



Impact of environmental management system implementation on financial performance

A comparison of two corporate strategies

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Abstract *Environmental management systems (EMS) seek to make companies simultaneously more competitive and environmentally responsible. Improved environmental performance can be sought from the adaptation of techniques that emphasize reduction of waste and process/product redesign in the quest of reducing environmental impact. However, EMS lacks a framework to quantify improvements and much of the evidence of EMS's impact on financial performance is anecdotal. This lack of theoretical development has served to diminish corporate support, thus reducing the likelihood of EMS implementation due to a perceived cost disadvantage. This paper proposes, and tests, a framework to quantify EMS improvements to determine the impact of EMS strategies on financial performance. Our findings suggest that implementation of an EMS strategy does not negatively impact a firm's financial performance.*

Introduction

Due to agreements on global warming, an increase in the number of environmentally aware consumers, and the advent of ISO 14000 (a voluntary international standard to certify environmental processes developed by the International Organization for Standardization); companies are increasingly interested in capturing benefits associated with environmental sustainability and stewardship. Environmental management systems (EMS) have emerged as a means to systematically apply business management to environmental issues to enhance a firm's long-run financial performance by developing processes and products that simultaneously improve competitive and environmental performance (Stead and Stead, 1992).

EMS implementation is increasingly seen as essential due to a perceived link between a company's impact on the environment and profitability. Process-based



strategies to improved environmental performance can be adapted from traditional just-in-time and total quality management techniques. Florida and Davison (2001) exemplify the viability of this strategy within their description of the “three-zero” manufacturing paradigm, where companies attempt to achieve a level of zero defects, zero inventory, and zero waste and emissions. However, lack of a theoretical framework to quantify the relationship between environmental and financial performance has hindered the ability of management to gain support for capital investment that these strategies may require.

The traditional environmentally conscious perspective argues that “greening” is good for society. Corporations, however, are typically motivated to reduce, not social, but organizational costs. As EMS strategies may require significant capital investment, conventional wisdom dictates that EMS adopting firms would be at a disadvantage versus non-adopting firms on the basis of cost. Thus, many firms may resist EMS implementation on this basis. The authors believe that it is this essential divergence that places the aims of supporters of environmental issues and corporations in opposition. Accordingly, the authors believe that representing environmental expenditures in terms of effective organizational cost reduction is a highly viable approach toward managerial justification of EMS expenditures. To that end, we previously introduced environmental cost of quality (Watson and Polito, 2002), an adaptation of the traditional cost of quality, to provide a framework to link environmental and financial performance. The current study is an extension of an exploratory examination to determine whether support for this framework exists in terms of corporate financial performance (Watson *et al.*, 2003).

Framework for quantifying environmental impact

Partly based on the cost of quality (COQ) framework, management was able to develop support for implementation of various quality techniques. The COQ framework identifies four costs associated with product and process quality: internal failure costs, external failure costs, appraisal costs and prevention costs. The COQ framework contributes understanding by means of its explicit identification of process-driven, proactive, quality costs (i.e., appraisal costs, prevention costs) in addition to more the obvious outcome-driven, reactive quality costs (i.e. internal failure costs, external failure costs).

The authors believe the COQ framework can be adapted to effectively classify environmental costs, and therefore have extended the COQ framework into the realm of environmental costs toward resolution of the aforementioned divergence that inhibit successful justification and implementation of EMS strategies. The Environmental Costs of Quality (ECOQ) framework retains the four types of cost employed in the COQ framework, but extends the interpretation of the meaning of each type of cost in terms of environmental quality:

- (1) Internal failure costs have been expanded to include worker compensation and lost work hours due to injury; Superfund costs or liability for environmental cleanup including reclamation of lands impacted by toxic exposure at the manufacturing or waste disposal facility decontamination or reclamation costs at the manufacturing or waste disposal facility due to toxic exposure; excess packaging costs; Occupational Safety and Health Administration penalties or fines; and opportunity cost of underused resources, waste, or pollutants.

- (2) External failure costs has been expanded to include loss of market share due to consumer sentiment; hazardous and non-hazardous waste disposal; Superfund costs or liability for environmental cleanup including decontamination or reclamation of lands impacted by toxic exposure outside the manufacturing or waste disposal facility; medical/environmental costs due to pollution in the communities surrounding manufacturing or waste disposal facilities; and end or useful life product disposal.
- (3) Appraisal costs have been expanded to account for all costs associated with environmental monitoring.
- (4) Prevention costs have been expanded to account for product design for sustainability, recycling, and disassembly; process design to reduce environmental impact of operations; worker training; and research and development costs associated with EMS.

