

# A Study on Performance Factors After Obtaining ISO 14000 Certification

- ISO 14000 인증 후 수행 요인에 대한 연구 -

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## Abstract

환경의 보호와 지속적인 경영이 전세계 경제시장의 수요로 되었다. 현재 ISO14000은 전세계의 환경관리 방법의 표준으로 되었다. 본 연구는 토론과 ISO14000 전문가들의 의견을 수집하여 13개의 ISO14000중의 성과지표와 9개의 영향 요소를 귀납하여 전형적인 관련 분석을 통하여 ISO14000인증 후의 현저한 관련적 영향요소를 확립하는 것이다.

**Keywords** : Performance, ISO 14000, Environment Management System

## 1. INTRODUCTION

While environmental protection and sustainable development have become the significant demand in global markets. Manufacturers are expected to become more environmentally responsible and environmentally conscious. The worldwide trend of environmental concern has been driving manufacturers to strive to implement competitive strategies in environmental management.

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The ISO 14000 standard, published in September 1996, provides a model for establishing a management system that is focused on controlling and improving a company's impacts on the environment. It applies to environmental systems and processes the same approach used by its predecessor, the ISO 9000 quality standards. ISO 14000 will become a way for firms to use one standard of practices rather than dealing with conflicting environmental regulations across national borders (Sayre, 1996). ISO 14000 does not focus on outcomes, such as pollution output, but focuses on processes. Most customers already demand this type of certification in terms of quality conformity with the ISO 9000 standard; experience with ISO 9000 can cast light on the potential impact of ISO 14000. Empirical studies show that advantage of market differentiation provided by the environmental management system certification has become a significant force (Jo, 1990; Anderson, 1995; Sayre, 1996).

Obtaining the ISO 14000 certification has already turned into an international trend, but the relationship among environmental systems, environmental performance, and overall corporate performance is not clear. As for manufacturers who have already got the ISO 14000 certification, some follow-up actions still need to be taken by us to get a better understanding of their present situation. In this connection, some questions are raised: Do their present business operations run smoothly? What kinds of benefits can they get through their application for the ISO 14000 certification? What kinds of performance have they turned in after getting the ISO 14000 certification? These are the motives for this study.

## 2. LITERATURE REVIEW

The ISO 14000 family of International Standards on environmental management is a relative newcomer to ISO's portfolio, but environment-related standardization is far from being a new departure for ISO. Representatives from some 50 countries around the globe have formally adopted the international standard on environmental management system, ISO 14000 attempts to build on the success and experience of its predecessor, the ISO 9000 standard, and variants such as the QS 9000 standards now being implemented within the automotive industry. If the ISO 14000 standards work as intended, they will set a higher level of expectations for environmental management practices worldwide. Additionally, these new standards are predicted to facilitate trade and remove trade barriers.

The ISO 14000 environmental standards specify the structure of information technology, this standards describe the basic elements of an effective EMS. These

elements include creating an environmental policy, setting objectives and targets, implementing a program to achieve those objectives, monitoring and measuring its effectiveness, correcting problems, and reviewing the system to improve it and overall environmental performance (Tibor and Feldman 1996). 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 aside from compliance with environmental regulation. Instead, the standards describe a system that will help an organization to achieve its own objectives and targets. The assumption is that better environmental management will indirectly lead to better environmental performance (Tibor and Feldman 1996).

ISO 14000 encompasses standards in seven general areas, and can be divided into two general categories: the EMS, auditing, and performance evaluation standards will be used to evaluate the firm; labeling, life cycle assessment, and environmental attributes in product standards emphasize the evaluation and analysis of product and process characteristics.

Many scholars have discussed the critical success factors of implementing an ISO 14000 environmental management system and the advantages of using ISO 14000 environmental management system. Summary are stated as Table 1, 2. By means of summarizing all the comments from specialists and consulting other specialists who had experiences in assisting and guiding manufacturers to get ISO 14000 certification, this research summed up 13 indicators of a firm's performance after it has obtained ISO 14000 certification together with its 9 affecting factors.

