

以混合多準則決策分析探討新產品開發之關鍵因素

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摘要

隨著地球村時代的來臨，距離已不再是企業之間的隔閡、保護的屏障。當競爭在全球市場開始更為劇烈時，企業不得不正視新產品開發議題的重要性。

新產品開發是影響企業成功與維持競爭力的重要關鍵，而關鍵成功因素與績效衡量指標皆影響了新產品開發的成功與否。過去數年來，學術界莫不致力於探討影響新產品開發的關鍵因素，然而在實務界，多數企業與管理者之需求，還是在於提高新產品開發之成功性。

本研究以多構面因素來選取相關的關鍵成功因素與績效衡量指標。並且以多準則決策問題來看待影響新產品開發之關鍵因素。而後透過模糊決策實驗室分析法，探討關鍵因素間之關聯性，最後以模糊層級分析法，建立各準則影響新產品開發的權重。

研究結果提供了許多豐富且有價值的資訊，可以幫助管理者選擇適合的競爭策略，以便將有限的資源做最佳的分配，達到最高的效益增加，進而提昇新產品開發之成功性。

關鍵詞：新產品開發、關鍵成功因素、績效衡量指標、多準則決策分析、模糊決策實驗室分析法、模糊層級分析法

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- 1.Aaker, D.A., 1995, Strategic Market Management, 4th ed, New York: John Wiley & Sons Inc.2.Afonso, P., Nunes, M., Paisana, A. and Braga, A., 2008, “The influence of time-to-market and target costing in the new product development success”, International Journal of Production Economics, Vol.115, pp.559-568.3.Archer, N.P. and Ghasemzadeh, F., 1999, “An integrated framework for project portfolio selection”, International Journal of Project Management, Vol.17, No.4, pp.207-216.4.Aronson, Z.H., Reilly, R.R. and Lynn, G.S., 2006, “The impact of leader personality on new product development teamwork and performance: The moderating role of uncertainty”, Journal of Engineering and Technology Management, Vol.23, pp.221-247.5.Aya?, Z. and ?zdemir, R.G., 2009, “A hybrid approach to concept selection through fuzzy analytic network process”, Computers & Industrial Engineering, Vol.56, pp.368-379.6.Blind, K. and Grupp, H., 1999, “Interdependencies between the science and technology infrastructure and innovation activities in German regions: empirical findings and policy consequences”, Research policy, Vol.28, pp.451-468.7.Brun, A., Caridi, M., Fahmy Salama, K. and Ravelli, I., 2006, “Value and risk assessment of supply chain management improvement projects”, International Journal of Production Economics, Vol.99, pp.186-201.8.Cai, J., Liu, X.D., Xiao, Z.H. and Liu, J., 2009, “Improving supply chain performance management: A systematic approach to analyzing iterative KPI accomplishment”, Decision Support System, Vol.46, pp.512-521.9.Carey, C.C. and Lynn, W.E., 1997, “Balanced scorecards for new product development”, Journal of Cost Management, Vol.11, No.3, pp.12-18.10.Chen, H.H., Kang, H.Y., Xing, X.Q., Lee, H.I. and Tong, Y.H., 2008, “Developing new products with knowledge management methods and process development management in a network”, Computers in Industry, Vol.59, pp.242-253.11.Chen, H.H., Lee, H.I. and Tong, Y.H., 2006, “Analysis of new product mix selection at TFT-LCD technological conglomerate network under uncertainty”, Technovation, Vol.26, pp.1210-1221.12.Chen, H.H., Lee, H.I. and Tong, Y.H., 2007, “Prioritization and operations NPD mix in a network with strategic partners under uncertainty”, Expert Systems with Applications, Vol.33, pp.337-346.13.Chien, C.F., 2002, “A portfolio-evaluation framework for selection R&D projects”, R&D Management, Vol.32, No.4, pp.359-369.14.Chin, K.S., Tang, D.W., Yang, J.B., Wong, S.Y. and Wang, H.W., 2009, “Assessing new product development project risk by Bayesian network with a systematic probability generation methodology”, Expert Systems with Applications, Vol.36, pp.9879-9890.15.Chiu, Y.J. & Chen, Y.W., 2007, “Using AHP in patent valuation”, Mathematical and Computer Modeling, Vol.46, pp.1054-1062.16.Chu, P.Y., Hsu, Y.L. and Fehling, M., 1996, “A decision support system for project portfolio selection”, Computers in Industry, Vol.32, pp.141-149.17.Coldrick, S., Lawson, C.P., Ivey, P.C. and Lockwood, C., 2002, “A decision framework for R&D project selection”, IEEE Engineering Management, pp.413-418.18.Chow, T. and Cao, D.B., 2008, “A survey study of critical success factors in agile software projects”, The Journal of Systems and Software, Vol.81, pp.961-971.19.Clinton, B.D. and Chen, S., 1998, “Do New Performance Measures Measure Up?”, Management Accounting, October, pp.38-43.20.Cooper, R.G., 1994,

