Assessment of Supply Chain performance in Small and Medium scale industries in India

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Abstract

A study has been done to assess green/sustainable practice. The study discusses on the motive behind sustainable practice, implementing sustainable practice & identify the gains from sustainable practice. A survey questionnaire framed to survey 120 managers from major industries in India like electronic, automobile, chemical, lather, textile/fabrics, fertilizer/pesticide, pharmaceutical, shoes & plastic items. We found the dominating factor for motives are societal pressure, globalization, competition from Indian and foreign players.

Keywords: Knowledge Sharing, Sustainable/Green Practices, and Manufacturing Supply Chains, Performance.

1) LITERATURE REVIEW

Sustainability

In literature, sustainability or sustainable development is defined as using resources to meet the needs of the present without compromising the ability of future generations to meet their own needs (Daly & Cobb, 1994; WCED - World Commission on Environment and Development, 1987).

There exist diverse debate among the academicians and practitioners regarding the implications of sustainability. Though the concept sustainability can be traced back in economic and philosophical literature (Harding, 1968; Linton et al., 2007), yet it migrated in management literature by the beginning of 1990’s (Linton, et al., 2007). Wide range of issues have been highlighted under the umbrella of sustainable development like public policies, political systems, cooperate citizenships, international trade, social equity/justice, economic growth/development, environmental concerns, and social practices (Vachon & Mao, 2008).

In context of SCM, sustainability is majorly viewed from environmental perspectives. Various supply chain perspectives like green purchasing, sustainability in logistics management (Murphy et al., 1994; Quariguasi et al., 2008), reverse logistics/reverse supply chain, product stewardship (Snir, 2001), and green supply chain (Kainumaa & Tawarab, 2006; Zhu et al., 2008) remained in spotlights. Accordingly, wide range of researches was conducted on waste management, from the studies of community participation in composition of waste to the examination of household incentives to recycle (Barr et al., 2001; Huhtala, 1999; Joseph, 2006; Papageorgiou, 2006; Refsgaard &Magnussen, 2008; Tonglet et al., 2004; Zia & Devadas, 2007). In accordance, Handfield et al. (2002) developed a decision model to measure environmental practices of suppliers using multi-attribute utility theory approach. Kainumaa and Tawarab (2006) proposed multiple attribute utility method for assessing re-use and recycling throughout the product life cycle across the supply chain.

Linton et al. (2007) proposed product design, manufacturing by-products, by-products produced during product use, product life extension, product end-of-life, and recovery processes at end-of-life as key areas to be addressed in order to attain sustainable supply chains. In a similar tune, Quariguasi et al.
Knowledge Dissemination

Organizations use ‘knowledge’ as power over others to acquire better understanding and to formulate competitive strategies (Ducker, 1994; Nonaka, 1995; Zack, 1999). Knowledge used as tool to get know-how and this know-how helps organizations to boost their performance (Milton, 2002). Knowledge can be classified as explicit and tacit. Ford (2001, p.33) defined explicit knowledge as “knowledge that can be easily coded”, while, tacit knowledge as “knowledge that is extremely difficult to code”. Tacit knowledge is quite personal in nature; moreover, it cannot be expressed because it’s deeply embedded into the persons (Sanchez, 2003). It’s normally rooted in actions, experiences and specific working environment (Nonaka, 1995). It is difficult to extract from individuals because it comes over through experience over the period of time.

2) METHODOLOGY

A questionnaire has been framed having three sections, like Section-1, Section-2, and Section-3.

Furthermore, each respondent were requested to mark his/her opinion on four point Likert scale, where, 4-stand for strongly agree to 1-strongly disagree. Respondents were requested to answer each statement in light of their organizations’ ‘knowledge dissemination policy’. To enhance response rate, backup emails (twice a week) were sent. Finally, 170 questionnaires received from 50 organizations via surface mail between February 2013 to August 2013. Out of 170, one hundred twenty (70.59%) were selected for final analysis, while, remaining 50 (29.41%) were discarded because of incomplete information. Table-1 indicates industry/sector wise response rate.

