

Impact of Human Resource Factors on Perceived Environmental Performance: an Empirical Analysis of a Sample of ISO 14001 EMS Companies in Malaysia

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Abstract

Increasing employee motivation for environmental endeavors continues to be poorly understood. The literature suggests that management commitment, employee empowerment, feedback and review, and rewards may be significant predictors of environmental performance and hence successful environmental management system (EMS) implementation. This paper aims to ascertain the relationships between the aforementioned human resource factors with perceived environmental performance using a sample of middle and lower level employees in five manufacturing companies. All five companies are currently certified to ISO 14001 EMS and moreover four are recipients of the Malaysian Prime Minister's Hibiscus Award (PMHA). A total of two hundred and twenty three survey responses were analyzed using the SPSS computer program version 16. The results of the regression analysis suggest that management commitment, feedback and review, and empowerment have a significant positive relationship to perceived environmental performance. However, the relationship between rewards and perceived environmental performance was statistically insignificant.

Keywords: ISO14001, EMS, Human resource factors, Malaysian, Environmental performance

1. Introduction

An environmental management system (EMS) provides the framework for continual environmental improvement through effective management of an organization's environmental impacts. The most well-known and accepted EMS is the ISO 14001 standard on environmental management established by the International Organization for Standardization (ISO). The ISO 14001 EMS guidelines' strong emphasis on pollution prevention can save companies money by improving efficiency and reducing costs of energy, materials, fines and penalties (Rondinelli & Vastag, 2000). Quazi's (1999) seven case studies in Singapore revealed that companies attained substantial monetary savings from ISO 14001/EMS implementation through recycling activities, reduced energy consumption, product and process modification, reduction in chemical use, process improvements for pollution prevention, and prevention of chemical emissions. In particular, difficulty in securing employee commitment was found to be common for the majority of the companies surveyed (Quazi, 1999). In Malaysia, the results of a mail survey administered to thirty eight companies showed that ISO14001 implementation did not motivate employees nor encouraged them to work willingly in teams (Tan 2005). Although support from top managers is crucial to EMS success, proactive environmental initiatives often come from middle and lower parts of the organization (Pun, Hui, Lau, Law & Lewis, 2002). For example, research findings in the quality management literature suggest that production workers are more important to their pollution prevention efforts than R&D staff, suppliers, customers or consultants (Florida, 1996). Despite the significant role production workers play in improving the companies' environmental performance there have been relatively few studies that have investigated shop floor reactions to EMS via survey questionnaire. Further studies in this area are now required.

Sparse research exist in the literature examining the impact of soft elements in the implementation of an environmental management system (Daily and Huang, 2001; Daily, Bishop & Steiner, 2003, 2007; Fernandez, Junquera & Ordiz, 2003; Govindarajulu and Daily, 2004, Wee and Quazi, 2005). Rigorous attempts to identify the critical success factors of environmental management began with Wee and Quazi (2005). Of the seven critical factors for environmental management identified, three are human resource factors: top management commitment, employee involvement and training. However, Wee and Quazi did not test the relationship between the critical success factors with environmental performance.

Daily et al., (2003, 2007) studied the impact of human resource (HR) factors on employees' perception of environmental performance using a sample of 437 employees in teams at various levels within and across departments of a large organization with a well-developed EMS program. The facility is ISO 14001 certified. The findings suggest that management support for an EMS, EMS training, employee's psychological empowerment, teamwork and EMS rewards have a significant relationship to perceived environmental performance and may be significant predictors of success or failure in the implementation of an EMS. Recently, Govindarajulu and Daily (2004, p. 365) presented a comprehensive theoretical framework for environmental performance by looking at the crucial employer and employee factors affecting environmental performance. The model emphasizes on the integration of management commitment, employee empowerment, rewards, feedback and review, and

environmental performance. To the best of the author's knowledge, no published journal articles to date have empirically validated the framework. Therefore, the aim of this paper is to address this void. The study will benefit companies in their effort to maximize employee motivation for successful ISO14001 EMS implementation. Moreover the paper will be of value to future researchers exploring the environmental management practices and environmental performance link.

2. Human Resource factors affecting an EMS

A review of the relatively sparse body of literature of companies participating in environmental management systems seem to indicate that soft factors may be significant organization variables affecting environmental performance (e.g. Govindarajulu & Daily, 2004; Daily, et al. 2003, 2007; Fernandez, et al. 2003; Daily & Huang, 2001). Sections 2.1 to 2.4 highlight the significance of management commitment, empowerment, rewards, and feedback and review for environmental performance.

2.1 Management Commitment

Numerous authors highlight the significance of top management commitment for successful environmental management (e.g. Chin & Pun, 1999; Daily & Huang, 2001; Kitazawa & Sarkis, 2000; Rezaee & Elam, 2000; Strachan, Sinclair & Lal, 2003; Quazi, 1999; Wee & Quazi, 2005). Cultural change is essential to support the successful implementation of environmental source reduction (Kitazawa & Sarkis, 2000). Strachan (1997) suggest that the systems of management recommended by BS7750, EMAS and ISO 14001 must be revised and stress on mechanistic solutions should be replaced with more participatory forms of management. Mallak and Kurstedt (1996) explained that when companies shift to more open forms of participative management, they begin the process of empowering their employees.