" Third-generation new product process " , Journal of Product innovation Management, Vol.11, No.1, pp.3-14.21.Cooper, R.G., 1999, " From experience: the invisible success factors in product innovation " , Journal of Product Innovation Management, Vol.16, No.2, pp.115-133.22.Cooper, R.G. and Kleinschmidt, E.J., 1987, " New Products: what separates winners from losers? " , Journal of Product Innovation Management, Vol.4, No.3, pp.169-184.23.Cooper, R.G. and Kleinschmidt, E.J., 1996, " Winning Business in Product Development: The Critical Success Factors " , Research Technology Management, Vol.10, No.4, pp.18-29.24.Crawford, C.M., 1996, New Products Management, 5th ed., Homewood, IL:RD.25.Daniel, D.R., 1961, " Management Information Crisis " , Harvard Business Review, pp.111-121.26.Datar, S., Jordan, C.C., Kekre, S., Rajiv, S. and Srinivasan, K., 1997, " Advantages of time-based product development in a fast-cycle industry " , Journal of Marketing Research, Vol.34, pp.36-49.27.Debruyne, G., Rudy, M., Griffin, A., Hart, S., Hultink, E.J. and Robben, H., 2002, " The impact of new product launch strategies on competitive reaction in industrial markets " , Journal of Product Innovation Management, Vol.19, No.2, pp.159-170.28.Driva, H., Pawar, K.S. and Menon, U., 2000, " Measuring product development performance in manufacturing organizations " , International Journal of Production Economics, Vol.63, No.2, pp.147-159.29.Dumaine, B., 1989, " How managers can succeed through speed " , Fortune, Vol.119, pp.54-59.30.Evans, H., Ashworth, G. and Gooth, D., 1996, " Who needs Performance Management? " , Management Accounting CIMA, Vol.12, pp.20-25.31.Ferguson, C.R. and Dickinson, R., 1982, " Critical Success Factors for Directors in the Eighties " , Business Horizons, Vol.25, No.3, pp.14-18.32.Gobeli, D.H. and Brown, D.J., 1987, " Analyzing Product Innovations " , Research Management, Vol.30, No.4, pp.25-31.33.González, F.J.M., Palacios, T.M.B., 2002, " The effect of new product development techniques on new product success in Spanish firms " , Industrial Marketing Management, Vol.31, pp.261-271.34.Grant, R.M., 2002, Contemporary Strategy Analysis: Concepts, Techniques, Applications, 4th ed, Blackwell Publishers, Oxford.35.Griffin, A., 1997, " PDMA research on new product development practices: Updating trends and benchmarking best practices " , Journal of Product Innovation Management, Vol.14, pp.429-458.36.Griffin, A. and Page, A.L., 1993, " An interim report on measuring product development success and failure " , Journal of Product Innovation Management, Vol.10, pp.291-308.37.Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C., 1998, Multivariate data analysis, 5th ed, Upper Saddle River, NJ: Prentice Hall.38.Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.L., 2006, Multivariate Data Analysis, New Jersey: Pearson Education.39.Hartley, J.L., Zirger, B.J., and Kamath, R.R., 1997, " Managing the Buyer-Supplier Interface on Time Performance in Product Development " , Journal of Operations Management, Vol.15, pp.57-70.40.Henriksen, A.D. and Traynor, A.J., 1999, " A Practical R&D Project-Selection Scoring Tool " , IEEE Transactions on Engineering Management, Vol.46, No.2, pp.158-170.41.Hertenstein, J.H. and Platt, M.B., 2000, " Performance Measures and Management Control in New Product Development " , Accounting horizons, Vol.14, No.3, pp.303-323.42.Hill, C.W. and Johns, G.R., 2001, Strategic Management Theory: An Integrated Approach. Boston: Houghton Mifflin Company Press.43.Hopkins, D.S., 1981, " New Product Winners and Losers " , Research