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Identifying the factors which affect the decision to attain ISO 14000

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Abstract

Formally adopted in 1996 by the International Organization of Standardization, ISO 14000 represents a new voluntary international environmental standard, which will likely be adopted by the vast majority of corporations. Its major focus is on the structure, implementation, and maintenance of a formal environmental management system. While the literature is clearly divided in its assessment of ISO 14000, an underlying common theme is that the decision to achieve ISO 14000 certification constitutes a major undertaking for most firms. Such an undertaking, it is argued, does not take place in a vacuum. Rather, it is a response to a number of factors or influences. However, no research to date has empirically identified these factors and explained how they can be leveraged into a competitive advantage. In this article, we use qualitative case studies to identify which factors affect the decision to attain ISO 14000 certification and we also explain how these factors can influence the level of success achieved during the certification process.

1. Introduction

Traditional ways of dealing with environmental issues in a reactive, ad-hoc, end-of-pipe manner, have proven to be highly inefficient. Only a properly implemented environmental management system can provide protection from short-term considerations which do not serve long-term goals. Daily details can impede an organization's long-term environmental goals unless some formal environmental management system clearly sets the requirements as a standard for daily activities [1,2]. Such a systematic approach to environmental management is at the heart of a formal assessment process such as ISO 14000. The standard was designed to achieve a full integration of environmental and business management and enable companies to take a more proactive approach towards managing environmental issues [3].

Certificates issued worldwide are estimated at more than 30,000, and there are now companies in over 50 countries that have endorsed the ISO 14000 standard. By the end of 2001, there were over 1,500 registered sites in the U.S. alone [4]. Since the fall of 1999, Ford Motor Company has told all of its suppliers with manufacturing facilities to get ISO 14000 certified. This requirement will affect over 5,000 of Ford's production and non-production suppliers. Rival General Motors says that by the year 2002, all suppliers will have to conform to ISO 14000 requirements [5]. Furthermore, according to the Environmental Protection Agency (EPA), an organization convicted of a noncompliance is entitled to a reduced penalty if it can show that it had an effective environmental management system in place (e.g., ISO 14000) at the time of the violation [3,6]. ISO 14000 is rapidly becoming the nationally and internationally accepted environmental standard.

A major reason for the increasing acceptance of ISO 14000 involves the perceived benefits associated with the certification process. The benefits are related to the direct advantages of an effective environmental management system combined with the potential of keeping current and obtaining new business. The likely benefits include the following: improved environmental performance, improved internal management methods, improved stakeholder satisfaction, avoiding a potential non-tariff trade barrier, competitive advantage in certain markets, fewer EPA inspections, reduced overhead costs, probable reduction in regulatory noncompliance and associated fines, improved access to capital and reduced capital costs, reductions in insurance costs, and improved company image [6,7].

Despite the perceived benefits, ISO 14000 is surrounded by controversy and criticism. A widespread criticism of the ISO 14000 program is that it is not connected directly enough to environmental performance. For example, a certified company can still have substandard processes and waste streams because certification does not tell a company how to improve efficiency and pollute less [6,8,9], nor does certification require that firms demonstrate compliance and that their stakeholders are satisfied [4,10]. Additionally, a focus on documentation and formalization has, in itself, forced some managers to view ISO 14000 as nothing more than another documentation-driven process for bureaucrats to approve. In the steel industry, ISO 14000 is too general to meet the more restrictive requirements faced from EPA regulators. Complying with the standard and duplication of record-keeping is costly and makes it even more difficult to produce steel profitably in the U.S. [5]. Therefore, ISO 14000 should not be viewed as a variant of Total Quality Environmental Management (TQEM) or any other complete environmental system [11]. ISO 14000 only ensures that an environmental management system exists, and cannot guarantee its functionality.

The concerns and objections to ISO 14000 center on several critical points. First, there is concern that the benefits offered by ISO 14000 may not be sufficient to offset the costs incurred in meeting the requirements of the program [12-14]. The second point involves the relationship between environmental and corporate performance. To date, unlike ISO 9000 which focused on quality (and where quality was shown to have a strong impact on corporate performance), there has not been strong evidence which shows that there is a strong positive relationship between improved environmental performance and strong corporate performance [15-19]. As a result, many managers are hesitant to pursue ISO 14000 certification because they are not sure of the

cost/benefit trade-off. In addition, because ISO 14000 is so new, there is a great deal of confusion and uncertainty surrounding it. Some managers may elect to wait until others have undergone ISO 14000 certification before proceeding or until customers demand it. Finally, there must be diligent documentation and communication which implies a legal disclosure problem that is far from resolved in the U.S. legal system [6].

The primary objective of this article is to explore the implications of ISO 14000 for environmental management. Developing a more accurate and realistic understanding of the implications of ISO 14000 certification will help alleviate some of the potential disappointments in the outcomes often associated with ISO 14000. The literature is clearly divided in its assessment of ISO 14000, which is viewed as either a variant of TQEM or a paper-driven process of limited value. An examination of this international environmental standard was inspired by recent visits to a number of manufacturing facilities. It was discovered that not only do managers embrace the ISO 14000 criteria, they view it as an integral part to their future success. These mangers insist that ISO 14000 is worth chasing, not only because their customers might demand it, but also because ISO 14000 improves performance.

These findings raise an interesting issue. The issue pertains to the decision to pursue ISO 14000 certification. That is, if there is a real benefit to being ISO 14000 certified, then what factors influence this decision? Examples from these field visits will introduce the factors which influenced certification and critically challenges the criticisms commonly associated with ISO 14000. The article is organized as follows. First, we define and provide a background of ISO 14000. Then we use examples from managerial experiences to identify the factors which affected certification status. The research concludes with an evaluation of the factors underlying the decision to attain ISO 14000 certification and how these factors can be leveraged to obtain a competitive advantage.