### 3. RESEARCHMETHOD

#### 3.1 Research Framework and Hypotheses

The objective of this research is to explore the relationship between the affecting factors of a firm's performance after it has obtained ISO 14000 certification. The affecting factors and indicators of performance after obtaining ISO 14000 certification used in this study are concluded from the expert's option and the related researcher. The research framework as shown in Figure 1.

And this study formulates several hypotheses to test the relationship shown in the research framework of this study. The following null hypotheses in Table 3 are suggested to be test.

<Table 1> the Critical Success Factors (CSF) of ISO 14000

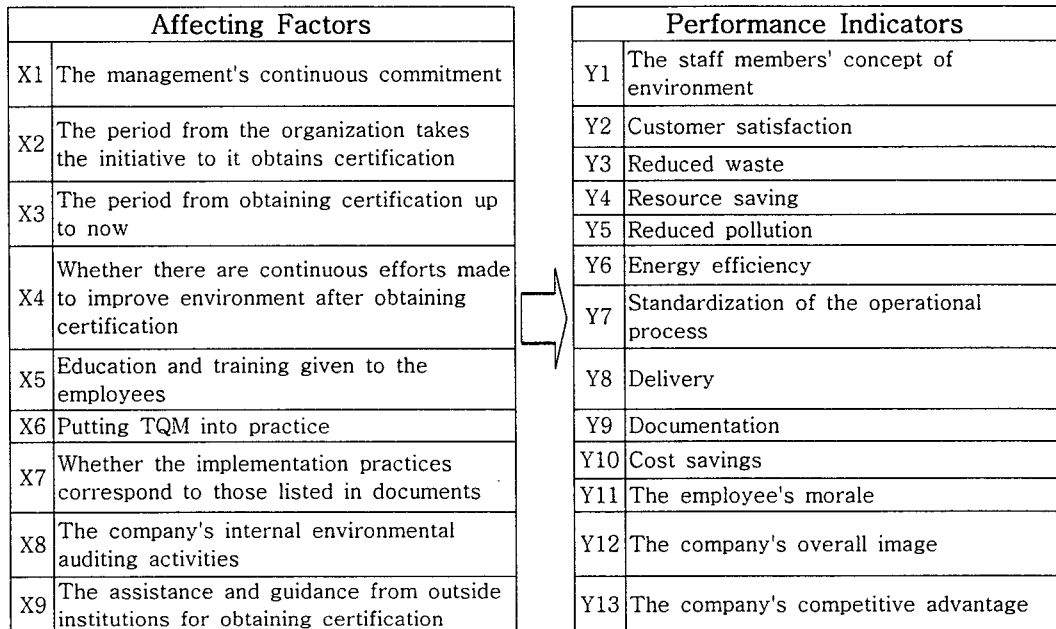
Items	Authors								
	1	2	3	4	5	6	7	8	9
Top management commitment	o	o	o				o	o	
Organization support			o				o		
The vision of sustainable development				o				o	
Integrated other management function				o	o			o	
Evaluation environmental risk	o			o	o				
Internal analysis	o			o	o		o	o	
External analysis	o						o	o	o
Environmental policy	o			o	o	o			
Build process of management			o			o			o
Develop method of EMS	o		o		o	o		o	
Internal support		o					o		
Technical transfer				o					
Education	o	o							
Communication	o	o	o	o					
Documentation	o	o	o	o					
Operation control	o			o					
Responsiveness	o		o	o					
Prevent	o		o	o					
Record and report	o			o					
Internal auditing	o				o				
Auditing of EMS	o		o						
Continuous improvement	o			o	o				
Enterprise culture					o		o		
Supplier support			o	o					
Staff participation				o					

1: ISO 14000 model, 2: Kirkpatrick, 3: ISO14000 handbook, 4: Sharivastave, 5: Epstein, 6: Zezaee, 7: Maxwell, et al., 8: Rondinelli, et al., 9: Inside ISO 14000

