

A Comprehensive Model for Intellectual Capital Evaluation

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ABSTRACT

As knowledge economy age comes, knowledge instead of traditional productive essentials like land and capital, becomes the most important determinant for businesses to retain their competitive advantage. Generally speaking, knowledge and other intangible assets are regarded as intellectual capital in businesses. It will be a crucial issue for businesses to manipulate intangible intellectual capital and to create benefit in a knowledge economy age. Thus far, financial and quantitative indicators are generally applied in most intellectual capital evaluation models. Besides conventional explicit financial indicators, the composition of intellectual capital contains several implicit core abilities such as human resource, customer, processes and product development. Due to characters of intellectual capital like abstract and non-quantity, it is hard for conventional evaluation models to evaluate them according to general financial data efficiently. That is one of primary reasons for businesses managing their intellectual capital so difficultly. Using nature linguistic term, fuzzy set theory can be applied to process abstract and non-quantitative evaluative value. In this study, the nature linguistic term based on fuzzy set theory is applied to represent the evaluative value of non-quantitative and subjective qualitative indicators. On the other hands, general quantitative indicators are also incorporated into the integrated intellectual capital fuzzy evaluation model. A model combining Efficient algorithm for Fuzzy Weighted Average (EFWA) with Analytic Hierarchy Process (AHP) is proposed to evaluate the degree of intellectual capital management. It is applicable for businesses to integrate those viii considerable components and improve the efficiency of performance evaluation for intellectual capital. In order to demonstrate the validity of the proposed intellectual capital evaluation model, an experimental evaluation process is taken in a high technology company. Furthermore, an easy, flexible, and accessible integrated intellectual capital fuzzy evaluation system is built to save the time and effort for experts processing the computation in the proposed evaluation model. According to experimental results, both accuracy and feasibility of this proposed intellectual capital evaluation model are demonstrated.

Keywords : Intellectual capital, Intellectual capital evaluation, Efficient algorithm for Fuzzy Weighted Average (EFWA), Analytic Hierarchy Process (AHP).

Table of Contents

封面內頁 簽名頁 授權書.....	iii	中文摘要.....	v	英文摘要.....	vii
誌謝.....	vii	目錄.....	ix	圖目錄.....	x
第一章 緒論 1.1 研究背景.....	01	1.2 研究動機.....	01	1.3 研究目的.....	03
1.4 研究範圍.....	03	1.5 研究流程.....	05	第二章 文獻探討 2.1 智慧資本.....	09
2.2 模糊理論.....	19	2.3 層級分析法.....	19	第三章 智慧資本評估系統架構 3.1 評估架構.....	29
3.2 評估指標之收集、分類流程.....	31	3.3 智慧資本整合型評估模式.....	32	3.4 智慧資本整合型評估程序.....	33
第四章 系統設計 4.1 系統架構.....	48	4.2 系統環境建構.....	49	4.3 系統功能.....	50
第五章 個案研究 5.1 個案企業.....	57	5.2 智慧資本評估.....	59	5.3 系統運作流程.....	67
5.4 評估結果與系統效益.....	83	6.2 後續研究建議.....	85	第六章 結論與建議 6.1 結論.....	86
6.2 後續研究建議.....	86	附錄.....	91		

REFERENCES

1. 吳思華、黃宛華、賴鈺晶, “智慧資本衡量因素之研究 以我國軟體業為例”, 1999 中華民國科技管理研討會論文集:1- 14, 1999.
2. 李驊芳、吳明達, “善用智慧資本增添企業戰力”, 中國生產力中心, 經濟日報, 2003.
3. 林燦瑩, “智慧資本發展模式之研究”, 台灣師範大學工業教育研究所博士論文, 2001.
4. 洪振添, “智慧資產之評價模式”, 會計研究月刊, 第180期, 2000.
5. 連郁菁, “以智慧資本觀點建構知識管理績效評估指標之研究 以管理顧問業為例”, 彰化師範大學商業教育學系, 2001.
6. 馬秀如、劉正

