

**DEVELOPMENT OF A SURVEY QUESTIONNAIRE FOR  
ANALYSIS OF AN EMS MODEL FOR  
MANUFACTURING INDUSTRIES**

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**Abstract**

A survey questionnaire is a research instrument which has been developed in this paper for testing and analysis of a research model based on Environmental Management System (EMS). Model has been designed after a huge literature survey and so many research papers have been found for different variables of model. A survey instrument has been prepared by taking various performance measures from different research papers. Survey Instruments have been validated by expert from academics and industries. This paper presents the selection methods and factors of survey questionnaire Environmental Management System (EMS).

**KEYWORDS:** *Environmental Management System (EMS), Environmental Performance (EP), Human resources (HR), Manufacturing Industries, Survey Questionnaire*

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## 1. Introduction

Environmental conscious manufacturing (ECM) is concerned with developing methods for manufacturing products, processes and operations etc. to satisfy the requirements of environmental standards. We live in a decade where environmental sustainability has been an important issue to business practice. Since the early 1990's, manufacturers have been faced with pressure to address environmental management (EM) in their production processes. A survey questionnaire has been developed for testing and analysis of research model based on EMS. The EMS Model has been developed after searching more than fifty research papers in literature survey and nine variables have been found out, in which environmental performance variables is dependent on other variables. Now further, we want to find out in our research that what will be relation between these variables with environmental performance. so for analysis of model, we require data which will be collected through filled survey questionnaire from various manufacturing industries of different industrial areas of India.

## 2. EMS-HR research model and variables

An EMS model based on HR and organizational dimensions has been developed from various research papers. This model has nine variables. Environmental performance variable is dependent variable on rest independent variables as Management Support, Employee Empowerment, Training & Awareness, Rewards, Recruitment & Selection, Organizational Culture, Organizational Learning and Teamwork. It is required to process the data from manufacturing industries for analysis of model through SPSS-16 software to check the relationship of variables with environmental performance.

### 2.1 Literature Review for constructs of Model

Various factors/ variables have been selected from the work of previous researchers from literature for construction of EMS. Various variables/constructs of model are discussed in the following section.

#### 2.2.1 Management Support

Daily (2007) proposed that management communication of environmental issues, may affect employee perceptions regarding the linkage of their actions to environmental consequences. Consequently, management can serve as champion of change to help the organization implement the EMS. Daily (2001) stated that Top management with in an environmentally conscious organization should strive for a strong culture that allow its employees the freedom to make environmental improvement.

Govindrajulu (2004) stated that Commitment from top management is like a framework for environmental improvement.

### **2.2.2 Employee Empowerment**

Daily (2001) stated that empowered employees are not only preferable but also essential to implement the organizations goal to be fiscally sound and environmentally responsible. Empowered employee are motivated & committed to participate and engage in good environmental practice. Employees who are not empowered have less commitment for improvement than the empowered employees. Management can encourage employee empowerment by changing the organizational structures that support empowerment. One way that management can encourage employee empowerment is by changing the form of the organization.

### **2.2.3 Employee Training and Awareness**

Jabbour (2008) stated that training may be understood as a systematic process that leads the employees' behaviour towards accomplishing the set of organizational objectives. As a consequence, it is considered as an essential component of successful companies. In fact, all the employees of a company, and not only the ones linked to certain departments, must receive training in the environment, which is considered one of the main factors for the success in environmental management.

### **2.2.4 Reward to employee**

Daily (2001) stated that a well designed reward system can be helpful in promoting employees to perform sound environmental practices. Reward can be a reinforcement to continuously motivate and increase commitment from workers to be environmentally responsible. Reward systems and incentive need to reflect corporate commitment to the importance of environmental performance. Rewards can be implemented in several forms such as financial rewards and recognition awards. Award and recognition programs, profit sharing programs, increase in pay, benefits and incentives and suggestions programs are some of the systems that can be used to reward employees for good environmental practices.

### **2.2.5 Recruitment & Selection**

Jabbour (2008) defined recruitment as the organizational activity that aims at "head hunting and stimulating potential candidates to apply for previous and for seen vacancies". Thus, recruitment intends to influence the quantity and the types of candidates for a certain vacancy. When this activity incorporates the environmental dimensions, the ecological performance of a company is used as an element for attracting talented people. German

companies use their institutional image in order to attract competent staff members that are committed to the environment. Whereas; the process of recruitment aims at increasing the quantity of candidates, the aim of short listing is to reduce this number by choosing the candidate who best meets the criteria of the offered vacancy.

