International Journal of Business and Management Study– IJBMS
Volume 1: Issue 2 *[ISSN:* **2372-3955***]*
Publication Date : 25 June 2014

Impact of Soft Factors on GSCM Performance

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***Abstract*-Green Supply Chain Management(GSCM) focuses on integration of ecological concepts with the supply chain strategies of the organizations that will enable them to reduce their environmental burden by minimizing the utilization of energy and material. There is a growing confidence among the researchers that GSCM performance can be enhanced through effective management of the soft factors. Keeping this fact in view this research has been framed to check the association of soft factors with GSCM performance. Twenty six soft elements under six scales were identified from literature which was included in the questionnaire. A questionnaire survey was conducted using a sample of 144 employees from the mining companies operating in India. Multiple regression analysis was employed to check the association of the six soft factors with GSCM performance. The result was in support of five research hypotheses that top management commitment, employee innovation, team work, work culture and minimizing employee resistance to change have positive association with GSCM performance. However association between employee motivation and GSCM performance was statistically insignificant, thus rejecting fifth hypothesis.**

***Keywords*—GSCM, Soft Factors, Factor Analysis, Regression Analysis, Indian Mining Industries.**

I. Introduction

Mining activities have grown manifolds in a few years due to heavy demand for the mined raw materials from manufacturing industries as a consequence of enhanced consumption levels. Subsequently environmental pollutions associated with mineral extraction, processing and transportation to market place has grown significantly and is a matter of serious concern. Due to these growing environmental concerns mining companies are experiencing heavy pressure from governments and societies to reduce the adverse environmental impact of their supply chain. Hence, the mining companies are trying to develop and implement several environmental management strategies. Green supply chain management(GSCM) is one of the environmental strategies that has been growingly adopted by various companies worldwide.

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GSCM enables companies to eliminate or minimize negative environmental impacts of their supply chain (air, water, and land pollution)and waste of resources(energy, materials, products)from the extraction or acquisition of raw materials up to final use and disposal of products[1].

Human resources engaged in execution of any environmental strategy influence its success. Therefore certain factors that potentially influence behaviour of a person to work for a particular objective, known as behavioural factors[2], or soft factors will definitely influence the success of the program. It has been advocated by several authors that human resource factors(soft factors) are very much essential for the success of any environmental management program[3]-[7].

II. Literature Review

Though significant effort has been made by various authors in examining the impact of soft factors on the implementation of environmental management practice[3]-[11], only few of them are based on empirical analysis[6],[5],[7].

Wee and Quazi[6] established 7 critical success factors for implementation of environmental management system, out of which three "top management commitment", employee involvement" and "training" are soft factors. In an another study Daily et al.,[5] used a sample of 437 employees to examine how the soft factors influence employee's perception of environmental performance. Latter, Kaur[7] studied the impact of soft factors on perceived environmental performance through an empirical analysis using a sample of ISO 14001 environmental management system(EMS) certified manufacturing companies in Malaysia.

Scanning of the past literature shows that Wee and Quazi[6] have considered only three soft factors and ignored a number of other soft factors that have potentiality to affect GSCM implementation. Though Daily et al., [5] considered a significant number of soft factors, yet they have not validated the framework. Further, study of Kaur[7] was focused on manufacturing companies operating in Malaysia only. None of the studies established a validated framework of soft factors in mining industries. Our study makes an attempt to establish a validated set of soft factors influencing GSCM implementation in mining industries.

III. Soft Factors Affecting GSCM

Review of past literature and expert consultation was employed to identify the following soft factors influencing GSCM implementation in Indian mining industries.

A. Top Management Support

Top management support has been advocated by many researchers as the dominant driver of any corporate environmental management programs. Past studies show that top management support has contributed significantly to the success of any environmental management practices[11]-[12]. Top management support and leadership is essential for establishment of clear and visible quality values along with a management system having the responsibility to guide all company activities towards environmental excellence[13]-[15]. Besides providing the framework for environmental improvements they are also accountable for deciding the environmental strategies to be followed, level of training required[4], allocating adequate resources on time[16] and designing the selection and recruitment process to ensure that the persons having commitment towards environmental improvements have a potential to get recruited. Hence we propose the following hypothesis:

H1: Support from top management positively influences GSCM performance.

