The Initial Study of Industrial Competitiveness in Accordance with the Indicator of the Accreditation of Environmental Management: The Case of Shoes Industry

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***Abstract*--The International Organization for Standardization (ISO) published the standard of ISO 14001 environment management system in September of 1996. After the publication of ISO 14001, many environmental accreditation systems were developed. Many famous brands developed their environment system, for example, the system of restricted substance limit of Nike.**

This study focused on the supply chain of shoes industry to research that how the environmental management system were maintained and what were their approaches to saved energies, reduced the production cost and passed the environment accreditation.

In this study, we interviewed one shoe factory, five leather tanneries, and also finished a survey of 15 leather tanneries, as the result, they all passed the ISO 14001 or the Leather World Group accreditation which are required by many worldwide athlete brands. This study found that the environmental accreditation became a basic element to become more competitive, however it is not the guarantee for new order.

However in the process to have the environment system, the leather tannery not only fulfilled the management system to achieve the synergy of quality, reduction of the material loss and power energy, and water resource saving. In this fashion, they are not only enhanced the satisfaction of customer but also reduced the cost of production and strengthen their competitiveness.

I. INTRODUCTION

A. Research Motivation

Environmental management has become the focus of global enterprises since the International Organization for Standardization (ISO) released the ISO 14001 environmental management system in September 1996. Subsequently, certifications specific to various environmental protection issues have been developed. Well-known international enterprises and brands have also developed unique environmental management systems. For example, the Panasonic Group devised an environmental quality assurance system and Nike, Inc. implemented a system of restricted substance limit (RSL). These brands and enterprises developed internal environmental management systems to establish frameworks for achieving green supply chain management. Suppliers which delivered the products to these brands were required to comply with environmental laws and regulations and fulfill corporate environmental responsibilities. These actions enable corporations to improved their social image and green competitiveness.

Using the supply chain in the shoe industry as the research subject, this study investigated the supply-chain environmental management mechanisms that well-known international brands implement in their supply chain systems. Additionally, how organizations in the shoe industry supply chain executed environmental protection, energy saving, and cost reduction to achieve environmental certification and enhanced market competitiveness was explored.

B. Research Objectives

Interviews and questionnaire surveys were conducted with managers employed at shoe and leather factories located in Taiwan. The interviews and surveys were intended to identify the motivations underlying leather factory managers' decisions to acquire international environmental certification. Additionally, we examined whether these factories achieved markedly improved competitiveness after obtaining certification, such as improvements in the form of enhanced product value, reduced raw material waste, decreased energy and resource consumption (e.g., decreased electricity and water consumption), improved customer satisfaction, and reduced manufacturing costs. Furthermore, we explored whether international environmental certification can enhance company managers' identification with environmental protection and social responsibility to fulfill their social responsibilities and thus improve the corporate image.

II. LITERATURE REVIEW

A. Green Economy and Corporate Competitiveness

Corporate competitiveness refers to the competitive advantages that companies have in an industry. Specifically, competitive advantages involve the competitive strategies that corporations implement are difficult for competitors to substitute or duplicate. Alternatively, competitive advantages can also refer to existing corporate interests and opportunities that are unavailable to rivals. To maintain competitive advantages, companies must possess resources with the following four properties: (a) value that enables companies to use various opportunities or neutralize threats in competitive environments; (b) rarity among current companies and potential competitors; (c) inimitability; and (d) irreplaceable value [1]. Such competitive advantages are derived from the value that companies create for their customers [1, 6].

Porter [6] divided the competitive strategies adopted by companies into product differentiation, cost leadership, and focus. Specifically, product differentiation refers to a company's capacity to offer products or services that customers consider distinctive from those provided by competing companies. In other words, the products and services provided by this company possess special values that

are recognized and accepted by customers. Additionally, these special values cannot be replaced with the products and services offered by competitors. These advantages are crucial for enterprises to enhance their competitiveness and maintain competitive advantages [7].

