

ISO 14001 FROM A CORPORATE PERSPECTIVE

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ABSTRACT

This paper discusses the environmental and organizational effectiveness of ISO 14001 in the United States from a corporate perspective. The findings presented were collected by an eight-member research team at the Donald Bren School of Environmental Science and Management as part of a larger project on ISO 14001. To evaluate the effectiveness of the ISO 14001 standard, we conducted a business case study with a manufacturing site of a national company and surveyed 152 ISO 14001 certified firms in the United States. The business case study provided us with information into corporations' considerations relating to the implementation of ISO 14001 Environmental Management System (EMS). The questionnaire gave us data on the broader corporate perspective on ISO 14001, including the incentives for seeking certification, and its resulting costs and benefits.

Our research suggests that the ISO 14001 standard is a helpful management tool—it encourages firms to commit to environmental stewardship and pollution prevention. The majority of surveyed firms stated that the overall benefits outweighed the cost, and that they had noted an improvement in environmental performance, internal communications, and competitive advantage as a result of implementing the standard. Surprisingly few firms experienced significant constraints in obtaining ISO 14001 certification. However, several managers did express concern with the potentially negative legal ramifications of voluntary disclosure of environmental actions or liabilities associated with the auditing component of the standard.

In response to corporate demand for clarification and guidance, we developed a set of ISO 14001 management tools, which address the issues of initial EMS assessment, ISO 14001 cost-benefit analysis, environmental aspects identification, and environmental cost accounting. We also synthesized a set of "Organizational Keys to Success" that can help companies minimize changes to the organizational structure and maximize the integration between ISO 14001 and the traditional management system.

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INTRODUCTION

The argument that sound environmental management strategies can improve an organization's business and environmental performance appeals intuitively to anyone who is faced with the intricacies and costs of environmental practices such as disposing of hazardous waste, reducing emissions, or treating effluent. Yet, achieving sound environmental management depends not on intuitive appeal, but rather on good judgement, systematic planning, and a certain amount of trial-and-error. To provide guidance to pro-active companies interested in going beyond compliance with environmental regulations, the International Organization for Standardization (ISO) published the ISO 14000 Series of environmental standards in September 1996 (ISO 1997). ISO 14001, the only certifiable standard of the Series, specifies a framework for designing an EMS based on a commitment to pollution prevention (P2), regulatory compliance, and continual improvement of the company's EMS. If designed appropriately to an organization's business activities and environmental impacts, the system allows corporations systematically to reduce environmental expenditures and improve environmental performance.

This paper examines the acceptance and applicability of ISO 14001 from a corporate perspective by identifying decision-making criteria for managers of companies considering obtaining certification, as well as providing suggestions to managers whose companies are already certified and who are seeking to improve their EMSs. Our objective is to provide environmental professionals with a summary of the key challenges they are likely to encounter while designing and implementing an ISO 14001 EMS, and offer a number of management tools that can help overcome these challenges.

For this purpose, we first review general trends in ISO 14001 implementation across the globe. Second, we discuss some of the major concerns U.S. companies face at the decision-making and design stage, such as incentives, constraints and compatibility with the existing management structure. Third, we consider the implementation issues of environmental aspects identification and environmental cost accounting. We also evaluate the effectiveness of ISO 14001 in light of incentives for implementation, including the core commitments to P2 practices, regulatory compliance, and improvement of the EMS. Our findings are supported by data gathered from a survey among senior environmental managers of U.S. companies that were certified prior to November 1998 (see table 1 for summary of survey data) and associated research by Edwards, Gravender, Killmer, Schenke & Willis (1999).