Management, Vol.12, pp.12-17.44.Hsu, C.Y., Chen, K.T. and Tzeng, G.H., 2007, " FMCDM with Fuzzy DEMATEL Approach for Customers' Choice Behavior Model " , International Journal of Fuzzy Systems, Vol.9, No.4, pp.236-246.45.Kaiser, H.F., 1974, " An Index of Factorial Simplicity " , Psychometrika, Vol.39, No.1, pp.31-36.46.Kaufman, R., 1998, " Preparing Useful Performance Indicators " , Training & Development, Vol.80, No.1, pp.1-20.47.Kessler, E.H. and Bierly, P.E., 2002, " Is Fast Really Better? An Empirical Test of the Implications of Innovation Speed " , IEEE Transactions on Engineering Management, Vol.46, No.1, pp.2-12.48.Kuczmarski, T.D., 1992, Managing New Products: The Power of Innovation, 2nd ed., New Jersey: Prentice-Hall, Inc.49.Kurtzman, J., 1997, " Is Your Company off Course? Now You Can Find out Why " , Fortune, Vol.135, No.3, pp.128-130.50.Lee, J., Lee, J. and Souder, W.E., 2000, " Differences of organizational characteristics in new product development: cross-cultural comparison of Korea and the US " , Technovation, Vol.20, pp.497-508.51.Leenders, A.M. and Wierenga, B., 2002, " The effectiveness of different mechanisms for integrating marketing and R&D " , Journal of Product Innovation Management, Vol.19, pp.305-317.52.Lester, D.H., 1998, " Critical success factors for new product development " , Research Technology Management, Vol.41, No.1, pp.36-43.53.Levitt and Theodore, 1966, " Innovative Imitation " , Harvard Business Review, Vol.44, pp.63-70.54.Li, C.W. and Tzeng, G.H., 2009, " Identification of a threshold value for the DEMATEL method using the maximum mean de-entropy algorithm to find critical services provided by a semiconductor intellectual property mall " , Expert Systems with Applications, Vol.36, pp.9891-9898.55.Li, R.J., 1999, " Fuzzy method in group decision making " , Computers and Mathematics with Applications, Vol.38, No.1, pp.91-101.56.Lin, C.J. and Wu, W.W., 2008, " A causal analytical method for group decision-making under fuzzy environment " , Expert Systems with Applications, Vol.34, pp.205-213.57.Lin, C.L. and Tzeng, G.H., 2009, " A value-created system of science (technology) park by using DEMATEL " , Expert Systems with Applications, Vol.36, pp.9683-9697.58.Lin, C.T. and Chen, C.T., 2004, " New product go/no-go evaluation at the front end: a fuzzy linguistic approach " , IEEE Transactions on Engineering Management, Vol.51, No.2, pp.197-207.59.Liou, J.H., Yen, L. and Tzeng, G.H., 2008, " Building an effective safety management system for airlines " , Journal of Air Transport Management, Vol.14, pp.20-26.60.Liu, P.L., Chen, C.W., and Tsai, C.H., 2005, " An empirical study on the correlation between the knowledge management method and new product development strategy on product performance in Taiwan's industries " , Technovation, 25(6), pp.637-644.61.Lo, C.C., Wang, P. and Chao, K.M., 2006, " A fuzzy group-preferences analysis method for new-product development " , Expert Systems with Applications, Vol.31, pp.826-834.62.Luu, V.T., Kim, S.Y. and Huynh T.A., 2008, " Improving project management performance of large contractors using benchmarking approach " , International Journal of Project Management, Vol.26, pp.758-769.63.Lynn, G.S., Abel, K.D., Valentine, W.S., Wright, R.C., 1999, " Key factors in increasing speed to market and improving new product success rates " , Industrial Marketing Management, Vol.11, pp.397-417.64.Ma, M.Y., Chen, C.Y. and Wu, F.G., 2007, " A design decision-making support model for customized product color combination " , Computers in Industry, Vol.58, pp.504-518.65.MacArthur, J.B.,

