Fuzzy Integral AHP for the Evaluation of Green Suppliers

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ABSTRACT

In the last ten years, the international Green Environment Protection has become the most important subject between governments and industries. The Research Agency of Nations have built the law of international Green Environment Protection and researched the tools for the appraisal of Green issues of industries via the system of evaluation that could get the correct Green Environment information from industries.These efforts also could assist sustainable management of industry. In this thesis, we built the appraisal system of electronics industry base on the law of RoHS and WEEE. First, we utilize the questionnaire investigation to understand the suppliers ’ motivation of implementing the green environment protection. Second, we evaluate the performance factors via reviewed suppliers ’ information and enforcement effort. The factors include environmental management system, document process system, procurement, and production management system. Third, we integrate experts ’ assessment policy of questionnaire investigation to get the index weight by Expert Choice 11 and LINGO to perform the analysis of Analytical Hierarchy Process(AHP) and Choquet-fuzzy-integral model. Finally, we evaluate the green score of suppliers to check which meets the green environment protection in electronics industry then suggest the decision maker to choose the appropriate suppliers. With this research of supplier appraisal system, the performance of environmental management of the regulation restriction and customers ’ requirement and that of document process system have the higher fuzzy weights. These two items indicate the importantance to the industries. Obviously, these evaluated results are due to the regulation WEEE and RoHS of European Union(EU). In addition, We observe that the suppliers with high capital emphasize much more on green environment protection, their evaluated scores are also higher.

Keywords : Green Environment Protection, RoHS, WEEE, Analytical Hierarchy Process (AHP), Fuzzy Integral.

Table of Contents

REFERENCES

中文部份:【1】吳寶雅(2000),「階層分析法在衛生掩埋場安全評估之應用」, 碩士論文,國立成功大學土木工程研究所。【2】林張群、鍾佳雯 (2001),「模糊積分在資訊人員遴選之應用」, 2001 年資訊管理學術暨實務研討會論文集,第101-108 頁。【3】黃義俊 (2001),「企業的綠色管理隻整合性模式的實證研究— 以化工與機電產業為例」, 博士論文,國立中山大學企業管 理學系研究所。【4】楊致行（2004）,「歐盟電機電子環保指令對我國產業的衝擊 與因應」,《永續產業發展雙月刊》,第10-27頁。【5】廖珮瑜 (2004) ,「歐盟WEEE & RoHS 指令及其他法規介 紹」,電子電機產品檢測技術研討會論文集,高雄:台灣檢 驗科技股份有限公司主辦。【6】鄧淵源,曾國雄(1989),層級分析法(AHP)的內涵特性與應用 (上),中國統計學報,27卷,6期,頁5-22,6月。【7】鄧淵源,曾國雄(1989),層級分析法(AHP)的內涵特性與應用 (下),中國統計學報,27卷,7期,頁1-20,7月。【8】黎漢林、許景華、李明純、張李志平(2001),供應鏈管理與決 策,台北市:儒林圖書有限公司。【9】戴維斯(1991),「綠色企業－永續經營新趨勢」,宋偉航譯, 台北市:天下文化圖書有限公司。 英文部份:【10】 Asai K.(1995), Fuzzy System for Management, Ohmsha Books Ltd. pp.49-54.【11】 Beamon, B. M. (1999) ,“ Designing the green supply chain, ” Logistics Information Management, Vol. 12, No. 4, pp.332-342.【12】Bellman, R. E. and Zadeh, L. A. (1970),“ Decision-making in a fuzzy environment. Management Science, ” Vol. 17,No. 4, pp. 141-146.【13】Boer, L. D.(2001), Labro, E. and Morlacchi, P.,“ A review of methods supporting supplier selection, ” European Journal of Purchasing & Supply Management, Vol. 7, No. 4,pp.78-89.【14】Chen, L.H., and Chiou, T.W. (1999), A fuzzy credit-rating approach for commercial loans: a Taiwan case. Omega, International Journal of Management Science, Vol.27, No. 4, pp. 407-419.【15】Chen, Y. W. and Tzeng, G. H. (2001),“ Using fuzzy integral for evaluating subjectively perceived travel costs in a traffic assignment model, ” European Journal of Operational Research, Vol.130, No. 3, pp. 653-664.【16】Chen, T. Y. and Wang, J. C.(2001),“ Identification of λ-fuzzy measures using sampling design and genetic algorithms, ” Fuzzy Sets and Systems, Vol.123,No. 3 , pp. 321-341.【17】Chen, T. Y., Chang, H. L. and Tzeng, G. H.(2002), ” Using fuzzy measure and habitual domains to analyze the public attribute and apply to the gas taxi policy, ” European Journal of Operational Research,Vol.137,No.2,pp. 145-161.【18】Ching, J. H. (1999),“ Coquet fuzzy integral-based hierarchical networks for decision analysis, ” IEEE Transactions on Fuzzy Systems Vol 7,No.1,pp. 63-71.【19 】Dubis, D. and Prade, H. (1978), Operations on fuzzy numbers, International Journal of Systems Science, Vol 1, No.9, pp. 613-626.【20】E. F. Schumacher (1973),Small is Beautiful: A Study of Economics as if People Mattered. London: Blond and Briggs, Abacus, Sphere Books Ltd.（李華夏譯，2000,《小即是美》，台北）【21】Eskew, M. L. (1999),“ Profiting Through Environmental Supply Chain Management, ” Executive Speeches, August/ September, pp.5-10.【22】Grabisch, M.(1995),“ Fuzzy integral in multicriteria decision making, ” Fuzzy Sets and System Science, Vol 9 No.3, pp. 279-298.【23】Grabisch, M.(1996),“ The application of fuzzy integral in multicriteria decision making, ” European Journal of Operational Research, Vol 89, No.3, pp. 445-456.【24】Hall, J.(2000),“ Environmental supply chain dynamics, ” Journal of Cleaner Production, Vol.8, No. 6, pp.455-471.【25】Ishii, K., and Sugeno, M. (1985),“ A model of human evaluation process using fuzzy measure, ” International Journal of Man-Machine Studies, Vol. 22, No. 1, pp.19-38.【26】Saaty, T. L. and L. G. Vargas.(1982),The logic of priorities. Boston, U.S.:Kluwer-Nijhoff Publishing.pp.16.【27】Nagel, M. H.(2000),“ Environmental Supply-Chain Management Versus Green Procurement in the Scope of a Business and Leadership Perspective, ” International Symposium on Electronic and Environment, pp. 225-228.【28】Saaty, T. L. (1977),“ A scaling method for priorities in hierarchical structure, ” Journal of Mathematical Psychology,Vol.15, No.3, pp.274-281.【29】Saaty, T. L. (1980), The analysis hierarchy process,McGraw-Hill Company, New York.【30】Sugeno, M.(1974), Theory of fuzzy integrals and its applications. PhD thesis, Tokyo Institute of Technology, Tokyo, Japan.【31】Sugeno,M. (1977), Fuzzy measure and fuzzy integrals: A survey Fuzzy Automata and Decsion Processes, Amsterdam:North Holland,pp.89-102.【32】Zadeh, L.A .(1975), Fuzzy Sets and Their Application to Cognitive and Decision Process, Academic Press,London, pp.1-39.【33】Zadeh, L.A. (1965),“ Fuzzy Sets, ” Information and Control,Vol.8,No.3 pp.338-353. 網站部份:【34】永續發展資訊網, http://portal.nccp.org.tw/, December 2004【35】綠色設計聯盟, http://gdn.ema.org.tw/, May 2005【36】美國 Green Supply line 網站, http://www.greensupplyline.com/