2. Defining the ISO 14000 certification standard

ISO 14000 was published on September 1, 1996, and provides the basic framework for the establishment of an environmental management system (EMS). The International Organization of Standardization (headquartered in Geneva, Switzerland) defines an EMS as that part of the overall management system which includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing implementing, achieving, reviewing and maintaining an environmental policy [5,6]. The five requirements of ISO 14000 include: formation of a corporate environmental policy and commitment to an EMS, development of a plan for implementation, implementation and operation of the EMS, monitoring and possible corrective action, and top management review and continuous improvement [3]. Basically, the corporation must say what it is going to do, how it is going to do it, who is going to do it, and by when it is going to do it. More concretely, the corporation must designate responsibility for achieving objectives and targets at each relevant function and level, provide the means for fulfilling the objectives and targets, and designate a time frame within which they will be achieved [6,10].

The ISO 14000 standards are designed to achieve a full integration of environmental and business management and enable companies to take a more proactive approach towards managing their environmental

issues, taking these issues beyond compliance. The standards are management tools, not performance standards. Therefore, the scope of ISO 14000 excludes test methods for pollutants, setting limit values regarding pollutants and effluents, setting environmental performance levels, and the standardization of products. ISO 14000's EMS standards are process, not performance, standards. In other words, these standards do not tell organizations what environmental performance they must achieve. Instead, the standards describe a system that will help an organization to achieve its own objectives. The assumption is that better environmental management will lead to improved environmental performance [20].

In designing the ISO 14000 specifications for an EMS, the intent was to create a generic model that could be applied by any type and size of organization throughout the world. The standards can be implemented within the whole organization or only in specific parts; they are not industry or sector specific. However, it must be emphasized that the implementation of a system alone cannot guarantee environmental excellence or even compliance. Furthermore, ISO 14000 specifically excludes operational health and safety issues, but they are touched upon in certain elements of the standard. Companies are not limited to the content of ISO 14000 when implementing their EMS. These merely represent the minimal requirements for certification against the ISO 14000 EMS standard [6,7].

ISO 14001 is the only specification standard in the series. This means a company can only be certified against this standard. As with ISO 9000, certification allows a company to convey to its consumers, investors, insurers, suppliers, and government that it has successfully implemented an EMS. To become ISO 14001 certified, an entity can either self-declare or undergo a third party audit. In the case of a third party audit, the auditor is given the discretion to make that recommendation to certify to the registering body [5,10].

ISO 14001 provides the core requirements for developing and implementing an EMS . All the other documents in the series are guidance standards, intended for use as internal management tools by an organization. For example, ISO 14004 provides practical advice for an organization on implementing and enhancing the EMS. ISO 14004 includes examples, descriptions and options that aid both in the implementation of an EMS and in strengthening its relation to the overall management of the organization. All documents are generic and applicable to any type and size of organization [9,21]. Table 1 describes the six groups of standards in the series.

Research on ISO 14000 published in refereed journals has been very limited. Most publications appear in practitioner publications, books, and monographs, and focuses on corporate experiences and the personal experiences of environmentalists and consultants. We tried to give increased attention to ISO 14000 articles published in refereed academic journals because of the rigorous review that these papers go through prior to publication. However, ISO 14000 is an emerging topic that has not been research widely within academia. The amount of research literature related to the ISO 14000 series has been small since being a relatively new concept. Most of the literature has been concentrated in industry publications or the popular business press. Some anecdotal examples of implementation issues exit, but these are isolated and limited to a very few companies [5-7].

Very little research has addressed whether ISO 14000 will be widely used by practitioners as a consensus model, or even whether if it should be. Instead, the literature is composed with conflicting predictions and viewpoints offered by the personal experiences of experts. The champions of ISO 14000 suggest that it will unify countries in their approach to environmental management and will eventually be looked upon more favorably than traditional measures [21]. Hammer [22] argues that small manufacturing firms constitute the largest potential market for ISO 14000, and that the real test of the standards can be measured by adoption rates among these firms, which typically need the most direction in these issues. According to Hammer [22], the development to watch is what industrial customers do with these standards with regard to their supply chains. Acceptance of the standards will come when conformance or certification becomes a condition for customer requirements (e.g., Ford and General Motors). This suggests that the predisposition of firms to ISO 14000 will most likely influence the adoption rates and, ultimately, the success of these standards. However, no empirically-based research to date has examined the views of managers toward ISO 14000. This concern forms the major impetus for this study.

While the literature is clearly divided in its assessment of ISO 14000, an underlying common theme is that the decision to achieve ISO 14000 certification constitutes a major undertaking for most firms. Such an undertaking, it is argued, does not take place in a vacuum. Rather, it is a response to a number of factors or influences. However, no research to date has provided an empirical identification and evaluation of these factors. The next section tries to address this void in the literature by identifying the factors underlying the decision to attain ISO 14000 certification and explaining how these factors can be leveraged into a competitive advantage.

3. ISO 14000 as a means of achieving a competitive advantage

In the course of interviewing managers and touring manufacturing facilities for a number of recent research projects, the authors have been repeatedly struck by certain factors which were identified as having a critical impact on predisposition and progress toward attaining ISO 14000 certification. Many times we were told that these factors not only influenced their decision to pursue ISO 14000 but these factors also influenced the level of success achieved during the certification process. What follows is an attempt to re-conceptualize ISO 14000 as a program that can lead to a competitive advantage. Our approaches to studying ISO 14000 are

qualitative and based on field studies. The next section details the qualitative methods used to conduct this research.