Porter also asserted that the conventional perception that rigorous environmental standards increase the manufacturing costs incurred for the suppliers and thereby reduce their competitiveness is incorrect. Conversely, rigorous environmental standards motivate suppliers to engage in energy, process, and human resource innovations. These measures can counteract the costs resulting from environmental improvements; subsequently, the overall manufacturing costs decline. As product value increases, corporate competitiveness grows. Empirical results have shown no significant negative correlations between stringent environmental policies and industrial competitiveness [2, 8]. Therefore, company managers should adopt positive attitudes when encountering environmental standards and regulations. In addition to complying with such laws and regulations, enterprises should focus on improving their environmental performance and fulfilling their social responsibility. Thus, the environmental competitiveness they possess can enable them to become prominent market players.

Furthermore, because consumers' environmental awareness is increasing and the green economy is expanding, enterprises should develop and manufacture green products that satisfy environmental-protection and energy-saving goals. Additionally, these enterprises should set sustainable development as their business objective and adopt the innovative strategy of product differentiation as the impetus for a green economy. Enterprises that actively pursue environmental excellence can transform environmental challenges into opportunities for engaging in environmental protection. Thus, favorable environmental performance and interests can be achieved [5].

B. ISO 14001International Environmental Certification

The ISO is an international organization that comprises standardization bodies from various member countries. The preparations for international standardization are typically performed by technical committees (TCs). The ISO 14001 was compiled in 1996 by Subcommittee 1 (SC1) under ISO/TC207, a TC committed to environmental management.

Enterprises of varying nature have focused on achieving and demonstrating their environmental performance by continuing their efforts to comply with environmental policies and manage the environmental impact of various activities, products, and services. Enterprises are particularly motivated to engage in such practices because environmental regulations are tightening, economic policies are evolving, attention to environmental issues related to various indicators is increasing, and environmental groups are constantly monitoring the relationship between environmental protection and economic development.

The standards of the ISO 14001 environmental management system were intended to provide enterprises with the elements for establishing an effective environmental protection system. Additionally, the system is integrated with additional management guidelines that enable company managers to accomplish the environmental and economic goals set for their corporations. The ISO 14001 standards were focused on the requirements of environmental management systems to enable company managers to formulate and implement environmental policies and goals. Specifically, these standards contain legal instructions and significant environmental considerations that are applicable to enterprises and organizations of various forms and sizes. Additionally, the application of these standards possesses no geographical, cultural, or social limitations. This system can serve as a reference for corporate and organizational managers to formulate environmental policies, define corporate or organizational objectives, design procedures for fulfilling their policy commitments, and perform necessary actions to improve their performance (Subcommittee 1, ISO/TC207 SC1, ISO, 1996).

C. The Leather Working Group Certification

The Leather Working Group (LWG) is an international organization that comprises well-renowned brands, retailers, material suppliers, industry technical experts, and non-profit environmental organizations. The mission of the LWG is to formulate criteria for assessing leather factories; these criteria can be used to inspect leather factories and determine whether the requirements of leather quality and environmental protection are satisfied.

Brands with LWG membership require factories to obtain LWG environmental certification to qualify as suppliers. Certified suppliers are classified with either a gold, silver, or bronze status to differentiate between the qualification and environmental performance of leather suppliers [4].

III. RESEARCH METHODS

A. Expert Interviews

In-depth expert interviews were conducted using a focused or semi-structured format. Specifically, semi-structured interviews, which can be quantity- or quality-oriented, involve researchers using general research questions as a basis and guideline for interviews. In this study, content analysis was subsequently conducted to analyze the information and recommendations provided by experts in the shoe industry. The contents of the concepts and opinions mentioned in the interviews were sorted before identifying the effects that green certification exerts on the industrial competitiveness of businesses in the shoe industry. Finally, key vocabularies were extracted from the results.

In this study, the shoe industry was adopted to conduct a case study; the subjects of this study consisted of Taiwanese leather and shoe manufacturers that supply shoe parts or end products to international footwear brands. The supply chain involved world-renowned brands such as NIKE, PUMA, and ADIDAS. We visited five leather factories and interviewed the factory owners and managers overseeing the environmental protection departments. Interviews were conducted to investigate whether the green certification

performance of these factories substantially enhanced their competitive advantages in the supply chain. Additionally, the internal and external effects of green certification were explored. The results were then used as a reference for designing a questionnaire.

