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The Impact of ISO 14001 on the Operations Management of Wooden Furniture Manufacturers in Malaysia

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Subject A survey of ISO 14001 certified and non-certified wooden furniture manufacturers in Malaysia revealed that the low cost-benefit factor was the main reason that deterred the adoption of the standard. However, the adoption of ISO 14001 resulted in the production of green furniture, the use of environmental friendly materials and technologies, re-training of the workers and waste reduction. Consequently, the adoption of the ISO 14001 environmental management system resulted in a more cost-effective wooden furniture production, contrary to previous perception.

1 Introduction

One of the most promising management tools available for wooden furniture to address environmental concerns is the ISO 14001, environmental management system (Kitazawa and Sarkis 2000). The standard enables companies to be proactive towards environmental management and has significant influences on the manufacturing and management practices (Gonzales-Benito and Gonzales-Benito 2005). Although, Malaysia is a large producer and exporter of wooden furniture, the number of ISO 14001 certified wooden furniture manufacturers remain small (Ratnasingam 2006, Ratnasingam et al. 2008). Therefore, a study was undertaken to evaluate the deterrents to the adoption of the ISO 14001 environmental management system, and also analyze the transformation in production processes that had taken place among the certified companies in the Malaysian wooden furniture industry. The findings of this study will be useful, as they provide information to what extent the use of ISO 14001 will bring out real environmental transformation of the furniture manufacturing enterprises.

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2 Methods

A questionnaire-based survey of 60 medium-sized (i. e., with an average workforce of 100) wooden furniture manufacturers in Malaysia were carried out in 2008. The samples including 30 ISO 14001 certified-companies were interviewed using a structured questionnaire, which had four parts. Part I determined the factors that deterred the adoption of the ISO 14001 system among non-certified companies. Part II evaluated the degree of agreement with the implementation of ten environmental-friendly operational practices among certified-companies, based on a six-point Likert scale rating. Principal component analysis of the ten operational practices was performed and two factors, namely the cultural manufacturing factor and technical manufacturing factor, with eigen-values higher than 1.0 which explained 60.3% of the variance were identified. Part III evaluated the degree of implementation of ten environmental practices among the certified companies, using a six-point Likert scale rating. These environmental practices were selected from previous studies by Handfield et al. (1997) and Bovea and Vidal (2004), and also from consultations with industrial experts. Principal component analysis of these practices were done and three factors, namely product design, logistic/support processes and environmental-friendly production processes,

with eigen-values higher than 1.0, which explained 67.5% of the variance, were obtained. Part IV determined the average values of processing wastage, rejection/rework rate, downtime loss and other operational inefficiencies related to the furniture manufacturing processes among certified and non-certified companies.

3 Results

The results of the study are presented in three parts.

1. Factors deterring wooden furniture manufacturers from adopting ISO 14001

The factors that deterred the implementation of the ISO 14001 among wooden furniture manufacturers in Malaysia were: (i) high cost involved, (ii) lack of customer demand, (iii) no government regulation, (iv) lack of government incentives and lack of trained personnel to implement and maintain the system.

2. Adoption of Advanced Manufacturing Practices among ISO 14001 Certified Wooden Furniture Manufacturers

Certified wooden furniture manufacturers showed high "cultural manufacturing factor" and "technical manufacturing factor" (Table 1), suggesting that these companies paid greater attention to employee training and were focused on continuous improvement of manufacturing practices, as reported previously by Morrow and Rondinelli (2002).

3. Adoption of Environmental Management Practices among ISO 14001 Certified Wooden Furniture Manufacturers

Certified wooden furniture manufacturers were proactive towards undertaking environmental management practices in terms of: (i) product design which focused on

Table 1 Principal component analysis of advanced manufacturing practices among ISO 14001 certified wooden furniture manufacturers
Tabelle 1 Hauptkomponentenanalyse der fortschrittlichen Fertigungspraktiken unter den ISO 14001 zertifizierten Holzmöbelherstellern

