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Improving environmental awareness training in business

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Abstract

The need for and the benefits of a more sustainable approach to business management have been widely discussed in the literature. Many organizations have engaged in environmental management initiatives to improve their environmental performance and have found other benefits to the process, such as financial savings and reduced risk of liability. However, many constraints can inhibit the transformation to an environmentally conscious and responsible organization. These constraints include issues related to organizational culture and change management. To overcome these constraints and succeed in implementing a successful environmental management initiative, the literature suggests the importance for members of the organization of understanding the environmental impacts and policies of the organization through participation in environmental awareness training efforts that produces enduring knowledge and commitment. Armed with this knowledge, employees can then understand how the environment can affect and be affected by their duties and decisions. Various companies have used different approaches to environmental management training. It is important that organizations evaluate the efficiency of their training investment to ensure that the benefits will be generated. A case study of two electricity companies is used to illustrate the importance of evaluating environmental awareness efforts. The results of the study suggest that the training performed did not sufficiently increase employee environmental awareness of the company's environmental impacts despite a considerable time and financial investment in a one-time environmental awareness training program. Results are briefly discussed and recommendations are made to improve the results of the training investment.

Keywords: Environmental awareness; Environmental management; Business; Education; Training; Organizational change

1. Introduction

The need for and the benefits of a more sustainable approach to business management have been discussed widely in various publications, not the least of which are Paul Hawken's *The Ecology of Commerce* [1], Stephan Schmidheiny's *Changing Course* [2], and Charles Holliday's *Walking the Talk* [3]. Business can no longer afford to consider the environment, the very fabric from which it extracts its resources, as an externality to which no price need be attached. In addition, a number of authors and studies have discussed the benefits, both social and financial, of addressing environmental sustainability issues [4–10]. But this quest for a more sustainable approach to business has yet to be widely realized.

Although a number of companies have introduced various environmental management systems, such as ISO 14001, BS 7750 and *The Natural Step Approach*, and have discovered the productivity and performance advantages of this approach [11–13], success has not been universal. One key aspect or necessary condition for a successful environmental management effort is the presence of an effective environmental education and awareness training initiative which provides employees, at all levels of the organization, with the tools and understanding necessary

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to conduct themselves in an environmentally aware manner and make environmentally responsible decisions in the organization [14–18].

This paper begins by discussing the constraints to environmental management, and then outlines the need and benefits of environmental education and awareness training in organizations. This is followed by a discussion of the environmental management education and awareness training efforts in a number of organizations to set the stage for the presentation of a case study of the environmental management education and awareness training efforts in two Canadian electricity companies. Finally, the conclusion will briefly review the implications of the case study for the proper implementation of an environmental management system and thus movement towards a more environmentally sustainable company.

2. Limiting environmental management

The limits and constraints to a more sustainable business approach and attitude are being uncovered. Some of these constraints are related to human aspects of the organization and the change process that needs to take place for an organization to incorporate environmentally sound behaviours in their activities. Environmental management, here used as a term to describe a more environmentally responsible and encompassing approach to business decisions and business activities, requires a number of aspects or conditions to fulfil its potential. In broad terms, environmental management can be viewed as an organizational change process [19,20–22]. Jorgensen [22] refers appropriately to the introduction of an environmental management system as a ''process,'' while arguing that an ''organization's ability to *change* is crucial in order to establish a dynamic environmental management system and to achieve continuous environmental improvements''. Beyond simple change, to become more sustainable, the organization must adopt an environmental culture where the entire organization must reorient its attitudes and behaviours to be committed to achieving new goals [17,23,24].

As for other forms of change, the introduction of an environmental management system and environmental culture requires a number of key activities to allow the change to take root and produce the desired effects. Nadler [25: p. 201] points to participation as one of the key steps to motivate change. Coch et al. [26] and Kotter et al. [27] found that participation in the organizational change process can reduce resistance, build ownership of the change and motivate individuals to make the change effort work. Training is one of the most critical tools to allow employees to learn and adopt these new mindsets, skills, and attitudes [14,28]. This aspect of the change process is often overlooked as it is assumed that not all members of the organization need to understand the new situation. However, many companies consider education to be key to inducing long-lasting environmental change [29].

3. Employees and the environmental organization

The social characteristics of an organization include what the employees think, feel, and do in the organization [30]. We are not only addressing the skills and abilities possessed by the employees, but also of what the employees, as individuals, care about, believe is important, and to which they are committed. The employees are the ultimate actors in the environmental management initiative of the company because they implement the changes in behaviours and routines that are required to reach the targeted improvements in the environmental performance of the company. Research on this subject shows that the human dimensions of an organization play an important role in the introduction of cleaner production in organizations [31]. Therefore, the introduction of environmental management into the organization's procedures and operations is only the first step in a continuous process [32]. As an integral part of the organization, employees need to be allowed and encouraged to participate in the environmental management initiative of the company for it to function at its greatest potential [23,32,33].

Employees are an important part of the implementation process because their support of the initiative will increase the probability of a successful implementation [32]. As well, employee participation is important because the employees are an important source of knowledge, expertise, and ingenuity when it comes to the company, its procedures and its equipment [34,35]. A number of companies have understood the role of their employees in attaining the goals of their environmental management system and other environmental and sustainability initiatives. As an example, the Dow Chemical Company launched their Waste Reduction Always Pays (WRAP) Award program to motivate their work force to reduce, reuse and recycle. The program has resulted in ''the reduction of 230,000 tons [233,680 tonnes] of waste, 13 million tons [13.21 million tonnes] of wastewater, and 8 trillion BTU's [2344.8 million kw/h] of energy'' involving ''395 projects'' [36]. The financial benefits associated with these reductions have been estimated at ''nearly US$1 billion'' for Dow Chemical Company. 3M has a similar program called Pollution Prevention Pays (3P) where manufacturing, research and development, logistics, transportation, and packaging employees are encouraged to prevent pollution at the source. From 1975 to 2002, 3M has prevented 857,282 tons [870,998.5 tonnes] of pollutants and saved US$894 million through their 3P program [37].