B. Questionnaire Survey

A questionnaire survey was conducted with managers employed by a well-known Taiwanese shoemaker and at 15 leather factories. Before the survey, we confirmed the international environmental certifications acquired by each factory and the managers' motivations and reasons for applying for such certifications. The results were used to thoroughly investigate whether the acquisition of international environmental certifications enhanced the environmental awareness of suppliers. Furthermore, the performance of environmental management and the key factors for successful implementation of the international environmental management systems were examined.

1. Topics included in the questionnaire

a) The motivations for implementing environmental management systems
b) The philosophies and perceptions of environmental management
c) The outcomes of implementing environmental management systems
d) The key factors for successfully implementing environmental management systems

2. Purposes of the questionnaire survey

a) To investigate whether the acquisition of international environmental certification enhances the environmental awareness of managers
b) To explore whether the acquisition of international environmental certification improves energy and resource consumption (e.g., water consumption) and waste management
c) To examine whether the acquisition of international environmental certification improves business management
d) To determine whether the acquisition of international environmental certification increases prices and advisor satisfaction, and
e) To identify the key success factors in acquiring international environmental certification

IV. THE RESULT OF STUDY

A. Samples resources

There were 1 famous shoes manufacturing factory and 15 tanneries located in Taiwan investigated in this study and the brands they are dealing with were very famous in Europe and American which include Nike, Puma, New Balance, Adidas, Clark, Deichmann, Converse, Diesel, Jackwolfskin etc.

Due to the scale of the tannery industry in Taiwan is small and there are not so many tanneries have the ISO 14001 or the other certifications, so that the sample size were limited. Therefore we invited the 30 experts from the well-organized and also have the ISO certificates tanneries to finish the questionnaire to ensure the quality of statistical analyses and the information collected are correct and meaningful. and the table of the sample resource as follow:

TABLE 1. THE LIST OF THE INTERVIEWEE IN THIS STUDY

No.	Position	Division	Staff of the Company	Product	Brand of OEM
1	Manager	administration	300	PU leather	NIKE,ADIDAS, NB
2	Manager	Sales	200	Cow leather	KEEN,Converse
3	General manager	General manager	200	Cow leather	KEEN,Converse
4	General manager	General manager	100	PU leather	PUMA
5	Manager	Sales	100	PU leather	PUMA
6	Manager	production	100	PU leather	PUMA
7	Manager	administration	100	PU leather	PUMA
8	Manager	administration	200	Cow leather	NIKE
9	Manager	administration	150	lining leather	CLARK
10	Manager	Sales	150	lining leather	CLARK
11	General manager	General manager	150	lining leather	CLARK
12	Manager	Sales	100	lining leather	PUMA
13	Manager	production	100	lining leather	PUMA
14	Manager	Sales	100	lining leather	DEICHMANN
15	Manager	production	100	lining leather	DEICHMANN
16	Manager	Sales	100	lining leather	NIKE,ADIDAS, NB
17	Manager	production	100	lining leather	NIKE,ADIDAS, NB
18	Manager	administration	100	lining leather	NIKE,ADIDAS, NB
19	General manager	General manager	100	lining leather	NIKE,ADIDAS, NB
20	Manager	administration	150	Cow leather	PUMA,ADIDAS,NB
21	General manager	General manager	150	Cow leather	PUMA,ADIDAS,NB
22	Manager	production	100	lining leather	PUMA
23	Manager	production	100	lining leather	NB
24	Manager	administration	200	Cow leather	NIKE,PUMA,FOOTJOY
25	General manager	General manager	200	Cow leather	NIKE,PUMA,FOOTJOY
26	Manager	production	100	Cow leather	PUMA,ADIDAS,DIESEL
27	Manager	production	150	Cow leather	NIKE,NB
28	Manager	production	200	Cow leather	PUMA,ADIDAS,NB
29	Manager	administration	200	Cow leather	PUMA,ADIDAS,NB
30	General manager	General manager	200	Cow leather	PUMA,ADIDAS,NB