TRENDS IN ISO 14001 IMPLEMENTATION WORLDWIDE

Judging by the number and distribution of certified companies worldwide, it is evident that acceptance of ISO 14001 varies considerably across the globe. Of the approximately 9,500 certified companies worldwide, 51% are located in Western Europe and 39% in Asia-Pacific (Peglau, 1999). (Japan and Germany alone account for 21% and 14% of the total number of ISO 14001 certified companies respectively.) In other regions, including the U.S., implementation of ISO 14001 has been slow in comparison. U.S. and Canadian companies account for only 5% of the world total (see table 2), while the remaining 5% are spread thinly over developing countries and the transitional economies of Central and Eastern Europe. A recent literature review revealed that the variation in the acceptance of ISO 14001 can partially be explained by the different corporate cultures, regulatory frameworks, supplier-producer relations, and consumer demands in each country (Edwards et. al., 1999).

We found that the incentives for obtaining ISO 14001 certification in Europe, Asia, and the U.S. are significantly different. Certified companies in Western Europe cite good corporate citizenship and consumer demands as two key reasons for implementing ISO 14001. A number of European companies had sophisticated EMSs prior to ISO 14001's publication, and many British and German companies were certified under the British EMS standard BS 7750 or the European Eco-Management and Audit Scheme (EMAS). Since EMAS is a more stringent standard (Cascio, Woodside, & Mitchell, 1996), EMAS certification provided an advantage for subsequent ISO 14001 certification. One exception to the corporate impetus to seek ISO 14001 certification appears to be the Netherlands, where environmental protection efforts are strongly driven by government through an 'Internal Environmental Care System', which requires implementation of an EMS (Baker & McKensie, 1996).

The acceptance of ISO 14001 in Asia-Pacific appears rather closely linked to possible trade implications and competitive advantages in international markets. In Japan, Korea, and Taiwan, where the majority of certified companies in Asia-Pacific are located, government and industry help to promote ISO 14001 to ensure that products are compatible with international preferences. For example, the Japanese Industrial Standards Committee is considering adopting the ISO 14000 Series into its national standards, and the China Productivity Center in Taiwan provides government-subsidized assistance to encourage ISO 14001 implementation (US-AEP, 1998a). In addition, Malaysia's government adopted an aggressive promotion of ISO 14001 because it was concerned that ISO 14001 certification may become a pre-condition for export growth (US-AEP, 1998b).

In the United States, attitudes toward the ISO 14000 Series, and ISO 14001 in particular, range from skepticism to enthusiasm, with little consensus from government agencies, the corporate sector, and the environmental community over the Series' potential implications. The Environmental Protection Agency (EPA) is currently

evaluating the effectiveness of ISO 14001 through various pilot and research projects across the nation. Meanwhile, the regulatory and legal implications of ISO 14001 certification continue to present an issue of debate. A number of non-governmental organizations in the U.S. oppose ISO 14001 because they fear that the standard will erode the strength of current environmental regulations. U.S. corporations have also been hesitant in adopting the standard for numerous reasons, including uncertainty over the potential legal repercussions of voluntary disclosure, as well as the financial and organizational implications. Nevertheless, there are currently 400 certified companies in the U.S. These companies have found satisfactory solutions to dealing with uncertainty, and now serve as a valuable source of information for other U.S. companies interested in ISO 14001.

APPROACH TO A U.S. CORPORATE PERSPECTIVE

Our preliminary research on ISO 14001 in the U.S. coupled with the completion of a business case study revealed numerous ambiguities in the standard. Specifically, we felt there was a great deal of uncertainty concerning the implications of complying with the standard, and a general lack of direction and management tools (Edwards et. al., 1999 and references therein). In response to this need for information and clarification, we surveyed senior environmental managers of ISO 14001 certified companies in the U.S. in November 1998 (Globus International, 1998 and McGraw-Hill, 1998). Overall, we contacted 152 of the 180 then-certified U.S. companies, and received 55 responses (36% response rate).

Our corporate questionnaire contained six sections: (i) company information, (ii) incentives to seek certification, (iii) ISO 14001 implementation, (iv) effectiveness of the company's ISO 14001 EMS, (v) integration of the EMS into the overall management structure, and (vi) the costs and benefits of certification.