In a study of Danish companies by Remmen et al. [38], employees in all the companies contributed to the

environmental management initiative by providing "numerous ideas and proposals on how to reduce the environmental impacts from the production process". The authors go on to say that the employees drew these ideas and proposals from their own "experience and knowledge" acquired in the company. Some studies have identified a relationship between employee participation and the environmental performance of a company. In their study of the relationship between employee participation and industry toxic releases, Bunge et al. [39] found that, in companies striving for improved environmental performance, the decrease in toxic releases tripled in the presence of significant employee participation. To ensure that environmental issues are a fundamental part of the company's culture, the training strategy of an organization should include environmental awareness [40].

4. Environmental education and awareness

The importance of environmental education and awareness training in organizations has been well established in the literature [15,41–45]. When discussing environmental change, Bernstein [23] writes that "managing [change] is impossible without employee participation. Participation is impossible without understanding." In the organization, participation that leads to better environmental performance relies on the utilization of knowledge [46]. The many small actions and decisions that all members of an organization can make in their everyday work can cumulate to large improvements in the environmental impacts of the organization. Employees should be brought to understand how they may contribute to the efforts for sustainability endorsed by the organization. Without their ingenuity and expertise, the environmental management and sustainability initiatives of an organization may be limited to a number of technical improvements and omit large efficiency gains initiated by the work force. Cohen-Rosenthal [16] and Hale [14] argue that an effective strategy for improved environmental performance requires that all employees in an organization be aware of the natural systems and their functioning as well as understand their effect on business performance. This understanding allows the employees to participate in the environmental management effort, and helps improve environmental performance of the company. A study of the factors restricting the implementation of energy efficiency improvement measures in organizations by Zilahy [47] found that one of the most important restrictive factors was environmental awareness. In fact, the study found that environmental awareness is one of the most important organizational predictors of the level of environmental measures assimilated by an organization.

Through their research, Cook and Seith [48] found that environmental training motivates employees to participate in the environmental initiatives. The National Round Table on the Environment and the Economy [33] suggests that education and communication are vital in helping employees and managers understand their role and responsibilities in implementing sustainable development in a corporation. In addition, a Green Paper on Promoting a European Framework for Corporate Social Responsibility from the European Commission [49] stresses the importance of involving and consulting employees. It suggests that the "social dialogue needs to be widened to cover issues and instruments for improving companies' social and environmental performance" while also suggesting that companies invest in environmental awareness training schemes. Therefore, for the employees to be involved, the company must provide some amount of environmental awareness education and training [40,50]. Sony has recognized the importance of such education and training. It has developed a program that determines targets and programs to measure and motivate change among its employees. Green Management 2005 encourages employees to incorporate environmental perspectives into their own task assignments in numerous areas of the company from marketing to repair services [51]. Because the attainment of the goals requires actions by individuals in the company, "staff education takes a high priority" through environmental management workshops and various company-wide awareness-raising initiatives [51].

There is a strong level of support for environmental education and training in the corporate world [7,52,53]. Saunders et al. [54] listed *employee education* as one of the most frequent elements recommended by organizations for inclusion in an environmental management system. This is reflected in many environmental guidelines and frameworks developed by or for industry. The British environmental management standard, BS 7750, also calls for employee awareness of environmental effects of their activities and of their responsibilities in relation to the system [55]. Saponara et al. [56] write that the intent of clause 4.4.2 of ISO 14001 is to "ensure that employees at all levels of the organization understand the goals of the EMS [environmental management system] and the ways their job activities impact the environment and the achievement of EMS goals". Further to these frameworks, the World Business Council on Sustainable Development (WBCSD) has recognized the role of employees in the organizations efforts for sustainability. WBCSD has developed a sustainability education tool for organizations called Chronos® that addresses the business case for sustainable development. This education tool can be used to increase employee awareness of sustainability issues encountered by their organization while prompting them to consider their role and potential contribution [57].

Organizations should implement an environmental awareness training program that communicates to their employees lasting knowledge of not only the organization's environmental management scheme and environmental policy but also of the organization's environmental impacts [14,16,50,58]. Beyond their basic work responsibilities, all employees need to be provided with the information they need in order to recognize environmental issues and situations, make the right decisions, and take appropriate action [59,60]. Worley [61] argues that "true environmental success comes only when environmental responsibility is embraced as part of every employee's job". There is therefore, strong support for employees to be versed in environmental issues, environmental processes, as well as the functioning of environmental management to ensure that the organization's environmental improvement efforts bring about the benefits due to the environment and to the organization [16,32,44,50,58,62]. In Canada, the Canadian Electricity Association (CEA) identified four principles in its Environmental Commitment and Responsibility Program. Principles one to three involve a more efficient use of resources; the reduction of adverse environmental business impacts; and accountability to constituents. Notably, the fourth principle requires the commitment of CEA members "to ensure that [their] employees understand the environmental implications of their actions and have the knowledge and skills to make the right decisions" [63].

The benefits of environmental awareness education and training in business are well known to include: a feeling of ownership among employees towards the success of the company; an improved ability to retain qualified employees; the ability to attract high achieving graduates; lower staff turnover; greater job satisfaction; closer employee identification with corporate goals and culture; better motivated staff; and, the improved status that comes from working for a company that shows care for the environment [13,34,46,64–67].

5. Sustained environmental education and awareness efforts

We learned from the behavioural literature that successful training programs which modify and lead to more environmentally responsible behaviours include means of changing the culture of an organization [68]. Environmental education and awareness training programs are an important part of changing the way businesses conduct their activities, however, even very carefully designed programs may not create the environmental behaviour changes desired and required for a sustainable organization [69]. A key concept in describing an environmental awareness and education program is *lasting knowledge*. As mentioned previously, little benefit may come from an educational effort that fades quickly over time, such as a one-time program blitz.

In a study of company environmental education and training in the European Union in which environmental managers, middle (technical) managers, and skilled and semi-skilled workers were interviewed, Madsen and Ulhoi [18] report that only 41.1% of the respondents know the content of the environmental policy, in full. Although Cook and Seith [48] consider environmental training to be the "single most important element of a company's compliance strategy", many organizations overlook the need to assess whether the environmental training effort produced the desired knowledge and change in attitude which was intended and required.

