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The important role of change management in environmental management system implementation

EMS
implementation

631

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Abstract

Purpose – There is increasing concern about the environmental aspects of business and production processes, and many companies have chosen to implement environmental management systems (EMSs). The purpose of this paper is to examine whether change management efforts improve the perceived success of EMS implementation.

Design/methodology/approach – The paper analyzes empirical survey data using hierarchical regression analyses with a sample of mid-level engineers and managers in manufacturing facilities.

Findings – Change management efforts appear to enhance the perceived environmental performance of manufacturing establishments, primarily driven by top management support for EMS implementation and efforts to institutionalize the EMS.

Research limitations/implications – Results are generalizable to large manufacturing facilities implementing EMSs. Results should be replicated with a larger sample and using measures of actual environmental performance.

Practical implications – Change management techniques can enhance the environmental performance outcomes of EMS implementations.

Originality/value – Change management concepts have been neglected in examinations of EMS implementation outcomes, and they may help explain mixed findings on EMS success to date. The findings suggest that change management efforts can enhance the value of firms' EMS implementations.

Keywords Change management, Environmental management, Production processes

Paper type Research paper

1. Introduction

Corporate social responsibility (CSR) encompasses the ways in which company policies, processes, and procedures affect its stakeholders and the natural environment (Waddock and Bodwell, 2004). CSR has become an important factor in firm performance as a result of CSR-related strategic choices by companies, increased public awareness and regulatory pressures (Mackey *et al.*, 2007).

Corporate environmentalism is an essential component of CSR, and it can take various forms: waste minimization and prevention, demand-side management, design for the environment, product stewardship, and full-cost accounting (Berry and Rondinelli, 1998).

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Many firms choose to implement an environmental management system (EMS), or a structured approach to addressing the environmental bottom line, as part of their environmental efforts (Delmas, 2000). An underlying assumption of EMSs, in particular, the EMS standard ISO 14001, is that it helps firms achieve better environmental performance through the use of standardized practices, documentation, communication, and organizational learning (von Malmborg, 2002; Cascio, 1996; Melnyk *et al.*, 2003).

However, research studies reveal contradictory results regarding the adoption of EMSs and improved environmental performance. One potential explanation for the inconsistent findings is variability in the degree to which EMSs are implemented and incorporated into the firm's culture and business processes. This variability is due to two factors. First, firms may choose to implement EMSs for strategic (e.g. market share), economic (e.g. financial returns), ethical (e.g. commitment to sustainability), or symbolic reasons (e.g. to appear to do business by industry standards) (Bansal and Roth, 2000; Klassen and Whybark, 1999; Pokinska *et al.*, 2003), and each may warrant different degrees of EMS implementation. Second, firms err by implementing an EMS without proper consideration of the basic processes by which employees and other firm members come to embrace and accept change (Hoffman and Bazerman, 2007). It is this potential problem that our study addresses.

Firms that fail to convey the urgency of the need to change to their employees, that do not provide a behavioral roadmap for the change, and that fail to institutionalize the change, in effect implement relatively weak versions of their EMSs (Cummings and Worley, 2008; Kotter, 1995; Lewin, 1947). This paper proposes that the achievement of better environmental performance through an EMS and/or ISO 14001 rests upon the implementation practices of firms, in particular their change management processes (Armenakis and Bedeian, 1999). This issue is similar to one that plagued early quality initiators implementing ISO 9000 (the quality standard of the ISO published in 1987) and total quality management (TQM) (Reger *et al.*, 1994).

The paper is organized as follows. We first introduce and discuss the various forms of EMSs. Next, we draw insights from the EMS and TQM implementation literatures, as well as theories of organizational development and change management to guide our examination of working professionals' perceptions of actual EMS implementation processes. We expect survey results to indicate that greater attention to change management will lead to better perceived environmental performance. Finally, we discuss the implications of the study for firms implementing EMSs, recognize the study limitations and offer suggestions for future research.