Data source: organized in this study

B. Basic Data and Data Analyze

The shoes factory investigated in this study is Pou Chen Corporation which was founded in September 1969 with canvas and rubber footwear as major products initially. Currently Pou Chen Corporation has transformed itself to be an industrial holding company. Its two core businesses, footwear and retail are mainly operated by its subsidiaries and affiliates. In the late 1970s Pou Chen Corporation began to produce athletic footwear on an original equipment manufacturer (OEM) basis for the branded company, "adidas". With the professional R&D ability and experienced factory management. Pou Chen Corporation from a simply OEM successfully turned to be an original design manufacture (ODM) for major international brand name companies such as Nike, adidas, Reebok, Asics, New Balance, Puma, Converse, Merrell, and Timberland.

The 15 tanneries had been interviewed and surveyed all were located in Taiwan area from north to south of Taiwan and they supplied the shoes material included shoes upper and inner material which made of cow hide and pig skin. Tannery were considered as an industry which have high pollution, high-energy-consumption and high risk with dangers in Taiwan. Because the tanneries used a large quantities of water in the process of tanning and dyeing and discharged a large quantities of waste water which may cause a serious pollution to the river or ocean if the waste water was not treated properly before discharged. And the tanneries also used a large quantities of electricity and heat in the process of drying process and may waste the energies if the process of the energy consumption are not under properly controlled. The location of the tanneries which covered in this study are below:

TABLE 2. THE LIST OF THE TANNERIES SURVEYED IN THIS STUDY

Location(in Taiwan) area)	Tannery Amount
Miaoli County	1
Taichung City	1
Changhua County	2
Chiayi County	1
Yunlin County	2
Tainan City	3
Kaohsiung City	4
Pingtung County	1
Total	15

Data source: organized in this study

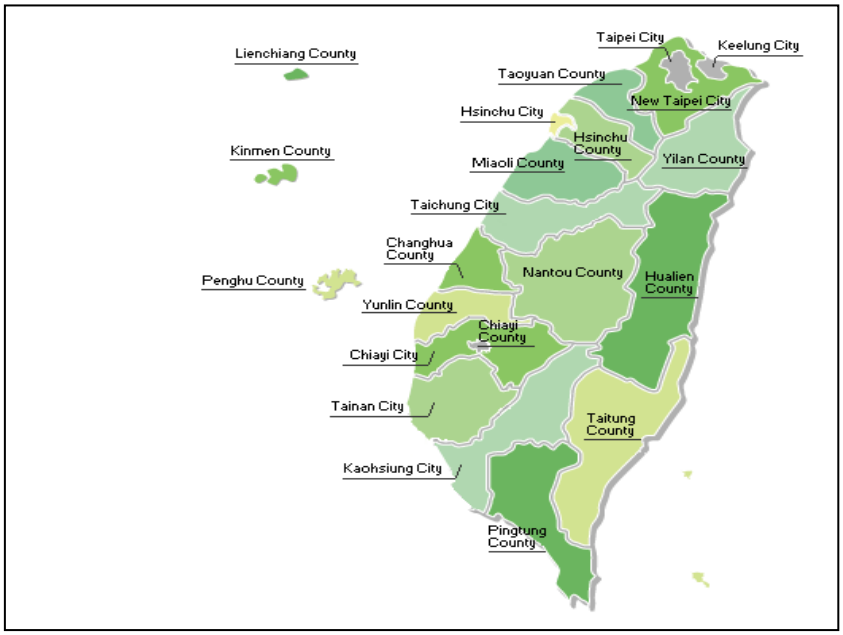

Figure 1. Map of Taiwan
Data source: from the website https://www.google.com.tw

C. One way analyses of variance (ANOVA)

1. The impacts of environmental protection recognition to the environmental performance.

Test item	SS	df	MS	F TEST	P value
Water usage performance	0.585	4	0.146	0.745	0.571
Energy saving performance	3.391	4	0.848	3.223	0.029*
Waste reduction performance	1.713	4	0.428	1.875	0.146
Management performance P*<0.05	1.459	4	0.365	5.721	0.002*

Result: The environmental protection recognition had the significant impact to the environmental performance of energy saving performance and management performance which include compliance of environmental regulation, improvement of social image, increasing of market share, enhancing of price of the product, satisfaction of the customers.