Top management within an environmentally proactive organization should strive to cultivate a strong culture that allows its employees the freedom to make environmental improvements without excessive management intervention (Daily & Huang 2001, Daily, et al., 2003, 2007; Govindarajulu & Daily, 2004) and promote innovation and risk taking (Govindarajulu & Daily, 2004; Ramus, 2001; Ramus & Steger, 2000). Employees should also be allowed inputs for improvement and time for experimentation (Woods 1993 cited in Govindarajulu & Daily 2004, p. 366). Top management's commitment could help EMS implementation because it allows commitment of resources such as time, money and staff (Hersey, 1998; Zutshi & Sohal, 2003; Zutshi & Sohal, 2004). Companies committed to ISO 14000 environmental management systems implementation require top management to come up with resources for training and process improvements (Chattopadhyay, 2001). Without the availability of adequate resources organizations can experience delays in adoption and completion of EMS. Furthermore, adequate resources are essential and important because they convey to employees that management is committed to the success of implementing the EMS (Daily, et al., 2003, 2007; Kirkland & Thompson, 1999).

In addition, the organization's environmental programs, initiatives, and goals should be communicated frequently to all employees (Daily & Huang, 2001; Daily, et al. 2003, 2007; Govindarajulu & Daily, 2004). Survey findings by Madsen and Ulhoi (2001) showed that employees in European companies are generally not sufficiently informed about environmental issues. According to Epstein and Roy (1997) communication may inspire employees to suggest new ways to effectively reduce the organization's environmental impacts. Employees are likely to eco-innovate when line managers adopt a democratic, participatory and open style of communication in regards to environmental ideas (Ramus, 2001; Ramus & Steger, 2000).

Another element essential in signifying management's commitment to environmental improvement is the provision of environmental training and education for the workforce which has been long recognized as a critical ingredient in promoting and implementing environmental management practices in business organizations (Dechant & Altman, 1994; Madsen & Ulhoi, 2001; Wee & Quazi, 2005; Zutshi & Sohal, 2004). All employees working within the organization, irrespective of their department or position should be provided general awareness training (Strachan, et al., 2003; Zutshi & Sohal, 2004). Employees that have key roles for influencing environmental impacts and the organization's EMS receive more detailed training. Training should include environmental policy and the requirements of an EMS, relevant objectives and targets, job specific environmental effects, the benefits of improved performance, and the consequences of non-compliance (Chin & Pun, 1999; Rondinelli & Vastag, 2000).

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

H1: Management commitment for the ISO 14001 EMS will be positively related to perceived environmental performance

2.2 Empowerment

Similar to TQM initiatives where empowerment makes everyone responsible for quality in a manufacturing setting, organizations need to mature environmental responsibilities to that, similar, level (Sarkis, 2001). The case study of Kitazawa and Sarkis (2000) of the relationship between ISO 14000 and the continuous source reduction programmes of three industrial companies identified employee empowerment, employee willingness to make suggestions for improvement and management's effort to create employee participation in decision making as

crucial in managing continuous source reduction programs. Employee empowerment may play an integral part in the operational and corrective action categories of the ISO 14001 (Daily & Huang, 2001). According to Klinkers and Nelissen (1995) hierarchical management structures and top-down command and control processes may not conduct environmental programs successfully. Instead, environmental policies can be effectively implemented when people participate in the overall change processes.

Central to the effective operation of the EMS is employee involvement (EI). Employee involvement becomes a necessity because ISO 14001 EMS takes a systems approach for improving environmental performance, meaning that environmental responsibilities are no longer mandated to the environmental function but is coordinated with existing efforts in other areas of an organization such as operations, finance, quality, occupational health and safety (Affisco, Nasri & Paknejad, 1997; Bansal & Hunter, 2003; Watson & Emery, 2004). Remmen and Lorentzen's (2000) action research on employee participation and cleaner technology in five Danish firms emphasized the significant role of employee involvement in preventive environmental actions and pollution reduction. The authors concluded that employee participation can have a strong effect on changing working routines, affecting behavior and increasing environmental consciousness. The monetary savings generated by Dow Chemical's energy conservation and Waste Reduction Always Pays Programs (WRAP) have in large part occurred because of good EI planning and activities (Denton, 1999).

The use of teams in conjunction with extensive EI efforts may be conducive in encouraging employees to actively partake in proactive environmental prevention efforts (Govindarajulu & Daily, 2004). For example, Beard and Rees (2000, p. 27) describe the use of 'green teams' approach to the solving of environmental problems in one of the largest UK local authorities, Kent County Council. The green teams were used to generate ideas, enhance learning experiences, explore issues, identify conflict and focus action to enhance understanding about why, what, how, where and where to pursue the best practicable environmental options. Similar to uses in TQM, cross-functional teams may be particularly helpful in achieving environmental improvement across departments (Daily, et al. 2007; Govindarajulu & Daily, 2004). According to May and Flannery (1995) cross-functional teams are crucial for successfully identifying and solving waste problems that exists in different parts of the organization. The responsibility for environmental performance improvement is distributed between operation management, environmental, health and safety (EHS) department, management, R&D, production, purchasing, finance, quality and marketing (Hanna, Newman & Johnson, 2000; Hart, 1995; Zsidisin & Hendrick, 1998).