2. Environmental management systems

An EMS consists of organized and documented procedures and policies of a firm that directly influence and control the environmental issues that firm has or may have in the future (Cascio, 1996). An EMS is:

[...] part of the overall management system that includes organizational practices, procedures, processes and resources for developing, implementing, achieving, reviewing, and maintaining the environmental policy. [Such a system provides] a framework for managing environmental responsibilities, including regulatory compliance (US EPA, 2009).

An EMS can be certifiable or non-certifiable. Certification shows that the organization, according to a third party auditor, has met the standards for an EMS as dictated by that

particular system. Currently, there are several EMS standards to which a company can certify. These standards include ISO 14001 from the ISO, the Eco-Management and Audit Scheme in Europe, and BS7750 in the UK. Any EMS that is not officially audited or recognized by a certifying body is classified as non-certifiable. Non-certifiable systems are internally generated EMSs which may or may not resemble certified systems.

Introduced in 1996, ISO 14001 is the most widely accepted EMS certification. Like ISO 9000, ISO 14001 is an international standard based on the premise of continuous improvement (Cascio, 1996). The standard consists of a five-stage process that is based on the plan-do-check-act (PDCA) cycle (Deming, 1986/2000, p. 88; Shewhart, 1939, p. 45). It is important to note that certified EMSs (and many non-certified EMSs), do not require that firms meet particular environmental performance goals. Thus, EMS implementation does not guarantee superior or improved environmental performance. Next, we review EMS and other change implementation models and explore the link between EMS implementation and environmental performance.

3. Literature review and hypothesis development

Most existing theoretical and empirical work on EMS implementation devotes insufficient attention to change management concepts. Environmental management research has focused primarily on the technical aspects of corporate environmental efforts, while neglecting important social factors included in well-established models of change management models. Studies that do consider change management concepts often do so under the umbrella of human resource or cultural factors, but lack a comprehensive theoretical framework.

Consideration of change management efforts may help explain the somewhat mixed research findings on the environmental performance outcomes of firms' environmental initiatives. A meta-analysis of nine studies concluded that firms employing voluntary environmental programs (certified or not) actually have worse environmental performance than firms not investing in environmental programs at all (Darnall and Sides, 2008). On the other hand, a large-scale longitudinal study of approximately 80 firms with EMSs found that EMS implementation improved overall firm-level environmental performance, although this achievement was not universal (National Database on Environmental Management Systems (NDEMS, 2003)). While acknowledging that there may be a myriad of factors that can facilitate positive EMS results, we focus on change management, a key component of successful transformational and technical change initiatives (Armenakis and Bedeian, 1999). We propose that the degree and effectiveness of change management techniques employed during EMS implementation is an important contingency in achieving enhanced environmental performance.

The foremost model of planned change in organizations assumes that an internal or external consultant directs the change, performing the steps of entering the organization and contracting for services, diagnosing the issues, planning and implementing change, and evaluating and institutionalizing change (Cummings and Worley, 2008). Importantly, the model incorporates multiple feedback loops, emphasizing that change management is an ongoing process. Underpinning this model, especially the implementation and institutionalization stages, is Lewin's (1947) change model.

Lewin's model arose from his examination of group dynamics and the forces that affect these dynamics. He observed that for change to occur there must be an interruption in the forces supporting an equilibrium state, either by removing forces acting against

a desired change, or by applying greater force to the change process. He also theorized that once a change is made, the forces must settle into a new equilibrium in order for the change to persist. Lewin referred to the operation of these change forces as unfreezing (preparing and justifying an upcoming change), movement (implementing the change) and refreezing (institutionalizing a change so as to make it a permanent part of business practices and expectancies) (Lewin, 1947). Armenakis and Bedeian (1999, p. 305) summarize and integrate subsequent theoretical models with Lewin's work to identify three "phases within which change agents act".

Unfortunately, much of the EMS implementation literature fails to incorporate Lewin's or other change management frameworks. The implementation model developed by the ISO Technical Committee that wrote the ISO 14001 standard (ANSI/ISO 14001-1996 Standard in Cascio (1996)) relies on the PDCA model to outline the sequential implementation steps of environmental policy, planning, implementation of technical activities, checking and corrective action, and management review (ANSI/ISO 14001-1996 Standard in Cascio (1996)). While this model serves as a helpful implementation guide, it ignores the change management process (Hoffman, 1999). It also incorporates only a single feedback loop.