2. The impacts of environmental protection recognition of government which include local government and EPA(environment protection agency) to the environmental performance.

Test item	SS	df	MS	F TEST	P value
Water usage performance	0.593	2	0.297	1.633	0.214
Energy saving performance	1.397	2	0.698	2.201	0.130
Waste reduction performance	0.826	2	0.413	1.690	0.204
Management performance P*<0.05	0.860	2	0.430	5.293	0.011 *

Result：The environmental protection recognition of government had the significant impact to the management performance of tanneries which include compliance of environmental regulation, improvement of social image, increasing of market share, enhancing of price of the product, satisfaction of the customers.

3. The impacts of successful environment management system to the environmental performance.

Test item	SS	df	MS	F TEST	P value
Water usage performance	3.103	9	0.345	2.881	0.023 *
Energy saving performance	5.967	9	0.663	3.315	0.012 *
Waste reduction performance	3.464	9	0.385	1.945	0.103
Management performance P*<0.05	1.989	9	0.221	4.156	0.004 *

Result: The successful environment management system had the significant impact to the environmental performance of water usage performance, energy saving performance and management performance which include compliance of environmental regulation, improvement of social image, increasing of market share, enhancing of price of the product, satisfaction of the customers.

4. The impacts of environment certification of tannery to the environmental performance.

Test item	SS	df	MS	F TEST	P value
Water usage performance	1.405	3	0.468	2.975	0.050*
Energy saving performance	1.654	3	0.551	1.725	0.187
Waste reduction performance	0.042	3	0.014	0.049	0.985
Management performance P*<0.05	0.390	3	0.130	1.270	0.305

Result: The environment certification of tannery had no impact to the management performance to get the more orders but it had the significant impact to the environmental performance of water usage performance.

D. T Test

1. The impacts of environmental protection recognition to the environmental performance.

Test item	T test for Equality of mean				
	t	df	significance (two-tailed)	avarge Variances	Standard error Variances
Water usage performance	1.416	28	0.168	0.223	0.158
Energy saving performance	-0.268	28	0.791	-0.059	0.220
Waste reduction performance	1.381	28	0.178	0.253	0.184
Management performance P*<0.05	-2.143	28	0.041*	-0.242	0.113

Result: The environmental protection recognition had significant impact to the tanneries for management performance which include compliance of environmental regulation, improvement of social image, increasing of market share, enhancing of price of the product, satisfaction of the customers.

2. The impacts of environmental protection recognition for complying the regulation

Test item	T test for Equality of mean				
	t	df	significance (two-tailed)	avarge Variances	Standard error Variances
Water usage performance	1.300	28	0.204	0.217	0.167
Energy saving performance	-0.217	28	0.830	-0.050	0.231
Waste reduction performance	1.290	28	0.207	0.250	0.194
Management performance	-0.710	28	0.483	-0.090	0.127
Successful environment system	-0.330	28	0.744	-0.058	0.176
environmental protection recognition	0.639	28	0.528	0.080	0.125

Result: The environmental protection recognition for complying the regulation had no impact to any performance of environment.

3. The impacts of environmental protection recognition for energy conservation and reduction of carbon emissions.

Test item	T test for Equality of mean				
	t	df	significance (two-tailed)	avarge Variances	Standard error Variances
Water usage performance	0.038	28	0.970	0.006	0.168
Energy saving performance	-1.401	28	0.172	-0.306	0.219
Waste reduction performance	0.443	28	0.661	0.086	0.194
Management performance	-1.102	28	0.280	-0.135	0.122
Successful environment system	-0.840	28	0.408	-0.143	0.170
environmental protection recognition	-0.665	28	0.512	-0.081	0.122

Result: The environmental protection recognition for energy conservation and reduction of carbon emissions had no impact to any performance of environment.