### **2.2.6 Organizational Culture**

Jabbour (2008) stated that organizational culture refers to a set of basic assumptions that a group has created, discovered or developed in its process of learning in order to deal with problems of either external fit internal integration. If these assumptions are considered valid, then they are taught to the other members of an organization, as the correct way of perceiving thinking and feeling changes. The adoption of a proactive environmental posture by a company has to be reflected in the changes of its organizational culture, the human resources management and the completeness of this organizational area as well. For this reason, organizational culture and human resources management become critical elements for the achievement of superior environmental patterns. The green organizational culture may be defined as a set of assumptions, values, symbols, and organizational artefacts that reflect either the desire or necessity of a company to operate in an environmentally correct way.

### **2.2.7 Organizational Learning**

Jabbour (2008) stated that organizational learning may be understood as a process where there is acquisition, interpretation and distribution of information that forms the organizational memory and states that companies that continuously enhance their ability of carrying out this process become learning organizations. Organizations which succeed in having dynamics of environmental learning and ecological competences developed by their employees may explore the opportunities related to green markets more quickly and effectively and the metaphor of organizational learning emerges as opportune in the attempt to explain the characteristics and the strategy of environmental management in companies.

### **2.2.8 Team work**

Neto (2010) stated that Team work requires meetings of people who possesses common beliefs and values. In this case, team work requires people who share respect for the environment. Team work for successful environmental projects, requires that team members accept responsibility for making efforts to achieve both individual and team objectives because the objectives of the team often mean going beyond one's own job and operating with a sense of empowerment. Thus, team work offers an opportunity for individuals to meet and find solutions for complex environmental problems.

### 2.2.9 Environmental Performance

Chien (2007) defined the environmental performance as the natural environmental impact of companies that perform business management, environmental performance indicators are divided into operating performance and management performance. The operating performance index refers to material cost, energy management, pollutant emission, and organisation physical environment assessment. The management performance index refers to the supply of effective administrative information and the contribution of environmental management to the whole organization.

### 2.3 Literature review for measures/questions of the questionnaire

In the developed survey questionnaire for all the variables of EMS model, each variable has 5 to 7 performance measures or questions for respondents to give their response by filling survey questionnaire. Table 1 shows the research papers based on performance measures of the questionnaire.

**Table 1 Performance measures for questionnaire**

S. No.	Constructs	No. of Items	References
1.	Management Support	7	Daily et al.(2007), Kaur (2011) and Singh (2011),
2.	Employee Empowerment	7	Singh (2011), Kaur (2011), Wee and Quazi (2005)
3.	Employee Training and Awareness	6	Daily et al.(2007), Sroufe (2003) and Perron (2006),
4.	Reward to employees	5	Daily et al.(2007), Kaur (2011), Wee and Quazi (2005)
5.	Recruitment & Selection	6	Othman(2009),
6.	Organizational Culture	7	Kalliath et al. (1996)
7.	Organizational Learning	5	Armstrong and Folly (2003)
8.	Team work	4	Daily et al.(2007) and
		1	Expert of concerned research area
9.	Environmental Performance	7	Daily et al.(2007), Kaur (2011),



		Sroufe (2003)
<b>Total Performance measures/questions</b>	<b>55</b>	

### 3. Development of Survey Questionnaire

The study will be conducted for sample size of 200; as shown in survey questionnaire form (Table 1A (Appendix A) which will be filled by managers/engineers/Senior officials working in different sector and area of manufacturing industries. The convenient purpose sampling procedures are used to collect data from employees/officers working in industries. Data will be collected on the basis of questionnaire related to EMS-HR dimensions such as Management Support, Employee empowerment, Employee Training, Reward to employee, Recruitment and selection, Organizational Culture, Organizational Learning, Team work and Environmental Performance. Apart from this industrial information are also collected on the basis of certain factors such as, name and address of organization, Type of Product, Sector, size of organization, Turnover and no. of Employees etc.

#### 3.1 Survey Questionnaire: a Research Instrument

To develop the survey instruments, a pool of items was identified from the literature for measuring the parameters of the research model. Available and appropriate existing items that had been empirically tested were adopted and utilized for research as in Table 1. Most of the items are modified from their original scale to accommodate the current context of the study. The first version of the questionnaire was based on the previous research in the field. To best adapt questionnaire items, a panel of industrial expert and academic expert was requested to evaluate the items and give their comments on the items of the questionnaire. All of the information provided by the experts was used to improve several of the questions and items further. All the 55 measures used in this study are reported in the Table 1A (Appendix A).

#### 3.2 Content Validity

All measures of the survey instruments are developed from the literature. The expressions of the items were adjusted, where appropriate, to the context of EMS as shown in Appendix A. Respondent are asked to rate the items which will be measured on a five point Likert interval rating scale from (1=Highly Disagree, 2=Disagree, 3=Not sure, 4=Agree, 5=Highly Agree).