Other models of EMS and environmental interventions acknowledge the importance of the change management process generally, but rely upon underdeveloped theoretical foundations. For example, some papers emphasize the importance of cultural change to improved environmental performance (Balzarova *et al.*, 2006; Kitazawa and Sarkis, 2000). Other studies identify factors that comprise or affect cultures: teams, training, empowerment, rewards and top management support for EMS/ISO14001 implementation (Balzarova *et al.*, 2006; Daily and Huang, 2001; Hanna *et al.*, 2000; Zutshi and Sohal, 2004). The NDEMS (2003) study identified environmental policy development, training, and top management review and leadership as critical factors to EMS success. The problem with these EMS-related studies is that they are relatively atheoretical, or they appear wedded to PDCA or similar frameworks that inadequately consider change management (Daily and Huang, 2001; Zutshi and Sohal, 2005). The lack of a comprehensive model renders it difficult to generalize current findings to the many types of support that can accompany major technical changes.

We did locate two book chapters that advocated change management interventions (specifically Lewin's change model), as part of the solution to environmentally destructive behavior (Bazerman and Hoffman, 1999; Hoffman, 1999). Also, encouraging is the fact that recent empirical work on quality management provides empirical support for the benefits of change-related activities (Huq, 2005; Yeung *et al.*, 2005).

To summarize, we propose that following the tenets of change management theory will result in more effective implementation of EMSs, which in turn will lead to better environmental performance. Theories of organizational development and change management, and research on EMS and TQM implementation suggest the following hypothesis regarding change management processes:

- H1. The greater the degree of change management efforts pertaining to EMS implementation, the more favorable the perceived environmental performance of the firm.

For firms with environmental and sustainability goals, information on the specific change management activities that influence EMS implementation success is essential.

Unfreezing, the first stage of Lewin's change model, involves enhancing the perceived necessity and urgency of the need for change among key stakeholders. Kotter (1995) identifies eight steps for successful change implementation, and his first steps of establishing the need for urgency and creating a powerful change coalition correspond to the unfreezing stage. There is little research devoted explicitly to the concept of unfreezing, although it may be included in other change steps. Arguably, firms that focus on cultural change as a key part of EMS implementation do some unfreezing by design (Ann *et al.*, 2006). Similarly, introductory training sessions on environmental interventions can raise initial awareness regarding environmental issues (Beard and Rees, 2000). Finally, firms that attempt to pierce cognitive biases regarding the importance of environmental management are also engaged in the unfreezing process (Hoffman and Bazerman, 2007).

The movement step assures that the change is in fact implemented and that managers and employees know what behaviors are expected in the new context. Kotter's next four steps (i.e. developing and communicating a vision; empowering the staff; ensuring short-term wins) correspond well to the movement phase. Important aspects of the movement step that are found in the TQM and environmental literature include top management support (Chin *et al.*, 1998; Yeung *et al.*, 2005), supervisory support (Ramus, 2001), employee training and involvement (Kitazawa and Sarkis, 2000), and communication (Chinander, 2001). In this paper, we focus on two movement factors that appear to be most critical to the success of environmental management interventions: top management support, and employee involvement (Wee and Quazi, 2005; Whelan-Berry and Somerville, 2009; Zutshi and Sohal, 2004).

The refreezing phase of Lewin's model is designed to give the movement phase continued momentum, and to prevent regression to the state prior to the change. The refreezing step institutionalizes the changes that have occurred so that the new paradigm is created. Kotter's final two steps of consolidating gains and embedding the change into the culture emphasize this point, and perhaps the step of ensuring small wins fits as well. Human resource factors such as rewriting job descriptions to reflect new responsibilities, and using reward systems that reinforce desired behaviors, are especially important to the refreezing process. Regardless of the mechanism, the refreezing step must deeply embed changes in the culture and routines of the organization in order for change to sustain itself in the long term (Wijen, 2007).