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Industry / Sector</th>
<th>Total response</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Plastic items producer</td>
<td>13</td>
<td>10.83%</td>
</tr>
<tr>
<td>2</td>
<td>Automotive</td>
<td>15</td>
<td>12.5%</td>
</tr>
<tr>
<td>3</td>
<td>Chemical</td>
<td>14</td>
<td>11.67%</td>
</tr>
<tr>
<td>4</td>
<td>Leather</td>
<td>14</td>
<td>11.67%</td>
</tr>
<tr>
<td>5</td>
<td>Textile/Fabric</td>
<td>11</td>
<td>9.17%</td>
</tr>
<tr>
<td>6</td>
<td>Fertilizer/Pesticide</td>
<td>3</td>
<td>2.5%</td>
</tr>
<tr>
<td>7</td>
<td>Pharmaceutical</td>
<td>25</td>
<td>20.83%</td>
</tr>
<tr>
<td>8</td>
<td>Shoes</td>
<td>17</td>
<td>14.17%</td>
</tr>
<tr>
<td>9</td>
<td>Electronics</td>
<td>8</td>
<td>6.67%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>120</td>
<td>100%</td>
</tr>
</tbody>
</table>

3) FINDINGS & DISCUSSION

Table 2: Motives behind Green/Sustainable Practices (OEM’s Response)

<table>
<thead>
<tr>
<th>SI</th>
<th>Questions</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
<th>CV%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>We have adopted green/sustainable practices because of Environmental rules &amp; regulations.</td>
<td>3.73</td>
<td>0.32</td>
<td>8.58</td>
</tr>
<tr>
<td>2</td>
<td>We have adopted green/sustainable practices because our suppliers’ insist us to adopt environmental practices.</td>
<td>2.56</td>
<td>1.14</td>
<td>44.53</td>
</tr>
</tbody>
</table>
We have adopted green/sustainable practices because our employees consistently insist us to adopt Environmental practices.

We have adopted green/sustainable practices because our customers’ insist us to adopt environmental practices.

We have adopted green/sustainable practices because of globalization & international pressures.

We have adopted green/sustainable practices because our major competitors have already adopted these Practices.

We have adopted green/sustainable practices by our own choice (i.e. desire to be leader for green/ sustainability).

Result in Table-2 indicates that environmental rules (m=3.73) considered being the most significant driver behind the adoption & implementation of green/sustainable practices, followed by globalization (m=3.45). Findings of this study also portray that organizations in India are not adapting green/sustainable practices by choice (m=1.71) rather they are forced to adopt & implement green/sustainable practices in compliance of recently introduced environmental laws. Likewise, results suggest, adoption of green/sustainable practices is due to rising pressures for sustainable practices from international players. Interestingly, industry trend also considered being a strong driver for the adoption & implementation of green practices (m=3.31).

On the other hand, mean score depicts that employees (m=2.05) seem least interested in green/sustainable practices, hence, employees (as initiators) never insist (motivate) their employers to adopt green/ sustainable practices. Unfortunately, general customers (m=2.18) observed somewhat indifferent towards green practices that may adversely affect the adoption & implementation of green/sustainable practices. It is generally believed that if customers will overlook the benefits of green/sustainable products in their purchase behavior, it may create hurdle in promoting green/sustainable practices. Amazingly, the role of suppliers in promoting green/sustainable practices also seem suspicious (m=2.56), that means, suppliers in India need strong enforcement from their buyers (OEM’s) to adopt green/sustainable practices. Such interesting outcomes itself justify the need to explore the role of inter-firm knowledge dissemination in promoting green/ sustainable practices i.e. the second objective of this study.

Table 3: Green/Sustainable Practices - Knowledge Dissemination Effort (OEM’s Response)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>VARIABLES</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
<th>CV%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>We organize seminars, training sessions and/or workshops etc for our suppliers to disseminate knowledge regarding sustainable/green practices.</td>
<td>3.53</td>
<td>0.66</td>
<td>18.70</td>
</tr>
<tr>
<td>2</td>
<td>We share exclusive documents, reports, manuals etc. with our suppliers to disseminate knowledge regarding sustainable/green practices</td>
<td>3.44</td>
<td>0.93</td>
<td>27.03</td>
</tr>
<tr>
<td>3</td>
<td>We educate our suppliers to use eco-logistics system for the movement of products/parts.</td>
<td>1.54</td>
<td>1.06</td>
<td>68.83</td>
</tr>
<tr>
<td>4</td>
<td>We educate our suppliers and extend our cooperation for the purchase of eco-friendly products/parts from next tier suppliers.</td>
<td>3.11</td>
<td>0.44</td>
<td>14.15</td>
</tr>
<tr>
<td>5</td>
<td>We educate &amp; assist our suppliers in attaining ISO 14000 and/or ISO 26000 certificate/s.</td>
<td>2.54</td>
<td>1.97</td>
<td>77.56</td>
</tr>
</tbody>
</table>
We educate our suppliers to adopt eco-labeling/eco-logo in their products/parts/supplies.  
We share techniques with our suppliers to implement Eco-inventory system in stock planning.  
We share techniques with our suppliers to avoid or minimize the amount of hazardous material in production.  
We educate & assist our suppliers to introduce lean measures to reduce possible wastage in material, water & energy usage in manufacturing.  
We educate & assist our suppliers to adopt eco-friendly technologies in manufacturing.  
We conduct seminars, training sessions and/or workshops etc. to share techniques with our suppliers to minimize the use of packaging material.  
We extend our cooperation by providing customer feedback in developing eco-friendly designs/products.  
We consider environmental measures and/or certificates like ISO-14000 and/or ISO-26000 etc. as key selection parameters for new vendors.  
We assist our suppliers to introduce design & material that can be reused, recycled, recovered and/or remanufactured.  
We provide design specification to our suppliers that include environmental requirements for purchased items.  
Our suppliers to communicate & share environmental procurement criteria/requirements to their marketing staff, employees, stakeholders and customers.  
We financially assist & motivate our suppliers for the purchase of eco-friendly technologies.