### 3.3 Data collection method

Data collection will be done by filling of questionnaire through direct personnel interview with managers or sending out the questionnaire to manufacturing companies through registered post. Manufacturing companies were chosen as target respondents because their operations have a larger impact on the environment compared to other sectors; questionnaire will be more suitable for manufacturing companies.

Target respondent selected from various industrial areas of India. Questionnaire addresses to either the managing director or chief executive officer of the target organizations. This was done because of the fact that all the sample companies may not have environmental management representatives or environmental departments. It was also not feasible to contact each company to determine the appropriate person to complete the questionnaire. Therefore, it was left to either the managing director or the chief executive officer to decide on the appropriate person to complete the questionnaire.

### 3.4 Development of EMS-HR Performance Measures for the Survey Instrument according to current context of research

Some of the items were modified from their original scale to accommodate the current context of the study as suggested by panel of experts.

#### 3.4.1 Management Support

Item nos. 1 to 4 are taken from Daily et al. (2007) and Item No. 5 to 7 are taken from Kaur (2011)

**Item No. 1:** stated as: “Top management at our facility treats EMS as an important issue” and re-stated as: “Management treats Environmental management system (EMS) as an important issue”.

**Item No. 2:** stated as: “Top management at our facility allocate adequate resources to EMS efforts” and re-stated as: “Management allocates adequate resources to EMS efforts”.

**Item No.3:** stated as: “Top management at our facility allows employees to spend time on EMS efforts” and re-stated as: “Management allow employees to spend time on EMS efforts”.

**Item No.4:** stated as: “Top management at our facility follows up suggestions for improvement on EMS” and re-stated as: “Management follow up suggestions for improvement on EMS”

**Item No.5:** stated as: “Top management frequently communicates the organization's environmental goals to employee” and re-stated as: “Management frequently communicates the organization's environmental goals to employees”.

**Item No.6:** stated as: “Top management is committed to employee training and education in environmental management” and restated as: “Management is committed to employee environmental training and education”.

**Item No.7:** stated as: “Top management provides employees training on interactive skills, team building, bench marking, brainstorming and consensus building” and re-stated as: “Management benchmark its environmental performance with other industries”.

### 3.4.2 Employee Empowerment

Item nos. 8, 10, 11, 12, 13 and 14 are taken from Kaur (2011) and Item No.9 is taken from Singh (2011).

**Item No.10:** stated as: “I feel free to discuss my concerns with someone in management other than my immediate supervisor” and re-stated as: “Employee feel free to discuss their concern with in management other than their immediate supervisor”.

**Item No. 11:** stated as: “Most employee suggestions are implemented” and re-stated as: “The Suggestions of employee are implemented”.

**Item No. 12:** stated as: “Cross functional teams are often used” and re-stated as: “Cross functional teams are often used for environmental performance improvements”.

**Item No. 13:** stated as: “I am not punished for environmental improvements ideas that are unsuccessful” and re-stated as: “Employees are not penalized for unsuccessful environmental improvements ideas”.

**Item No.14:** stated as: “Managers and supervisors rarely allow employees to take necessary action on their own” and re-stated as “Managers and supervisors rarely allow employees to take action on their own for environmental related activities”.

### 3.4.3 Training and Awareness

Item nos. 15 and 16 are taken from Daily et al. (2007) and item No.17 is taken from Sroufe (2003). Item No. 18 and 19 are taken from Perron (2006) and Item No. 20 is taken from Wee (2005).

**Item No. 15:** stated as: “We have many opportunities to get EMS training about EMS in our facility” and re-stated as: “Employee have many opportunities to get EMS training”



**Item No. 16:** stated as: “I am satisfied with the EMS training provided by our facility” and re-stated as: “Employees are satisfied with the EMS training provided by organization”

**Item No. 17:** stated as: “Environmental issues, policies and procedures are included in training” and restated as: “Environmental issues, policies and procedures have been included in training”.

**Item No.18:** stated as: “The environmental management training has contributed to your understanding of the environmental impacts of the company” and re-stated as: “Training has contributed to employees understanding for the environmental impacts of the organization”

**Item No.19:** stated as: “you feel better equipped to make environmentally responsible decisions due to the environmental training' and re-stated as: “Employee feel better equipped to make environmental oriented decisions due to environmental training”.

#### 3.4.4 Reward to Employees

Item No. 21 to 25 are taken from Kaur (2011).

**Item No. 21:** stated as: “Supervisors in my department give credit to people when they work on EMS improvements” and re-stated as: “Organizations provides incentives to employees for EMS improvements”.