In the spirit of 'what gets measured gets done', for all training as for environmental training efforts, an evaluation of the training outcomes should be done to ensure that the information has been transferred to and retained by the employees [70]. Environmental management and the measuring of environmental training should not be an exception, since training is an investment and the company should show interest in whether or not the training was successful [71,72]. Worthen [73] writes that training is the workplace issue for which the largest amount of money is spent, but no accountability is required for the expenditure. Companies need to be accountable for their expenses, and this means evaluating the outcomes and success of their training efforts [70]. Only then can a company be confident that the outcomes (employee participation, improved environmental performance, improved employee attitudes, etc.) of environmental awareness training will become reality.

The Southern Company, consisting of five operating electrical companies and three additional subsidiaries, is an example of a company that evaluates the outcome of its training efforts. Their audit procedure, to determine the effectiveness of their environmental management program in complying with the company's rules and procedures, includes an evaluation of the employee general environmental awareness training performed through interviews with the workforce [74]. This type of audit procedure should become the norm rather than the exception. In Canada, the CEA made a commitment to track the progress of its member companies in terms of the fourth principal on environmental awareness. Although they are very general, the CEA developed indicators of implementation for the companies to report on annually [63].

6. Case study of environmental awareness education and training

A number of companies have developed environmental education and training programs and others have adopted education and awareness tools which are

available to help organizations address environmental awareness, such as Chronos® from the World Business Council on Sustainable Development. For some, such as Stora Enso [75,76], Sony [77], and Interface [78], these programs are central to the company's environmental management vision. Some companies go as far as claiming that an environmental program that does not include an employee environmental training and awareness component is "doomed to failure" [79]. Although such companies have found success with their environmental awareness training efforts, little information is available to suggest how these training programs were devised and implemented. This is a common issue in business management research where information on the processes and tools used or developed by organizations are rarely made public but rather guarded as a business advantage.

In addition, a number of other methods may have been used in consort with the training effort to help the organizational change process to take root. Other methods which can assist in improving the environmental performance of organizations include, to name a few, performance reviews and compensation schemes, norm appeals feedback, and senior management visibility. These tools can also improve the environmental culture and performance of organizations and may be complementary to training efforts. However, this study focused on training as the literature suggests that training is key to the success of organizational environmental improvement efforts, although other tools can further improve the environmental performance of organizations.

We undertook a study of environmental management training in two Canadian electricity companies that are engaged in environmental management efforts. Both companies are members of the CEA and have thus committed to the principles of the Environmental Commitment and Responsibility Program as mentioned previously. The study's primary objective was to assess whether the environmental awareness training provided to employees in the selected electricity companies includes those elements that support a strong environmental management performance. An environmental training program should address the environmental impacts and issues of the company as well as convey to the employees their environmental responsibilities [16,32,44,50,58,62]. The study looked at the environmental knowledge acquired by the employees of a company following the training effort and contrasted this with a second company that had yet to initiate a formal training program.

The study took the form of a program evaluation of the environmental training and awareness education programs in the two companies. The sequence of evaluation steps were adapted from Kirkpatrick [80] and his levels of evaluation. The first level assessed the attitude of the employees in relation to the training and awareness program to determine whether or not they had a positive view of the program. The second level determined whether the participants had learned what they were expected to learn and whether the participant's impressions of the environment changed due to the program. The knowledge acquired was assessed and compared to the environmental awareness goals derived from the literature [15,52,56]. These included basic environmental knowledge such as the order of preference of the three "R"s of reducing, recycling and reusing, and aspects of the environmental implications of the company's specific field of work.

6.1. Research design

The research used a matched non-random control group design combined with a two-group post-test-only design where a second company with a similar environmental management system was selected to be the control group [81,82]. This study focused on the Canadian electricity industry where environmental awareness training had been identified as a crucial element of environmental management [83]. The two companies were both municipal utilities of similar size but operated in two different provinces. This matched pair control group design allowed some quasi-comparisons to judge the effectiveness of the training programs.

The sequence of evaluation steps were adapted from Kirkpatrick [80] and his levels of evaluation. Levels one and two are addressed by this study. The first level assessed the attitude of the employees in relation to the training and awareness program to determine whether or not they had a positive view of the program. The second level determined whether the participants learned what they were expected to learn. The knowledge acquired was assessed and compared to the environmental awareness goals derived from the literature [12,52,56]. The second level assessed whether the participant's impressions of the environment changed due to the program. This assessment only looks at how the participants felt about the environment, rather than assessing actions they engaged in prior to the program and after the program, because people are more accurate at remembering past feelings than past actions (validity of retrospective measures) [84]. An additional motivation for assessing not only training reactions but also training learning and behaviour lies in the fact that assessing the success of a training effort from trainee reaction does not provide a proper measure of training effectiveness. Measures of trainee self-efficacy, learning, and behaviour formed the majority of questions in the questionnaire because they offer a more valuable measure of training success [85]. In addition, this study offered the advantage of an assessment performed more than 6 months after the training effort providing for

a more suitable assessment of retained knowledge and a more appropriate evaluation of attitude change as the employees had considerable time to adopt new attitudes and use their knowledge in their work situation.

The environmental awareness of a company that had performed an environmental awareness training program with all its employees, referred to here as Company 1, was compared to the environmental awareness of employees in a company which had yet to do so but had implemented a similar environmental management program, i.e. Company 2. A stratified random sampling method was used to select the volunteers. Employees interviewed included upper managers, first level managers, customer service employees, inside production and maintenance workers, and outside production and maintenance workers for a total of 62 participants. A standard questionnaire was used to conduct the structured interviews with 48 multiple-choice questions and six open-ended questions in three sections: environmental knowledge, attitudes, and environmental policy. Sample questions from the questionnaire can be seen in Table 1. The interviews lasted 15–20 min each. Statistical tests, namely one-way ANOVAs and univariate ANOVAs were performed on the data and a significance level of $\alpha = 0.05$ was used in the analysis.

The questionnaire included 48 multiple-choice questions and six open-ended questions in three sections: environmental knowledge, attitudes, and environmental policy. The attitude section of the questionnaire was separated into four scales: attitude, training, behaviour, and job satisfaction. Based on electrical utility expert opinions we divided the two organizations into five strata. Strata percentages represented in the study sample are 5% upper management, 15% first level management, 5% customer service, 38% inside maintenance, and 38% outside maintenance; this to roughly approximate the percentage of each stratum in the organization in the study [86].