4. Methodology

The purpose of this study was to identify why companies seem to embrace ISO 14000 even though the standards have been the subject of great debate and criticism. Since the focus of this research was exploratory in nature (rather than confirmatory), qualitative data collection methods were used. Field-based data collection methods were used to ensure that the important variables were identified. It also helped us develop an understanding of why these variables might be important [23]. A small detailed sample fit the needs of the research more than a large-scale survey would have.

The method followed was similar to the grounded theory development methodology suggested by Glasser and Strauss [24]. In instances where a well-developed set of theories regarding a particular branch of knowledge does not exist, Eisenhardt [23] and McCutcheon and Meredith [24] suggest that theory building can best be done through case study research. The researchers participating in this project relied primarily on the methods of qualitative data analysis developed by Miles and Huberman [25], which consisted of simultaneous data collection, reduction, display, and conclusions testing. The end result was a series of case studies in which each case was treated as a replication.

There are some pitfalls to case study analysis, including lack of simplicity or narrow and idiosyncratic theories [23]. A primary disadvantage of the case research approach is the difficulty in drawing deterministic inferences, and there are limitations in terms of the external validity of the study. These limitations are often addressed by using large samples, or using “before” and “after” quasi-experimental designs [26]. However, due to the lack of theory building in the area of environmental management systems such as ISO 14000, it is important to use the case study approach to identify differences among adopters. While causality can never be shown in case studies, analysis of data collected from multiple sites can help support the generalizability of results.

5. Sample selection

Cook and Campbell [26] suggested that random samples of the same population be used in theory testing research. However, the sample selected for qualitative research such as in this study should be purposeful [23,25]. The goal of this study was to identify variables that explain the predisposition of ISO 14000 across manufacturing settings. Furthermore, the research set out to address a variety of ISO 14000 outcomes. Firms from different stages in ISO 14000, industries, products, processes, and sizes were selected based on a literature search and general knowledge of appropriate case study candidates. In addition, other issues important to manufacturing strategy were addressed which would not have been served by limiting the sample solely to successful adopters of ISO 14000. Therefore, the sample included industries such as office furniture which the literature suggested would have a high, but not universal, rate of ISO 14000 adoption. Table 2 describes the number of firms involved in the field research, the industry, and the annual sales.

Each of the firms selected was chosen to represent different stages of ISO 14000 certification (e.g., assessing suitability, planning to implement, currently implementing, successfully implemented). The other firms included in the study were chosen because they were in the same industries as the firms found in the literature search. The objective of this sampling approach was to construct a sample of firms that would be diverse enough to capture the variance of ISO 14000 variables across firms and products that may be overlooked in a single industry or product sample.

Similar to much of the research in operations strategy, several industries were chosen for this study. Single industry studies do not provide a strong basis for achieving generalizability. External validity is more easily achieved in cross-industry studies. For the industries selected, the types of issues and range of certification used must offer sufficient variability for study.

Klassen [27] and Logsden [28] determined that industries subjected to environmental regulations for many years, such as paper, steel, pulp, or petroleum industries tend to have very standardized environmental management systems through contact with industry associations. At the other extreme, if regulation is non-existent for an industry, then little variation in EMS is evident because there is often little perceived environmental impact. EMS is not crucial for all types of industries, and some managers will remain inherently skeptical about it [29]. Thus, ideal industries are those in which significant, new environmental regulations are under development or in the early stages of implementation. This state of uncertainty prompts some firms to try and lead the industry with new approaches, while many other firms adopt a "wait and see" approach; therefore, a high degree of variation in EMS is more likely. The firms in our sample met the criteria for offering a range of EMS.

An initial idea of the level of ISO 14000 understanding and implementation at each potential firm was obtained through preliminary screening over the telephone. Some of the questions used in making our initial assessment can be found in Appendix 1. Twenty-two firms were initially contacted and screened.

After the initial screening, which also addressed the willingness of the company to participate, 16 firms were again contacted and site visits were arranged. The interviews were conducted with several managers responsible for portions of the ISO 14000 certifications process at each site. Some titles of the people interviewed include "manager of:" environmental health and safety, corporate quality services, supervisor/planning group, plant planner, global director of development, environmental science and assessment, new product group, and design engineering.

6. Interview protocol

Eisenhardt [23] suggested that a researcher should have a well developed interview protocol before making the site visits. A structured interview protocol was used at all of the plants. The interview protocol, included in Appendix 2, was developed based on the researchers' general understanding of ISO 14000. The protocol was pre-tested at four manufacturing facilities and then used for the 16 firms included in this study. Minor changes were made to the protocol after the pre-test. Questions focused on previous and current EMS, and the roles and experiences of the players involved. Interviews were conducted in the respondents' facilities,

and discussions focused on the consideration of ISO 14000 as an important part of their EMS and the factors affecting their predisposition towards ISO 14000.

Research concerning environmental issues is fraught with Socially Desirable Response issues [30]. To avoid responses exhibiting social desirability, different managers were questioned. The same structured interview protocol was used at all of the site visits. After each visit the protocol was reviewed, and/or updated to accommodate new lessons learned. This constant updating of the protocol after each visit is the foundation of grounded theory development [24]. When the sessions involved multiple respondents, all comments or views of the managers were recorded separately. Subsequent coding of the notes would highlight any differing views of the managers.

All respondents were asked if they were ISO 14000 certified. In addition, their reasons for certification (or for not being certified) were solicited. Of the 16 companies, 14 were certified, while the remaining 2 were considering certification. Finally, we discussed the outcomes of certification with those firms which were certified. This research is built primarily on the responses of the firms that were certified. However, the comments and concerns of the non-certified firms were also used to help explain why firms may be reluctant to adopt the environmental standard.