B. Work Culture(WC)

Work culture of any organization can be defined as a set of basic assumptions developed by a group in its process of learning in order to deal with problems of either external fit or internal integration[10],[12]. Chin et al. [17], advocate that existing work culture has the potentiality to affect the implementation of new management practices unconsciously and in a taken for granted fashion. Observation by Govindarajulu and Daily[4], supports the argument that work culture influences employee motivation towards environmental management. Researchers Fernandez et al.[8] and Jabbour and Santos [10] strongly proposed work culture of the organization as a critical element for improvement of environmental performance. An organizational culture that encourages employee participation and thereby mutual trust and respect between employees and management increases responsiveness and helps in innovation and risk taking. Therefore the following hypothesis is proposed:

H2: Work culture positively influences GSCM performance.

C. Team Work

Though contribution of an individual towards environmental wellness is vital, yet the role of team-work in achievement of superior environmental performance cannot be ignored[3]. It refers to a small group of employees having complementary knowledge, common beliefs and values, all of whom are devoted to attaining shared or common goals and objectives that will guarantee integration of this group[10],[12]. In fact identification and reduction of environmental problems at their sources demands inputs from all organizational areas by forming cross-functional teams with members from the departments like manufacturing, planning, designing and purchasing[18]. Significance of team-work towards environmental performance improvement has been indicated by various authors[3],[4],[19]. The following mentioned hypothesis is proposed on the above mentioned theoretical background for empirical testing:

H3: Team Work positively influences GSCM performance.

D. Minimising Resistance to Change

Everybody offer resistance to alteration of their typical working style as change is often difficult for them and has long been understood as a cause of conflict that is undesirable and detrimental to the health of any enterprise[12],[20]. Zutshi and Sohal[9], observed that employees offer resistance to environmental improvement programs. In fact in this situation if any strategy is imposed on them, may lead to a response of denial in a more aggressive manner resulting not only in delays but also in failure of the program[16]. Through education and training, employees become more aware of the need for quality and environmental control, increase adaptability to change and change to a proactive attitude[4]. Insight of the preceding discussion, the following hypothesis is proposed for empirical testing:

H4: Minimizing resistance to change positively influences GSCM performance.

E. Green Motivation

Because the employees are directly in charge of implementing the strategy, it is necessary to motivate them towards its success[12],[21].Various efforts required for shifting the attitudes of employees from negative to positive towards environmental programmes of the organisation may be referred as green motivation. Employee motivation not only results in increased employee participation but also higher rate of cooperation that are critical for the implementation of either cleaner production practices or environmental management practices in mining industries[22]. Govindarajulu and Daily[4], observed significant influence of monetary reward on job satisfaction and work motivation. Further, it has been observed that empowered employees exhibit higher commitment than less powered employees for environmental improvement. Insight of the preceding discussion, the following hypothesis is proposed for empirical testing:

H5: Green motivation is positively associated to GSCM performance.

F. Green Innovation

Innovations are the creative ideas that are generated from either individuals or teams of employees([23]. Development of new and superior approaches for the existing task often results in the enhanced greening effort of the supply chain. Employee creativity or innovation serves as an important environmental problem-solving resource for companies [24]and aids to fulfill an organization's quest for continuous and break-through improvements [2],[12].Green education and training creates awareness among employees regarding environmental control requirements, increases flexibility, and fosters a proactive attitude towards the natural environment [6],[25] and helps in generating innovative ideas for greener process and practices.

Insight of the preceding discussion, the following hypothesis is proposed for empirical testing:

H6: Green innovation positively influences GSCM performance.

IV. Perceived GSCM Outcomes

GSCM performance of any organization can be defined as its degree of success in managing the relationships between its activities and the natural environment[19]. Complexity associated with the measures of performance and unavailability of relevant information often leads to the use of self-report measurements. Various researchers also have employed perceived measures of environmental performance[5],[26],[27]. In this study we have employed six measures of GSCM performance as mentioned in table I.