**Item No.22:** stated as: “In the past, our organization has been known to discipline an employee for violating environmental policies and procedures” and re-stated as: “The organization has been known to discipline an employee for violating environmental policies and procedures”.

**Item No.23:** stated as: “Employee are recognized for taking initiatives for environmental management through company environmental awards to individuals or teams” and re-stated as: “Employees are recognized for taking initiatives for environmental performance improvements”.

**Item No. 24:** stated as: “Achievements of environmental goals is used as one of the criteria in my performance appraisal” and re-stated as: “Achievements of environmental goals is used as one of the criteria for employee's performance appraisal”.

**Item No. 25:** stated as: “I feel that if I do not contribute to improving environmental performance, my chance of career advancement will be negatively affected” and re-stated as: “Employees feel that if they do not contribute to improve environmental performance, than their chance of career advancement will be negatively affected”.

### 3.4.5 Recruitment and Selection

Item nos. 26 to 31 are taken from Ekhsion (2009).

**Item No. 26:** stated as: “Recruitment and selection based on job analysis” and re-stated as: “Recruitment and selection is based on job analysis related to EMS”

**Item No. 27:** stated as: “Recruitment and Selection process are linked with corporate strategy” and re-stated as: “Recruitment and selection is based on corporate environmental strategy”.

**Item No. 28:** stated as: “Recruitment and selection process are integral part of HR strategy” and restated as “Recruitment and selection process is an integral part of environmental performance strategy”

**Item No.29:** stated as: “Recruitment/ Selection include development and succession plans” and re-stated as: “recruitment and selection include development and succession plans related to EMS”.

**Item No. 30:** stated as: “Appropriate skills are in place to support the strategies” and re-stated as: “Appropriate skills are in place to support the environmental strategies”.

**Item No. 31:** stated as: “Induction, training/development and mentoring programs are available” and re-stated as: “Induction, training/development and mentoring programs are available for EMS”.

### 3.4.6 Organizational Culture

Item Nos. 32 to 38 are taken from Kalliath et al.(1999)

**Item No.32:** stated as: “Managers in my facility are risk takers. They encourage employees to take risks and be innovative” and re-stated as: “Mangers in the organization are risk takers for EMS”.

**Item No. 33:** stated as: “Managers in my facility are risk takers. They encourage employee to take risks and be innovative” and re-stated as: “Management encourage employee to take risks and be innovative”.

**Item No. 34:** stated as: “Managers in my facility are rule enforcers. They expect employees to follow established rules, policies, and procedures' and re-stated as: “Managers in the organization are rule enforcers and they expect employees to follow established rule, policies, and procedures for EMS”.

**Item No. 35:** stated as: “My facility emphasis permanence stability keeping things the same is important”, and re-stated as: “Organization emphasize on the stability of environmental outcomes”.

**Item No. 36:** stated as: “The glue that holds my facility together is loyalty and tradition commitment to this facility runs high' and restated as: “The glue that holds the organization and employee together is loyalty and tradition”.

**Item No. 37:** stated as: “My facility emphasizes human resources high cohesion and morale in the organization are important” and re-stated as: “High cohesion and morale in the organization are important”.

**Item No. 38:** stated as: “Managers in my facility are coordinators and coaches. They help employees meet the facility's goals and objective” and re-stated as: “Managers in the organization are coordinators and coaches and help employees meet the organization's environmental goals and objective”.

### 3.4.7 Organizational Learning

Item Nos. 39 to 43 are taken from Armstrong and Folly (2003).

**Item No. 39:** stated as: “Learning and development plans are linked to ABC's vision, mission and goals” and re-stated as: “Learning and development plans are linked to company's environmental performance vision, mission and goals”.

**Item No. 40:** stated as: “ABC sees developing staff as essential to organizational success” and restated as: “The organization sees developing staff essential to EMS success”

**Item No. 41:** stated as: “ABC is an organization that encourages me to learn and develop to my full potential” and re-stated as: “The organization encourages employee to learn and develop to their full potential of EMS”.

**Item No. 42:** stated as: “ABC's learning and development plans focus on continuous organizational improvements” and re-stated as: “The organization's learning and development plans focus on continuous organizational EMS improvement”.

**Item No. 43:** stated as: “ABC has a comprehensive and structured organizational planning process which regularly sets and reviews short and long term organizational goals: and re-stated as: “The organization has a comprehensive and structured organizational planning process which regularly sets reviews short and long organizational goals related to environment”.

### 3.4.8 Team work

Item No. 44 to 47 are taken from Daily et al. (2007) and Item No.48 is suggested by one academic expert of the concerned area.

