2002), mentioned that with higher pressure or awareness it can be understood that Indonesian enterprises GSCM innovators can pass on their experience to rest of the firms (Ali & Haseeb, 2019; Haseeb, Abidin, Hye, & Hartani, 2018; Haseeb., 2019; Suryanto, Haseeb, & Hartani, 2018).

4.0. Research Analysis and Discussion

Data collected from the survey is then utilized for factor analysis, and for further ensuring the grouping of performance and GSCM activities. Maximum likelihood technique is employed for choosing factors based on varimax rotation. Furthermore, Kaiser criterion was also incorporated through scree value assessment. The results of initial eigenvalue and scree tests indicated four practice factors and three performance factors that are preserved for further rotation.

The outcome of factor analysis grouped GSCM items empirically, thus reassuring original set of grouping. Factors of GSCM practices suggested 71.3 percent of variation by these factors in their items. Outcome of another factor analysis of performance items for GSCM, also exhibit scale item groupings. Three performance items of GSCM shows that 74.8 percent of variation is explained by these factors. Furthermore, 82.9 percent of variation is explained by two moderating factors. Four GSCM practicing factors are labelled as external GSCM, managing internal environment, eco-design, and investment recovery. Moreover, reliability for each group is also tested using Cronbach alpha, their values turned out to be 0.92, 0.94, 0.86 and 0.85 respectively. Performance factors are further named as positive economic performance, negative environmental performance and environmental performance having Cronbach alpha values as 0.90, 0.87, and 0.93 respectively. Values for all factors of Cronbach alpha are higher than 0.70, which confirms validity and internal consistency among variables.

The structural equation modeling (SEM) is used, which is the most advance form of multivariate analysis in social science especially in business literature. Basically, SEM is a multivariate analysis used to test the causal direct and indirect relationships among and between variables by estimating a series of
separate, still interdependent, multiple regression equation simultaneously. The main difference between multiple regression and SEM is that earlier, examines the casual relationship between and among the variables independently, whereas later examines simultaneously. The main objective of SEM analysis is to determine the extent to which the proposed model for observed and latent variable is supported by sample data collection. Specifically, SEM is used to examine the co-variation structure among the observed variables. The observed variables are a set of variables that researchers use for defining or inferring the latent variables or construct. The term latent variables are explained as an unobserved phenomenon which required more or more constructs or variable explain them. SEM analysis was evaluated by using maximum likelihood estimates, which is the most common estimation method for generating estimates of the overall SEM analysis.

As explained earlier that the SPSSv19 is used to analyze the data. Therefore, we have used SPSS to check the reliability of our data. From the findings, it is clear that all measures have reliability with all values are above threshold levels. The claim is made on the basis of Sekaran and Bougie Wayhan, et al. (2002), asserted that an instrument with coefficient value of 0.60 as poor, 0.70 as acceptable; and 0.80 and above as good. Additionally, the rule of thumb provided by Judge, and Douglas, (1998) states that alpha values of greater than 0.50 are adequate and acceptable for testing the reliability of constructs; while the values of less than 0.50 are considered not acceptable. Hinze (2000), also suggested that a modest reliability range of 0.50 and 0.60 would suffice. Basing on the above studies and most recent debate on the issue the current study has used 0.60 as threshold values of Cronbach alpha and basing on them it is evident that all the constructs in our model are reliable. After accessing the reliability, the next step in SEM-AMOS is to measure the inner model. The value of model fit CFI = .94, TLI .938, PNFI .933 and RMSEA = .05), are above the threshold levels which indicates that there are no model fit issues in our study.

The inner model assessment includes CFA, which included the composite reliability, discriminant validity and factor loading. According to Hair et al. (2016) and Hameed et al. (2018) confirmatory Factor Analysis (CFA) with the measurement model where the evaluation of the measurement instruments will be assessed through confirmatory factor analysis (CFA).