TABLE I. GSCM PERFORMANCE MEASURES

Performance Measures	References
Better public relations and information on environmental issues	Daily et al., 2007; Diabat et al., 2013
Better control and monitoring of emissions into environment	Zhut et al., 2007; Kaur, 2011; Diabat et al., 2013.
Better selection & use of raw material, water management	Diabat et al., 2013.
Better disposal/recycling of waste	Kaur, 2011; Diabat et al.,2013.
Better selection and rational use of energy sources	Zhu and Sarkis, 2004; Zhut et al., 2007.
Selection of new production process/ Improving production process	Zutshi and Sohal, 2004;Jabbour and Santos, 2008.

V. Research Methodology and Data Collection

Research methodology plays a vital role by setting a guideline for the researchers that need to be followed in order to meet the research objective. The study was conducted with an objective to establish a valid instrument as a measure of the soft factors in GSCM implementation in mining industries. A total of twenty six elements to measure the soft factors were developed based upon extensive review of relevant literature, expert guidance and inputs from colleagues.

Questionnaires were mostly sent through either e-mail or post with a self addressed stamped envelope. Besides this corporate offices of some of the mining industries located in Bhubaneswar as well as mining sites nearer to Bhubaneswar were visited for collection of data through questionnaire. In this process a total of 500 questionnaires were sent to the environmental officers, quality control officers and project managers. It was observed that 163 questionnaires were returned out of which 144 were valid, indicating a response rate of 28.8 percent. The response rate in this study can be considered reasonable as in a similar kind of study Wee and Quazi[6] on development and validation of critical factors for environmental management considered 21.9 percent to be reasonable.

VI. Empirical Assessment of The Developed Survey Instrument

The instrument developed in this study consisted of 26 items under 6 scales. These scales were tested and validated empirically as discussed below.

A. *Reliability*

Reliability is a measure of the extent to which a test, or any measuring instrument produces identical results on repeated attempts[31]. Reliability of the scale was assessed using internal consistency method. Internal consistency is measured using Cronbach's alpha which is a measure of the degree of homogeneity of the survey instrument[32]. It can be observed from table II that all the six soft factors demonstrate high reliability for having reliability co-efficient values well above the minimum required value of 0.7[33].

B. *Assessment of Validity of The Survey Instrument*

Validity of a measure refers to how well it measures what it intends to measure[34]. Three types of validity tests content validity, criterion-related validity and construct validity are proposed in literature.

Content Validity: Content validity is evaluated subjectively due to lack of quantitative measures for it. A measure has content validity if there is general agreement that the measure has items that covers all aspects of the variable being measured[6]. The six soft factors developed in this study are based on exhaustive literature review and thorough assessment by a group of experts consisting of two academicians, three members from industry as well as five members from government organizations.

Construct Validity: Construct validity evaluates the degree to which all the elements of a construct(scale) measures the same construct[32]. Test of unifactoriality has been suggested as a test for construct validity in literature[35]. Each of the six factors was subjected to principal component factor analysis using varimax rotation individually to check unifactoriality. The general purpose of factor analysis is to find a way of condensing or summarizing the information into a smaller set of new composite dimensions(factors) with a minimum loss of information[32],[36]. To check the appropriateness of the data for factor analysis, Kaiser-Meyer-Oklin(KMO) measure of sampling adequacy and Bartlett's test of sphericity were employed[37], [38]. Results of individual factor analysis of the soft factors, listed in table II, indicates that KMO values for all the factors are in the range of 0.768-0.857 which are above the minimum suggested standard of 0.5 required for running the factor analysis[6],[36]. Further, all the items have factor loading values in the range of 0.690-0.933 on their respective scales, indicating a higher correlation of the items with their respective scales. The Bartlett's test of sphericity in this study demonstrated high value for all the six soft factors($p<=0.000$).It can also be observed from Table-1, that the factors are unifactorial and variance explained by each

other in the unifactoriality test is more than 60 percent which is an indication of the construct validity of the instrument[35].