<Table 2> the Performance after Obtaining ISO 14000 Certification

Items	Authors							
	1	2	3	4	5	6	7	8
Competitive capacity			o		o			
Overall cost		o	o			o	o	
Market sales			o	o				o
Efficiency		o				o		o
Customer satisfaction		o				o		o
Public image			o				o	
Credit worthiness			o	o		o		
Social liability	o	o		o			o	
Concept of environment	o	o			o			o
Documentation								o
Technical level	o		o					
Reducing risk		o	o	o		o		
Staff moral							o	o
Improving profitability							o	
Promoting marketing		o	o			o		

1: Ceres (1992), 2: CMA (1992), 3: Sadgrove (1994), 4: Gottlieb (1996), 5: Sigmon (1997), 6: Geisler (1997), 7: Chin (1999), 8: Darnall (2001),



<Figure 1> Research Framework of this Study

### 3.2 Questionnaire Design

The measuring of the questionnaire of this study adopts the Likert 5 Scale. Following it, respondents indicate their attitudes by checking how strongly they agree or disagree with constructed statements that range from very positive to no comment toward the questions on the questionnaire. It has three parts:

1) The basic information of respondents: This part adopts selection question to ask respondents some basic question about their position, how many employees in the company, the product type of the company, the capital of the company etc.

2) The affecting factors of performance after obtaining ISO 14000 certification: This part asks respondents to focus on the affecting factors of performance after obtaining ISO 14000 certification and to answer the question that enable one to understand the existing situation in implementing these factors.

3) Performance after obtaining ISO 14000 certification: This part focuses on the 13 indicators of performance and asks respondents to weight the degree of improvement in these indicators after obtaining ISO 14000 certification.

&lt;Table 3&gt; The Summary of Hypotheses

H1: The affecting factors of performance after obtaining ISO 14000 certification are unrelated to the performance after obtaining ISO 14000 certification.
H1a: The management's continuous commitment is unrelated to the performance after obtaining ISO 14000 certification.
H1b: The period from the organization takes the initiative to it obtains certification is unrelated to the performance after obtaining ISO 14000 certification.
H1c: The period from obtaining certification up to now is unrelated to the performance after obtaining ISO 14000 certification.
H1d: Whether there are continuous efforts made to improve environment after obtaining ISO 14000 certification.
H1e: Education and training given to the employees are unrelated to the performance after obtaining ISO 14000 certification.
H1f: Putting TQM into practice is unrelated to the performance after obtaining ISO 14000 certification.
H1g: Whether the implementation practices correspond to those listed in documents is unrelated to the performance after obtaining ISO 14000 certification.
H1h: The company's internal auditing activities are unrelated to the performance after obtaining ISO 14000 certification.
H1i: The assistance and guidance from outside institutions for obtaining certification are unrelated to the performance after obtaining ISO 14000 certification.

## 4. RESEARCH RESULTS AND ANALYSIS

### 4.1 Data Collection

From the 990 manufacturers who have got ISO 14000 certification, this study sampled 500 manufacturers as objects by using systematic sampling. Copies of four-page questionnaires were mailed to the management representative of the environmental management department, 176 out of 500 questionnaires mailed were received, of which 175 are usable with a 35.0% valid response rate. Respondents were asked to indicate their job titles. The respondents embody a variety of job titles. They occupy position ranging from general manager to engineer and administrator. This diversity argues strongly in favor of these results of the generalizability.

### 4.2 Factors Influence Performance after Obtaining ISO 14000 Certification

The F statistic for the one-way ANOVA where the independent variable is the degree of the management's continuous commitment(X1). The result is shown as Table 4. It can be found X1 is significantly related to the staff members' concept

about environmental protection(Y1), reduced waste(Y3), reduced pollution(Y5), standardization of the operational process(Y7), documentation(Y9), cost savings (Y10), the employee's morale(Y11), the company's overall image(Y12). By using the same method we can do F statistic for the one-way ANOVA where the independent variable from X2 to X13.