6.2. Results

The results of the environmental knowledge assessment did not confirm that the employees of the company which had received the environmental training, Company 1, met the level of environmental awareness that the literature associates with better environmental and financial performance. The environmental knowledge of employees in Company 1 was not found to be significantly different from the environmental knowledge of the employees of Company 2 when assessed

Table 1
Sample questions from the multiple-choice questionnaire

Question grouping		Sample questions
Environmental knowledge		1.Which of the following is better for the environment? (a) Recycling the products; (b) reusing the products; (c) reducing the amount of products purchased 9. The air emissions from the burning of petroleum or coal contributes to: (a) ozone depletion (degradation of the ozone layer); (b) acid rain; (c) Eutrophication 13. Which of these emissions causes acid rain? (a) carbon dioxide (CO_2); (b) sulphur dioxide (SO_2); (c) phosphoric acid
Environmental attitudes	Attitude	24. Outside of work I changed my behaviours to become more environmentally responsible (strongly agree, agree, disagree, strongly disagree) 31. Environmental issues deserve a greater part of the government's resources (strongly agree, agree, disagree, strongly disagree)
	Training	19. The environmental management training has contributed to your understanding of the environmental impacts of the company (strongly agree, agree, disagree, strongly disagree) 26. You feel better equipped to make environmentally responsible decisions due to the environmental training (strongly agree, agree, disagree, strongly disagree)
	Behaviour	22. Because of the environmental training you have made changes in the way that you perform your duties at work which were not required by the training (strongly agree, agree, disagree, strongly disagree) 37. Have you ever consulted your superiors about an environmental management issue? (strongly agree, agree, disagree, strongly disagree)
	Job satisfaction	33. I would recommend working for this company to others (strongly agree, agree, disagree, strongly disagree) 35. You feel better about working for this company since the environmental training program initiated (strongly agree, agree, disagree, strongly disagree)
Environmental policy		41. Does your company have an environmental policy? (a) yes; (b) no 42. Did the company require you to be aware of the environmental policy? (a) yes; (b) no 44. The environmental policy of the company supports open communications with the public about its environmental performance: (a) yes; (b) no; (c) don't know

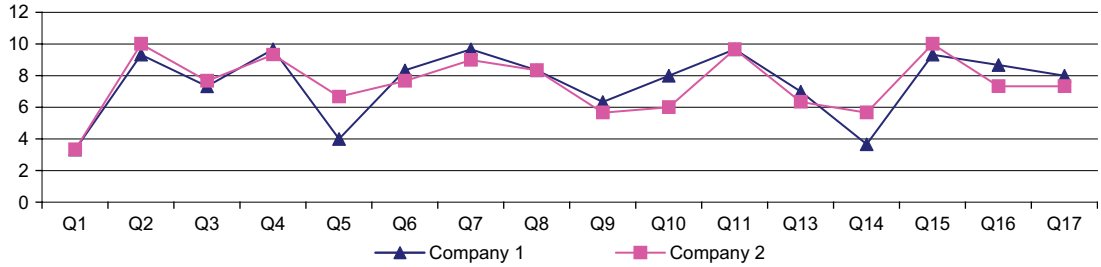

Fig. 1. Environmental knowledge questions company mean results.

using this study's questionnaire. Fig. 1 shows the results of the environmental knowledge questions.

However, although, a higher mean score was found for Company 1 for half of the questions pertaining to environmental knowledge, as shown in Fig. 1, the difference was not significant, and the mean score totals were almost the same for Company 1 (120.67 ± 20.16SD; $n = 30$) and Company 2 (120.00 ± 24.21SD; $n = 30$). The fact remains that a better performance on the questionnaire should be expected as a result of the training effort. Even on questions of general environmental knowledge, questions addressing issues of energy savings and aspects of recycling, the employees of Company 1 did not show better results than those of Company 2 as shown in Fig. 1. Greater concern may come from the fact that employees from Company 1, which had received the training, had lower results than Company 2 on questions pertaining to the environmental impacts of the company and the electricity industry as a whole. Perhaps surprisingly, the study did find that the employees of Company 1 felt better equipped to handle environmental situations ($F = 3.245$, $p = 0.019$, df = 1, 50; $R^2 = 0.256$).

The success of the environmental awareness training effort within the company strata was also evaluated. Significance was found when comparing the strata ($F = 4.726$, $p = 0.003$, df = 4, 50; $R^2 = 0.28$) using the sum of the scores for all the questions for each interview. In the analysis of the difference in environmental knowledge between the different strata, the study found that, of all the strata, the customer service stratum knew the least about the environmental impacts of the company and had the least general environmental knowledge. The upper management stratum, with a mean score of 150, was significantly different from the customer service stratum with a mean score of 133.33 (Sidak = 0.012). The maximum score for the environmental knowledge section was 160. In addition, the customer service stratum showed the lowest mean scores most often for individual questions in the environmental knowledge section as showed in Fig. 2.

The results for questions Q41 and Q42 (Table 2) show that more positive results were found on questions relating to the environmental policy of the company. Only comparable questions are shown in Table 2 as a number of environmental policy questions were only relevant to Company 1 and so their results could not be compared to those of Company 2. There was a significant difference between Company 1 and Company 2 where Company 1 employees were more aware of the policy's existence ($F = 8.884$, $p = 0.004$, df = 1, 50; $R^2 = 0.344$) and whether the employees are required to be aware of the environmental policy ($F = 5.207$, $p = 0.027$, df = 1, 50; $R^2 = 0.272$). When combining all comparable environmental policy questions, Company 1 had a mean score of 28.667 and Company 2 had a mean