**Item No. 44:** stated as: “we frequently use EMS teamwork to solve EMS problems” and re-stated as: “Employees frequently use teamwork to solve EMS problems”.

**Item No. 45:** stated as: “we get a amount of EMS information from our EMS teamwork” and re-stated as: “Employees get a great amount of EMS information from their EMS team work”.

**Item No. 46:** stated as: “I have an opportunity to express my opinion about EMS issues in team meetings” and re-stated as: “Employees set opportunities to express their opinion and EMS issues in team meetings”.

**Item No. 47:** stated as: “people in our facility attend team meetings on EMS frequently” and re-stated as: “Employees in the organization frequently attend team meetings on EMS”.

### 3.4.9 Environmental Performance

Item nos. 49 to 52 are taken from Daily et al. (2007) and item no.53 is taken from Kaur (2011). Item nos. 54 and 55 are taken from Sroufe (2003).

**Item No. 49:** Stated as: “Our facility's EMS efforts have significantly reduced waste within the production process” and re-stated as: “The organization's EMS efforts have significantly reduced waste with in the production process”.

**Item No. 50:** stated as: “Our facility's EMS efforts have significantly improved product quality” and re-stated as: “The organization's EMS efforts have significantly improved product quality”.

**Item No. 51:** stated as: “Focusing on EMS has enhanced our facility's reputation” and restated as: “Focusing on EMS has enhanced organization's reputation”.

**Item No.52:** stated as: “our facility's EMS efforts have lead to improved facility performance” and re-stated as: “organizational EMS efforts have lead to improved organization performance”.

**Item No. 53:** stated as: “Managers and supervisors encourage activities that improve customer satisfaction” and re-stated as “Environmental activities that improve customer satisfaction”.

**Item No. 55:** stated as: “reasons for environmental problems are attacked” and re-stated as: “reasons for poor environmental performance are attacked”.

#### 4. Limitation of the research

Some limitations of the research are discussed in this section.

- **Complexity of measures:**

Some measures of the questionnaire may seem to be difficult to understand by the respondents. Due to complexity of the measures; respondents may leave the response. Though; an option of 'not sure' has been included in the questionnaire for the respondents.

- **Lack of availability of literature:** Researchers face the lack of availability of literature on some issues which are not available in the literature.

- **Lack of interest of industry for providing data**

Researchers may face the problem for getting filled the survey questionnaire from industry people because of either lack of interest for filling survey questionnaires or due to their busy working schedule.

- **Lack of knowledge of respondent**

Sometimes respondent may have lack of knowledge on the topic of the survey questionnaire.

#### 5. Conclusions

Environmental performance is defined by ISO 14031 as an organization's success in managing the relationship between its activities, products or services and the natural environment. Thus, reducing the environmental impact created from an organization's activities, products and services, improve environmental performance. Environmental impacts are reduced through environmental management system (EMS) based on EMS model and designed on the basis of different EMS-HR variables. Different variables for EMS model will be finalized through data received from respondent and will be analyzed in statistical software. Data will be received from respondents through filling of survey questionnaire. A survey questionnaire will be developed on the basis of different measures of HR variables which are taken from available research literature. This paper reported that how survey questionnaire has been developed and designed for analysis of an EMS model. The designed EMS model will be surly beneficial for different manufacturing industries for managing environmental performance.