In light of the preceding discussion the following hypothesis is proposed for empirical testing:

H2: Employee empowerment will be positively related to perceived environmental performance.

2.3 Rewards

Environmental rewards can be implemented in the form of monetary and non-monetary rewards and recognition awards (Daily & Huang, 2001; Daily, et al. 2003, 2007; Govindarajulu & Daily, 2004; Ramus 2002; Ramus, 2001; Ramus & Steger, 2000). Daily and Huang (2001) claim that rewards reinforce empowerment and good-decision making, improving corrective and preventive measures employees initiate. In a study of eight oil and gas firms operating in the UKCS, Strachan, et al. (2003) discovered that rewards and recognition schemes were the main methods employed to sustain employee motivation for ISO 14001 EMS implementation. The case study at Cooke Brothers Ltd showed that recognition for work well done was an effective means of promoting positive attitudes and increased involvement at lower levels for the application of 5S as a means of improving environmental performance (O'hEocha, 2000). As a matter of fact, Dow Chemical believes cash awards for employees' innovative waste reduction ideas can actually be de-motivating. Instead of receiving cash awards, employees are awarded an engraved plaque given at formal awards ceremony (Denton, 1999). Empirical findings from six environmentally proactive European firms have shown that employees responded positively with creative ideas in the environmental area if their supervisors encouraged daily praise and company environmental awards (Ramus, 2001; Ramus, 2002; Ramus & Steger, 2000). Russo and Harrison (2005) showed by means of an empirical analysis that when managerial pay is tied to environmental performance, facilities reported improvements in their environmental performance.

On the contrary Denton's (1999) survey on the some of the best known pollution reducing companies in the world revealed that rarely are incentives, bonuses, salaries and promotions based on how well environmental goals were met. His findings also showed that employees' job appraisals rarely include an environmental category. According to Govindarajulu, Daily and Bishop (2003) the lack of formal individual performance assessment criteria in environmental programs may not provide significant motivation for employees to engage in environmental endeavors. In this regard, companies need to decide if environmental initiatives and improvements should be a part of employees' performance appraisal, as it could be a major motivating factor for some employees (Govindarajulu & Daily, 2004). Proactive environmental companies should also consider how promotion is linked to environmental performance, as it could be a major motivating factor for some employees.

Apart from positive rewards, sometimes negative reinforcements may be necessary for making employees perform certain environmental improvement tasks (Govindarajulu & Daily, 2004). In summary the literature suggest that

organizations committed towards achieving their sustainable environmental aspirations should ensure that appropriate rewards system exists to support and promote desired employee behaviors in the organization.

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

H3: Rewards will be positively related to perceived environmental performance.

2.4 Feedback and review

The strong emphasis ISO 14001 places on monitoring and measurement; nonconformance and corrective and preventive action, environmental management system audit and management review can be found in paragraphs 4.5.1, 4.5.2, 4.5.4 and 4.6 respectively. Despite the significance of feedback on individual and organizational performance, Chinander (2001) highlighted that many environmental management programs fail to stress the importance of feedback on environmental issues. According to Ramus (2001) the lack of clarity with regards to environmental goals and environmental responsibilities may actually inhibit employee participation in environmental work.

Informal verbal feedback in addition to formal written feedback concerning employees' impact and effectiveness on environmental improvement efforts may help motivate employees for environmental endeavours (Govindarajulu & Daily, 2004). Hence, employees will therefore need communication of specific environmental measures. This requires that the organization conduct thorough environmental monitoring on a continuous basis. Under ISO 14001 EMS, the organization is required to develop procedures to measure, monitor and evaluate its environmental performance (Affisco, Nasri & Paknejad, 1997). The monitoring and measurement activities are required to provide the proper feedback on the effectiveness of the environmental programs in place (Epstein & Roy, 1997). Organizations should continuously communicate the EMS progress to the employees through bulletins, visual management, newsletters and team meetings (Balzarova, Castka, Bamber & Sharp, 2006).

Having implemented the environmental management system, an organization must then check to ensure that it has been successful in meeting its environmental objectives and targets. If these have not been met, then corrective action is needed (Strachan, et al. 2003).

The checking and corrective action elements of the system help ensure continuous improvement by addressing root causes of non-conformances. It is at this stage that the auditing aspects are pertinent (Ann, Zailani & Wahid, 2006). Another form of review and source of feedback is the environmental audit (Govindarajulu & Daily, 2004; Rezaee & Elam, 2000). The environmental audit report received from the environmental auditor may be used to communicate areas for environmental improvements to employees (Govindarajulu & Daily, 2004).