The first section provided background data on company size, company ownership, and ISO 9000 (Total Quality Management) certification. The second section asked companies to comment on the importance of various incentives for seeking certification. These issues fell into six categories: environmental performance, regulatory effectiveness, management effectiveness, competitive advantage, financial impacts and stakeholder interest. In the third section of the questionnaire, we queried firms about the level of stakeholder involvement, the constraints to certification, and the changes in pollution prevention practices observed since ISO 14001 implementation. The fourth section solicited an overall judgment on the changes in environmental performance, regulatory performance, management effectiveness, communication, financial effectiveness, and competitive advantage observed after introduction of ISO 14001. Section five addressed the link between ISO 14001 and the traditional management systems, and section six inquired about the costs and benefits of certification.

By design, the questionnaire provided relative rather than absolute data on the changes observed since ISO 14001 implementation. A few companies that had implemented sophisticated EMSs prior to receiving ISO 14001 certification perceived this as a bias. They felt that their improvements in environmental performance were not adequately reflected in the survey data, primarily because previous legislation had previously forced them to significantly alter their production processes or products. We deliberately chose a relative evaluation, because we were interested in detecting any correlation between ISO 14001 implementation and environmental performance. In other words, we investigated the hypothesis that ISO 14001 may offer *additional* incentives to improve environmental performance.

Having said that, we should add a caveat about the potential for detecting improvements in environmental performance at this point in time. At the time of our survey, only two years had passed since publication of the standard, and therefore the time series data available to corporations was severely limited. We conducted the questionnaire to identify any currently available information on the standard's effect (if any) on environmental management. The information and experiences of certified companies can help other companies reduce the uncertainty in their environmental planning processes. Our questionnaire data is by no means intended as a final judgment on the actual (probably not yet fully realized) potential of ISO 14001 as a management tool. Such judgments will only be possible when there is ample time series data.

We decided against surveying a control group of non-certified companies because of the substantial inaccuracies involved in attempting to match companies for comparison. However, we designed the questions regarding estimated environmental expenditures such that they were comparable to data compiled in the U.S. Bureau of Census' Pollution Abatement Capital Expenditure report, which includes both certified and non-certified companies (U.S. Bureau of Census, 1996). Unfortunately, companies volunteered little to no quantitative data for these questions, and consequently we were unable to perform any valid statistical analysis on these questions.

PROFILE OF SURVEY RESPONDENTS

The respondents to our corporate questionnaire represented over 30% of the 180 ISO 14001 certified U.S. companies in November 1998. To test for geographic biases, we divided the U.S. into five regions prior to viewing the survey data. Table 3 shows the similarity between the geographic distribution of certified firms and that of the respondents, which suggests that there is very little geographic distortion in the data. The respondents represented a variety of industry sectors (as classified by SIC code), the most common ones being transportation equipment and parts, and electrical industry and machinery. Other common sectors included chemicals and allied products,

measuring, analyzing, and controlling instruments, primary metal industries, non-electrical machinery, and consulting.

We obtained the majority of responses from facilities that received annual revenues of \$10-500 million, had less than 1000 employees, and were part of a large corporation (annual revenues greater than 500 million and over 5000 employees). Sixty-two percent of the certified corporations (or parent corporations of the certified facilities) were publicly held. This profile of respondents could support the common perception that larger, publicly held corporations have a greater incentive or potential for becoming ISO 14001 certified. Alternatively, larger corporations may simply have a greater incentive (or potential) for responding to the questionnaire. In either case, the polarity in the profile should be kept in mind throughout the following discussion, and in any extrapolations or conclusions drawn from the presented data.

DECISION-MAKING & DESIGN PHASE

A company that is deliberating the decision to implement an ISO 14001 EMS is faced with four major considerations: (i) the incentives for and constraints to implementation, (ii) the costs and benefits of implementation, (iii) the consistencies between a company's existing EMS and the ISO 14001 requirements, and (iv) the organizational modifications that may be required during implementation. We discuss each one of these in turn, and suggest two management tools (an initial EMS assessment and an ISO 14001 cost-benefit matrix) that may be helpful during the decision-making process. Should a company decide in favor of ISO 14001, the management tools can be expanded to guide the design phase of the EMS implementation.