The expanded definition of the traditional costs of quality to reflect environmental costs has several benefits. Expansion of internal failure cost allows for a broader definition of waste, anything that does not add value to the product (Schonberger, 1982). There being no clearly defined difference between waste and pollutants, waste by-products (pollutants) can be considered potential new resources and sources of cost savings by allowing for identification of alternative uses for an underutilized resource beyond the traditional means of disposal. Additionally, it allows for explicit identification of cost reduction due to utilizing recycled material in production. Expansion of the external failure costs more fully reflects the overall societal costs imposed by non-environmentally responsible corporations. Expansion of prevention costs broadens this definition to include redesigning pollution controls, waste disposal, and waste treatment; redesigning products to limit the use of virgin raw materials and facilitating disassembly and recycling to lessen their impact on disposal facilities upon end of life; recycling production scraps; redesigning facilities; and using renewable energy sources. These broader definitions allow for identification of corporate and societal benefits and cost reductions resulting from elimination of emissions, effluent, and wastes, which do not add value to the product, but do increase product costs due to costs related to their disposal (Stead and Stead, 1992, Ward, 1994, Borri and Boccaletti, 1995).

The traditional view regarding environmental responsibility is that costs are minimized when the firm is in compliance with all environmental regulations and that the costs of reducing the level of impact beyond this point outweigh any benefits the company may receive. Essentially, this line of thought believes that regulatory compliance allows a corporation to minimize costs associated with environmental stewardship by minimizing costs associated with appraisal activities while mitigating external costs associated with exposure to potential legal liability. Implicit in this view is that society will be exposed to some adverse environmental impact produced by either the product or the process used in production and that no extrinsic benefit in terms of financial incentive to the corporation exists for proactive management of the environment.

In contrast, the Corporate Self-Greenewal approach to environmental stewardship is proactive in that it attempts to introduce environmental technology to reduce a

company's environmental impact while simultaneously improving its competitive position (Shrivastava and Hart, 1992).

By incorporating proactive environmental management into the culture of the company, it is believed that companies can decrease their impact on the environment to zero. This can be accomplished by redesigning products and processes to minimize their impact on the environment, using recycled materials, eliminating discharge of toxins or eliminating their use during production by substituting non-toxic replacements, reducing packaging, etc. Implicit in this approach is the belief that any additional fixed investment necessitated by the development of environmentally responsible products and processes (prevention costs) is off-set by reductions in variable costs associated with the internal and external environmental cost components.

Corporations that follow a Corporate Self-Greenewal strategy may realize financial incentives beyond those of cost containment. That is, if the company can accurately predict or cause new environmental regulations to come into being, they may be able to build a competitive advantage based on their ability to be innovative with regard to environmental technology. As stated by Cairncross (1990):

... companies that spot what society wants have an opportunity for innovation... Once they have done so, government is likely to raise standards... When this happens, the innovative company acquires a protected market, hedged in by environmental standards that it can meet, but its competitors cannot.

This would allow such a company to either grow market share by maintaining lower costs relative to competitors required to pay environmental fines due to obsolete business practices or to gain additional revenue by licensing its technology to competitors.

Methodology

As stated above, we wish to determine whether the ECOQ framework can be utilized to garner support for EMS strategies by establishing a link between environmental stewardship and financial performance. To test this relationship, two propositions are formed:

- P1.* Companies that have adopted EMS strategies experience significantly higher levels of profitability (e.g. return on assets and profit margin) than those that follow a regulatory compliance strategy.
- P2.* Companies that have adopted EMS strategies experience significantly higher relevant Market Value Ratios (e.g. Price to Earnings Ratio and Market to Book Ratio) than those that follow a regulatory compliance strategy.

To test these propositions, a survey of relevant industries was undertaken to identify specific companies from which comparisons of financial performance could be made. Companies typifying the Corporate Self-Greenewal approach were identified by their mission statement as well as their membership in the National Environmental Performance Track. This program, sponsored by the Environmental Protection Agency, is a joint public/private partnership that recognizes environmental excellence while focusing on measurable results. Each company was paired with a company within its respective industry based on comparable size, as established by the book

value of assets. The second company represents the regulatory compliance approach, identified by the absence an environmental impact statement and lack of an existing EMS system. Financial information of the respective pairs was gathered from the Thomson Analytics database, using data of the business year 2001 for financial performance, as well as market performance data from 2003.

The most appropriate statistical test to analyze these pairs is the Wilcoxon signed-rank test (Aczel, 1993). The Wilcoxon signed-rank test is appropriate since the distribution of both the EMS adopter and non-EMS adopter populations are unknown requiring the application of a non-parametric test. Indeed, it is to be expected that both populations are not normal. The Wilcoxon signed-rank test was used to determine whether there is a significant difference between the financial performances for the EMS adopter (Corporate Greenewal strategy) versus the non-EMS adopter (regulatory compliance strategy). The test was performed for each of the following financial indicators: Price to Earnings Ratio (P/E Ratio), Market to Book Ratio (M/B Ratio), Return on Invested Capital (ROIC), ROA, Profit Margin, Operating Margin, and Beta.