## References:

1. Armstrong A. and Foley Patrick (2003) ' Foundations for a learning organization : organization learning mechanisms', *The learning organization*, vol.-10, No.2, pp 74-82.
2. Banerjee S.B.(2001) 'Corporate environment strategies and actions', *Management decision* 39/1, pp. 36-44, <http://www.emerald-library.com/ft>
3. Beamon B.M.(1999) 'Designing the Green Supply chain', *Logistic information management*, vol.-12, no.-4, pp.332-342.
4. Bekiroglu C. Erdil oya and Alpkam L. (2011) ' variables perceived by managers as antecedents that lead firms to environmental management :an empirical research in the Turkish construction sector', *procedia social and behavioral sciences*,vol.-24, pp 101-122.
5. Bergmiller Gary G. and McCright Paul R.(2009) 'Lean Manufacturers' Transcendence to Green Manufacturing', Proceedings of the 2009 Industrial Engineering Research Conference.
6. Boohene R.(2011) ' The effect of Human Resources management practices on corporate performance: A study of Graphic communications Group Limited', *International Business Research* , Vol.-4, No.-1, pp 266-272.
7. Brio J.A.D. & Junquera B.(2003) ' A review of the literature on environmental innovation management in SMEs: implications for public policies', *Technovation*, vol.-23, 2003, pp 939-948
8. Calder A. (2012) ' Recruitment and Selection in small and medium sized enterprises' , otago management graduate review, vol.10, pp 1-7
9. Chien, M. K.and Shih, L. H.,(2007a) 'An empirical study of the implementation of green supply chain management practices in the electrical and electronic industry and their relation to organizational performances.', *Int. J.Environ. Sci. Tech.*, 4 (3), 383-394.
10. Chien, M. K.and Shih, L. H.(2007b) 'Relationship between management practice and organisation performance under European Union directives such as RoHS: A case-study of the electrical and electronic industry in Taiwan' , *African Journal of Environmental Science and Technology*, Vol.1(3), pp.037-048..
11. Comoglio C. and Botta S. (2012) 'The use of indicators and the role of environmental management systems for environmental performance improvement : a survey on ISO 14001 certified companies in the automotive sector', *Journal of Cleaner production*, vol.-20, pp 92-102.
12. Curkovic Sime (2003) ' Environmentally Responsible Manufacturing : The development and validation of a measurement model', *European Journal of operation research*, vol.146, pp130-155
13. Daily B.F. and Huang S.C.(2001) 'Achieving sustainability through attention to human resource factors in environmental management', *International Journal of operations and production management* , vol.-21, No.-12, pp 1539-1552.
14. Daily B.F.,Bishop J.W. and Steiner R S (2007) 'The mediating Role of EMS Team work as it pertains to HR factors and perceived environmental performance', *Journal of applied Business Research*, Vol.-23, No.-1, pp 95-110.

15. Darnall N., Henriques I. and Sadorsky P.(2008) 'Do environmental management systems improve business performance in an international setting?', *Journal of international management*, vol.14, pp 364-376.
16. Demendonca M. and Baxter T.E.(2001) 'Design for the environment (DFE), An approach to achieve the ISO 14000 international standardization', *Environmental Management and Health*, Vol. 12, No. 1, pp. 51-56.
17. Ellram LM., Tate Wendy and Carter C.R.(2008) 'Applying 3 DCE to environmentally responsible manufacturing Practices', *Journal of cleaner production*, vol.-16, pp 1620-1631.
18. Gamero M.D.L., Azorin J.F.M. and Cortes E.C.(2009) 'The whole relationship between environmental variables and firm performance: competitive advantage and firm resources as mediator variables', *Journal of environmental management* , pp 1-12.
19. Govindarajulu and Bonnie E Daily(2004) 'Motivating Employees for Environmental improvement', *Industrial management and Data systems*, vol.-104, No.-4, pp 364-372.
20. Handfied R, Walton S.V., Sroufe R and Melnyk S.A. (2002) ' Applying environmental criteria to supplier assessment : a study in the application of the analytical hierarchy process', *European Journal of operational Research* , vol.- 141, pp 70-87.
21. Henri J.F. and Journeault M.(2008) 'Environmental performance indicators: an empirical study of canadian manufacturing firms', *Journal of environmental management* , vol.87, pp 165-176.
22. Jabbour C.J.C., Jabbour A.B.L.D.S., Govindan K., Teixeira A.A. and Freitas W.R.D.S. (2013) ' Environmental management and operational performance in automotive companies in Brazil: the role of human resource management and lean manufacturing' , *Journal of Cleaner Production*, Vol.47, pp 129-140.
23. Jacobs B.W., Singhal V.R. and Subramanian R.(2010), ' An empirical investigation of environmental performance and the market value of the firm', *Journal operations management*, Vol.28, pp 430-441.
24. Jimnez J.D.B. and Lorente J.J.C.(2001) 'Environmental performance as an operations objective', *International Journal of operation & production management* ,vol.-21, No.-12, pp 1553-1572.
25. Jobbour C.J.C. and Santos F.C.A. (2008) 'Relationships Between human resource dimensions and environmental management in companies: proposal of a model', *Journal of cleaner Production*, vol.-16, pp 51-58
26. Kalliath, T.J., A.C. Bluedom and D.F.Gillepsi (1999) 'A confirmatory factor analysis of the competing values instrument', *Educational and Psychological measurement*, vol.59, No.1, pp 143-158.
27. Kaur Harjeet(2011a) 'Impact of HR factors on employee attitudes: an empirical analysis of a sample of ISO 14001 EMS companies in Malaysia', *Journal of Public administration and Governance* ,vol.-1, No.-1, pp 174-196.
28. Kaur Harjeet (2011b) 'Impact of Human Resources factors on perceived environmental performance : an empirical analysis of a sample of ISO 14001 EMS companies in malayasia' , *Journal of sustainable Development*, Vol-4, No.-1, pp -211-224.