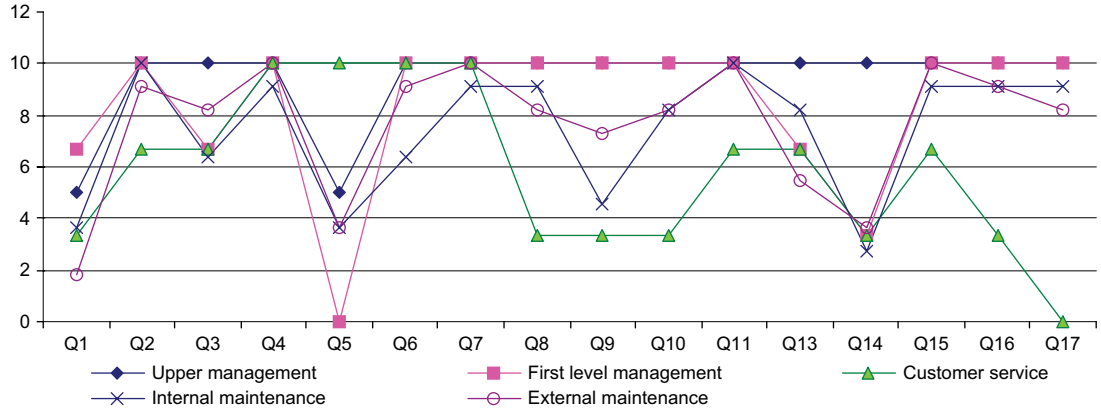

Fig. 2. Strata mean environmental knowledge scores for Company 1.

Table 2
Environmental policy questions company mean scores

Company		Q41	Q42	Q47	Q48	Total
1	Mean	10.00	10.00	3.33	5.33	28.67
	N	30.00	30.00	30.00	30.00	30.00
	SD	0.00	0.00	4.79	5.07	6.81
2	Mean	6.00	7.67	2.33	8.67	24.67
	N	30.00	30.00	30.00	30.00	30.00
	SD	4.98	4.30	4.30	3.46	8.19

score of 24.667. The maximum score for the environmental policy section was 40. A significant difference in environmental policy knowledge between the management positions and the maintenance positions in the company was found within Company 1. The maintenance strata knew significantly less than the management strata of the companies. In comparing the strata of Company 1, the analysis of the sum of the environmental policy question scores was found to be significant ($F = 3.216$, $p = 0.029$, df = 4, 25). However, no specific stratum comparison was found to explain this significant difference between the strata. The scores can be seen in Fig. 3.

6.3. Discussion and limitations of the study

According to managers of Company 1, a considerable amount of time and money was allocated to this training program, and it is disappointing to find that the program did not succeed in improving employee awareness as had been expected by the managers. The fact that the knowledge of the employees exposed to environmental awareness training was equal to that of employees who had not been exposed to such training underlines the need for companies to evaluate the outcomes of training programs. Companies and other organizations aiming for a more sustainable approach to their activities should increase the environmental awareness of their members, but as we can see from the case study, in some cases, the awareness training provided may not succeed in increasing the environmental awareness of their members. In such cases, the members may not be able to participate effectively in the environmental management of the organization. This may jeopardize the success of the environmental management initiative and restrain the organization's ability to obtain the associated social and economic advantages.

In addition, the environmental awareness training was not received equally well amongst the various strata of the company. From general discussions with members of management, it seemed that all were expected to have understood and absorbed the information provided. This was not the case in the company that received the training. This situation also suggests that different organizational strata do not have the same information base before the training and may not be as well equipped to integrate the information provided by the environmental awareness training. Zilahy [47] found similar irregularities in the environmental awareness of company employees where employees in lower positions were less aware of environmental measures in the company. This difference in pre-training information base should be taken into consideration when providing environmental awareness training, whether employee strata are mixed or separate during the training. In this case, a pre-training assessment of the state of the environmental awareness of the participants may be in order to ensure the training will be appropriate and effective.

The employees reported feeling better equipped to handle environmental situations following the environmental awareness training. The results, however, suggest that there was no greater environmental awareness among the employees who had received the environmental awareness training compared to employees who had received no training. The training was, therefore, unsuccessful in raising the environmental awareness of the employees to a level that would improve their ability to participate in the environmental improvement effort. The results suggest that an inaccurate assessment of employee awareness may be obtained if the awareness goals

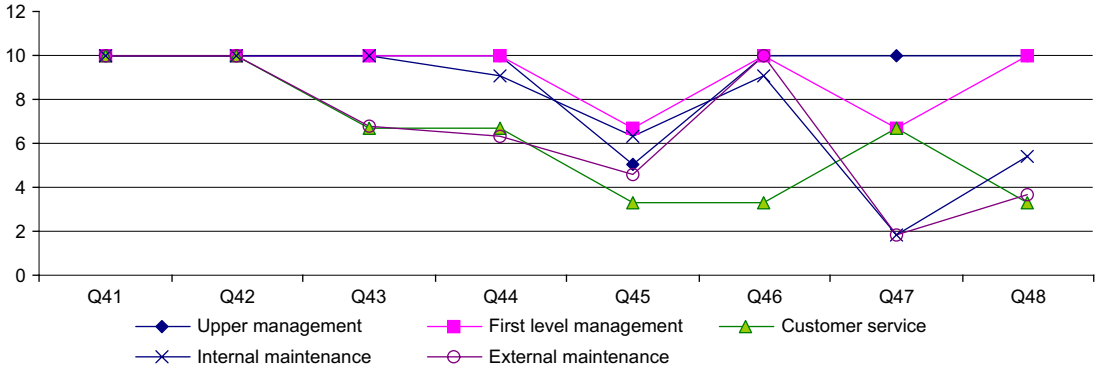

Fig. 3. Company 1 strata results for environmental policy questions.

of the training effort are not properly assessed, or if the company relies exclusively on testimonials of appreciation from the participating members. There is thus, much work to be done if companies are to make the cultural shift necessary for measurable improvements in their environmental performance, and thereby, benefit from the related advantages of an environmental management scheme and an environmentally aware workforce.

A number of qualitative observations are worthy of note beyond the results of the multiple-choice questionnaire. The conversations and comments offered by the employees during the data gathering session at Company 1 suggested that the perceptions of upper and first level management concerning the environmental training effort were inaccurate. Their perceptions were that the members of management believed the environmental training effort to be a success and that the training had run its course. Senior management showed a certain level of pride in the belief that the employees in the entire organization were aware of the company's environmental situation and, mostly, of the company's environmental policies. During the interviews with employees of all strata, some hesitation and confusion was displayed when faced with questions about the environmental impacts of the electricity industry and respondents often admitted freely that they were guessing the answers and "had no idea". This suggests that the outcomes of the training effort were not assessed accurately and should be more thoroughly evaluated in terms of the real level of awareness of the employees.