田、俞洪昭、譚家蘭, “資訊軟體無形資產鑑價制度之研究報告”, 台灣證券交易所, 2002。7. 陳美純、林子銘, “從整合觀點探討智慧資本之研究”, 第六屆資管與實務研討會論文集, 2000。8. 陳振東、戴偉勝, “模糊相似度衡量於資訊推薦系統應用之研究”, 模糊理論研討會論文集, 2002。9. 郭建榮, “企業智慧資產的衡量與管理之研究 以食品公司為例”, 靜宜大學企業管理研究所碩士論文, 2002。10. 黃淑慧, “應用模糊理論構建知識管理績效評估模式及系統開發之研究”, 大葉大學資訊管理研究所碩士論文, 2002。11. 傅振焜譯, Peter Drucker 原著, “後資本主義社會”。台北: 時報文化出版, 1994。12. 鄧振源、曾國雄, “層級分析法(AHP)的內涵特性與應用(上)”, 中國統計學報, 第二十七卷, 第六期, 第13707- 13724 頁, 1989。13. 鄧振源、曾國雄, “層級分析法(AHP)的內涵特性與應用(下)”, 中國統計學報, 第二十七卷, 第七期, 第13767- 13870 頁, 1989。14. Agor, W.H., “The measurement, use, and development of intellectual capital to increase public sector productivity,” *Public Personnel Management*, Vol.27, No.2, pp.175-186., Summer 1997。15. Bontis, N., “Intellectual capital: an exploratory study that develops measures and models,” *Management Decision*, 36/2, pp.63-76., 1998。16. Brooking, K., “The Management of Intellectual Capital,” *Long Range Planning*, Vol.30, No.3, pp.364-365., 1997。17. Buckley, J.J., “Fuzzy Hierachy Analysis,” *Fuzzy Sets and Systems*, Vol.17, pp.233-247., 1985。18. Chen, S.J., and Hwang, C.L., “Fuzzy Multiple Attribute Decision Making Methods and Applications,” Springer-Verlag, 1992。19. Chen, C.T., “Extensions of TOPSIS for group decision-making under fuzzy environment,” *Fuzzy Sets and Systems*, Vol.114, pp.1-9., 2000。20. Delgado, M., Herrera, F., Herrera-Viedma, E., and Martinez, L., “Combining numerical and linguistic information in group decision making,” *Journal of Information Sciences*, Vol.107, pp. 177-194., 1998。21. Dong, W.M., and Wong, F.S., “Fuzzy Weighted Averages and Implementation of the Extension Principle,” *Fuzzy Sets and Systems*, Vol.21, pp.183-199., 1987。22. Dubois, D., Prade, H., “Fuzzy Sets and Systems: Theory and Applications,” Academy Press, 1980。23. Edvinsson, L., and Malone, M., “Intellectual Capital,” published by HarperCollins, New York, pp.147-160., 1997。24. Guthrie, J., “The management, measurement and the reporting of intellectual capital,” *Journal of Intellectual Capital*, Vol.2, No.1, pp.27-41., 2001。25. Housel, T., and Bell, H. Arthur, “Measuring and managing knowledge,” New York: McGraw-Hill Co., 2001。26. Ishii, K., and Sugeno, M., “A model human evaluation process using fuzzy measure,” *International Journal of Man-Machine Studies*, Vol.22, pp.19-38., 1985。27. Johnson, W.H.A., “An integrative taxonomy of intellectual capital: measuring the stock and flow of intellectual capital components in the firm,” *International Journal of Technology Management*, Vol. 18, pp.562-575., 1999。28. Kaplan, R.S., and Norton, D.P., “The Balanced Scorecard: Translating Strategy into Action,” the president and fellows of Harvard College, 1996。29. Kaufmann, A., and Gupta, M.M., “Introduction to fuzzy arithmetic: Theory and application,” Van Nostrand Reinhold, New York, 1991。30. Klir, G.J., and Yuan, B., “Fuzzy Sets and Fuzzy Logic – Theory and Application,” Prentice-Hall Inc., New Jersey, 1995。31. Lee, D.H., and Park, D., “An Efficient Algorithm for Fuzzy Weighted Average,” *Fuzzy Sets and Systems*, Vol. 87, pp.39- 45., 1997。32. Liebowitz, J. and Suen, C.Y., “Development knowledge management metric for measuring intellectual capital,” *Journal of Intellectual Capital*, Vol.1, No. 1, pp. 55., 2000。33. Liou, T.S., and Wang, M.J., “Fuzzy Weighted Average: An Improved Algorithm,” *Fuzzy Sets and Systems*, Vol. 49, pp.307- 315., 1992。34. Masoulas, V., “Organizational requirements definition for intellectual capital management,” *International Journal of Technology Management*, Vol. 16, pp.126-143., 1998。35. Roos, J., Roos, G., Dragonetti, N., and Edvinsson, L., “Intellectual Capital: Navigating in the New Business Landscape,” Macmillan Business, London, pp.15., 1997。36. Roos, J., “Exploring the Concept of Intellectual Capital(IC),” *Long Range Planning*, February, Vol. 31, pp.150-153., 1998。37. Saaty, T.L., “The Analytic Hierarchy Process,” McGraw-Hill, New York, 1980。38. Stewart, T.A., “Intellectual Capital: The New Wealth of Organizations,” *Fortune Magazine*, 1997。39. Zadeh, L.A., “Fuzzy set,” *Information and control*, Vol. 8, pp.338- 352., 1965。40. Zadeh, L.A., “The concept of a linguistic variable and its application to approximate reasoning I,” *Information Science*, Vol. 8&9, pp.199-251;301-357;43-80., 1975。41. Zimmerman, H.J., “Fuzzy Set theory and its applications,” 2nd, Kluwer Academic Publishers, Boston, 1991。