Qualitative theory building research is an iterative process [23,25,31]. Eisenhardt [23] suggested that data collection and data analysis should be done simultaneously. In other words, the data from one case is collected and then analyzed before the next replication is performed. Improvements in the protocol can be made between replications by collecting data in this manner. Important issues that are raised in early cases can be included in the protocol for subsequent replications. This ability to refine and improve upon the protocol between cases is a significant advantage of this type of research. For the sake of clear explanation the data collection and analysis are described separately in the following sections. However, the actual process was one where a case was collected, analyzed, the protocol was improved upon, and then the next case was collected.

7. Data collection

The primary data collection was done using structured interviews in a field setting. Sixteeen plants in 7 industries were visited over a one-year period. In the sample of 16 installations (one installation per site), 14 different companies were represented. The plants were located in 6 Mid-Western states: 1) Michigan; 2) Ohio; 3) Indiana; 4) Illinois; 5) Wisconsin; and 6) Minnesota.

Structured interviews at each plant generally took place with the plant manager as well as the environmental manager. At most plants, additional interviews also took place with company presidents or vice presidents, manufacturing engineers, quality engineers, purchasing managers, and designers. At three of the smaller plants, interviews were limited to the plant manager or presidents.

Data were collected following a strict interview protocol that included a tour of the plant. The primary researcher was accompanied on all visits by a second researcher who reviewed all field notes prior to final coding. The use of multiple respondents and multiple interviewers at every plant helped limit possible biases introduced by a single respondent and researcher. The field notes identified responses to all of the protocol

questions, answers to other questions that were raised during the interview and plant tour, and other information such as company publications.

8. Data analysis

The two main components of data analysis included within and across case analysis. Within case analysis helped us examine ISO 14000 in a single context, while the across case analysis served as a form of replication [31] where the constructs of interest in one setting were tested in other settings. One concern was controlling for the affects of the researchers' a priori beliefs as to the reasons why ISO 14000 was embraced. This was accomplished a variety of ways. First, the primary researcher wrote up the field notes prior to coding. The secondary researcher, who also went to the plant, reviewed these notes. By using a variety of secondary researchers (5 in total), a second unbiased person reviewed the notes. Any discrepancies between the primary researcher and the secondary researcher were clarified through follow-up contact with the respondents.

The second step taken was intended to mitigate against confirmation bias. That is, the amount of within case analysis performed before the cross case analysis was limited. Miles and Huberman [25] note that the acts of coding and data reduction are actually forms of data analysis. In other words, the act of coding could lead to confirmation bias problems in future cases. Therefore, coding for within case analysis was limited to categorizing the individual case on previously identified constructs and identifying interesting new issues to pursue at future sites. We were more open to alternative explanations raised in future replications by avoiding comparisons early in the research.

The between case analysis consisted of looking for patterns of firms' experiences with ISO 14000 across the various organizations. Between case analysis is facilitated by using a variety of tools to reduce the amount of data and to display the data in a meaningful fashion [25,31]. Data reduction was done primarily through categorization. A number of categories were formed based on the literature. Through a process of combination, renaming, and redefining, the data was reduced to seven main concepts that were most frequently noted as reasons for embracing ISO 14000. The factors are included in Table 3. The next section will discuss these factors in more detail.

Following each interview, the field notes were typed. To facilitate data coding and analysis, a meta-matrix display was constructed. This matrix summarized the major findings at each site (see Appendix 3). The next step involved coding the data using Nudist® qualitative data analysis software. On reviewing the first six field notes, a list of several primary codes was developed to capture information in different meta-environmental categories. The researchers reviewed the transcribed field notes for all 16 of the site visits at least three times. In doing this, the events and processes observed at each site were classified into an EMS category, and into several other complimentary environmental categories, including product and process hazards, factors affecting predisposition towards ISO 14000, metrics, tools, options, and opportunities. The meta-matrix is available from the authors upon request.

To check the reliability of the coding, an approach suggested by Miles and Huberman [25] was applied: reliability = number of agreements/total of items. They suggest 70 percent inter-coder reliability is appropriate

when using multiple raters to code field notes. An agreement was achieved when at least two of the three primary researchers agreed on the coding used. The total number of agreements minus the number of disagreements comprised the actual number of agreements used in the reliability formula. The coding of each interview had reliabilities ranging from 0.90 to 1.00, with an average inter-coder reliability of 0.95.

9. RESULTS

ISO 14000 has only recently been introduced and many organizations are still struggling with the decision whether to implement the system and get certified. This may be attributable to having no clear picture of the critical factors for successful implementation of ISO 14000. In this section, case studies, combined with the literature, are used to determine which major factors affect the decision to attain ISO 14000 certification and how these factors can influence the level of success achieved during the certification process.

10. Past experience with Total Quality Management

There has been a great deal of discussion within the literature about Total Quality Management (TQM) in environmental programs such as ISO 14000. Namely, environmental systems are viewed as being TQM systems modified to deal with pollution issues. The gradual evolution of quality to include aspects of the environment has been anticipated by several authors [10,12,32-34]. The "no waste" aim of ISO 14000 closely parallels the TQM goal of "zero defects." Because the two systems share a similar focus, it makes sense to use many of the tools, methods, and practices of TQM when implementing an EMS such as ISO 14000 [13,14,35].

Several of the companies visited utilized TQM approaches to developing their environmental systems. Some of the relevant TQM principles which were integrated into their ISO 14000 based programs included: 1) a systems analysis process orientation that aimed to reduce inefficiencies and identify product problems; and 2) data-driven tools, such as cause and effect diagrams, quality evolution charts, pareto analysis, and control charts. A chemical manufacturer was among the first to extend their TQM initiatives to an EMS. Some of the TQM principles which were integrated into their waste minimization programs included the use of pareto analysis and control charts to signal pollution problems with the manufacturing process. For example, control charts were used to determine the capability of a wastewater treatment system to operate within permit levels. They also made use of pareto charts which provided a graphic tool that organized data to identify and focus on the major contamination problems.