29. Kovach K.A.(1987) 'What Motivates Employees ? ,workers and supervisors .Give Different answers', *Business Horizons* , pp 58-65.
30. Kumari Neeraj (2012) ' A study of the Recruitment and Selection process: SMC Global ', *Industrial Engineering letters*, vol.2, No.-1, pp 34-43.
31. Lin R.J.(2011), ' Moderating effects of total quality environmental management on environmental performance ', *African journal of business management*, Vol.-5, No.-20, pp 8088-8099.
32. Lundberg K., Balfors B. and Folkeson L.(2009) 'Framework for environmental performance measurement in a swedish public sector organization', *Journal of Cleaner Production*, vol.17, pp 1017-1024.
33. Mandip Gill (2012) 'Green HRM : People Management commitment to environmental sustainability', *Research journal of Recent Sciences* , vol.-1, pp 244-252.
34. Melnyk S.A., Sroufe R.P. and Calantone R. (2003) 'Assessing the impact of environmental management systems on corporate and environmental Performance', *Journal of operations management*, vol.21, pp 329-351.
35. Montabon F., Sroufe R. and Narasimhan R. (2007) 'An examination of corporate reporting, environmental management practices and firm performance', *Journal of operations Management*, vol.25, pp 998-1014.
36. Nawarocka D. and Parker T. (2009) ' Finding the connection : environmental management system and environmental performance', *Journal of Cleaner production*, vol. 17, pp 601-607.
37. Nee G.Y. (2011) 'Determining Factors for ISO 14001 EMS Implementation among SMEs in Malaysia: A resource based view', *world academy of science, engineering and Technology* , vol.-59, pp -1294-1299.
38. Neto A.S. and Jabbour C.J.C.(2010) 'Guide lines for improving the adoption of cleaner production in companies through attention to non technical factors: Aliterature review', *African Journal of Business Management* , vol.-4, No.19, pp 4217-4229.
39. Olugu E U, Wong K Y and Shaharoun A M (2010) 'A Comprehensive Approach in Assessing the Performance of an Automobile Closed-Loop Supply Chain', *Sustainability- 2010*, vol- 2, pp 871-889, [www.mdpi.com/journal/sustainability](http://www.mdpi.com/journal/sustainability)
40. Othman, A.E.A. (2009) 'Recruitment Selection and training development practices: value added contribution towards organizational effectiveness ', *Economics & administrative series*, No.-3, pp 73-100.
41. Perron G.M. ,Cote R.P. and Duffy J.F. (2006) 'Improving Environmental awareness training in business'' *Journal of Cleaner Production*,Vol.-14, pp 551-562
42. Prieto L.C., Gilmore J. and Osiri J.K.(2009) 'Environmental Leadership Development: A Framework for Designing and Evaluating a Training Program', *European Journal of Social Science*, Vol.-9, No.-4, pp 586-593.
43. Pun K F (2006) 'Determinants of Environmentally Responsible operations: a review', *International Journal of Quality and Reliability Management*, vol. 23, No.- 3, pp 279-297.

44. Pun K F , Hui I K ,Lau H.C.W. and Law H.W. (2002) 'Development of an EMS planning framework for environmental management practices', *International Journal of Quality & Reliability Management* , vol.-19, No.-6, pp 688-709.
45. Rao P (2002) 'Green the supply chain: a new initiative in south East Asia', *International journal of operation & production management*, vol.-22, No.-6, pp. 632-655.
46. Singh PJ & Sangwan KS (2011) 'Management Commitment and Employee Empowerment in Environmentally Conscious Manufacturing Implementation', *Proceedings of the World Congress on Engineering 2011, Vol I, WCE 2011, July 6 - 8, 2011, London, U.K.*
47. Sroufe Robert (2003) 'Effects Of Environmental Management Systems on Environmental Management Practices and Operations', *Production and Operations Management*, Vol. 12, No. 3, Fall 2003.
48. Sujatha R. and Basu S.(2013) ' Human Resources Dimensions for Environmental management system : Evidence from two indian fertilizer firms' , *European journal of business and management* , vol.5, no.9, pp 54-61.
49. Wee Y S and Quazi H. A.(2005) 'Development and Validation of critical factors of environmental management', *Industrial management and Data system*, Vol.-106, No.- 1, pp 96-114.
50. Wu Guo-Ciang, Cheng Yu-Hui and Huang Shin-Ying (2010) 'The study of knowledge transfer and green management performance in green supply chain management', *African Journal of Business Management*, Vol.4 (1), pp. 044-048.
51. Yang Ma Ga, Hong Paul and Modi Sachin B(2011) 'Impact of lean manufacturing and environmental management on business performance: An empirical study of manufacturing firms', *Int. J. Production Economics*, 129, pp 251–261
52. Zeng S. X., Meng X.H., Zeng R.C., Tam C.M., Tam V.W.Y. and Jin T. (2011) ' How environmental management driving forces affect environmental and economic performance of SMEs : a study in the Northern china district', *Journal of Cleaner Production*, Vol.19, pp 1426-1437.
53. Zhu Qinghua and Sarkis Joseph (2004) 'Relationship between operational practices and Performance among early adopters of green supply chain management practices in chinese manufacturing enterprises', *journal of operations Management* 22, pp 265- 289