Despite somewhat distinct approaches to modeling the change process, Lewin, Kotter, and Cummings and Worley are remarkably consistent in their recommendations for implementing planned change. Like Ford and Greer (2006), we examine the most parsimonious, three-stage model by Lewin (1947):

- H2.* The greater the degree of (a) unfreezing (b) movement, and (c) refreezing efforts pertaining to EMS implementation, the more favorable the perceived environmental performance of the firm.

4. Method

4.1 Sample and setting

A voluntary written survey was distributed in 2002 to full-time professionals enrolled in a master's program in engineering and global operations management at a small research university in the northeast that holds national rankings in engineering and business. Participants were asked to complete the survey and return it to the administrative office of their academic program. Of the 53 surveys distributed, 31 were returned with

complete data, resulting in a response rate of 58.5 percent. The majority of the surveys not used were non-responses due to the lack of an EMS system in the respondent's facility. Although far from ideal, similar studies have used small samples to draw meaningful research conclusions (Avittathur and Swamidass, 2007; Delmas, 2001).

The final sample consisted of responses from 26 men and five women in 17 facilities. The average facility at which these respondents worked employed 1,747 employees (SD = 1,441) and all respondents worked in a facility with some form of structured EMS in place. Of the 14 responses came from those working at an ISO 14001 certified facility, while the remaining 17 worked at a facility with an internal EMS. Work experience of respondents ranged from four to 28 years (avg. = 14.2, SD = 5.74) with one entry level, 22 lower mid-level, and eight mid- to upper-level professionals included. Of the 31 respondents, 25 worked at facilities that were ISO 9000 certified. All but one respondent worked in manufacturing settings.

4.2 Survey procedure and measures

The survey was comprised of four sections:

- (1) individual background information;
- (2) facility background information;
- (3) ISO 14001 questions; and
- (4) EMS information.

Participants answered either Section (3) or Section (4) depending on the EMS status of their facility. Prior to full distribution, the survey was distributed to three industry professionals, and based upon their feedback, minor changes to the survey were made.

To ensure that the participants had adequate knowledge of EMS systems, two questions were asked about the level of respondents' knowledge of EMSs in general and the EMS at their own facility. The participants felt that on average they had good knowledge of EMSs in general and at their own facility although they did feel they had a slightly better knowledge of their own EMS (avg. = 3.11, SD = 0.96) than of EMSs in general (avg. = 2.95, SD = 0.88).

Dependent variable. The dependent variable for this study was professionals' perceptions of the future environmental performance and the emissions levels of their particular facilities. Perceptions can be better indicators than actual environmental performance data in some cases because employee perceptions may have more influence on employee behavior (Argyris, 1998; Chinander, 2001). A number of other studies have examined perceptions of environmental performance as an outcome variable (Ann *et al.*, 2006; Florida and Davison, 2001; NDEMS, 2003). The environmental performance index in this study consisted of four survey items regarding the future environmental performance and emissions levels of a facility, relative to other facilities in the industry, on a five-point Likert scale (1 – well below average . . . 5 – well above average; $\alpha = 0.88$). These items are presented in the Appendix.

Independent variables. This study assessed change management perceptions using 18 items corresponding to the three stages of Lewin's (1947) change model:

- (1) unfreezing (three items);
- (2) movement (12 items); and
- (3) refreezing (three items).

An overall change management index was created using all 18 items ($\alpha = 0.94$). For the movement measure, items were analyzed in the aggregate and for two sub-indexes of top management support and employee involvement. Developing and matching items to the change management phases followed a similar process to Ford and Greer (2006). These items are presented in the Appendix.

Control variables. Control variables for this analysis were facility size and ISO 14001 status. Size was measured by the estimation of the survey takers of the number of employees working at their facility. The primary reason for controlling on facility size was to recognize the fact that larger facilities tend to have more resources with which to implement environmental change (Klassen, 2001). ISO 14001 status was controlled because there is conflicting evidence regarding whether ISO 14001 certification is associated with enhanced (Ann *et al.*, 2006; Potoski and Prakash, 2005), the same (NDEMS, 2003), or worse environmental performance (Moxen and Strachan, 2000).