To maintain continual improvement in environmental performance, ISO 14001 requires a periodic comprehensive review and proper documentation of the management system by top management and appropriate staff to ensure its continuing effectiveness and suitability (Abounaga, 1998; Chin & Pun, 1999; Kolk, 2000; Rezaee & Elam, 2000; Rondinelli & Vastag, 2000; Strachan, et al., 2003). Generally, management reviews involve critical assessments of internal audits, progress reports indicating the extent to which environmental goals and objectives have been met, non-compliance actions, the continuing suitability of the EMS in relation to changing conditions and information; and concerns amongst relevant interested parties (Rezaee & Elam, 2000; Netherwood 1998 cited in Bansal, 2005).

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

H4: Feedback and review will be positively related to perceived environmental performance.

3. Methodology

Five manufacturing companies currently certified to ISO 14001 EMS agreed to participate in the survey. Four out of the five participating companies are recipients of the Prime Minister's Hibiscus Award (PMHA), Malaysia's premier private sector environmental award for business and industry. The PMHA winners are expected to manifest superior leadership and human resource management and could become learning targets for other firms in the implementation of a successful EMS. In terms of size, four are large companies while the other is a small medium enterprise (SME). In general large enterprises are companies with full time employees exceeding 150 or with annual sales turnover exceeding RM25 million. Small and medium enterprises (SMEs) are companies with full time employees not exceeding 150 or with annual sales turnover not exceeding RM25 million (source: Malaysian International Chamber of Commerce & Industry, MICCI).

3.1 Survey Instrument

A copy of the survey is attached under Appendix A. Available and appropriate existing survey items that had been empirically tested were adapted and utilized to ensure reliability and validity. Some of the items were modified from their original scales to accommodate the current context of study. For example, an item taken from Flynn, et al. (1994) scale stated 'Information on quality performance is readily available to employees'. The item was restated to say, 'Information on environmental performance is readily available to employees'. The management commitment items were from Daily, et al. (2003, 2007), Grandzol and Gershon (1998) and Wee and Quazi (2005). The empowerment items were from Ahire and O'Shaughnessy (1998), Daily, et al. (2003, 2007), Grandzol and Gershon (1998), Howard and Foster (1999), Jun, Cai and Shin (2006), Wee and Quazi (2005). The feedback and review items were from Chinander (1997), Flynn, Schroeder and Sakakibara (1994), Howard and Foster (1999),

Ramus (2001), Ramus and Steger (2000), Wee and Quazi (2005). The rewards items were from Chinander (1997), Daily, et al. (2003, 2007), Ramus and Steger (2000), Wee and Quazi (2005). All scales were measured using a five-point interval scale (e.g., 1=strongly disagree, 5 = strongly agree). The environmental performance items were from Grandzol and Gershon (1998) and Wee and Quazi (2005). Perceived environmental performance was measured on a six-point interval scale (1=strongly disagree, 5 = strongly agree, 6 = not applicable). The 'not applicable option' is treated as missing value. The respondents to the survey were also required to provide information pertaining to: 1) educational level, 2) work department, 3) length of experience with current type of job, 4) length of service in the current organization, 5) gender, 6) age, 7) race, and 8) job title. The survey was translated from English to Malay by the researcher and all wording discrepancies were then corrected with the assistance of a qualified and experienced instructor.

3.2 Pilot study

Since management representatives and two technical committee members of the Malaysian PMHA were involved in the assessment of the survey, it was considered to be a part of the pilot-testing (see for example, Quazi, Khoo, Tan & Wong, 2001; Wee & Quazi, 2005; Zutshi & Sohal, 2003; Zutshi & Sohal, 2004; Zutshi & Sohal, 2005). The survey was adjusted accordingly based on their feedback. Additionally, an onsite survey was conducted in November 2 and 3, 2006 with eleven employees representing a variety of positions and functions within the small and medium enterprise (SME) currently certified to ISO 14001 and the recipient of the PMHA.

The pre-test group was asked to review the survey primarily for clarity of questions, and to comment on the length, layout as well as the time required to complete the survey. The eleven (11) survey responses were excluded from the final data analysis.

3.3 Sample

Within each company, a research coordinator (i.e. staff) served as a liaison between the researcher and the respondents of the survey. The coordinators were responsible for selecting employees, distributing and collecting questionnaires from the company. The stratified sampling approach was utilized in order to achieve heterogeneity among respondents to reduce the common survey bias (Jun, Cai & Shin, 2006). The sub grouping criteria are organizational level and work-departments. A pre-tested survey was distributed to four hundred and seventy two middle and lower level (472) employees in working various departments within the five manufacturing companies. A total of two hundred and thirty four (234) surveys were received, producing a valid response rate of 49.58 percent. The eleven (11) survey responses from an onsite survey conducted within a small and medium enterprise (SME) were excluded from the final data analysis (see subsection 3.2). Of the two hundred and twenty three (223) survey responses used in the final data analysis, two hundred and eleven responses (211) are from the recipients of the Malaysian Prime Minister's Hibiscus Award (PMHA).