1996, "Performance measures that count: Monitoring variables of strategic importance", *Journal of Cost Management*, Vol.10, No.5, pp.39-45.66.March-Chorda, I., Gunasekaran, A., Lloria-Aramburo, B., 2002, "Product development process in Spanish SMEs: an empirical research", *Technovation*, Vol.22, pp.301-312.67.Matias, H.J.C., Vizan, A., Garcia, P.J. and Rios, J., 2008, "An integrated modeling framework to support manufacturing system diagnosis for continuous improvement", *Robotics and Computer-Integrated Manufacturing*, Vol.24, pp.187-199.68.Matsui, Y., Filippini, R., Kitanaka, H. and Sato, O., 2007, "A comparative analysis of new product development by Italian and Japanese manufacturing companies: A case study", *International Journal of Production Economics*, Vol.110, pp.16-24.69.McDonough, E.F., Kahn, K.B. and Barczak, G., 2001, "An Investigation of The Use of Global, Virtual, and Colocated New Product Development Teams", *Journal of Product Innovation Management*, Vol.18, No.2, pp.110.70.McGrath, M.E., 2004, *Next Generation Product Development: how to increase productivity, cut costs, and reduce cycle time*, McGraw-Hill.71.Mclvor, R. and Humphreys, P., 2004, "Early supplier involvement in the design process: lessons from the electronics industry", *Omega, The International Journal of Management Science*, Vol.32, pp.179-199.72.Millson, M.R. and Wilemon, D., 2006, "Driving new product success in the electrical equipment manufacturing industry", *Technovation*, Vol.26, pp.1268-1286.73.Monczka, R. and Trent, R., 1997, *Purchasing and Sourcing 1997: Trends and Implications*, Tempe, AZ: NAPM/CAPS.74.Naveh, E., 2005, "The Effect of Integrated Product Development on Efficiency and Innovation", *International Journal of Production Research*, Vol.43, No.13, pp.2789-2808.75.Nijssen, E.J. and Frambach, R.T., 2000, "Determinants of the Adoption of New Product Development Tools by Industrial Firms", *Industrial Marketing Management*, Vol.29, pp.121-131.76.Nunnally, J.C. and Berstein, I.H., 1994, *Psychometric theory*, NY: McGraw-Hill.77.Oliver, N., Dostaler, I. and Dewberry, E., 2004, "New product development benchmarks: The Japanese, North American and UK consumer electronics industries", *The Journal of High Technology Management*, Vol.23, No.1, pp.371-388.78.Olson, E.M., Walker, O.C., Ruekert, R.W. and Bonner, J.M., 2001, "Patterns of cooperation during new product development among marketing, operations and R&D: implications for project performance", *Journal of Product Innovation Management*, Vol.18, pp.258-271.79.Ozer, M., and Chen, Z., 2006, "Do the best new product development practices of US companies matter in Hong Kong?", *Industrial Marketing Management*, Vol.35, pp.279-292.80.Patanakul, P. and Milosevic, D., 2008, "A competency model for effectiveness in managing multiple projects", *Journal of High Technology Management Research*, Vol.18, pp.118-131.81.Poh, K.L., Ang, B.W. and Bai, F., 2001, "A comparative analysis of R&D project evaluation methods", *R&D Management*, Vol.31, No.1, pp.63-75.82.Poolton, J., Barclay, I., 1998, "New product development from past research to future application", *Industrial Marketing Management*, Vol.27, pp.197.83.Pun, K.F. and Chin, K.S., 2005, "Online assessment of new product development performance: an approach", *Total Quality Management & Business Excellence*, Vol.16, No.2, pp.157-169.84.Rockart, J.F., 1979, "Chief executives define their own data needs", *Harvard Business Review*, Vol.57, No.2, pp.81-93.85.Roussel, P.A., 1991, *Third Generation R&D: Managing the Link to Corporate Strategy*, Boston: Harvard Business School Press.86.Ruekert, R.W. and Walker, O.C., 1987, "Marketing's Interaction with Other Functional Units: A Conceptual Framework and Empirical Evidence", *Journal of Marketing*, Vol.51, pp.1-19.87.Saaty, T.L., 1989, "Decision making, scaling, and number crunching", *Decision Science*, Vol.20, pp.404-409.88.Sands, S., and Warwick, L.M., 1977, "Successful Business Innovation: A Survey of Current Professional View", *California Management Review*, Vol.20, No.2, pp.5-16.89.Santarelli, E. and Piergiovanni, R., 1996, "Analyzing Literature-based Innovation Output Indicators: the Italian Experience", *Research Policy*, Vol.25, pp.689-711.90.Seyed-Hosseini, S.M., Safaei, N. and Asgharpour, M.J., 2006, "Reprioritization of failures in a system failure mode and effects analysis by decision making trial and evaluation laboratory technique", *Reliability Engineering and System Safety*, Vol.91, pp.872-881.91.Sherman, J.D., Berkowitz, D. and Souder, W.E., 2005, "New Product Development Performance and the Interaction of Cross-Functional Integration and Knowledge Management", *Journal of Product Innovation Management*, Vol.22, pp.399-411.92.Sivadas, E. and Dwyer, F.R., 2000, "An examination of organizational factors influencing new product success in internal and alliance-based processes", *Journal of Marketing*, Vol.64, No.1, pp.31-49.93.Song, M., Thieme, R.J., 2006, "A cross-national investigation of the R&D marketing interface in the product innovation process", *Industrial Marketing Management*, Vol.35, pp.308-322.94.Song, X.M., Montoya-Weiss, M.M. and Schmidt, J.B., 1997, "Antecedents and consequences of cross functional cooperation: a comparison of R&D, manufacturing, and marketing perspectives", *Journal of Product Innovation Management*, Vol.14, pp.35-47.95.Song, X.M. and Montoya-Weiss, M.M., 1998, "Critical Development Activities for Really New versus Incremental Products", *Journal of Product Innovation Management*, Vol.15, No.2, pp.124-135.96.Song, X.M. and Montoya-Weiss, M.M., 2001, "The Effect of Perceived Technological Uncertainty on Japanese New Product Development", *Academy of Management Journal*, Vol.44, No.1, pp.61-80.97.Stephen, F.K. and Thomas, F.B., 2006, "Beyond critical success factors: A dynamic model of enterprise system innovation", *International Journal of Information Management*, Vol.26, pp.59-69.98.Sun, H. and Wing, W.C., 2005, "Critical success factors for new product development in the Hong Kong toy industry", *Technovation*, Vol.25, pp.293-303.99.Syamil, A., Doll, W. and Apigian, C.H., 2004, "Process performance in product development: measures and impacts", *European Journal of Innovation Management*, Vol.7, No.3, pp.205- 217.100.Toor, S.R. and Ogunlana, S.O., 2008, "Critical COMs of success in large-scale construction projects: Evidence from Thailand construction industry", *International Journal of Project Management*, Vol.26, No.4, pp.420-430.101.Topfer, A., 1995, "New product-cutting the time to market", *Long Range Planning*, Vol.28, No.2, pp.61-78.102.Tsai, W.H. and Chou, W.C., 2009, "Selecting management systems for sustainable development in SMEs: A novel hybrid model based on DEMATEL, ANP, and ZOGP", *Expert Systems with Applications*, Vol.36, pp.1444-1458.103.Tseng, M.L., 2009, "A causal and effect decision making model of service quality expectation using grey-fuzzy DEMATEL approach", *Expert Systems with Applications*, Vol.36, pp.7738-7748.104.Tseng, M.L., 2009, "Using the extension of DEMATEL to integrate hotel service quality perceptions into a cause-effect model