5. Analyses and results

5.1 Correlation matrix and descriptive statistics

Means and standard deviations and correlation results for the study variables are displayed in Table I. As expected, all of the change management indexes (unfreezing, top management support, employee involvement, movement, refreezing, change management) are positively correlated with each other at the $p < 0.01$ level. The environmental performance index was positively correlated with both firm size ($p < 0.05$) and not being ISO certified ($p < 0.01$). No other correlations were significant.

5.2 Hierarchical regression results

In hierarchical regressions, variables are entered in groups to determine their incremental importance to the questions at hand. Following this convention, we first regressed the four-item environmental performance index on the two control variables. The second regression added the change management index to the regression, and the final sets of regressions tested phases of Lewin's change model separately. Because of the small sample size we chose an a priori p -value threshold of 0.10 instead of the more common value of 0.05. Table II presents all of these regression results.

In the first regression equation (column (a)) there was a significant positive association between firm size and the environmental performance index ($p < 0.05$) and a significant negative association between ISO-certified firms and the environmental performance index ($p < 0.01$). That is, results indicated that larger firms had better perceived environmental performance, and that ISO certification was associated with worse perceived environmental performance. This result held across all of the regression equations.

H1 stated that a facility that utilized change management techniques to a greater degree during EMS implementation would have better environmental performance, controlling for the size of the firm and certification status. In support of *H1*, the change management index was a significant predictor of environmental performance ($p < 0.10$), and its addition to the regression equation resulted in a significantly better fitting model (column (b)). That is, the greater the degree of change management used during implementation of the EMS, the more favorable were participants' perceptions of their facility's future environmental performance. Next *H2(a)-(c)*, were examined by regressing environmental performance on change management

Table I.
Correlation matrix and
descriptive statistics

Variables	<i>n</i>	Mean	SD	1	2	3	4	5	6	7	8	9
1. Firm size (no. of employees)	31	1,747	1,441	—	—	—	—	—	—	—	—	—
2. ISO firm (1 – ISO, 0 – EMS)	31	0.45	0.51	–0.17	—	—	—	—	—	—	—	—
3. Unfreezing	31	3.87	0.81	–0.15	0.17	0.86**	—	—	—	—	—	—
4. Employee input	31	3.54	0.81	–0.11	0.00	0.73**	0.88**	—	—	—	—	—
5. Top management	31	3.74	0.78	–0.14	0.18	0.79**	0.76**	0.87**	—	—	—	—
6. Movement index (a)	31	3.64	0.75	–0.13	0.10	0.81**	0.94**	0.93**	0.91**	—	—	—
7. Refreezing	31	3.58	0.85	0.03	0.05	0.65**	0.69**	0.73**	0.76**	0.82**	—	—
8. Change management index (b)	31	3.68	0.72	–0.10	0.11	0.89**	0.89**	0.92**	0.96**	0.87**	0.94	—
9. Environmental performance	31	4.15	0.72	0.45*	–0.58**	–0.03	0.09	0.13	0.12	0.26	0.13	0.88

Notes: Correlation is significance at: *0.05 and **0.01 levels (two-tailed); variables 3-9 were all measured on a five-point Likert scale with 1 indicating strongly negative and 5 indicating strongly positive responses; alpha values indicated on the diagonal and in italics; movement index (a) is comprised of independent variables: employee input + top management; change management index (b) is comprised of independent variables: unfreezing + employee input + top management + refreezing

	(a) Control variables only	(b) Control variables + change management index	(c) Control variables + unfreezing variables	(d) Control variables + movement index	(e) Control variables + EE involvement, top management involvement	(f) Control variables + refreezing variables
Coefficient (SE)						
Firm size (no. of employees)	0.35* (0.00)	0.35* (0.00)	0.36* (0.00)	0.36* (0.00)	0.36* (0.00)	0.32* (0.00)
ISO firm (1 – ISO, 0 – EMS)	– 0.51** (0.21)	– 0.55*** (0.20)	– 0.54** (0.20) 0.14 (0.13)	– 0.55** (0.20)	– 0.60** (0.20)	– 0.55** (0.20)
Unfreezing Employee input	–	–	–	–	–	–
Top management	–	–	–	–	– 0.15 (0.19)	–
Movement index (1)	–	–	–	–	0.42*** (0.20)	–
Refreezing Change management index (2)	–	–	–	0.24*** (0.14)	–	–
<i>n</i>	31	31	31	31	31	31
<i>F</i> -value	11.04**	9.00**	7.59**	8.14**	6.88**	9.81**
Adjusted <i>R</i> ²	0.41	0.45	0.41	0.45	0.48	0.48