## Appendix-A

### Table 1A Questionnaire for Survey (a Research Instrument)

#### Management Support

- Item1: Management treats Environmental Management System(EMS) as an important issues
- Item2: Management allocates adequate resources to EMS efforts
- Item3: Management allows employees to spend time on EMS efforts
- Item4: Management follow up suggestions for improvement on EMS
- Item5: Management frequently communicates the organization's environmental goals to employees
- Item6: Management is committed to employee environmental training and education
- Item7: Management benchmarks its environmental performance with other industries

#### Employee Empowerment

- Item8: Employees can express their opinions openly and frequently without fear of reprisal
- Item9: Employee are encouraged for giving suggestions for environmental performance improvements
- Item10: Employees feel free to discuss their concerns with in management other than their immediate supervisor
- Item11: The suggestions of employee are implemented
- Item12: Cross functional teams are often used for environmental performance improvements
- Item13: Employees are not penalized for unsuccessful environmental improvement ideas
- Item14: Managers and Supervisors rarely allow employees to take action on their own for environmental related activities.

#### Training and Awareness

- Item15: Employees have many opportunities to get EMS training.
- Item16: Employee are satisfied with the EMS training provided by organization.
- Item17: Environmental issues, policies and procedures have been included in training.
- Item18: Training has contributed to employee's understanding for the environmental impacts of the organization.
- Item19: Employee feel better equipped to make environmental oriented decisions due to environment training.
- Item20: Training promotes continuous learning for EMS.

#### Rewards

- Item21: Organization provides incentives to employees for EMS improvements
- Item22: The organization has been known to discipline an employee for violating environmental policies and procedures.
- Item23: Employees are recognized for taking initiatives for environmental performance improvements
- Item24: Achievement of environmental goals is used as one of the criteria for employee's performance appraisal
- Item25: Employees feel that if they do not contribute to improve environmental performance, than their chance of career advancement will be negatively affected.

#### Recruitment and Selection

- Item26: Recruitment and Selection is based on Job analysis related to EMS.
- Item27: Recruitment and Selection is based on corporate environmental strategy
- Item28: Recruitment and Selection process is an integral part of environmental performance strategy
- Item29: Recruitment and Selection include development and succession plans related to EMS.
- Item30: Appropriate skills are in place to support the environmental strategies.
- Item31: Induction, training/development and mentoring programs are available for EMS

#### Organizational Culture

- Item32: Mangers in the organization are risk-takers for EMS.
- Item33: Management encourage employees to take risks and be innovative.



Item34: Managers in the organization are rule-enforcers and they expect employees to follow established rules, policies, and procedures for EMS

Item35: Organization emphasizes on the stability of environmental outcomes .

Item36: The glue that holds the organization and employee together is loyalty and tradition.

Item37: High cohesion and morale in the organization are important.

Item38: Managers in the organization are coordinators and coaches and help employees meet the organization's environmental goals and objectives.

#### **Organizational Learning**

Item39: Learning and development plans are linked to company's environmental performance vision, mission and goals.

Item40: The organization sees developing staff essential to EMS success.

Item41: The organization encourages employee to learn and develop to their full potential of EMS

Item42: The organization's learning and development plans focus on continuous organizational EMS improvement

Item43: The organization has a comprehensive and structured organizational planning process which regularly sets reviews short and long term organizational goals related to environment

#### **Team work**

Item44: Employees frequently use teamwork to solve EMS problems.

Item45: Employees get a great amount of EMS information from their EMS teamwork

Item46: Employees set opportunities to express their opinion and EMS issues in team meetings

Item47: Employees in the organization frequently attend team meetings on EMS

Item48: Organization has a cross functional team to solve environmental, health & safety issues

#### **Environmental Performance**

Item49: The organization's EMS efforts have significantly reduced waste with in the production process

Item50: The organization's EMS efforts have significantly improved product quality.

Item51: Focusing on EMS has enhanced organization's reputation

Item52: Organizational EMS efforts have lead to improved organization performance.

Item53: Environmental activities that improve customer satisfaction

Item54: Environmental performance is periodically captured and summarized

Item55: Reasons for poor environmental performance are attacked.

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