4. Data Analysis

The data was analyzed using the SPSS computer program version 16. According to Sureshchandar, Rajendran and Anantharaman (2002) exploratory factor analysis (EFA) is particularly useful only in the absence of a sufficiently detailed theory about the relationships of the observed variables to the latent constructs. Given that research on the human resources of environmental management is at the infancy stage, exploratory factor analysis was employed. Hence the hypothesized relationships (H1 to H4) were not examined within the context of confirmatory factor analysis (CFA) and structural equation modeling (SEM). In ascertaining the hypothesized relationships, the multiple regression analysis was adopted. The constructs were subjected to appropriate statistical tests to establish reliability and validity, consistent with the methods adopted by Wee and Quazi (2005). Three different types of validity were considered in Wee and Quazi's study: content, construct and criterion validity. Construct validity of each scale was factor analyzed individually based upon principal components factor analysis with Varimax rotation. Criterion-related validity was assessed by the multiple correlation coefficient, R and detailed item analysis was carried out by adopting Nunnally's (1978) method for proper assignment of items to each scale. Internal consistency analysis was carried out to measure the reliability of the items under each scale using Cronbach alpha. Lastly, cross-company comparisons were not made as the sample studied was too small (n=223). In the words of Daily, et al. (2007) although every organization has its own culture and set of norms, the ISO 14001 standards provide a degree of uniformity and commonality in developing an environmental management system. Hence organizations who have ISO 14001 certification have an environmental management system that is more similar than those who do not have ISO 14001 certification.

4.1 Respondents profile

Respondents were assured that the final results will be reported in aggregate, so there is no way to identify any one individual response, thus participants are protected from management concerns about honesty of answers. Anonymity of responses was maintained by the collection of surveys in sealed envelopes. Yet despite these measures, the responses on the categories of age, education, tenure, and length of experience with current type of job were incomplete. It is possible that some the respondents may have been reluctant to provide the aforementioned information as many of the survey items were assessed using open-ended questions. For example, gender was assessed with a fixed-response item (1=male; 2=female). Education level consist of six levels from 1)

primary school to 6) doctorate. Ethnicity was assessed with a fixed-response item (1=Malay; 2=Chinese; 3=Indian; 4=others). Job title, work department, age, length of experience with current type of job, and length of service in the current organization were open-ended items.

Future research needs assess the demographic information using closed-ended questions. The following provides the collected information on demographics of the sample. Age of participants ranged from 19 to 55, the mean age of the total employee sample was 33 years. 68.6 percent of the employees were male and 31.4 percent female. The average tenure was close to 7.77 years. Approximately 45.3 percent of the employees were Malays, 25.6 percent Chinese, 19.7 percent Indians, 9.0 percent others and 0.4 percent failed to categorize their ethnicity. Educational background for the respondents ranged from secondary school to the doctorate level.

The mean number of years on experience with current type of job was 9.5 years. 15.7 percent of the survey respondents in this study consist of executives, managers and supervisors whereas 84.3 percent are staff (i.e. engineers, technicians and the majority being the production workers).

4.2 Reliability assessment and item analysis

Internal consistency analysis was carried out to measure the reliability of the items under each scale using Cronbach alpha. Item 8 was deleted. After assessing reliability, detailed item analysis was carried out by adopting Nunnally's (1978) method for proper assignment of items to each factor, which is consistent with the literature (Conca, Llopis & Tari, 2004; Grandzol & Gershon, 1998; Wee & Quazi, 2005). Item 6 had an almost constant correlation index across the management commitment and empowerment construct, thus item 6 was eliminated from the item analysis. After the deletion of item 6, both the item analysis and reliability test were performed again. The remaining items had shown high correlations with the scale score that they were assigned to. For example, the range of correlation coefficients for management commitment ranged from 0.574 to 0.753, for empowerment 0.651 to 0.762, for rewards 0.631 to 0.769, and for feedback and review 0.610 to 0.772. It can be concluded that the remaining items had been correctly assigned to the scales, because the highest correlations were found in the scales to which they had been assigned.

Table 1 shows the new Cronbach's alpha values ranging from 0.781 to 0.829 after item 6 was dropped. The minimum advisable alpha level for established scales is 0.70 although it may be reduced to 0.6 for new scales in exploratory research (Nunnally, 1978). Overall the alpha values demonstrate that the constructs have relatively high scores of reliability.

Insert Table 1 here

Looking at the correlations among the exogenous constructs, as measured by the average of the construct items and depicted in Table 2. As expected the exogenous constructs are highly correlated. The strongest correlation exists among the pairs, management commitment-empowerment (0.760), management commitment-feedback and review (0.744), and feedback and review-empowerment (0.702).

Insert Table 2 here

4.3 Validity assessment

In an effort to ensure content validity available and appropriate existing measurement items that had been empirically tested were adapted and utilized whenever possible. The survey was reviewed by management representatives of ISO 14001 certified companies and two technical committee members of the Malaysian Prime Minister's Hibiscus Award.