Notes: Significance at: *0.05, **0.01 and ***0.10 levels; movement index (1) is comprised of independent variables: employee input + top management; change management index (2) is comprised of independent variables: unfreezing + employee input + top management + refreezing

Table II.
Regression results
for environmental
performance/emission
index

sub-indexes (e.g. refreezing), because multicollinearity between the individual change management indexes precluded their inclusion in the same regression equation[1].

We find support for two of the three remaining hypotheses. *H2(a)* stated that the greater the degree of unfreezing during implementation of the EMS, the better the facility's environmental performance, all else being equal. This hypothesis was not supported in that the coefficient on the unfreezing index was not significant (column (c)). *H2(b)* predicted that the greater the degree of movement steps taken during implementation of the EMS, the more favorable the perception of environmental performance of a facility. We examined this hypothesis in two ways. First, we performed a regression of environmental performance on the control variables plus the movement index (column (d)). Movement was significantly and positively related to environmental performance ($p < 0.10$), and it explained significant variance above and beyond the control variables. Second, we performed a regression of environmental performance on the control variables plus the movement sub-indexes of employee input and top management support (column (e)). The coefficient on the top management support variable significantly predicted environmental performance ($p < 0.10$), and significantly higher variance was explained. The coefficient on the employee input predictor was not significant. This suggests that the movement index regression (column (e)) was driven primarily by the influence of top management support. In summary, *H2(b)* was partially supported. *H2(c)* states that the greater the degree of refreezing during implementation of the EMS, the more favorable the perception of future environmental performance. In the final regression (column (f)), a positive association was found between the refreezing index and the environmental performance index ($p < 0.05$). This finding supports *H2(c)*.

We performed a robustness check of these analyses, separately examining the environmental performance sub-index (environmental performance items (1) and (2) in the Appendix), and emissions sub-index (environmental performance items (3) and (4) in the Appendix). The perceived environmental performance dependent variable yielded similar, yet somewhat weaker results. The perceived emissions dependent variable yielded non-significant results on all of the key predictor variables, although the coefficients were in the expected directions. Based upon these results, the existence of a correlation of 0.56 ($p < 0.01$) between the two environmental performance sub-indexes, and the high reliability of the four-item environmental performance index, we believe that the full four-item future environmental performance index produces more reliable and valid results than either sub-index alone.

6. Discussion

Corporate environmentalism is a predominant component of CSR (Hoffman and Bazerman, 2007; Jay *et al.*, 2009). As pressure grows on corporations to expand their success metrics to include environmental performance (Berry and Rondinelli, 1998), firms are introducing or updating their EMSs. In this paper, we pair organizational development and change management models (Armenakis and Bedeian, 1999; Cummings and Worley, 2008; Lewin, 1947) with a traditional PDCA model to study EMS outcomes (Cascio, 1996; Deming, 1986/2000). We seek to enrich the prescriptions of the PDCA cycle (Deming, 1986; Shewhart, 1939) and EMS certification standards (e.g. ISO 14001) that focus on the tactical implementation of the technical features of EMSs. In other words, we try to address an important deficiency of current EMS implementation models.

Our empirical results reveal that the amount of change management activity was positively related to the perceived future environmental performance of firms with EMSs. This supports the possibility that environmental performance gains associated with EMS implementation may be enhanced even further with attention to change management processes. In addition, the intensity of change management processes may be a potential explanation for the lukewarm findings to date regarding the relationship between EMS implementation and environmental performance at the firm level. That is, the apparent inefficacy of some EMS programs over time, or as compared to firms without EMSs (Darnall and Sides, 2008; NDEMS, 2003) may reflect the use of poor or no change management efforts. Finally, we can add change management to the list of factors that appear to improve the environmental performance of EMSs, such as the rigor of the environmental targets of the EMS, pre-existing environmental capabilities, and market-based motivations for implementing the EMS (NDEMS, 2003).