in uncertainty " , Expert Systems with Applications, Vol.36, pp.9015-9023.105.Tzeng, G.H., Chiang, C.H. and Li, C.W., 2007, " Evaluating intertwined effects in e-learning programs: A novel hybrid MCDM model based on factor analysis and DEMATEL " , Expert Systems with Applications, Vol.32, pp.1028-1044.106.Tzokas, N., Hultink, E.J. and Hart, S., 2004, " Navigating the New Product Development Process " , Industrial Marketing Management, Vol.33, No.7, pp.619-626.107.Ulrich, K.T. and Eppinger, S.D., 2007, Product Design and Development, 4thed, McGraw-Hill, New York.108.Verona, G., 1999, " A Resource-Based View of Product Development " , The Academy of Management Review, Vol.24, p.133.109.Wang, M.L. and Lin, Y.H., 2008, " To construct a monitoring mechanism of production loss by using Fuzzy Delphi method and fuzzy regression technique - A case study of IC package testing company " , Expert Systems with Applications, Vol.35, pp.1156-1165.110.Wang, W.P., 2009, " Evaluating new product development performance by fuzzy linguistic computing " , Expert Systems with Applications, Vol.36, pp.9759-9766.111.Wu, W.W. and Lee, Y.T., 2007, " Developing global manager ' s competencies using fuzzy DEMATEL method " , Expert Systems with Applications, Vol.32, pp.499-507.112.Wu, W.W., 2008, " Choosing knowledge management strategies by using a combined ANP and DEMATDL approach " , Expert Systems with Applications " , Vol.35, pp.828-835.