<Table 4> The Effect of Factor X1 on Dimension of Performance

Factor	Performance	F	p value
The management's continuous commitment (X1)	The staff members' concept of environmental protection (Y1)	9.534*	0.000*
	Customer satisfaction (Y2)	2.001	0.097
	Reduced waste (Y3)	4.984*	0.001*
	Resource saving (Y4)	2.085	0.085
	Reduced pollution (Y5)	3.538*	0.008*
	Energy efficiency (Y6)	0.932	0.447
	Standardization of the operational process (Y7)	3.168*	0.015*
	Delivery (Y8)	1.351	0.253
	Documentation (Y9)	3.245*	0.014*
	Cost savings (Y10)	6.370*	0.000*
	The employee's morale (Y11)	7.871*	0.000*
	The company's overall image (Y12)	2.426*	0.049*
	The company's competitive advantage (Y13)	1.298	0.273

\*  $\alpha=0.05$

### 4.3 The Improvement of Performance Indicators

Based on the data collected from the valid questionnaires, this study has summarized the improvement of the 13 performance indicators of the 175 respondents as shown in Table 5. It indicates that the companies obtaining ISO 14000 certification has a certain extent of improvement in the staff members' concept about environmental protection(Y1), customer satisfaction(Y2), reduced waste(Y3), resource saving(Y4), reduced pollution(Y5), energy efficiency(Y6), standardization of the operational process(Y7), delivery (Y8), documentation(Y9), cost savings(Y10), the employee's morale(Y11), the company's overall image(Y12), the company's competitive advantage(Y13).

### 4.4 The Relationship Between Performance after ISO 14000 Certification and its Affecting Factors

By using STATISTICA statistical program, this study analyzed the data collected from the questionnaires. Table 6 lists the summary of canonical analysis. In the predict variables column, the percentage of variables that can be explained

by the canonical variant selected from the predict variables. That is, the canonical variant can explain 33.8904% of predict variables, and in the criterion variable column, the variate can explain the percentage of criterion variables is 33.2812%. The redundancy index in predict variables column stands for that the 15.6611% of the total variance of 9 predict variables can be explained by 13 criterion variables through the first set of canonical variate. The redundancy index in criterion variables column stands for that the 15.3796% of the total variance of 13 criterion variables can be explained by 9 predict variables through the first set of canonical variate.

<Table 5> Summary of Improvement of Performance Indicators

Performance Indicator	Mean	Standard Dev.	Variance	Improvement Extent
1) The staff members' concept of environmental protection	3.9429	0.5541	0.3071	to a certain extent
2) Customer satisfaction	3.4971	0.9026	0.8146	to a small extent
3) Reduced waste	3.8629	0.7059	0.4983	to a certain extent
4) Resource saving	3.4286	0.8606	0.7406	to a small extent
5) Reduced pollution	3.6743	1.0295	1.0600	to a certain extent
6) Energy efficiency	3.4343	0.8610	0.7413	to a small extent
7) Standardization of the operational process	3.7143	0.8500	0.7225	to a certain extent
8) Delivery	3.0629	1.0836	1.1742	to a small extent
9) Documentation	3.6971	0.8198	0.6721	to a certain extent
10) Cost savings	3.1200	0.8856	0.7844	to a small extent
11) The employee's morale	3.2857	0.9088	0.8259	to a small extent
12) The company's overall image	3.7486	0.8056	0.6491	to a certain extent
13) The company's competitive advantage	3.3829	0.9326	0.8698	to a small extent

5: Has been improved to a large extent: 4: Has been improved to a certain extent: 3: Has been improved to a small extent: 2: Has been improved merely to the narrowest extent: 1: Has not yet been improve at all

From the data shown in Table 6, we can find out that: ① Three predict variables(X2, X3 and X9) have no significant correlation with the set of significant canonical variate. ② The management's continuous commitment(X1), continuous efforts made to improve environment after obtaining certification(X4), education and training given to the employees(X5), putting TQM into practice(X6), whether the implementation practices correspond to those listed in documents(X7), and the company's internal environmental auditing activities(X8) are significantly related to the staff members' concept about environmental protection(Y1), customer satisfaction(Y2), reduced waste(Y3), resource saving (Y4), reduced pollution(Y5), standardization of the operational process(Y7), delivery(Y8), documentation(Y9), cost savings(Y10), the employee's morale(Y11), the company's overall image(Y12), the company's competitive advantage(Y13).