	Mean (S.D.)	Cultural	Technical
Employee Training	5.28 (1.19)	0.728 *	0.144
Continuous Improvement	5.15 (1.24)	0.735 *	0.165
Employee Participation	4.93 (1.21)	0.710 *	0.179
Innovative Product Design	5.24 (1.17)	0.668 *	0.211
Total Quality Management	4.98 (1.44)	0.624 *	0.248
Collaboration with Suppliers	3.85 (1.31)	0.613 *	0.515
Advanced Manufacturing Technologies (CNC)	4.75 (1.24)	0.315	0.644 *
CAD/CAM Technologies	4.50 (1.31)	0.288	0.533 *
Computerized Production Planning (MRP)	4.15 (1.35)	0.244	0.635 *
Lean Manufacturing, SPC	4.38 (1.21)	0.194	0.801 *

Note: Total variance explained 60.3% – Varimax orthogonal rotation; Greatest loading of each item is marked with *

Table 2 Principal component analysis of environmental management practices among ISO 14001 certified wooden furniture manufacturers
Tabelle 2 Hauptkomponentenanalyse der Umweltmanagementpraktiken unter den ISO 14001 zertifizierten Holzmöbelherstellern

	Mean (S.D.)	Factor 1	Factor 2	Factor 3
Use of environmental-friendly materials and resources	5.32 (1.21)	0.895*	0.256	0.188
Product design focused on waste and pollutant reduction during processing	5.13 (1.37)	0.815*	0.312	0.207
Product design focused on reusability and recycling	4.69 (1.24)	0.737*	0.219	0.170
Environmental criteria in supplier selection	3.41 (1.31)	0.552	0.805*	0.355
Use of cleaner transportation methods	3.11 (1.79)	0.234	0.775*	0.321
Recyclable or reusable packaging materials	4.14 (1.09)	0.403	0.724*	0.220
Responsible disposal of waste and mill residues	4.88 (1.39)	0.261	0.697*	0.323
Processing methods focused on waste, pollutants and energy reduction	5.41 (1.21)	0.317	0.278	0.884*
Production planning and control focused on optimization and maximizing use of resources	4.89 (1.44)	0.412	0.256	0.835*
Application of high-technology equipment to reduce waste and energy consumption	4.65 (1.13)	0.469	0.212	0.720*

Note: Total variance explained 67.5% – Varimax orthogonal rotation; Greatest loading of each item is marked with *; Factor 1 – Product Design, Factor 2 – Logistics/Support Processes, Factor 3 – Production Processes

producing "green/environmental-friendly products", (ii) logistics/support processes which emphasized on reducing, reusing, and recycling concepts, and (iii) production processes which employed high-technology processes to reduce waste (Table 2). As a result, certified wooden furniture manufacturers were more cost-effective compared to their non-certified counterparts due to higher processing yield and lower waste, rejections as well as quality problems.

4 Industrial Implications

The high cost related to the implementation of the ISO 14001 environment management system is the main reason that deters companies from adopting the standard. Nevertheless, certified-companies have reported positive cultural and technical manufacturing practices within their companies, which contributed towards cost-effective manufacturing of furniture. Contrary to common belief (Ratnasingam et al. 2008), adopting the environment management system paves the way for cost-effective wooden furniture manufacturing.

References

Bovea M, Vidal R (2004) Materials selection for sustainable product design – a case study of wood-based furniture eco-design. Mater Design 25:111–116

Gonzales-Benito J, Gonzales-Benito O (2005) An analysis of the relationship between environmental motivations and ISO 14001 certification. Brit J Manage 16:133–148

Handfield RB, Walton SV, Seegers LK, Melnyk SA (1997) Green value chain practices in the furniture industry. J Oper Manag 15:293–315

Kitazawa S, Sarkis J (2000) The relationship between ISO 14001 and continuous source reduction programs. Int J Oper Prod Man 20:225–248

Morrow D, Rondinelli D (2002) Adopting corporate environmental management systems: Motivations and results of ISO 14001 and EMAS certification. Eur Manag J 20:159–171

Ratnasingam J (2006) Transforming the South East Asian Furniture Industry. Irama Persada, Kuala Lumpur

Ratnasingam J, Macpherson TH, Ioras F (2008) An assessment of Malaysian wooden furniture manufacturers' readiness to embrace chain of custody (COC) certification. Holz Roh Werkst 66:339–343