Table 1: CR, AVE, MSV, ASV

<table>
<thead>
<tr>
<th>CR</th>
<th>AVE</th>
<th>MSV</th>
<th>ASV</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSCM</td>
<td>0.933</td>
<td>0.503</td>
<td>0.336</td>
</tr>
<tr>
<td>ECNP</td>
<td>0.924</td>
<td>0.529</td>
<td>0.336</td>
</tr>
<tr>
<td>ENVP</td>
<td>0.955</td>
<td>0.508</td>
<td>0.227</td>
</tr>
<tr>
<td>QM</td>
<td>0.923</td>
<td>0.618</td>
<td>0.327</td>
</tr>
</tbody>
</table>

Next, evidence of the discriminant validity of measures used in this study is provided. Discriminant validity refers to the extent to which different measures of different constructs are distinct from each other’s. In the present study, discriminant validity was established by comparing the items loadings with cross-loadings as presented in Table 1.

Table 2. Discriminant Validity

<table>
<thead>
<tr>
<th>SCI</th>
<th>SCF</th>
<th>ISCP</th>
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</thead>
<tbody>
<tr>
<td>GSCM</td>
<td>0.709</td>
<td>0.680</td>
</tr>
<tr>
<td>ECNP</td>
<td>0.680</td>
<td>0.727</td>
</tr>
<tr>
<td>ENVP</td>
<td>0.657</td>
<td>0.676</td>
</tr>
<tr>
<td>QM</td>
<td>0.580</td>
<td>0.527</td>
</tr>
</tbody>
</table>

The second step is structural equation model which specifies the structural relationships among latent variables in the measurement model using a path diagram for the testing of the hypotheses. Once the measurement model has achieved its goodness of fit, it is considered that the model is appropriate for hypothesis testing. The next step is to convert the measurement model into a structural equation model.
model to test the relationship between the endogenous and exogenous models. Path analysis SEM is a technique for observed variables, it measures the direct and indirect relationship as well as it measures model fit. This is the reason we have preferred structural equation modeling over conventional multiple regression techniques. The hypothesized structural equation model is developed in first order construct since the intention is to test the relationship between latent constructs in this study. The relationship between constructs is determined through the path coefficient which will be used to make decisions on hypotheses tested in this thesis. The results of the direct hypothesis are shown in table three. The results revealed the fact that all the direct hypothesizes are accepted significantly.

### Table 3. Direct Effect

<table>
<thead>
<tr>
<th></th>
<th>(β)</th>
<th>SD</th>
<th>T-Value</th>
<th>P-Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>0.211</td>
<td>0.135</td>
<td>3.211</td>
<td>0.000</td>
</tr>
<tr>
<td>H2</td>
<td>0.357</td>
<td>0.152</td>
<td>3.678</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The moderation results of the current study are reported in table 4.

### Table 4. In-Direct Effect through moderation

<table>
<thead>
<tr>
<th></th>
<th>(β)</th>
<th>SD</th>
<th>T-Value</th>
<th>P-Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>0.321</td>
<td>0.03</td>
<td>3.261</td>
<td>0.002</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>0.322</td>
<td>0.12</td>
<td>4.311</td>
<td>0.000</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>1</td>
<td></td>
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The results of the current study have shown.

### 5.0. Conclusion

Indonesia is presently focusing upon integrated and systematic construction of environmental management approaches, including green SCM to move closer towards cyclical or closed-loop industrial network, and industrial ecology. This paper aims to empirically assess environmental and economic association with the green SCM. Present research will facilitate in analyzing, if the implementation of environmental measures add value to organizations efforts for improving economic as well as environmental growth. Moreover, other company operations can moderate the relation among performance and green supply chain management operations. This paper particularly focuses to assess whether just in time practices and quality management can play moderating role for affecting association among performance and SC operations. The presence or absence of these moderating activities can facilitate or create obstacles in achieving performance. Enforcing restrictions on firms regarding application of GSCM activities in the form of eco-design cooperation and principle, arises as a result of adoption of internal procedures and adherence with existing regulations i.e. following the rule to produce certain item in a specified way. Moreover, and, stated that adherence of external and internal techniques postulates several numbers of restrictions upon firm’s opportunistic behavior, and their operational cost, thus negatively influencing financial performance of firms. Corporate environmental performance provides positive as well as negative potential for economic performance as a whole. The relation among financial performance of firm and corporate environmental management provides supporting affirmation about this underlying finding. As a few studies, have reported a positive association among environmental strategies and financial performance, while other researchers, and, have witnessed negative association.

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