Criterion validity examines the degree to which items in each HR construct scale is correlated with external referents, in this case the perceived environmental performance measure. Criterion validity was assessed using two methods. In the first method, criterion-related validity was assessed by comparing the correlations between exogenous scale scores and endogenous scale scores. As recommended by Grandzol and Gershon (1998), correlations that exceed the acceptable threshold of 0.30 demonstrate legitimate criterion validity. The bivariate correlations shown in Table 3 demonstrate legitimate criterion validity with all values exceeding the acceptable threshold of 0.30.

Insert Table 3 here

In the second method, criterion validity was assessed by examining the multiple correlation coefficient, R which is consistent with the literature (Flynn, et al., 1994; Quazi, Khoo, Tan & Wong, 2001; Samson and Terziowski, 1999; Wee and Quazi, 2005). In general a high correlation value indicates a high degree of criterion validity. As indicated in Table 5, the multiple R correlation coefficient computed for the four HR factors and environmental performance is 0.563. The result suggests that the four HR factors have a reasonably moderate degree of criterion validity when taken together.

Construct validity measures the extent to which the items in a scale all measure the same construct (Flynn, et al., 1994). The principal components factor analysis is chosen to evaluate construct validity, which is consistent with the literature (Flynn, et al., 1994; Geralis & Terziowski, 2003; Samson & Terziowski, 1999; Wee & Quazi, 2005). As suggested in the literature each scale was factor analyzed separately using the principal components factor analysis with orthogonal rotation using the Varimax method.

To limit the threats of construct validity, available and appropriate existing measurement items that had been empirically tested were adapted and utilized whenever possible.

Coakes (2005) suggest that a sample of 100 subjects is acceptable, but sample sizes of 200+ are preferable. With a sample size of 223, all factors loaded acceptably well with factors loadings in the 0.531 – 0.836 range (shown in Table 4). According to Hair, Anderson, Tatham and Black (1998) items with factor loading 0.50 or greater are considered practically significant. Each scale was factor analyzed separately using the principal components factor analysis with orthogonal rotation using the Varimax method. A total of five analyses were carried out. A summary of separate factor matrices for each construct is presented in Table 4. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy test results shows factors ranging from 0.747 to 0.863, which is much above the suggested minimum standard of 0.6 required running factor analysis (Coakes, 2005). Unidimensionality of the constructs is demonstrated by extracting a single component with an Eigen value greater than 1. Ideally, factor analysis should explain at least 60% of the variance. The percentage of variance explained was the highest for perceived environmental performance (56.90%) and as for the four HR factors the percentage of variance was below the recommended 60% level. The low percentage may have resulted because the survey items were not worded in a similar manner. Future research needs to work on continuing to improve the HR and environmental performance scales. This can be accomplished by continuing to add and modify items, based on feedback obtained from experts on the subject and by testing the scales in various samples.

Insert Table 4 here

4.4 Regression analysis

With reliability and validity of the constructs established, the mean rating of all items within each construct was calculated. The mean values for each construct were used as variables in the multiple regression analysis. As a check for multicollinearity, the results of the Pearson's correlation matrix of the independent variables and VIF values were examined. Multicollinearity is present if the paired correlation among the independent variables is in excess of 0.80 (Bryman & Cramer, 1999) and VIF values as a rule of thumb must not exceed the threshold of ten (Jun, et al., 2006; Quazi, et al., 2001). Multicollinearity was not a problem in this case as the paired correlation values among the independent variables in this study were all less than 0.80 (shown in Table 2) and the VIF coefficients are in the 2.207-3.245 range (shown in Table 5). The correlation matrix in Table 3 indicates that the four HR factors were positively and moderately correlated with environmental performance: management commitment ($r = 0.507$, $p < 0.01$), empowerment ($r = 0.495$, $p < 0.01$), rewards ($r = 0.334$, $p < 0.01$) and feedback and review ($r = 0.506$, $p < 0.01$). Rewards showed the lowest correlation with environmental performance. As indicated in Table 5 the Durbin-Watson index was at 1.892, which lies within the range of 1.50 – 2.50, suggesting that there was no autocorrelation problem (refer to Ooi, Arumugam, Teh & Chong, 2008).

The standardized partial beta estimates were significantly greater than zero for management commitment ($\beta = 0.245$, $p < 0.05$), empowerment ($\beta = 0.241$, $p < 0.05$) and feedback and review ($\beta = 0.245$, $p < 0.05$). The statistical results demonstrate that management commitment, employee empowerment and feedback and review were positively related to environmental performance, thereby supporting hypotheses H1, H2 and H4 respectively. The slope parameter estimate for rewards was negative, but it was not significant at the 0.05 level. Further conceptual work followed by empirical research is required in order to determine in greater detail the role of rewards in implementing an EMS/ISO14001. The results imply that employees at the middle and lower levels in some of the environmentally proactive organizations in Malaysia are rarely rewarded for good environmental practices. The R square value in Table 5 is statistically significant ($F_{4, 218} = 25.317$; $p < 0.000$) thus confirming the overall significance of the regression model. Samson and Terziovski (1999, p. 404) defended that 'any management method that explain over 20% of performance variance do not merit the label "failure". The R squared value indicates that 31.7 percent of the variation in perceived environmental performance can be explained by the four HR factors.