A first-tier automotive supplier also described that during the ISO 14000 certification process, statistical tools were both appropriate and beneficial for eliminating errors in air emission sampling/monitoring procedures. Several of the companies were also using benchmarking techniques to assess conformance to the ISO 14000 standards. One company regularly audited its facilities throughout the world in the areas of public relations, direct environmental impact, incident prevention, and continuous improvement. Standards were developed in each of these areas at the facility level ensuring business unit commitment and they generated a score for each facility. Benchmarking was also used by a company to convince upper management of the compatibility of ISO 9000 and ISO 14000. It provided corporate decision-makers with examples of other companies that have successfully integrated their quality and environmental management systems.

Some researchers, such as Makower [13,14] and Willig [35], bring together first hand reports on how leading companies are going beyond meeting regulatory compliance to gaining a competitive advantage and improved profitability by applying TQM practices to environmental management. Most of the companies in our study reported aggregate savings and significant environmental benefits generated by using TQM concepts during the ISO 14000 certification process. Many of the respondents argued that their TQM based systems conditioned their firms to be more interested in ISO 14000. Companies that implemented TQM based systems already had the foundation for ISO 14000. There existed a high level of senior management commitment for major initiatives and operational tools such as continuous improvement, teamwork, empowerment, and prevention-based approaches. All of these factors describe a situation where the respondents saw ISO 14000 as an extension of the TQM movement. Predisposition toward and success achieved during ISO 14000 certification was influenced in a significant manner by their previous experiences with TQM.

11. Past Experience with ISO 9000 and QS 9000

It has been argued that ISO 14000 builds on the foundation established by ISO 9000 and QS 9000 [5,6]. Both of these certification processes are quality oriented, with QS 9000 oriented towards the automotive industry and ISO 9000 more broad based in its focus. Both ISO and QS 9000 are also process-based. Finally, both require external auditing and assessment before certification can be conferred. These traits are very much in evidence in the ISO 14000 certification process. In addition, it has been argued that past experience with these two quality-based certification processes positively prepares a firm to plan for and attain ISO 14000 certification [36-38].

It was observed at several of the companies visited that ISO 14000 status was positively influenced by the status of the plant in terms of either ISO 9000 or QS 9000 certification. All of the respondents agreed that operating two separate quality and environmental management systems would have been wasteful and redundant. Integration was not only possible at the facilities, it was preferable. Since they already had an ISO and/or QS 9000 quality management system in place and wanted to implement an ISO 14000 EMS, integration was the next logical step. Most of the companies used their existing quality management systems as a baseline for implementing ISO 14000. The examples show that with well-developed management systems already in place, companies were well along the road to complying with ISO 14000 requirements. By using the synergy which exists between the two management systems, an EMS implementation was achieved with marginal additional expenditures.

The greatest efficiency opportunities were created by addressing the common elements. By keeping the ISO/QS 9000 and ISO 14000 commonalities in mind, the companies were able to develop project management economies. In addition to the commonalities of required elements, such as documentation and management review, some elements of the two standards were developed with similar intentions. For example, ISO 14001 has a section for legal and other requirements which are already addressed in 4.3.2 (Contract Review of ISO 9001). Integration was also achieved by several companies through a common set of forms workers filled in

during activities. This aspect showed up very clearly in the control plans for waste streams, where data collected could be used for both quality and environmental management.

The early research on the relationship between ISO/QS 9000 and ISO 14000 are decidedly mixed. While our findings suggest that firms who have achieved ISO 9000 certification should have a relatively easier time achieving ISO 14000 certification, this may not actually be the case. Several managers did warn us that significant differences between the two standards exist. Wilson [37,38] likewise suggested that if these distinctions are not recognized, the potential advantages of an ISO 14000 EMS, as well as the synergies of an integrated quality and environmental management system, will not be seen. An existing QMS cannot be transformed into an EMS by merely replacing the word "quality" with the word "environmental." ISO/QS 9000 focuses on waste as it applies to process inefficiencies, whereas ISO 14000 tends to focus more on concrete outputs, such as solid and hazardous waste. Several managers believed that ISO 14000 has a longer learning curve than ISO 9000.

As long as a company understands the fundamental differences between ISO 14000 and ISO 9000, and can successfully address their distinct issues separately, the two systems can be integrated. This approach was adopted at one company by ISO 9000 auditors when auditing the EMS. The auditors were very familiar with management system elements, but they needed to develop new skills and include environmental specialists to audit an EMS effectively. Certain differences on the organizational and operational level must be maintained, as environmental and quality systems require specific skills. In general, most companies felt that a large-scale integration between the quality and environmental system was possible from an operational point of view, though not entirely. There also appeared to be total integration in general procedures while the working procedures were different because of the specific skill sets required as they pertained to quality versus environmental issues.

Another example deals with sections 4.1.2.3 (ISO 9001) and 4.1 (ISO 14000). Both sections provide for the creation of a business policy based on a common approach in all management for quality and environmental systems development. In both cases, the organization has to appoint a Director who will see to the quality/environmental system being set up, carried out and maintained in compliance with the standards and will be responsible for informing top managers on the system trend, so as to let them test it again and improve it. Even if the text for the standards was substantially the same, managers thought it was necessary to appoint two different directors: one for quality, the other for the environmental system, because the specific know-how of each professional has a fundamental importance on this level. At all the companies, one could clearly see that the quality manager and the environmental manager were two different professionals who had different tasks, responsibilities and staff. Once again, we saw strong integration on the top levels of different departments, but separation on the intermediate levels, where specific skills were required.