&lt;Table 6&gt; Summary of Canonical Analysis

Predict Variables	Canonical Loadings	Criterion Variables	Canonical Loadings
1) The management's continuous commitment	-0.8000	1) The staff members' concept of environmental protection	-0.7424
2) The period from the organization takes the initiative to it obtains certification	-0.0242	2) Customer satisfaction	-0.5133
		3) Reduced waste	-0.5854
3) The period from obtaining certification up to now	0.0898	4) Resource saving	-0.5575
4) Whether there are continuous efforts made to improve environment after obtaining certification	-0.8545	5) Reduced pollution	-0.6029
		6) Energy efficiency	-0.3920
5) Education and training given to the employees	-0.6356	7) Standardization of the operational process	-0.6291
6) Putting TQM into practice	-0.4885	8) Delivery	-0.4365
7) Whether the implementation practices correspond to those listed in documents	-0.6097	9) Documentation	-0.5117
		10) Cost savings	-0.6534
8) The company's internal environmental auditing activities	-0.8024	11) The employee's morale	-0.0785
9) The assistance and guidance from outside institutions for obtaining certification	-0.1106	12) The company's overall image	-0.4621
		13) The company's competitive advantage	-0.4859
Variance accounted for (%)	33.8904	Variance accounted for (%)	33.2812
Redundancy index (%)	15.6611	Redundancy index (%)	15.3796
Square of canonical correlation coefficient		0.4621	
Canonical correlation coefficient		0.6798	

Referring to Table 6, the first canonical function is significant ( $p$ -value $<0.05$ ). It means that, by the canonical functions, the affecting factors of performance after obtaining ISO 14000 certification are related to the performance after obtaining ISO 14000 certification. And the research hypothesis H1 is rejected. Furthermore, the predict variables(X1, X4, X5, X6, X7, and X8) of the canonical functions have significant relationship with the canonical variate. This means that the research hypotheses H1a, H1d, H1e, H1f, H1g, and H1h are rejected.

## 5. CONCLUSION AND DISCUSSION

Obtaining ISO 14000 certification is merely the beginning of the operation of an environmental management system. In order to put environmental management system into practice and maintain its function, the companies have to be fully aware of the principles of the environmental management system, to examine its

operation regularly; moreover, to work out the policy of improvement to deal with the sudden change in the outside environment. The results of some analyses made in this research lead this study to come to the following conclusions: ① Improving environment is an endless process. The efforts continuously tried by a company to pursue a good environment and the education and training given to its employees has a profound influence on the performance after getting ISO 14000 certification. ② If the company could precisely implement TQM, then it could build a good environmental management system before obtaining ISO 14000 certification. Thus, this has a great help for ISO 14000 to be guided into the company smoothly. ③ Whether the company's concrete actions correspond to the records listed in its files and the company's internal environmental management system auditing activity have influenced the performance after obtaining ISO 14000 certification.

Strengthening environmental management seems to be a major policy for manufacturers to take the sustainable development in the keen competition business world. According to the results we would like to make following suggestions for the further improvement of the manufacturers: ① The top management should centralize its management concept on environment management and also provide all the employees with its full supports. Besides, managers should participate in the environmental management promotion campaign personally so that both the employee and the top management can get a better understanding about the importance of sustainable development and then work in close cooperation. ② Emphasizing education and training. Except for clarifying the employee's concept about environmental protection and improving techniques, the top management can seize this opportunity to promulgate its environmental quality-oriented policy. ③ Strengthening the system and having all the staff participated. The company should establish a proper and integrated system, a procedure and a file for every flow process of environmental management system so as to ensure that the best environmental quality can be achieved in every process of environmental management system. ④ Entrenching the internal environment auditing system and making continuous improvement. The internal environmental auditing system will enable the company to upgrade its standard continuously.

Environmental improvement is an endless process. The importance of the continuous improvement is one thing that stressed by scholars over and over again. Obtaining ISO 14000 certification does not mean no more defects in environmental management. In short, the data seems to indicate that, with ISO 14000 certification, company can be both clean and green. These are important findings for the operations manager.

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