Insert Table 5 here

5. Conclusion

The statistical results support some of the specific proposed research hypotheses. Specifically, management commitment, feedback and review and empowerment were positively related to perceived environmental performance, thereby supporting hypotheses H1, H2 and H4 respectively.

Although the literature in general suggests that an appropriate reward scheme should be implemented to sustain employee motivation for ISO 14001 EMS implementation, the statistical results did not provide sufficient support for hypothesis H3. The results support the contention by Denton (1999) that incentives, bonuses, salaries and promotions are rarely linked to environmental performance.

Overall, the HR factors model explained 31.7 percent of the variance in perceived environmental performance. This implies that management controlled processes and activities could have a significant impact on environmental performance (Daily, et al. 2003, 2007). Hence managers should carefully consider human resource factors when implementing an EMS/ISO 14001. The results support the contention by Daily, et al. (2003, 2007) that managerial commitment for an EMS should be strong and highly visible. In addition top management should strive for and

support a work environment that allows its employees the freedom to make environmental improvements. The organizations' environmental programs, initiatives, and goals should be frequently communicated (Daily & Huang 2001; Daily, et al., 2003, 2007; Govindarajulu & Daily, 2004) and employees should be provided environmental training (Dechant & Altman, 1994; Madsen & Ulhoi, 2001; Wee & Quazi, 2005; Zutshi & Sohal, 2004). The results also support the contention by Daily, et al. (2003, 2007) and Daily and Huang (2001) that employees motivated by feelings of empowerment should be expected to be more involved in the improvement of the environment. In particular environmentally conscious organizations should have horizontal organizational structures in place (Daily & Huang, 2001; Govindarajulu & Daily, 2004), be high users of employee involvement practices (Denton, 1999; Fernandez, et al., 2003; Hanna, et al., 2000; Remmen & Lorentzen, 2000) and employ green teams (Beard & Rees 2000; Daily, Bishop & Steiner, 2007; Strachan, 1996). Companies should provide employees continual feedback concerning their impact and effectiveness on environmental improvement efforts (Chinander, 2001; Govindarajulu & Daily, 2004; Ramus 2001). In particular the environmental audit report should be used to communicate areas for environmental improvements to employees (Govindarajulu & Daily, 2004; Rezaee & Elam, 2000).

5.1 Research limitations

Overall, the statistical results are encouraging for scales which are based on a newly developed theoretical framework however, it is important to be cognizant of the potential weakness of the study which must be considered for future research. First, one should be cautious in interpreting the findings as regression analysis tells us nothing about the cause-effect nature of relationships between HR practices and environmental performance. Although the data shows the existence of connections between the HR factors and environmental performance, it cannot be strictly proven that the HR factors causes increased environmental performance, but simply that such relationship exists. This is a correlational cross sectional study and therefore causality can only be inferred. Moreover, data collection at a single point in time does not allow for changes in perception and attitudes over time as compared to longitudinal studies.

For these reasons a longitudinal study is recommended. Second, this study found the standard deviations for assessments of the HR factors amongst the employees within each organization to be reasonably low, showing close agreement. Nonetheless the data has been developed from a relatively small sample, thus it may not be representative of the majority of the employee views. Third, the generalizability of the findings of the present study might be questionable due to the nature of the sample. The research facilities for this study had fully developed EMS programs and four out of the five participating companies are recipients of the Prime Minister's Hibiscus Award (PMHA). Hence the findings may not be applicable to other organizational settings, industries and cultures. Fourth, the respondents to the survey were asked to rate the items based on their perception therefore, it is possible that they may have deliberately rated themselves higher in the survey. Moreover, since the list of employees working at each site was not made available to the researcher, it was left to the coordinators in each company to randomly select the employees. This might have introduced certain amount of bias in the data collected. Fifth, the empirical work into environmental management to date has generally focused on management's perspective hence the environmental performance measures in the literature may not be appropriate to non managerial employees. Further studies in this area are now required. In the present study 15.7 percent of the survey respondents consist of executives, managers and supervisors whereas 84.3 percent are staff (i.e. engineers, technicians and the majority being the production workers). For example the items on environmental performance in Daily, et al.'s (2003, 2007) study were adopted directly from Montabon, Melnyk, Sroufe and Calantone (2000). Montabon, et al. (2000) examined the views of American managers toward ISO 14000 and the relative impact of this new approach on the view of the effectiveness and efficiency of corporate environmental management systems as well as its impact on corporate performance.

The respondents to the survey in their study represented a variety of positions and job titles ranging from presidents (12 percent) and chief executive officers (0.9 percent), to managers (64.1 percent), and staff (21 percent).

5.2 Directions for future research

Because of the scarcity of empirical research addressing HR factors in the environmental management literature, more work is needed to clarify the linkages between the HR factors and environmental performance. Future research needs to work on continuing to improve the scales. This can be accomplished by continuing to add and modify items, based on feedback obtained from experts on the subject and by testing the scales in various samples.