The idea of attempting both certifications concurrently does appear to have some appeal to firms. Wilson [37,38] believed that a growing number of organizations have set their sights on double certification. To this end, there has even been some discussion of combining the two standards in order to streamline the

certification process. However, it does not appear that the International Organization of Standardization is moving in this direction [21]. The initial intent was to make the EMS elements an integral part of the quality management system, but the difficulties of getting both sets of interests under one umbrella became too great to overcome, and the International Organization for Standardization decided to create a separate environmental management standard. However, the structure is based on the same principles as the ISO 9000 quality standards.

12. Current status of cross-functional programs

Ultimately, to be certified on the ISO 14000 standards, the plant's personnel must be able to work together. Many of the problems uncovered during the process of attaining ISO 14000 certification cannot be addressed by one functional area or group working in isolation. As a result, it is expected that success in implementing cross-functional programs should have a significant influence on the plant's progress and status in attaining ISO 14000 certification.

A team orientation that uses the knowledge of employees to develop solutions for waste problems was integrated into the EMS for several of the cases. One company showed that employee involvement can be promoted by improving employee-management interaction and promoting responsibility for the environment among all levels of management including individual employees. Using such a team orientation for environmental management has already been advocated by a number of groups, most notably the Global Environmental Management Initiative [39,40] and the Council on Environmental Quality [41].

Another facility, whose environmental managers complained that a noncompliance analysis was taking too long to finish, assembled a team to: 1) arrive at a specification for turnaround time; and 2) analyze the reasons for existing turnaround time. The team working on the analysis delays showed that almost all of the turnaround time could be attributed to two factors: 1) a lack of communication between divisions within the company to anticipate information needs; and 2) a lack of standards for technicians. Shortly after beginning their improvement process, the analysis team used a histogram to measure how close they were to achieving their time-reduction goal. The histogram showed that they had reduced the mean delivery time and dispersion by over half.

Given the limited resources of most pollution prevention programs, using employee involvement teams has made good sense [42]. By using this recourse, many of the companies in our study claim their environmental staffs generated greater reductions in the generation of waste in a shorter period of time. They also suggested that the most effective way to get employees involved and working together is by linking the reward system to efficiency and waste management. Gripman [43] actually suggested a 2 reward system: 1) a system in which an employee's raise is determined, in part, by what the employee is doing in the area of waste reduction; and 2) a system in which an employee is honored at the end of the year for waste reduction ideas.

When developing an integrated system documentation between ISO 9000 and ISO 14000, there was a benefit to creating cross-functional teams assigned to specific elements of the standards. Cross-functional teams, at a minimum, should include delegates from the quality and environmental areas of the business, but

also included delegates from such diverse areas as engineering, manufacturing, sales, marketing, and public relations.

Our visits show that the best results from ISO 14000 can only be obtained when there is a high level of commitment, involvement, and cooperation from people. Many other authors also contend that using employee involvement teams for an EMS is the most effective approach for most organizations [33,44-47]. The employees must recognize the environmental responsibilities both for the company and themselves. Training can shape employees' positive attitudes about their company's commitment to the environment [47,48].

13. Firm size/full-time equivalents

FTE, which reports the number of employees in terms of full time equivalents, is a proxy for corporate size. It is included because some researchers have argued that ISO 14000 certification is primarily pursued by larger firms. That is, the larger the firm, the more likely it is to attempt and to achieve ISO 14000 certification. It was acknowledged during our investigation that adoption is most likely by larger firms. They have the staffing and environmental specialists to implement it. One manager said it would not apply ISO 14000 at its smaller facilities. If there is already an environmental management system in place targeting waste reduction, then there may be little advantage in applying ISO 14000 to a small site.

14. End sales

End sales captures the percentage of total sales made by the plant that go directly to the end consumer, as compared to another industrial customer. It has been argued that the more a plant or firm sells directly to the end consumer, the greater the probability of it being interested in attaining ISO 14000 certification. The reason is that end consumers are more interested in the environmental activities of the supplier. Achieving ISO 14000 certification for such firms offers a method of differentiating their products and their corporate image from that of their competitors.

Subsequently, the development of EMS initiatives received a considerable boost among first-line suppliers in different industries such as automotive. Led by Rover Group and the European assembly operations of Toyota and Honda, one of the criteria for inclusion on the approved supplier list now is demonstration of an operating EMS such as ISO 14000. The justification was increasing pressure on the OEMs by consumers to demonstrate its commitment to improved environmental performance, as well as the need to reduce resource consumption. The "recyclability" content of new car models increasingly is becoming an important marketing attribute.

The consequence of such purchasing strategies by major manufacturers that serve consumers directly has been that in a relatively short period of time their successful suppliers – those that have become ISO 14000 certified and benefited in terms of operating efficiency and improved marketing opportunities – have begun encouraging similar strategies among their own suppliers. This cascading effect has started to set the pace in other industries.

The direct consequence of major purchasers demanding ISO 14000 has been the cascading of implementation down to second and third tier suppliers. Many of the suppliers involved in these programs were

associated with not only the automotive but other industries, further exposing the standard and creating cascading effects up and down the supply chain.