Incentives & Constraints

Companies are interested in pursuing ISO 14001 for a variety of environmental, organizational, and financial reasons. For example, Johnson (1997) suggested improved compliance, environmental performance, increased access to new and international markets, reduced environmental costs and liabilities, and enhanced public images as key driving forces for seeking certification. Our questionnaire asked managers to evaluate 23 incentives in six categories on a 5-point scale from 'not important' to 'very important'. Combining the highest two categories revealed majority votes of 58% or more for the following six incentives: (i) improved management of environmental impacts, (ii) reduced environmental risk, (iii) reduced pollution, (iv) improved compliance with government regulation, (v) public demonstration of environmental stewardship, and (vi) increased competitive advantage. Furthermore, a majority of respondents (55% or more) indicated that greater permit flexibility, decreased insurance fees, decreased permit costs, greater access to capital, buyer requirements and lender requirements were not considered important incentives for implementation. No majority was reached for the other eleven incentives we

suggested. In summary, our questionnaire data indicates that the key incentives for ISO 14001 implementation are related to improving environmental performance and in competitive advantage, while permit flexibility, financial impacts, and stakeholder considerations appear to have little influence on the decision. We will return to these findings in our discussion of the observed changes subsequent to ISO 14001 implementation.

We also inquired about the importance of ten potential constraints, ranging from management and personnel support to various costs to uncertainties about the standard and its requirements (see table 1 for details). Surprisingly, the clear majority of companies considered the suggested possibilities at worst a 'mild constraint', and mostly not a constraint at all. Only 33% considered potential legal penalties from voluntary disclosure of auditing documents a 'moderate constraint', and less than 30% named design, registration or maintenance costs in this category. These results contradict the popular literature, which suggests that the financial costs and legal uncertainties of implementing the standard can be prohibitive (Cascio et. al., 1996). We did not find a satisfactory explanation for this divergence.

Costs & Benefits

Overall, certified companies believed that the benefits of ISO 14001 outweighed the costs. Certified firms generally found costs to be as they expected-- 73% of the respondents reported spending less than \$100,000 on design, and 91% reported spending less than \$50,000 for the third-party certification process. In terms of benefits, 49% of the certified firms observed a 'decrease' in environmental liabilities, while an overwhelming majority of respondents stated 'no change' in insurance costs, legal fees, regulatory fines, access to capital, and market share. Although some companies noted slight changes in these areas, these could not be correlated to ISO 14001 implementation—in the absence of data on the background level of fluctuation. Given that we received no quantitative information on benefits, we were not able to evaluate the net benefits of ISO 14001 numerically.

Two further results from the cost-benefit section are noteworthy. First, only 22% of the responding companies conducted a cost-benefit analysis prior to seeking certification. Second, merely 26% of the surveyed companies reported that they tracked their current EMS costs using principles of environmental cost accounting. We do not suggest that a cost-benefit analysis should be the first and foremost criteria in deciding for or against ISO 14001. However, we do suggest that estimating the expected, and monitoring the actual financial impacts of ISO 14001 would help environmental managers make decisions about appropriate environmental strategies. For this reason, we developed an ISO 14001 Cost-Benefit Matrix (see table 4). The matrix is initially intended as an assessment tool during the decision-making and planning phase of an ISO 14001 EMS, but it can subsequently be expanded into an

environmental cost accounting tool during the implementation phase. (Also, the matrix can be applied, irrespective of ISO 14001, to any company wanting to improve the understanding of its environment-related finances.) We realize, of course, that allocating environmental costs involves certain difficulties, particularly for positions such as 'avoided remediation costs' and 'access to new markets', but a number of environmental cost savings and expenses can--and should--be quantified with reasonable accuracy. For in the absence of sound environmental cost accounting, the belief in the net benefits of ISO 14001 will remain just that – a belief.