It was also noted by the investigator that upper management in both companies thought that their efforts to inform their employees of the environmental management program had been successful and appropriate. In the case of Company 1, the implementation of the environmental management system had been mostly completed following the environmental training session and the managers believed the entire organization knew of the program, the environmental policies, and knew of the importance of environmental management. In contrast, the time spent with Company 1 employees suggested they knew of the existence of the program but could not describe it, although they remembered being informed of it at one point in the past. Systematic evaluation of the effectiveness of such programs could correct these misperceptions.

A noteworthy limitation to the study was the lack of available information regarding the training effort design and delivery. Many factors inherent to the design and delivery of a training program can be barriers to the transfer of knowledge and to instilling the desired behavioural changes. Training aspects, such as delivery that is not engaging, high complexity content, lack of management support for the efforts, and low employee involvement in the training effort, can prevent the success of the training effort. Such aspects may have been partly responsible for the low level of information retention observed in Company 1, however this could not be confirmed. The company management was not directly involved in the training design and delivery and did not retain any of the materials used by the consultants hired to provide the training.

The level of management support for the training could not be determined during this study and this again leaves one factor unanswered. Although the management staff voiced their support for the training effort and for other environmental improvement efforts in Company 1, appropriate communication of this support to employees could not be confirmed adequately.

Another limitation lies in the study design. The research used a non-equivalent control group design combined with a two-group post-test-only design [81,82]. This design was used because of several restrictions to the data collection for the study. The post-test control group could not be selected from within the company which performed the environmental awareness program because it was conducted with all the employees in the company. Thus, a second company with a similar environmental management system, but no environmental awareness training, was selected to be the control group. This accounts for the non-equivalent control group aspect of the design. Also, due to a limited time frame, no pre-test was possible to determine the knowledge base before the training hence the two-group post-test-only aspect of the design. This type of design does offer the advantage of avoiding the bias that pre-testing can have on the outcomes of training [81,87]. Two companies participated in the study mainly because of the limited amount of time and resources that were available to complete this study.

7. Conclusions and recommendations

The move towards a more sustainable approach to business is essential if organizations are to compete in a reality of limited resources and interlinked ecological systems. The implementation of environmental management approaches and initiatives requires that the values and culture of the company must permeate the activities of the organization and be adopted by all personnel. The implementation of environmental management systems or other forms of responsible business management require some level of change in the companies' values and culture to permeate the organizations' activities. These systems and this change in culture require an effective and sustained education and awareness effort to ensure that the information necessary for this movement is acquired and retained; otherwise, the benefits of implementing an effective environmental management system or other initiative will most probably not be realized.

It remains to be determined whether or not the efforts put forth by businesses, including environmental awareness training and education, fruitfully translate into more sustainable and responsible business decisions at every level of the company. For those organizations that plan and implement environmental awareness and education initiatives, it is crucial that provisions to evaluate the program be included in the process. The case study presented underlines the need for organizations to assess the outcome and success of their environmental awareness initiatives. Such initiatives require the commitment of time and finances which should not, just as for other initiatives, be expended without setting goals and measuring the output and outcomes: knowledge retained and behaviour/culture change. Our case study indicates that simply having a training program is not enough. It must be a good program, and only through training evaluation will a company know that they have a good training program.

To improve training investment, organizations need to start treating their training investments like other financial investments which they consider. Assessing the needs of the organization and the needs of the employees, ensuring that the training design, content, and delivery will provide maximum uptake considering the organization's characteristics, and assessing the results of the training to ensure the training was successful in terms of the organizational expectations. This involves more than a simple assessment of trainee reaction to the training to determine whether it was enjoyed by the participants. However, to make more precise suggestions as to the way training should be undertaken, more research needs to be done to uncover the links between training format and training success. In addition, other tools used to promote environmental awareness and the adoption of an environmental culture in organizations may have an important role in promoting environmental behaviour and greater environmental performance in organizations. Further research into the synergy between such tools and other environmental awareness efforts would assist in understanding how best to approach environmental awareness training in organizations to improve environmental performance.

Although this study suggests that environmental awareness training efforts may not be performed successfully, much work needs to be done to uncover the reasons for this. Further research should be carried out to better link successful environmental awareness training efforts to the training conditions including, to name a few, the training content level of difficulty, the approach to training delivery, the level of management support communicated to employees, and the employee involvement in the training effort. Obviously, much work remains to be done if we are to understand how to better implement successful environmental performance improvement efforts in organizations.

References

[1] Hawken P. The ecology of commerce: declaration of sustainability. New York: HarperCollins Publishers; 1993.

[2] Shmidheiny S. Changing course: a global business perspective on development and the environment. Cambridge: MIT Press; 1992.

[3] Holliday CO, Shmidheiny S, Watts P. Walking the talk: the business case for sustainable development. Sheffield, San Francisco: Greenleaf Publishing; 2002.

[4] Feldman SJ, Soyka PA, Ameer P. Does improving a firm's environmental management system and environmental performance result in a higher stock price? ICF Kaiser International 1996.

[5] Kiernan MJ, Levinson J. Environment drives financial performance: the jury is in. Environmental Quality Management 1997; 7(2):1–9.

[6] Willard B. The sustainability advantage: seven business case benefits of a triple bottom line. Gabriola Island, British Columbia: New Society Publishers; 2002.

[7] Lowy DC, Wells RP. Corporate environmental governance: benchmarks toward world-class systems. New York: The Conference Board; 2000.

[8] Descano L, Gentry BS. How to communicate environmental performance to the capital markets. CMA News 1998;April;33–7.

[9] Pearce D. Corporate behaviour and sustainable development: the view from economics. In: Bansal P, Howard E, editors. Business and the natural environment. Oxford: Butterworth-Heinemann; 1997. p. 102–24.

[10] Baxter International Inc. Annual environmental, health & safety performance report; 1997.

[11] Romm JJ. Lean and clean management: how to boost profits and productivity by reducing pollution. New York: Kodansha International; 1994.

[12] McInerney F, White S. The total quality corporation: how 10 major companies turned quality and environmental challenges to competitive advantage in the 1990's. New York: Truman Talley Books/Dutton; 1995. 127–41.