14. Ownership

A U.S.-based pharmaceutical firm which is publicly traded had a Belgium facility and it was their first facility to become ISO 14000 certified. They claim this was largely due to cultural influences in the European Union. Another facility visited was a Tier 1 supplier to the automotive industry. This is a publicly traded company owned by a larger company from England. Their primary product is automotive glass and it only does assembly with no cutting, bending, or fabrication. The direction for ISO 14000 certification came from the parent company in Britain. Headquarters said that all facilities globally had to be certified by 1999. Another plant is part of a privately owned foreign subsidiary. They make braking systems (e.g., calipers, wheel cylinders, etc.) and most of their parts are for passenger cars and light-duty trucks. The motivations influencing the decision to pursue ISO 14000 certification was the German influence of other European facilities being ISO 14000 certified. There is a strong environmental corporate culture coming from Europe, and all of the parent company's European plants were certified, so the company wanted to try something similar in North America.

Most ISO 14000 registered sites in the U.S. are operated by affiliates of companies headquartered elsewhere [4]. Many of these larger firms say they consider ISO 14000 to be inherently unfair to companies in the U.S. This perception was a result of the drafting process, in which the U.S. had much less input than European countries. U.S. corporations were behind the curve but are moving more aggressively now.

15. Exports/exports to the European Union

These two variables measure different aspects of export sales. The first variable captures the percentage of total sales made by the plant/firm that consist of exports. The second variable measures the percentage of total sales made by the plant/firm that consists of exports destined to the European Union. Both variables are based on the view that ISO 14000 certification is most desirable internationally overall, and in the European Union, specifically. As the percentage of sales going to exports increase, the firm is increasingly likely to seek ISO 14000 certification. Such certification is seen as a vehicle for responding to the "stricter" environmental requirements found in foreign markets and as a marketing means of appealing to the demands of the "foreign" consumer.

A privately owned company in the U.S. manufacturers automotive glass, windows, mirrors, glass touch screens that you see on the instrument panel. The CEO made a trip to Europe to visit their facilities there and saw the plants there being pressured by customers to pursue ISO 14000, and then made it a corporate priority. Their customers in Europe include Rover, Vauxhaull, Opel, and Volvo. These companies placed pressure on the European facilities to become ISO 14000 certified. External pressures have shown some less informal interest from their North American customers to pursue ISO 14000.

16. Discussion

While many factors have been cited as influencing the predisposition toward ISO 14000 certification and the value of this certification, certain factors were identified as having a critical impact on predisposition and progress toward attaining this new form of certification. These factors included:

- Previous experiences with Total Quality Management;
- Past success with quality-based certification processes, such as ISO 9000 or QS 9000;
- Previous experience with cross-functional teams and management;
- Firm size/full-time equivalents;
- End sales;
- Nature of corporate ownership (foreign-owned plants are more likely to pursue and receive ISO 14000 certification); and,
- Exports

These factors describe a situation where the respondents saw ISO 14000 as an extension of the TQM movement. They also describe a situation in which respondents recognized that success with ISO 14000 requires cross-functional teams and cooperation. There seems to be recognition that succeeding with ISO 14000 requires more than simply introducing a new program or creating a new department. Rather, ISO 14000 is an undertaking that requires the participation of multiple parties working together. It is argued that these various factors act to pre-condition the firm and its systems to the introduction, acceptance, and progress on ISO 14000.

This research was exploratory in nature and qualitative data collection methods were used. Our findings need to be evaluated in future studies which use confirmatory techniques to build and evaluate a model that explains the factors underlying the decision to attain ISO 14000 certification and the level of progress in becoming certified. In future studies, researchers should view the progress in ISO 14000 certification as a dependent variable, which can be explained in terms of certain critical (independent) explanatory variables identified in this article.

17. Concluding Comments

Customer demands and government regulation have and will continue to drive the acceptance of ISO 14000. Although many U.S. industries have not indicated that they will require their suppliers to become certified, many suppliers are seeking certification because they believe it will happen. It has already happened in the U.S. automotive industry. If well implemented, ISO 14000 can result in less pollution, greater efficiencies, cost reductions, and improved productivity. Clearly, the extent of the improvements and the amount of the savings depend on several factors independent of ISO 14000.

The ISO 14000 certification process forced companies to examine all areas to determine potential environmental impacts and set improvement objectives. As companies explored territories which went beyond manufacturing, opportunities to reduce pollution and cut costs frequently turned up. As goals were set in areas outside the traditional manufacturing/environmental arena, there was a reexamination of accepted norms and practices resulting in unanticipated business benefits.

ISO 14000 is a trend in environmental management that cannot be ignored. In fact, for those companies who wish to remain competitive and improve their environmental systems, it can be an invaluable tool. Many managers warned that ISO 14000 certification can result in non-value added costs if it is pursued only for its marketing or regulatory appeal. The true commercial value associated with ISO 14000 can only be achieved when it is made consistent with a company's strategic direction [This means using the ISO 14000 standards as a foundation for a much broader system such as TQEM]. The experiences of these companies can serve as an illustration for organizations contemplating pursuing certification. Through its standardization of environmental systems, ISO 14000 can help an organization not only reduce waste, but also gain a competitive advantage in the international marketplace.

Appendix 1. Initial assessment questions

1. Is your plant ISO 14000 certified?
2. Why are you (not) certified?
3. If not certified, are you considering certification?
4. What is your overall impression of ISO 14000?
5. Has ISO 14000 improved the overall competitive stance of your plant?
6. Specifically, how has ISO 14000 influenced your environmental performance?
7. How has ISO 14000 influenced your ability to provide the level and types of service required by your customers?
8. Please detail the types of documentation performed to be certified. Were these activities valuable?
9. Please describe the types of continuous improvement activities performed at the plant. Has certification helped/hindered or not affected these efforts?
10. Do you feel you have received a good return on this investment?

Note: Managers were asked to explain all of their answers.

Appendix 2. Interview protocol

Protocol for ISO 14000 interview

Date:
Name of respondent(s):
Name of interviewer(s):
Company:
Primary product(s):
Primary customer(s)
Your job title:
How long have you been involved (directly or indirectly) with ISO 14000?
What is the length of time in your current position?
What are your current job responsibilities?
What were your previous job responsibilities?
What is the nature of your formal education?