Existing EMS & ISO 14001

The third consideration companies are faced with during the decision-making and design phase is an initial assessment of the compatibility between the existing EMS and the requirements of the ISO 14001 standard. A systematic documentation of consistencies and discrepancies with the standard is not only critical for deciding the feasibility of ISO 14001 certification, but also very valuable in setting priorities and tracking progress during the implementation or enhancement phase. As mentioned previously, a few of the respondents to our corporate questionnaire felt that the changes in their environmental performance after implementing ISO 14001 did not accurately reflect their environmental achievements. This suggests that non-certified companies may (unknowingly) already fulfill or exceed the majority of requirements posed by ISO 14001. An initial EMS assessment is necessary to gauge the extent, and potential costs, of required system modifications.

To evaluate our business case study, we used a two-column table to document how the company programs met the standard's requirements. Each row in the first column contained a paragraph of the ISO 14001 standard. The corresponding space in the second column showed how the existing EMS meets the standard's requirements by listing the names of plans, procedures, and programs in place, as well as the job title of the responsible employee. Since the ISO 14001 standard is open to interpretation, dissecting it paragraph-by-paragraph is very helpful in determining the explicit and implicit requirements. Also, the clear layout of the matrix made it easy to establish needs for future EMS improvement. Subsequently, during ISO 14001 implementation, we expanded the matrix by adding information about the enhanced elements into the second column. For the purpose of keeping the manual clear and accessible, supporting documents such as permits, plans, and training material were linked as part of an electronic database, rather than included directly. As the matrix evolved and expanded, it eventually became the cornerstone for the principle documentation required by the ISO 14001 standard: the EMS manual.

Organizational Modifications

What applies to consistencies and discrepancies between the existing EMS and ISO 14001 also applies, on a larger scale, to a company's management organization as a whole. A substantial number of the standard's requirements relate to the organizational structure of a company, which implies that the integration of ISO 14001 may entail significant organizational modifications. Alternatively, the existing system may, once again, already fulfill the predominant number of ISO 14001 requirements. Based on the insights gathered during our case study, we identified a series of "Organizational Keys to Success", a set of indicators that can help estimate the degree and scale of modifications necessary for certification based on the characteristics of the existing management structure (Edwards et. al. 1999). We present extracts from four common system components: management review process, regulatory compliance, ISO 9000 certification, and EHS training program below:

"Established Management Review Process. A company with an established review process for its management system will face only minor modifications to implement [the management review section] of the standard. The review process has to be expanded to include the setting of annual environmental objectives and targets, the regular update of environmental aspects and impacts, and a review of the effectiveness of the EMS at achieving the specified goals....

Regulatory Compliance. A company's track record for regulatory compliance is a useful indicator, despite the fact that ISO 14000 certification is not dependent on regulatory compliance. It indicates that a substantial number of process, plans and practices implicitly required by the standard ... are already implemented.... In addition, environmental regulations generally require appropriate monitoring of the regulated process.... This in turn provides the raw data for tracking environmental impacts and progress towards environmental targets, as set within the EMS, thereby addressing the requirements in the monitoring and measurement section.

ISO 9000 Certification: ISO 9000 certified companies have already implemented a systematic management of company documents and records. Hence ISO 9000 certification will substantially reduce the modifications necessary to comply with [the EMS documentation, document control and records sections] and the documentation and record-keeping requirements of all other sections.