[13] Hui IK, Chan AHS, Pun KF. A study of the environmental management system implementation practices. Journal of Cleaner Production 2001;9(3):269–76.

[14] Hale M. Training for environmental technologies and environmental management. Journal of Cleaner Production 1995;3(2): 19–23.

[15] Wehrmeyer W. Greening people: human resources and environmental management. Sheffield, England: Greenleaf Publishing; 1996.

[16] Cohen-Rosenthal E. A walk on the human side of industrial ecology. American Behavioral Scientist 2000;44(2):245–64.

[17] Daily B, Huang S. Achieving sustainability through attention to human resource factors in environmental management. International Journal of Operations & Production Management 2001; 21(12):1539–54.

[18] Madsen H, Ulhoi JP. Greening of human resources: environmental awareness and training interests within the workforce. Industrial Management and Data Systems 2001;101(2):57–63.

[19] Roome N. Developing environmental management strategies. Business Strategy and the Environment 1992;1(1):11–24.

[20] Post JE, Altman BW. Managing the environmental change process: barriers and opportunities. Journal of Organizational Change 1994;7(4):64–82.

[21] Post JE, Altman BW. Managing the environmental change process. In: Moxen J, Strachan PA, editors. Managing green teams: environmental change in organizations and networks. Sheffield, England: Greenleaf Publishing; 1998.

[22] Jorgensen TH. Environmental management systems and organizational change. Eco-Management and Auditing 2000;7(2):60–6.

[23] Bernstein D. In the Company of Green. London: ISBA; 1992.

[24] Keogh PD, Polonsky MJ. Corporate commitment to the natural environment: issues in a team approach. In: Moxen J, Strachan-PA, editors. Managing green teams: environmental change in organizations and networks. Sheffield, UK: Greenleaf Publishing; 1998. p. 35–47.
[25] Nadler DA. Managing organizational change: an integrating perspective. Journal of Applied Behavioral Science 1981;17(2): 191–212.
[26] Coch L, French Jr JRP. Overcoming resistance to change. Human Relations 1948;1:512–32.
[27] Kotter JP, Schlesinger LA. Choosing strategies for change. Harvard Business Review 1979;57(2):106–14.
[28] Jick TD. Accelerating change for competitive advantage. Organizational Dynamics 1995;24(1):77–83.
[29] Saunders T, McGovern L. The bottom line of green is black: strategies for creating profitable and environmentally sound business. San Francisco, CA: HarperCollins; 1993.
[30] McShane SL. Canadian organizational behaviour. 4th ed. Toronto, Ontario, Canada: McGraw-Hill Ryerson; 2001.
[31] Stone L. When case studies are not enough: the influence of corporate culture and employee attitudes on the success of cleaner production initiatives. Journal of Cleaner Production 2000;8: 353–9.
[32] Klinkers L, Nelissen N. Employees give business its green edge: employee participation in corporate environmental care. In: Wehrmeyer W, editor. Greening people: human resources and environmental management. Sheffield, UK: Greenleaf Publishing; 1996. p. 213–24.
[33] National Round Table on the Economy and the Environment. Decision making practices for sustainable development. Ottawa, Ontario: National Round Table on the Environment and the Economy; 1991.
[34] Cramer JM, Roes B. Total employee involvement: measures for success. Total Quality Environmental Management 1993;3(1):39–52.
[35] Wehrmeyer W. Introduction. In: Wehrmeyer W, editor. Greening people: human resources and environmental management. Sheffield, UK: Greenleaf Publishing; 1996. p. 11–32.
[36] Dow Chemical Company. The Dow global public report 2003: waste reduction always pays (WRAP). Dow Chemical Company, <http://www.dow.com/publicreport/2003/studies/wrap.htm>; 2004 [accessed June 2004].
[37] 3M. More about pollution prevention pays – 3M's environmental tradition. 3M, <http://www.3m.com/about3m/sustainability/policies_ehs_tradition_3p.jhtml>; 2004 [accessed June 2004].
[38] Remmen A, Lorentzen B. Employee participation and cleaner technology: learning processes in environmental teams. Journal of Cleaner Production 2000;8:365–73.
[39] Bunge J, Cohen-Rosenthal E, Ruiz-Quintanilla A. Employee participation in pollution reduction: preliminary analysis of the Toxics Release Inventory. Journal of Cleaner Production 1996; 4(1):9–16.
[40] Milliman J, Clair J. Best environmental HRM practices in the US. In: Wehrmeyer W, editor. Greening people: human resources and environmental management. Sheffield, UK: Greenleaf Publishing; 1996. p. 49–74.
[41] Cohen-Rosenthal, E. Health, ecology, and learning: a perspective on change. Presented at the International Conference on Healthy Work Environments Healthy People, held at the University of Michigan, on June 3, 1991. <http://www.cfe.cornell.edu/wei/health.html> [accessed 24 November 2000].
[42] Conklin DW, Hogson RC, Watson ED. Sustainable development: a manager's handbook. Ottawa, Canada: National Round Table on the Environment and the Economy; 1991.
[43] Beard C. Environmental training: emerging products. Industrial and Commercial Training 1996;28(5):18–23.
[44] Bird A. Training for environmental improvement. In: Wehrmeyer W, editor. Greening people: human resources and environmental management. Sheffield, UK: Greenleaf Publishing; 1996. p. 227–46.
[45] Hart T. The role for the personnel practitioner in facilitating environmental responsibility in work organizations. In: Wehrmeyer W, editor. Greening people: human resources and environmental management. Sheffield, UK: Greenleaf Publishing; 1996. p. 185–98.
[46] North K, Daig S. Environmental training in British and German companies. In: Wehrmeyer W, editor. Greening people: human resources and environmental management. Sheffield, UK: Greenleaf Publishing; 1996. p. 247–70.
[47] Zilahy G. Organizational factors determining the implementation of cleaner production in the corporate sector. Journal of Cleaner Production 2003;12:311–9.
[48] Cook J, Seith BJ. Designing an effective environmental training program. Journal of Environmental Regulation 1992;1: 53–62.
[49] European Commission (Employment and Social Affairs). Promoting a European framework for corporate social responsibility (Green Paper). Luxembourg: Office of Official Publications for the European Communities; 2001.
[50] Miller J. Working in environment: skills, expertise and new opportunities. In: Wehrmeyer W, editor. Greening people: human resources and environmental management. Sheffield, UK: Greenleaf Publishing; 1996. p. 301–14.
[51] World Business Council for Sustainable Development. Sony: green management 2005, <http://www.wbcsd.ch>; 2002. Cross-cutting themes – innovation/technology – case studies, [accessed visited June 2004].
[52] Confederation of British Industry. Environmental education and training: guidelines for business. London: CBI; 1992.
[53] Global Environmental Management Initiative. Environmental self-assessment program. Washington: Global Environmental Management Initiative; 1994.
[54] Saunders T, McGovern L. How to add a green lining to your business: guidelines and checklists. In: Saunders T, McGovern L, editors. The bottom line of green is black: strategies for creating profitable and environmentally sound business. San Francisco: HarperSanFrancisco; 1993. p. 65–74.
[55] British Standards Institute. Environmental management system: BS 7750. London: BSI; 1994.
[56] Saponara A, Roig RA. ISO 14001 environmental management systems: a complete implementation guide. Vancouver: STP Specialty Technical Publishers Inc.; 1998.
[57] World Business Council for Sustainable Development. Chronos®, <http://www.sdchronos.org/en/index.htm>; 2003 [accessed June 2004].
[58] Burleigh C. Achieving improvements in production through environmental management systems. In: Hillary R, editor. Environmental management systems and cleaner production. Chichester: John Wiley and Sons Ltd; 1997. p. 330–6.
[59] Duck JD. Managing change: the art of balancing. Harvard Business Review 1993;71(6):109–18.
[60] Bansal P. Business strategy and the environment. In: Bansal P, Howard EB, editors. Business and the natural environment. Oxford, UK: Butterworth-Heinemann; 1997. p. 173–94.
[61] Worley T. Promoting employee environmental awareness and involvement. In: Global Environmental Management Initiative, editor. Proceedings of the Global Environmental Initiative Conference. Arlington, VA: United States; 1994. 141–5.
[62] Johnson R. Meeting the refrigerant challenge. Occupational Health & Safety 2000;69(11):75–7.
[63] Canadian Electricity Association. 2002 ECR annual report. Canadian Electricity Association, <http://www.canelect.ca/english/