Third variable asked was, “we educate our suppliers and extend our cooperation for the purchase of eco-friendly products/parts from next tier suppliers”. Outcome (m=3.11) disclose that organizations are extending their cooperation by educating their suppliers to establish links (integrate) only with those suppliers (next tier) those engaged in green/sustainable practices. Outcome substantiates the effort of OEM’s in promoting green/sustainable practices within and across their supplier network. In response to next variable i.e. “we educate & assist our suppliers in attaining ISO 14000 and/or ISO 26000 certificate/s”, mean score and stand deviation (m=2.54 & sd=1.97) depicts that some organization facilitate their supply chain partner (suppliers) in attaining ISO 14000 and/or ISO 26000 certificate/s, while, others assume it as the responsibility of their suppliers to attain environmental certificate/s i.e. ISO 14000 and/or ISO 26000 by themselves. Next, variables under investigation became; “we educate our suppliers to implement eco-labeling/eco-logo in their products/parts/supplies”.

High mean score (m=3.37) reveal that organizations (OEM’s) educate their suppliers to adopt & implement eco-labeling/eco-logo in their products/parts/supplies. Findings substantiate the effort of OEM’s in promoting eco-labeling/eco-logo within their supplier network. As opposed to above results, low mean score (m=1.21) for eleventh variable i.e. “we share techniques with our suppliers to implement eco-inventory system in stock planning”, negate the efforts of OEM’s in promoting green/sustainable practices. Indeed, eco-inventory practices itself are not well known in Indian; hence, low sharing has been reported. To attain the real objective of this study, it was imperative to know whether suppliers’ are actively engaged in promoting green/sustainable practices within their organization, hence, next variable
probed were; “our suppliers communicate & share environmental procurement criteria/requirements to their marketing staff, employees, stakeholders and customers”. This variable was included to look into the current sustainable policy of the suppliers. Mean score (m=2.77) indicate that at present, suppliers are communicating & sharing environmental procurement criteria/requirements to marketing staff, employees, stakeholders and customers. However, results provoke the attention of policy makers at OEM’s and suggest to re-asses their efforts in disseminating knowledge regarding green/sustainable practices.

Based on mean analysis presented in Table – 3, it can be concluded that except few area, OEM’s in Indian are effectively engaged in disseminating knowledge regarding green/sustainable practices within their supplier network. To further explore the role of inter-firm knowledge dissemination, it is imperative to study the impact of green/sustainable practices on supply chain performance. To attain this objective, various supply chain performance indicators were included in the questionnaire. Respondents were asked to mark their opinion on four point Likert scales, where, 4 stand for strongly agree to 1 – strongly disagree. Table-4 present performance outcomes of suppliers after adopting & implementing green/sustainable practices.

Results in Table-4 disclose significant impact of inter-firm knowledge dissemination on supply chain performance. Supply chain performance indicators reflect valuable gains, for example, suppliers reported ‘scrap reduction and/or elimination’ with mean value i.e. (3.31) as the most valuable gain achieved after the adoption & implementation of green/ sustainable practices. Similarly, production capacity optimization (m=3.17), reduction in the use of packaging material (m=3.12), radical changes in supplier organizational structure & procedure (m=3.03), and percentage increase in on-time deliveries (m=2.98) are some other prominent gains reported as a result of green/sustainable practices.

