A DEA Application Model for Merger & Acquisition in High-tech Businesses

Chia-Nan Wang
Department of Business Administration
Yuanpei Institute of Science and Technology
Hsinchu, 300, Taiwan

Chih-Hong Wang
Small & Medium Enterprise Service Center
Taipei City Government
Taipei, 110, Taiwan

Abstract – In the globalization and competition situation, merger and acquisition (M&A) become a popular way to acquire technology and realize enterprise expansion. However, most traditional M&A evaluations focus on finance indices, and these methods are not appropriate for operation efficiency of technology-oriented business in fast changeable environment. The objective of this paper is to develop an effective method to assist high-tech companies to evaluate the operation efficiency and find the candidate priority of M&A under several different inputs and outputs. We develop an approach by combining with DEA (Data Envelopment Analysis) and heuristic technique to efficiently find the M&A candidate in complicatedly technology conditions. Numerical exercises based on Taiwan realistic data are conducted. To implement this model, the basic information of 22 Taiwan’s Integrated Circuit (IC) design houses which went public is completely collected. The results demonstrate that our method can help the high-tech companies effective explore the best efficient candidates of M&A to expand their business strategy. Moreover, the results are sound by verifying with some managers of IC design houses.

Keywords: data envelopment analysis, merger and acquisition, technology

I. INTRODUCTION

In the globalization and competition situation, merger and acquisition (M&A) become a popular way to acquire technology and realize enterprise expansion. Even high-tech businesses, companies often use M&A to acquire technology and consolidate their business strategic plan. However, the M&A evaluation for traditional industries, primarily focusing on the value of tangible assets, such as P/E (Price/Earnings) ratio, P/B (Price/Book) ratio, P/S (Price/Sales) ratio, P/D (Price/Dividend) ratio and P/FCF (Price/Free Cash Flow) ratio, is not suitable for technology-oriented business which primarily takes the value of intangible assets in consideration in fast changeable environment [1].

The objective of this paper is to develop an effective method to assist high-tech companies to evaluate the operation efficiency and find the candidate priority of M&A under several different inputs and outputs. Base on the methodology of DEA (Data Envelopment Analysis) and combining with heuristic technique, we try to provide an evaluation method for top managers to assess the business efficiency before and after M&A under some certain control factors.

DEA was first introduced in literature in 1978 by Charnes, Cooper and Rhodes (CCR) [2]; it is a nonparametric linear programming technique and CCR model can present the Technical Efficiency (TE). It does not count for random errors, thus assuming all deviations from the estimated frontier represent inefficiencies [3], [4]. This method might much approach to reality. Therefore, the DEA is chosen for our frontier acquiring method. In this paper, the proposed DEA model comes from Bander, Charnes, and Cooper (BCC) [5]; BCC model can present the Pure Technical Efficiency (PTE) and the indicator of Return To Scale (RTS). DEA is a non-parametric methodology and it use linear programming method for determining the relatively efficient production frontier, based on the empirical data on chosen inputs and outputs of a number of organizations, called Decision Making Unit (DMU). People can use DEA for analyzing the relative efficiency and managerial performance of productive DMU which includes the same multiple input and output items. This characteristic of DEA allows us to evaluate the relative efficiency of banks by determining the efficient DMU as the benchmarks.

Some researchers suggest that merger have the potential to produce efficiencies [6], [7]. A great deal of attention for merger by DEA has been paid on the banking [8], [9], [10], [11]. Ralston et al. [10] use DEA to evaluate the post-merger gains in technical and scale efficiency achieved by 31 Australian credit union mergers. They find that mergers are not associated with improvements in efficiency superior to those achieved by internal growth. Worthington [11] uses DEA and multinomial logic model to evaluate the determinants of M&A activity in Australian credit unions. The results indicate that asset size and quality, management ability, earnings and liquidity are a significant influence on the level of M&A. Cummins et al. [12] examine the relationship between mergers and acquisitions, efficiency, and scale economies in the US life insurance industry. They conclude M&A in the life insurance industry have had a beneficial effect on efficiency. Utility industries have started to use DEA to analyze. However none of them apply in...
not 1). However, the efficiency after merger is improved. The frontier number is 4. This means merger have the good chance to enhance Novatek’s efficiency in many assumed scenarios.

4. For Tontek, it is the third priority to merge. Even its efficiency is good (score is 1), it only has 2 frontiers after merger.

5. For other companies which frontier number is 0 after merger, they could be not sufficient for merger with target company.

The results are sound by verifying with some managers of IC design houses.

IV. CONCLUDING REMARKS

In the globalization and competition situation, M&A become a popular strategy for many high-tech companies to extend their business roadmap. We develop an approach by combining with DEA and heuristic technique to efficiently find the M&A candidate in complicatedly technology conditions. Its focuses are on the realization of operation efficiency and evaluate the intangible assets. According our proposed model, we can easily separate target candidates to different priority and assist high-tech companies to evaluate the operation efficiency and find the candidate priority of M&A under several different inputs and outputs. This application design might help top managers for decision making in business extension.

Future direction will consider involving with tangible resources for input factors or output factors, and analysis for different industries.

REFERENCES