Results

Although the stated propositions are formed in terms of finding a positive relationship between environmental and financial performance, this being an exploratory study we have formed the hypothesis in such a way as to establish whether a difference in financial performance exists. The H_0 hypothesis was defined as follows:

H_0 . There is no financial performance difference between firms that have implemented EMS strategies and those that have not.

Structuring the hypothesis in this manner allows a determination of not only an incentive for EMS adoption, but whether there is a financial disincentive for adoption of an EMS strategy. Ten pairs of firms, covering a range of industries, were compared using the Wilcoxon signed-rank test at a 95 percent confidence level with a critical value of 11. The results are summarized in Table I and clearly show that none of the tested criteria is below the critical value. Therefore, the null hypothesis could not be rejected for any of the financial indicators. Stated in other words, it was found that the given data does not show any significant difference in financial performance between

	Positive sum	Negative sum	Remarks
P/E Ratio	19	36	Positive, not rejected
M/B Ratio	40	15	Negative, not rejected
ROIC	23	32	Positive, not rejected
ROA	24	31	Positive, not rejected
Profit Margin	29	26	Negative, not rejected
Operating Margin	17	38	Positive, not rejected
Beta	26	29	Positive, not rejected

Notes: Price to Earnings Ratio (P/E Ratio): Market Value of Stock/Annual Earnings Per Share; Market to Book Ratio (M/B Ratio): Company Market Value/Book Value of Assets; Return on Invested Capital (ROIC): Net Operating Income/Invested Capital; Return on Assets (ROA): Net Operating Income/Total Assets; Profit Margin: Net Operating Income/Sales; Operating Margin: Earnings Before Interest and Taxes/Sales; Beta: Covariance of Company's Stock to the Market Portfolio/Variance of the Market

Table I.
Results of statistical
testing

EMS adopters and non-EMS adopters. Hence, *P1* and *P2*, namely that EMS adopters experience significantly higher levels of profitability as well as market values compared to non-EMS adopters could not be substantiated with the chosen data set.

Considering the efficient market hypothesis, this unexpected result allows for the following interpretations. First, it could be argued that since the financial performance of EMS implementers and non-implementers is not substantially different, that implementation of an EMS strategy produces zero benefits. This would substantiate conventional wisdom, which argues that the cost of reducing environmental impact outweighs the benefits of doing so. However, it is believed that there are substantial costs associated with EMS implementation. Therefore, no difference between the financial performance of EMS implementers and non-implementers appears to suggest that, at a minimum, the costs associated with EMS implementation are recovered in the post-implementation period. As such, it becomes clear that EMS does produce some benefit to the implementing firm, the question becomes whether the magnitude of those benefits justifies the expense of implementation.

A second interpretation of the data suggests that the market is not currently valuing information regarding EMS implementation efficiently. However, it also indicates that the market does not render the costs of EMS implementation significant. Based on this interpretation, it can be concluded that the results of the financial analysis indicate three important points:

- (1) the cost of reducing environmental impact does not seem to significantly impair a company's profitability;
- (2) the benefits produced by EMS may not be fully realized by existing accounting practices; and
- (3) companies employing EMS strategies may have not fully exploited their competitive position.

These findings provide important new aspects in the discussion of corporate environmental strategies and question generally accepted views of the cost of environmental stewardship. While a positive relationship between environmental and financial performance could not be substantiated, this research indicates that a disincentive for improving environmental performance does not exist. This is in direct contrast to conventional wisdom which states that the cost of improving environmental performance would place an adopting firm at a disadvantage versus non-adopting firms. As the financial data of the analysis are gathered for a specific business year and do not control for the maturity of the EMS implementation, it is of interest to extend the analysis to look at the development of financial performances from the beginning of the implementation of EMS systems and thus to further test the developed theoretical framework of ECOQ. To address this issue, it is suggested that a longitudinal study capturing pre-implementation, implementation and post-implementation phases be conducted. This would enable a comparison of financial performance to determine whether the cost of EMS implementation has a substantial impact and whether these costs are recaptured in the post-implementation period.

Conclusions

Companies are increasingly interested in adopting environmental management systems, seeking to make companies simultaneously more competitive and

environmentally responsible. EMS lacks a sufficient framework to quantify improvements in terms that management and shareholders can understand. As such, this paper has proposed a framework, adapted from the cost of quality literature. This framework allows managers to quantify environmental decisions, on a dollar basis, to determine the impact of EMS on a corporation's profit/loss statement. This may prove useful in encouraging implementation of EMS strategies, as many companies require a monetary basis for capital expenditures.

To verify that such a framework is a workable solution, statistical analysis of an EMS versus non-EMS adopters has been conducted. Interestingly, it was found that for the given data, EMS adopters do not experience superior financial performance. It can therefore be concluded that on one hand, the expected competitive advantage of EMS strategies is not yet fully exploited. On the other hand, it also indicates that the perceived cost of EMS implementation does not negatively affect financial performance. This result is in contradiction to conventional wisdom regarding the cost impact of environmental stewardship indicating a need for further research.

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