Our results provide partial support for the influence of Lewin's three change management phases on perceived environmental performance. Unfreezing did not have a significant impact on environmental performance, and this contradicts change theories which view this step as vital (Kotter, 1995; Lewin, 1947). We may have been challenged in our sample by a more distal relationship to future firm outcomes in the context of the already-implemented change (Ford and Greer, 2006).

Our movement variable, in particular the top management support component, significantly predicted perceived environmental performance. This finding is consistent with the predictions of change management theories (Kotter, 1995; Lewin, 1947), as well as empirical research that documents the benefits of top management support in the context of EMS implementation (Wee and Quazi, 2005; Zutshi and Sohal, 2004). The finding that employee input does not positively affect environmental performance was unexpected as it contradicts literature on the benefits of employee participation (Wee and Quazi, 2005; Zutshi and Sohal, 2004). One possible explanation is that studies that assess employee views of their own participation may find a positive relationship with environmental outcomes (Wanberg and Banas, 2000), whereas studies that measure managers' views of employee participation may find no relationship (Delmas, 2001). *Post hoc* discussions with study participants indicated that they view employee input ambivalently, acknowledging some benefits of employee involvement but also viewing it as a potential impediment to productivity. From a human resource management standpoint, we recommend training and development for middle managers and team leaders regarding change management, and specifically, on how to manage employee participation effectively during the introduction and implementation of EMSs (Reay *et al.*, 2006). Our results also provide support for the refreezing phase of Lewin's change model, consistent with the important role of human resource management factors (Daily and Huang, 2001) and organizational cultural support (Balzarova *et al.*, 2006; Kitazawa and Sarkis, 2000) to EMS success.

In this paper, we suggest a change management framework, specifically the planned change model of unfreezing, movement, and refreezing (Armenakis and Bedeian, 1999; Lewin, 1947) for consideration of the many change management and human resource factors identified in both the TQM and EMS literatures as important to successful implementation (Balzarova *et al.*, 2006; Daily and Huang, 2001; Hanna *et al.*, 2000; Lee, 2009). This and similar conceptual frameworks have the potential to highlight traditionally overlooked change management steps, such as conveying a sense

of urgency to organizational members (Kotter, 1995). Application of change management models could have highlighted the lack of attention to unfreezing activity in the well-done study by Zutshi and Sohal (2004), for example. More importantly, change management theories provide potential explanations for why certain factors facilitate EMS success. These explanations include the timing and degree of change efforts, as well as the existence of emotional, cognitive, and work-related barriers to change (Armenakis and Bedeian, 1999).

Our study adds to the change management literature in two ways. First, it provides new empirical evidence regarding the link between change processes and organizational performance outcomes (Pettigrew *et al.*, 2001). Second, the study provides empirical support for the role of change management in the context of EMS implementation. The managers and engineers in our study viewed planned change management steps such as top management support and institutionalization efforts as important to their firm's future environmental performance (Kotter, 1995; Zutshi and Sohal, 2004).

The most important implication from our study is to incorporate change management concepts into EMS implementation. This may be challenging in practice because the benefits of change management efforts can be difficult to quantify (Chin *et al.*, 1998), and because the evidence is still somewhat mixed regarding financial or market returns to environmental management investments (Lee, 2009; Molina-Azorin *et al.*, 2009). Moreover, environmental initiatives in the USA face more substantial cultural, institutional and organizational barriers than in other countries (Delmas, 2000). Nevertheless, our and others' findings demonstrate suggest that change management may in fact translate to tangible environmental performance benefits for firms implementing EMSs.