Similarly to check the dimensionality of the dependent variable(perceived environmental performance) another varimax rotated principal component factor analysis was performed. A single factor solution emerged with eigen value 4.797 and explaining 79.945 percent variance in the data. KMO measure of sampling adequacy was 0.892 and Bartlett's test of sphericity was significant($p=0.000<0.01$).

Criterion-related validity: Assessment of criterion-related validity is done in this research by examining the value of multiple correlation coefficient R obtained through the multiple regression analysis of the six soft factors(independent variable) with the perceived environmental performance(dependent variable). The multiple R, value of 0.713(R^2=0.508, F=23.580, p<=0.000) in this research indicates a strong criterion related validity of the six soft factors.

VII. Hypothesis Testing

Multiple regression analysis, which has been suggested by various authors for analysis of relationship between a single dependent and multiple independent variables, was employed to test the hypotheses. The results of the regression analysis are summarized in table III. Through the examination of the results of the regression analysis 'F' statistic value(F=23.580) was found to be significant at 1 percent level indicating the fitness of the model. Further, analysis of the regression results demonstrated that there is no autocorrelation problem in the data as the Durbin-Watson index was 1.696, which lies within the acceptable range of 1.5-2.5[7],[39]. The results also confirmed the absence of the problems of multicollinearity in this research as the variance inflation factor(VIF) values for all the six soft factors are less than the threshold value of 10[7]. The test results shows that TMC(β=0.279, p<0.05), EI(β=0.152, p<0.05), WC(β=0.156, p<0.05), TW(β=0.166, p<0.05) and MRC(β=0.143, p<0.05) positively influence GSCM performance thus supporting the hypotheses H1, H2, H3, H4, & H6. However, the factor EM(β=0.127, p>0.05) does not show significant association with GSCM performance, thus rejecting hypothesis H5. The results imply that employee motivational efforts have been ignored in Indian mining industries.

TABLE II. INDIVIDUAL FACTOR ANALYSIS RESULTS

Soft factors	Cronbach's alpha	Total number of items	KMO	% Variance	Component Loading
TMS	0.900	5	0.857	71.722	0.774-0.905
EI	0.905	4	0.839	77.910	0.851-0.920
WC	0.859	4	0.768	70.850	0.748-0.917
TW	0.893	4	0.805	75.751	0.807-0.933
EM	0.827	5	0.819	60.108	0.690-0.836
MRC	0.914	4	0.770	79.756	0.846-0.924

TABLE III. RESULTS OF MULTIPLE REGRESSION ANALYSIS

Multiple R	0.713			
R- square	0.508			
Adjusted R Square	0.486			
Std. Error	4.313			
Durbin-Watson	1.696			
F	23.580, p<=0.000			
Variables	Standardized Beta	t	sig	VIF
TMC	0.279	3.199	0.002	2.123
EI	0.152	2.085	0.039	1.470
WC	0.156	2.120	0.036	1.513
TW	0.166	2.048	0.042	1.828
EM	0.127	1.882	0.062	1.272
MRC	0.143	2.043	0.043	1.373

VIII. Conclusion

statistical results of this study shows that the soft factors model explained 50.8 percent(R^2=0.508) of the variance in GSCM performance. This finding is in line with the argument that activities and process controlled by management have a visible impact on environmental performance[5],[7]. Hence the soft factors should be given for the enhancement of GSCM performance. Further, the results of the study provide a clear evidence to the fact that top management support and involvement has notable influence on GSCM performance which is consistent with the literature.

Though the literature supports the argument that improved employee motivation enhances GSCM performance, yet the statistical results of this study failed to provide adequate support for the hypothesis H5. The results back the contention by Denton[40] that the employee motivational efforts like enhanced salary, bonuses, rewards and promotions are hardly associated with environmental performance. However, the results support other hypotheses implying that top management commitment, employee involvement, work culture, team work and minimising resistance to change have positive relationship with GSCM performance

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