EHS training program: ...Environmental training, if not already implemented in the company, can be integrated into current EHS training (both, in the classroom and on the job). Other means of meeting the requirements in [the training, awareness and competence section] are the use of team meetings or regular workshops to discuss environmental concerns and efforts, or of bulletin boards, e-mail or frequent company-wide mailings to introduce an environmental topic-of-the-month."
(Edwards et. al., 1999, pp. 79-81)

Possibly unaware of the compatibility between traditional management structures and ISO 14001, a number of companies do not seem to take full advantage of the inherent possibilities for streamlining their systems. While 36% of ISO 9000 *and* ISO 14001 certified companies in our survey sample stated that their systems were integrated or highly integrated, 29% had little to no integration – despite an annex to the ISO 14001 standard that clearly delineates the correspondence to ISO 9000 elements (ISO, 1997). Furthermore, our data showed a distinct shortcoming in integration with respect to ‘international business strategies’ ‘research and development’, ‘accounting’, ‘supplier/distributor requirements’, and ‘advertising’ for the majority of companies. Only ‘marketing/public relations’ and ‘purchasing’ strategies obtained a median response of ‘some integration’ (though the negative responses still outweighed the positive ones, even in these two categories). In sum, the potential of an integrated management system that considers environmental concerns as part of the overall business strategy (as intended by ISO 14001) has yet to be realized by the majority of certified companies. Such integration requires increased awareness of the opportunities inherent in a company’s management systems, continual improvement not only of the EMS but also of its coordination with other elements of the business, and, last but not least, time.

IMPLEMENTATION PHASE & BEYOND

By definition, an ISO 14001 EMS is a perpetually evolving system, and therefore, the implementation phase is initiated, rather than concluded by the certification process. Yet, regardless of where a company finds itself in the continual improvement spiral, there are three questions that accompany the process: What aspects of the company’s operations need to be managed by the EMS? Are they being managed effectively relative to the desired goals? What are the costs and benefits? The following section presents the responses we encountered to these three questions, and discusses how the initial cost-benefit matrix used in the design phase can be expanded into an environmental cost accounting tool for company-internal use.

Environmental Aspects & Impacts

We found, during our case study and subsequent research, that the identification of environmental aspects and impacts is possibly one of the most complex, controversial and confusing requirements of the ISO 14001 standard (Edwards et. al., 1999; Diamond, 1996). The guidance given in the standard (ISO, 1997) does not sufficiently clarify ‘environmental aspects’ or the approach that should be used for their identification. This often leaves U.S. companies with a tendency to revert to their company’s particular regulatory requirements. The results are much uncertainty about

the meaning and intent of 'environmental aspect', and a wide range of interpretations and approaches to their identification. In response to this, Edwards et. al. (1999) developed an 'Environmental Aspects Checklist' modeled after templates used to comply with the National Environmental Policy Act provisions concerning environmental impacts of development projects. Companies may use the checklist, which outlines a range of potential aspects related to construction, start-up, normal operations, and abnormal operations, as an internal management and planning tool. In addition to this internal solution, we recommend that ISO modify the ISO 14001 standard to include a detailed methodology for identifying environmental aspects, as well as representative examples.

ISO 14001's Effectiveness

The question about ISO 14001's effectiveness in improving environmental management is probably equally complex as that about environmental aspects—not least because companies are largely free to set individual management goals. Hence, for the sake of comparability, we limit our discussion to the six incentives identified earlier: improved management of environmental impacts, reduced pollution, reduced environmental risk, improved compliance with government regulation, public demonstration of environmental stewardship, and increased competitive advantage. These incentives, incidentally, contain the three goals explicitly set by the standard, namely pollution prevention, regulatory compliance, and continual improvement.

To determine ISO 14001's effect on the management of environmental impacts, we asked companies to comment on the changes in seven management areas: (i) overall commitment to environmental stewardship and P2, (ii) development of innovative technologies, (iii) funding of environmental R&D, (iv) use of 'Design for the Environment (DfE)' practices, (v) creation of new P2 practices, (vi) number of environmental production processes, and (vii) number of identified environmental impacts. (Our focus here was any improvement in management practices rather than in the results of those practices.) The majority of survey respondents observed an increase or slight increase in commitment to pollution prevention (76%), and to environmental stewardship (86%). However, this increase in commitment was expressed only as an increase or slight increase in the number of P2 practices (69%) and identified environmental impacts (65%). The other four areas were generally not affected by ISO 14001 implementation. Thus, certified companies achieved their aim for improved management of environmental impacts primarily with respect to P2 processes, and identification of environmental impacts.