Table 4: Supply Chain Performance - After Adopting & Implementing Green/Sustainable Practices

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>VARIABLES</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
<th>CV%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>After green/sustainable practices, reduction in the inventory level has been reported by our suppliers.</td>
<td>2.02</td>
<td>0.63</td>
<td>31.19</td>
</tr>
<tr>
<td>2</td>
<td>After green/sustainable our suppliers have reported practices, reduction or elimination of scarp.</td>
<td>3.31</td>
<td>0.57</td>
<td>17.22</td>
</tr>
<tr>
<td>3</td>
<td>Green/sustainable practices have helped our suppliers to optimize their production capacity.</td>
<td>3.17</td>
<td>1.17</td>
<td>36.91</td>
</tr>
<tr>
<td>4</td>
<td>Green/sustainable practices have significantly improved the quality of our suppliers’ production process.</td>
<td>2.12</td>
<td>0.77</td>
<td>36.32</td>
</tr>
<tr>
<td>5</td>
<td>Green/sustainable practices have significantly helped our suppliers to reduce the use of packaging material.</td>
<td>3.12</td>
<td>0.43</td>
<td>13.78</td>
</tr>
<tr>
<td>6</td>
<td>Green/sustainable practices have significantly improved the performance of our suppliers’ inbound logistics system.</td>
<td>1.39</td>
<td>0.84</td>
<td>60.43</td>
</tr>
<tr>
<td>7</td>
<td>Green/sustainable practices have significantly improved the performance of our suppliers’ outbound logistics system.</td>
<td>2.03</td>
<td>1.04</td>
<td>51.23</td>
</tr>
<tr>
<td>8</td>
<td>Green/sustainable practices had helped our suppliers’ in improving percentage of on-time deliveries.</td>
<td>2.98</td>
<td>0.53</td>
<td>17.79</td>
</tr>
<tr>
<td>9</td>
<td>Green/sustainable practices have helped us and our suppliers to attain customer goodwill and have improved our competitive position in the industry.</td>
<td>2.18</td>
<td>1.10</td>
<td>50.46</td>
</tr>
<tr>
<td>10</td>
<td>Green/sustainable practices have positively affected the financial performance of our suppliers.</td>
<td>2.30</td>
<td>0.78</td>
<td>33.91</td>
</tr>
<tr>
<td>11</td>
<td>Green/sustainable practices have radically changes the structures and procedures of our suppliers.</td>
<td>3.03</td>
<td>0.15</td>
<td>4.95</td>
</tr>
</tbody>
</table>
• Analysis of variance

<table>
<thead>
<tr>
<th></th>
<th>Sum</th>
<th>Degree of freedom (df)</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variance between samples</td>
<td>712.72</td>
<td>2</td>
<td>356.36</td>
</tr>
<tr>
<td>Variance within samples</td>
<td>15010.71</td>
<td>32</td>
<td>469.08</td>
</tr>
</tbody>
</table>

It is found that from the table of df (2,32) the calculated F factor much lower than that of the table value. So, the three results are significant.

• **t-test of significance between motives, green practices and supply chain performance**

<table>
<thead>
<tr>
<th>Tables</th>
<th>t-value</th>
<th>df</th>
<th>Critical value 5% significance in 2 tail test</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table-2 Motives</td>
<td>0.25673</td>
<td>22</td>
<td>2.0739</td>
<td>Significant</td>
</tr>
<tr>
<td>Table-3 Green practice</td>
<td>0.83369</td>
<td>26</td>
<td>2.0555</td>
<td>Significant</td>
</tr>
<tr>
<td>Table-4 Supply chain performance</td>
<td>0.23479</td>
<td>16</td>
<td>2.1199</td>
<td>Significant</td>
</tr>
</tbody>
</table>

Motives are significant to green practice and supply chain performance.

SD—Standard Deviation, df- degree of freedom

5) Conclusion & managerial implications

In context of India, this study provides valuable insight regarding major motives behind the adoption & implementation of green/ sustainable practices. Additionally, the outcome of this shed light on some interesting facts regarding the role of inter-firm knowledge dissemination in promoting & implementing green/sustainable practices.

Lastly, through empirical evidences, this study provides useful insight on the major gains attained from green/sustainable practices. Reportedly significant gains itself may purposefully be publicized for promoting & implementing green/sustainable practices. It is argued that the outcomes of this study will help business managers in enhancing their understating towards green/sustainable practices. Findings of this study will also facilities organizations in India to review their existing green/ sustainable practices and revise new strategies accordingly. Based on some bitter facts, prevailing situation invites the attention of Ministry of Production and Ministry of Environmental Affairs (Government of India), not only to review existing rules & regulations, rather assist organizations and their supply chain networks in implementing green/ sustainable practices. Finally, it is argued that the results of this study can be generalized, if the scope of research extends to more industries.

Similarly, a more systematic sampling could also add to the validity of findings.

6) REFERENCES