Appendix 3. Meta-matrix for Company A

Summary

Company A was very proactive regarding ISO 14000 certification. This firm understands the environmental and financial benefits of the certification process. The environmental functional unit is primarily responsible for ISO 14000. The system is viewed as opportunistic and should help reduce risks, differentiate products, and be cost effective.

The factors influencing ISO 14000 certification are many. Overseas sales and government regulation has a strong impact on ISO 14000. The certification process helps firm A conduct internal audits, evaluate product and personnel performance, and track waste. EMIS, LCS, and DfE are the primary ISO 14000 tools used. Several of Firm A's facilities are already ISO 14000 certified and there is a large effort under way to conform to ISO 14000 across plants. The largest opportunity for ISO 14000 is in pollution prevention. With the vast amount of people at firm A, cross-functional communication and teamwork play a large role in certification.

Context of the firm:

1. Large:
2. Public:
3. Manufacturing includes: MTO, MTS, ATO, ETO
4. Importance of international trade – high: an example of this importance can be seen in the positioning of a new product in a particular country because of the manufacturing advantages this country offered.

Respondents (Primary (/P), Secondary (/S)

1. ERM:
2. Engineering:
3. Quality:
4. NPD:

Product type

1. Chemical

Product hazard

1. High: perceived as high due to the many chemically intensive processes
2. Recognized environmental hazard (uncertain): the uncertainty is due to the wide range of products this firm makes. Products can range from very high to very low environmental hazards.

ISO 14000 status

Certified. While realizing the financial benefits of an EMS, Firm A is proactive in such things as ISO 14000 certification, environmental information systems, life cycle analysis of products, and exceeding pollution compliance goals.

EMS opportunities

Respondents discussed the environmental operations group. This group is responsible for environmental issues and regulations at the plant level and making sure the necessary tools and equipment are available. They have a program in place whose goal is to exceed compliance requirements. The goal is describe as being sustainable development through maximizing environmental operations and minimizing waste. This all started with ISO 14000 and should lead to getting out from under regulations(beyond compliance) and future liabilities.

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Table 1

ISO 14000 Series of Standards	
Organizational Evaluation	***Product Evaluation***
Environmental Management Systems *-ISO 14001 and ISO 14004*	Environmental Labeling *-ISO 14021 –1402X*
Environmental Auditing *-ISO 14010 – 14012 and ISO 14015*	Life Cycle Assessment *-ISO 14040 – 14043*
Environmental Performance Evaluation *-ISO 14031*	Guide for the Inclusion of Environmental Aspects of Product Standards *-ISO Guide 64*
Terms and Definitions -ISO 14050	

ISO/TC 207 Document Development Status		
Document	**Title**	**Status**
ISO 14001	Environmental Management Systems (EMS) – Specifications with Guidance for Use	IS
ISO 14004	Environmental Management Systems (EMS) – General Guidelines on Principles, Systems and Supporting Techniques	IS
ISO 14010	Guidelines for Environmental Auditing (EA)- General Principles on Environmental Auditing	IS
ISO 14011/1	Guidelines for Environmental Auditing (EA)- Audit Procedures – Auditing of Environmental Management Systems	IS
ISO 14012	Guidelines for Environmental Auditing (EA)- Qualification Criteria for Environmental Auditors	IS
ISO 14015	Title TBD: Site Assessment, Due Diligence	NWI
ISO 14020	Goals and Principles of All Environmental Labeling	CD
ISO 14021	Environmental Labels and Declarations (EL) – Self Declaration Environmental Claims – Terms and Definitions	CD
ISO 14022	Environmental Labels and Declarations (EL) – Self Declaration Environmental Claims – Symbols	Preliminary
ISO 14023	Environmental Labels and Declarations (EL) – Self Declaration Environmental Claims – Testing and Verification Methodologies	Preliminary
ISO 14024	Environmental Labels and Declarations (EL) – Environmental Labeling (Type I) – Guiding Principles and Procedures	CD
ISO 1402X	Type III Labeling	Preliminary
ISO 14031	Evaluation of Environmental Performance (EPE)	CD
ISO 14040	Life Cycle Assessment (LCA) – Principles and Guidelines	CD
ISO 14041	Life Cycle Assessment (LCA) – Life Cycle Inventory Analysis	WD
ISO 14042	Life Cycle Assessment (LCA) – Impact Assessment	Preliminary
ISO 14043	Life Cycle Assessment (LCA) – Interpretation	Preliminary
ISO 14050	Terms and Definitions – Guide on the Principles for ISO/TC 207 Terms /SC6 Terminology Work	WD
ISO Guide 64	Guide for the Inclusion of Environmental Aspects in Product Standards	ISO Guide

IS = Internationals Standard WD = Working Draft CD = Committee Draft
DIS = Draft International Standard Preliminary NWI = New Work Item

Table 2. Firms in the sample

No. of firms	Industry	Annual sales (U.S. $)
5	Tier I automotive suppliers	25M-5B
3	Chemical	>15B
3	Office and furniture	>1B
2	Aerospace	>33M
1	Windows and doors	>1B
1	OEM specialty trucks	>25M
1	Pharmaceutical	>15B

Table 3. Factors influencing the predisposition toward ISO 14000

- Previous experience with Total Quality Management
- Past success with quality-based certification processes such as ISO 9000 or QS 9000
- Previous experience with cross-functional teams and management
- Firm size/Number of full-time equivalents
- End sales
- Nature or corporate ownership (foreign-owned plants are more likely to pursue and receive ISO 14000 certification)
- Exports