Judging by the data on changes in total emissions, total recycled waste and reused waste, the improvements in P2 management seemed to pay off: roughly half of the respondents noted an 'improvement' or 'slight improvement' in these facets of their environmental performance. (Changes in production levels or background fluctuations in these values over time could not be accounted for.) However, with respect to reduced

environmental risk/liability and improved regulatory compliance, the change in management commitment did not (yet) show the same desired effects. For each of the two areas, only 31% of respondents observed a slight improvement. It should of course be kept in mind, that environmental liability in the U.S. is closely associated with CERCLA/Superfund, and hence with past rather than current environmental management. Also, companies that had high regulatory compliance prior to ISO 14001 implementation will show little or no change as a consequence thereof. Thus, drawing any general conclusions about ISO 14001's effect on pollution prevention, environmental risk and regulatory compliance may not be possible at a point so soon after implementation of the standard. Nevertheless, the data currently available indicates that certified companies experience improvements—albeit mainly slight ones—with respect to these three areas.

A similar picture reveals itself with respect to the last two incentives: public demonstration of environmental stewardship and increased competitive advantage. Again, roughly half the respondents noted an increase in public education and communication of environmental issues, access to new markets, access to international markets, and overall competitive advantage. The other half experienced no significant changes. We acknowledge that there are other factors that may have given rise to these tentative trends. Yet, the survey explicitly asked environmental managers to indicate the degree of change they associated with the ISO 14001 EMS. Thus, assuming that managers may partly have accounted for confounding factors in their judgement, the results imply that ISO 14001 has the potential to influence a company's competitive advantage.

Costs & Benefits Revisited

Many of the potential improvement just discussed are indirectly related to cost savings: increase in reuse and recycling, decrease in waste production and pollution, decrease in environmental risk, and overall competitive advantage all affect the financial performance of a company. Other benefits are more direct: 16% and 11% of the survey respondents experienced at least a slight decrease in the cost of regulatory fines and insurance respectively. With respect to regulatory compliance and overall operating costs, most companies noted no financial effects, while the rest divided themselves fairly evenly between 'decrease' and 'increase'. And then there are of course the costs associated with maintaining the EMS and the processes governed by it. But no matter which side of the cost-benefit comparison the financial impact of an environmental activity falls on, we strongly recommend that companies identify, monitor, and evaluate these impacts for internal management purposes. This is no doubt a complex task, partly because it may be difficult to tease apart the impacts specific to the EMS rather than the traditional management system. Yet, we conclude from our research that it is import for companies to understand and integrate environmental costs and savings into their overall business considerations. As a point

of departure, we suggest expanding the cost-benefit matrix introduced for the decision-making and design phase into an 'Environmental Income Statement', as illustrated in table 4.

CONCLUSIONS

While a number of European and Asian countries adopted the ISO 14001 standard rather rapidly, U.S. companies have been slow in comparison. This seems to be largely due to the present difficulty of judging how effective ISO 14001 is at achieving its goals.

The certified U.S. companies we surveyed implemented the standard with the aim to improve management of environmental impacts, reduce environmental risk, reduce pollution, improve regulatory compliance, publicly demonstrate environmental stewardship, and increase competitive advantage. The majority of respondents believed that the standard was effective, and that overall benefits outweighed the costs. Among other trends, environmental managers observed an increase in the number of identified environmental impacts and pollution prevention practices, an reduction in emissions and waste disposal, and increase in public and employee education, and greater access to new and international markets. Many of the trends realized to date are slight, and, absent any rigorous statistical analysis, could be partially attributed to other factors. Nevertheless, according to the corporate perspective revealed in our questionnaire, ISO 14001 appears to be effective in achieving the goals that companies set when implementing the standard.

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