managing_issues_environment_ecr_library.html>; 2002 [accessed June 2004].
[64] Schneider B, Bowen DE. Employee and customer perceptions of service in banks: replication and extension. Journal of Applied Psychology 1985;70:423–33.
[65] Charter M. Greener marketing: a responsible approach to business. Sheffield, UK: Greenleaf Publishing; 1992.
[66] Torrens IM, Yeager KE. The electric utility industry. In: Richards DJ, Pearson G, editors. The ecology of industry. Washington, DC: National Academic Press; 1998. p. 72–100.
[67] Reinhardt FL. Down to earth. Boston, MA: Harvard School Press; 2000.
[68] Monroe MC, Chambers N. Building capacity through training. In: Day BA, Monroe MC, editors. Environmental education and communication for a sustainable world: handbook for international practitioners. Washington, DC: Academy of Educational Development; 2000.
[69] Stern PC. Information, incentives, and proenvironmental consumer behavior. Journal of Consumer Policy 1999;22(4):461–78.
[70] Martin M. Ensure a return on your training investment. Occupational Hazards 2001;63(8):30.
[71] James P, Stewart S. The European environmental executive: technical specialist or corporate change agent. In: Wehrmeyer W, editor. Greening people: human resources and environmental management. Sheffield, UK: Greenleaf Publishing; 1996. p. 143–62.
[72] Kerr S. On the folly of rewarding A, while hoping for B. In: Matteson MT, Ivancevich JM, editors. Management and organizational behavior classics. 6th ed. Toronto, ON: Irwin; 1996. p. 371–87.
[73] Worthen B. Measuring the ROI of training. CIO 2001;14(9):128–36.
[74] Woodall Jr WR. Environmental management system assessment. In: Global Environmental Management Initiative, editor. Environmental management in a global economy conference proceedings. Arlington, VA: Global Environmental Management Initiative; 1994.
[75] Stora Enso Kvarnsveden AB. Environmental report 2001. Stora Enso, <http://www.miljostyrning.se/emas/redovisningar/emas107-2001en.pdf>; 2002.
[76] Stora Enso. Sustainability annual report 2003. Stora Enso, <http://www.storaenso.com/CDAvgn/showDocument/0,2452,00.pdf>; 2003.
[77] Sony. Sony and the global environment: environmental education. Sony, <http://www.sony.net/SonyInfo/Environment/environment/management/education/index.html>, 2004 [accessed August 2004].
[78] Interface. Learning and development. Interface, <http://www.interfaceinc.com/getting_there/learning.html>, and <http://www.interfaceinc.com/getting_there/sustainability_training.html> [accessed June 2004].
[79] Saunders T, McGovern L. Introduction. In: Saunders T, McGovern L, editors. The bottom line of green is black: strategies for creating profitable and environmentally sound business. San Francisco: HarperSanFrancisco; 1993. p. 8–17.
[80] Kirkpatrick DL. Evaluating training programs: the four levels. San Francisco: Berrett-Koehler Publishers; 1994.
[81] DeSimone RL, Werner JM, Harris DM. Human resource development. 3rd ed. Orlando, FL: Harcourt College Publishers; 2002.
[82] Rutman L, Mowbray G. Understanding program evaluation. Newbury Park, CA: Sage Publications; 1983.
[83] Metcalf KR, Woodall WR, Hobson CM, Williams PL. Environmental performance measurement: a case study. Environmental Quality Management 1996;6(1):27–38.
[84] Murphy K, Balzer W. Systematic distortions in memory-based behaviour ratings and performance evaluations: consequences for rating accuracy. Journal of Applied Psychology 1986;71(1):39–44.
[85] Haccoun RR, Sacks AM. Training in the 21st century: some lessons from the last one. Journal of Canadian Psychology 1998;39(1-2):33–51.
[86] Cooper DR, Schindler P. Business research methods. 6th ed. Toronto: Irwin McGraw-Hill; 1998.
[87] McBurney DH. Research methods. 5th ed. Toronto: Wadsworht; 2001.