MEASURING THE PERFORMANCE OF ERP IMPLEMENTATION BY TOBIN'S Q VALUE: A CASE STUDY OF TATUNG COMPANY

Yu-Chung Hung, Department of Accounting and Information Technology, National Chung Cheng University, Taiwan, 886-5-2724211, hung6599@ms3.hinet.net

ABSTRACT

Justifying the performance of ERP implementation had attracted attention of senior management. The traditional models built up by financial ratios were too complex to use in practice. This study considered Tobin's Q as an easy way to measure the business performance of ERP implementation, also by using a case study of Tatung Company to verify it. The findings showed that Tatung Company's performance after ERP implementation was significantly better than the performance prior to ERP implementation.
Keywords: ERP, ERP Implementation, Performance Measurement, Tobin's Q

INTRODUCTION

In order to survive in the ever-changing business environment, many firms expect to leverage IT (Information Technology) to gain the competitive edges. Since ERP can help to streamline business processes, to integrate business functions, and to take advantage of real-time information, implementing ERP have regarded as core IT investment for many firms in the mid-1990s to 2000. After implementing ERP, Chevron saved purchasing cost by 15%; IBM shortened its time to send out quotation from 80 days to 5 minutes. [1] However, not all enterprises implementing ERP was awarded as positive performance feedback. The implementation of ERP systems had reduced Hershey's sales by $100 million in the 3rd quarter of 1999, and caused the actual profit drop by 19%. [3] Miller Industries reported a $3.5 million operating loss in the 4th quarter of 1999 due to the costs and inefficiencies of its ERP system. [2]

How to justify the possible performance feedback brought by ERP systems have attracted attention of senior management. Many researches proposed the performance evaluation models of ERP systems from the perspectives of financial ratios, which can be decomposed into 5 dimensions, namely financial structure, solvency, operating performance analysis, profitability and cash flow, and cover at least 20 financial ratios. However, cumbersome financial ratios are too complex and tedious to utilize in practice.

Tobin's Q is a ratio which can be used to measure the market value of a firm. So this study considered Tobin's Q as an easy way to measure the business performance of ERP implementation. A case study of Tatung was also provided to verify this proposition. This study expected to conclude that Tobin's Q could distinguish the performance difference between before and after ERP implementation.

BUSINESS PERFORMANCE MEASUREMENT

Referring to business performance measurement, the most common and traditional way is to evaluate firm performance through financial statement analysis, which uses financial ratios. However, such accounting-based measurement is very exhausting, and hard to fully disclosure the impact of intellectual assets such as software. Rosemann and Wiese [9] employed the Balanced Scorecard (BS) introduced by Kaplan and Norton to assess business performance after ERP implementation. Nevertheless, the BS model become less useful as one attempts to apply it to measure the

performance change caused by introducing new software due to some limitations like unclear location of organizational capabilities/resources in this model. [8] Besides, Poston and Grabski [7] explored the financial impacts of ERP implementation by financial ratios for 3 years. Hitt et. al. [4] constructed measures to calculate the performance after introducing ERP systems from the productivity viewpoint; Hung, Wu, and Sung [5] proposed ERP performance measurement from the perspective of customer satisfaction.

In order to find an easy and comprehensive way to figure out the performance difference, this study intended to utilize the value of Tobin's Q to analyze the business performance of ERP implementation. The ratio compares the market value of a firm with the replacement cost of the firm's assets. The research of Klock and Thies [6] indicated that the higher the value of Tobin's Q, the better the business performance. Compared with the traditional financial ratios, Tobin's Q is a much easier way to measure business performance. This study would like to test the difference of Tobin's Q values between ERP pre-implementation and post-implementation.

CASE COMPANY BRIEFING

The case company, Tatung Company, was founded in 1918 and headquartered in Taipei, Taiwan. Tatung used to be the leader of home appliance industry in Taiwan. In recent, Tatung shifted its core business from a home appliance manufacturer to a computer-related products OEM vendor. Currently, the product lines of Tatung include digital consumers products, storage-based media players, wireless telecommunication devices, videophones and home appliance. The production value of IT-related products accounts for at least 70% of total annual revenues.