4. The impacts of cost saving recognition to the environmental performance.

Test item	T test for Equality of mean				
	t	df	significance (two-tailed)	avarge Variances	Standard error Variances
Water usage performance	-1.127	28.000	0.269	-0.185	0.164
Energy saving performance	-1.763	28.000	0.089	-0.378	0.214
Waste reduction performance	1.477	28.000	0.151	0.278	0.188
Management performance	0.069	28.000	0.946	0.009	0.125
Successful environment system	0.354	28.000	0.726	0.061	0.172
environmental protection recognition	0.744	28.000	0.463	0.091	0.122

Result: The cost saving recognition had impact to energy saving performance although the figure is 0.089 which is not so significant.

V. CONCLUSION AND RECOMMENDATIONS

A. Conclusion

In this study, we interviewed the key parties at a shoe factory, which were an OEM for a world-renowned brand and five upstream leather factories. Representatives from 15 leather factories completed the questionnaire survey, yielding 30 valid questionnaires. These factories attained the ISO 14001 international environmental management system certification and/or the leather factory certification awarded by the Leather Working Group (LWG). The LWG is acknowledged by major world brands. The results of the final questionnaire survey indicated that leather factories that earned ISO 14001 and LWG international environmental certifications acquired brand recognition. These factories were recognized as qualified suppliers for OEM factories manufacturing branded shoes. However, these certifications contributed little to increasing product value in the market. The results indicated that manufacturers acquired environmental certifications because of an imitation effect; thus, acquiring certification became a fundamental requirement for market competitiveness. However, acquiring certification does not guarantee an increase in product prices.

According to the data analyses of this study, we found that when establishing environmental management systems, leather factories implemented management systems combining environmental performance, quality assurance, energy conservation, and carbon reduction; these systems were based on the requirements of environmental certification for restricted substance management (RSL), energy conservation, carbon reduction, and quality management. By controlling operational procedures and conducting statistical analysis, the factories achieved quality control and reduced their raw material waste, power and

water consumption and the use of other energy and resources. These actions increased customer satisfaction and enterprise competitiveness and reduced product manufacturing costs.

In addition to improving product costs and quality, establishing environmental management systems enhanced the intangible competitiveness of factories, strengthened their social responsibility regarding environmental protection, solidified their concept of quality management, and demonstrated management efficacy.

B. Recommendations

1. Leather factories in the shoe manufacturing industry must acquire international environmental certifications; however, these certifications do not guarantee desired product prices. Engaging in innovative activities related to energy, manufacturing process, and manpower, may reduce the overall production costs of factories, which compensates for increased environmental protection costs and thereby elevates the value of products and enhances manufacturer competitiveness.
2. Although qualified existing brand suppliers already possess international environmental certifications, they can evaluate their strength and weakness and try to develop differentiated competitive strategies and further improve various areas such as product research and development, service quality, and cost management and control.
3. In addition to attaining basic environmental certifications from the ISO 140001 and LWG, manufacturers can employ high-standard international environmental certifications, such as carbon footprint certification to differentiate themselves from competitors despite the acquisition of these certifications not required as a prerequisite.
4. Manufacturers should continually operate their environmental management systems to control and reduce water, power and oil costs and consumption during the manufacturing process. This approach can saves energy, reduces carbon emissions, and lowers production costs.
5. Understanding environmental protection and business management is a key factor for successfully establishing environmental management systems. Therefore, the support and involvement of upper-level managers and internal education and training are required to facilitate the implementation of an environmental management system.
6. In the focus of technology management, we suggest the tanneries can evaluate the feasibility of renewable sources and technical approach to save the energies and cost and reduce the greenhouse gas emissions. For the purpose of environment and cost down of the energies and water consumption, the tanneries can take the technological management approach such as using of the renewable sources and water re-cycling system. Renewable sources of energy include waste, geothermal, wind, photovoltaic, biomass and solar thermal energy. Currently, there are many organizations apply renewable sources to reduce the energies consumption and save the cost. So that we suggest the tanneries can evaluate the feasibility of renewable sources. Internally, we suggest that the tanneries can try to find some practical method and technical equipment such as using of the dosing and metering system to save the chemical material and water.

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