7. Study limitations and future research

Our sample and study design did not permit examination of the full complexity of change, including the scope of the EMSs (NDEMS, 2003), temporal element of change (Pettigrew *et al.*, 2001) or firms' experiences with multiple, concurrent changes (Herold *et al.*, 2007; Tushman and O'Reilly, 1996). The sample for this study was a small sample of mid-level professionals in large firms, which makes it difficult to estimate the extent to which results can be generalized to other contexts. However, an advantage of our sample was that respondents worked primarily in manufacturing, which may constrain the variance in EMS scope to a certain extent. Although our findings are consistent with current literature on TQM and EMS implementation, we encourage similar studies with larger and different samples. On the other hand, our study is one of the few studies of EMS implementation that is not case based.

The use of a perception measure as a dependent variable can be considered a limitation, since actual environmental performance measures would provide a stronger test of our hypotheses. Also, there is some risk of common method bias in that employees who perceive favorable environmental performance may respond more favorably to the change process items, and vice versa. This risk is mitigated to some extent by the fact that the change process items are factual in nature and thus less prone to perceptual biases. Our divergent results on the two movement items, employee input and top management support, also help counter common method concerns.

We encourage future research to determine under what circumstances ISO 14001 certification results in worse perceived environmental performance, as we found in our study. A good starting point would be the explanations currently offered:

- the goal of ISO certification may distract the organization from actual improvement in its EMS (Balzarova *et al.*, 2006);
- ISO 14001 may uncover more environmental hazards due its standardization requirements (Delmas, 2000); or
- firms may achieve certification for primarily symbolic reasons (Bansal and Roth, 2000).

Furthermore, future studies may wish to include firms without EMSs as referents for assessing the degree of environmental performance (Darnall and Sides, 2008).

Finally, we urge greater collaboration between research fields. The change management field offers well-developed, empirically tested theoretical models, yet it appears to be applied almost reluctantly in the field of operations management. We urge consideration of change management theories prior to the implementation of technical change initiatives. We also encourage development of a fuller model of implementation, including intermediate outcomes such as stakeholder acceptance of changes, behavioral intentions, and actual employee behaviors, all of which may lead to improved environmental performance.

8. Conclusion

Recently, corporate environmentalism is transforming business operations, as quality management did previously (Berry and Rondinelli, 1998). In the global economy, companies are often looking for a source of competitive advantage that will distinguish them from competitors. Proactive and strategic firms are incorporating CSR, including EMS implementation, as a business strategy and a way to improve the environmental bottom line. We recommend that organizations implement future technical process changes, including EMS implementations, with the important guidance of change management theory and evidence.

Note

1. None of the coefficients on the four change management factors (unfreezing, refreezing, top management support, and employee involvement) were significant when all were included in the model.

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Appendix

Environmental performance index items

- (1) My perception of my facility's environmental performance compared to other facilities in our industry, as anticipated in two years.
- (2) My perception of my facility's environmental performance compared to other facilities in our industry, as anticipated in five years.
- (3) My perception of my facility's emissions record compared to other facilities in our industry, as anticipated in two years.
- (4) My perception of my facility's emissions record compared to other facilities in our industry, as anticipated in five years.

Unfreezing index items

- (1) My company explained the consequences of not having an EMS.
- (2) My company communicated the need to implement an EMS.
- (3) My company provided justification of the need for an EMS.

Movement: top management support index items

- (1) Top management fully supported efforts to implement the EMS.
- (2) Top management encourages employees to learn environmental skills in appropriate activities outside of EMS training.
- (3) Adequate resources were devoted to the EMS implementation.
- (4) Employees who want to improve the environmental performance of the facility were provided with the necessary resources.
- (5) My facility provided employees with a clear description of new behaviors required by the EMS.
- (6) Management clearly describes the requisite knowledge, skills and abilities that are required for EMS implementation.
- (7) Resistance to the EMS was effectively addressed.

Movement: employee involvement index items

- (1) My facility uses employee suggestions in the EMS.
- (2) My facility provides educational opportunities and training needed for the EMS.
- (3) My facility seeks employee input about the EMS.
- (4) To some degree, all employees were included in the EMS implementation process.
- (5) My facility provides opportunities for employees to express concerns about the EMS.

Refreezing index items

- (1) Job descriptions reflect new responsibilities related to the EMS.
- (2) The reward system at my facility reinforces desired environmental behaviors.
- (3) Environmental concern is an important part of our facility's culture.

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