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Table 1. Final summary of items and measures of reliability

Construct	Original items (by item number)	Items deleted (item number)	Remaining number of items	Cronbach alpha
Management commitment	1- 9	6, 8	7	0.811
Empowerment	10-17	10, 17	6	0.795
Feedback and review	18-25	25	7	0.810
Rewards	26-33	26, 29	6	0.781
Environmental performance	34-38	None	5	0.808

Table 2. Scale item means, standard deviations and correlations among exogenous constructs (n = 223)

	Mean	SD	1	2	3	4
1. Management commitment	3.58	0.56	1			
2. Empowerment	3.38	0.63	0.760**	1		
3. Feedback and Review	3.41	0.54	0.744**	0.702**	1	
4. Rewards	3.00	0.66	0.690**	0.693**	0.606**	1

**Correlation is significant at the 0.01 level (2-tailed)

Table 3. Correlations for mean scale scores

Exogenous scale	Environmental performance
Management commitment	0.507**
Empowerment	0.495**
Rewards	0.334**
Feedback and review	0.506**

** Correlation is significant at the 0.01 level (2-tailed).

Table 4. Summary of separate factor matrices for each construct

Construct	KMO	Item loading range	Eigenvalue	% variance explained
Environmental performance	0.747	0.692 – 0.836	2.845	56.901
Management commitment	0.863	0.531 – 0.767	3.321	47.447
Empowerment	0.849	0.655 – 0.763	2.974	49.561
Rewards	0.817	0.617 – 0.789	2.879	47.976
Feedback and review	0.839	0.621– 0.776	3.278	46.822

Table 5. Test results of regression analysis

Dependent variable	Environmental performance			
Multiple R	0.563			
R – square	0.317			
Adjusted R – square	0.305			
Standard error	0.522			
Durbin Watson	1.892			
Analysis of variance	df	Sum of squares	Mean square	
Regression	4	27.582	6.895	
Residual	218	59.375	0.272	
F = 25.317	Significant F = 0.000			
Variables	Standardized Beta	t	Sig.	VIF
Management commitment	0.245	2.430	0.016	3.245
Empowerment	0.241	2.518	0.013	2.922
Rewards	-0.150	-1.810	0.072	2.207
Feedback and review	0.245	2.771	0.006	2.506

Appendix A: Survey

Management commitment

Item 1: Top management treats EMS as an important issue.

Item 2: Top management allocates adequate resources (money, manpower etc) to EMS efforts

Item 3: Top management allows employees to spend time on EMS efforts

Item 4: Top management follows up suggestions for improvement on EMS

Item 5: Top management frequently communicates the organization's environmental goals to employees

Item 6: Employees have the opportunity to share in and are encouraged to help the organization implement change

Item 7: Top management is committed to employee training and education in environmental management

Item 8: We get EMS training frequently

Item 9: Top management provides employees training on interactive skills, team building, benchmarking, brainstorming and consensus building.

Employee empowerment

Item 10: I am not punished for environmental improvement ideas that are unsuccessful.

Item 11: Employees can express their opinions openly and freely without fear of reprisal.

Item 12: We frequently use teamwork to solve EMS problems.

Item 13: Cross-functional teams are often used.

Item 14: Top management encourages employee suggestions for environmental performance improvement by setting up employee environmental suggestion schemes.

Item 15: I feel free to discuss my concerns with someone in management other than my immediate supervisor.

Item 16: Most employee suggestions are implemented.

Item 17: Managers and supervisors rarely allow employees to take necessary action on their own.

Feedback and review

Item 18: Supervisors and managers talk regularly with employees to assess progress toward explicit environmental goals.

Item 19: My supervisor uses both quantitative (numbers) and qualitative (quality) measures to assure that I am making progress toward or contributing to organization's environmental goals.

Item 20: Information on environmental performance is readily available to employees.

Item 21: I receive sufficient amount of information from management concerning what I am expected to do in my job regarding environmental performance.

Item 22: Progress towards environmental goals is constantly monitored and measured.

Item 23: Results from environmental audits are communicated to employees for identifying areas for environmental improvement

Item 24: My immediate supervisor gives me regular feedback on my job performance.

Item 25: I am told right away when there is something wrong with my work.

Rewards

Item 26: In the past, our organization has been known to discipline an employee for violating environmental policies and procedures.

Item 27: We are rewarded for making suggestions for improvement on EMS.

Item 28: Employees are recognized for taking initiative for environmental management through company environmental awards to individuals or teams.

Item 29: I feel that if I do not contribute to improving environmental performance, my chance of career advancement will be negatively affected.

Item 30: Achievement of environmental goals is used as one of the criteria in my performance appraisal.

Item 31: Supervisors in my department give credit to people when they work on EMS improvements.

Item 32: Employees who have achieved or surpassed their environmental goals are rewarded bonus pay or other monetary awards.

Item 33: Our organization provides individual financial incentives for EMS improvements.

Perceived Environmental performance

Item 34: Managers and supervisors encourage activities that improve product quality.

Item 35: Recycling activities are carried out extensively.

Item 36: Managers and supervisors encourage activities that improve customer satisfaction.

Item 37: A lot of effort is put in to improve energy efficiency.

Item 38: Waste is being reduced through product and process redesign.