In order to meet the OEM needs of international information companies like IBM and HP, Tatung decided to implement ERP systems linking with suppliers and customers in 1998. While determining the appropriate ERP vendor, Tatung opted for J. D. Edwards's ERP systems by gradually replacing its original MIS systems as well as solving the Y2K problem. In the 1st stage, Tatung picked up the subsidiaries of Netherlands, USA, and Mexico to implement ERP systems as pilot tests. Within 6 months to 1 year, these 3 subsidiaries had successfully completed ERP implementation by overcoming lots of problems. In the 2nd stage, Tatung rolled out the results of pilot tests to all branches. At the end of 2000, ERP systems successfully went "alive" within the whole Tatung.

METHODOLOGY AND HYPOTHESES

This study collected Tatung's public financial statement from the 1st quarter of 1997 to the 3rd quarter of 2004 in order to calculate the value of Tobin's Q. [10] The equation of Tobin's Q value is as follows:

$$\text{Tobin's Q} = \text{Market value} / (\text{Total Assets} - \text{Total Liabilities}) \quad (1)$$

By following equation (1), the Tobin's Q value of Tatung was derived in table 1. Since Tatung ended up ERP implementation at the end of 2000, this study decomposed the Tobin's Q values into two groups using the end of 2000 as the cut-off point. By comparing the average value of these two populations, this study tested performance difference between ERP pre-implementation and post-implementation, so this study proposed the first stage hypothesis: H1. Then, this study tested whether the average Tobin's Q value of ERP pre-implementation and post-implementation were the same by hypothesis H2.

H1: The average Tobin's Q value of ERP pre-implementation will be less than or equal to that of ERP post-implementation ($\mu_{\text{pre-implementation}} \leqq \mu_{\text{post-implementation}}$)

H2: The average Tobin's Q value of ERP pre-implementation will be the same as that of ERP post-implementation ($\mu_{\text{pre-implementation}} = \mu_{\text{post-implementation}}$)

Table 1 Tobin's Q value of Tatung Company

Year	1997				1998				1999				2000			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Tobin's Q	0.56	0.31	0.61	0.61	0.62	0.44	0.67	0.78	0.79	0.6	0.77	0.79	0.78	0.8	0.86	0.87
Year	2001				2002				2003				2004			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Tobin's Q	0.88	0.92	0.98	1.07	1.08	1.01	1.03	1.11	1.11	1.12	1.3	1.36	1.24	1.23	1.17	N.A.

RESULTS AND CONCLUSIONS

In order to support this inference, Tatung's performance became better after ERP implementation; this study had to test the hypotheses H1 and H2 with t value. The hypothesis H1 was supported by (t^*=-8.14085; α =0.05; t(0.95;29)=1.699; $t^* \leqq t$). The average value of Tobin's Q for ERP pre-implementation was less than or equal to the value of Tobin's Q for ERP post-implementation. The hypothesis H2 was rejected by ($|t^*|$ =8.14085; α =0.05; t(0.975;27)=2.045; $|t^*| \geqq t$). The Tobin's Q values of ERP pre-implementation and post-implementation were not the same. By combining the results of H1 and H2, this study concluded that implementing ERP resulted in better business performance in the case of Tatung. Since ERP systems involves all business functions, people and technologies, any ERP systems cannot be regarded as just software packages. The performance impact caused by ERP implementation may not be fully revealed only from financial ratio analysis. As the case of Tatung, this study successfully employed Tobin's Q to figured out the performance difference between ERP pre-implementation and post-implementation, and concluded that the business performance of ERP post-implementation was significantly better than that of ERP pre-implementation. However, whether ERP can bring in positive performance feedback is still under debates. The evidence from this case company may not be so strong to generalize the conclusion. Further studies on different companies and industries have to be conducted to enhance the conclusion.

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