ERP Contribution to Long-Term Financial Performance and the CIO's Membership in the Top Management Team (TMT)

Carlos Alberto Dorantes, The University of Texas at San Antonio, One UTSA Circle, San Antonio, TX 78249, USA; E-mail: Carlos.Dorantes@utsa.edu
Myung Ko, The University of Texas at San Antonio, One UTSA Circle, San Antonio, TX 78249, USA; E-mail: Myung.Ko@utsa.edu

ABSTRACT

The difference in the contribution of Enterprise Resource Planning (ERP) systems to financial performance between firms that have a Chief Executive Officer (CIO) in the top management team (TMT) and those without a CIO in the TMT is investigated. A new and robust method to measure this contribution is proposed. Preliminary results showed that the mean contribution of ERP for firms with a CIO in the TMT is higher than those without a CIO but did not show any statistical significance.

INTRODUCTION

Although it is generally believed that the relationship between the CIO and the TMT is an important factor influencing the performance impact of information technology (IT), empirical support for this belief is nonexistent. Since IT has increasingly been an important enabler of business strategies and innovation in organizations (Karahanna and Watson[6]), IT leadership becomes critical especially when implementing and maintaining large-scale ERP systems. The inclusion of IS executive in the TMT might help to make the effective decisions needed to reap the maximum benefits of the technology. According to information Systems (IS) leadership research, the role of CIO is crucial in the assimilation of ERPs through his or her IT and business knowledge (Smaltz, et al.[13]) and also critical in enabling IT to enhance business performance (Karahanna and Watson[6]). However, this suggestion comes more from anecdotal cases than from empirical research.

This paper addresses two issues. First, drawing from upper echelons theory, the study argues that CIO in the TMT significantly influences the contribution of the ERP to long-term business performance. Second, a robust and innovative method to measure such contribution is proposed.

LITERATURE REVIEW AND RESEARCH HYPOTHESIS

Several studies have investigated the ERP impact on organizational performance (Hunton, et al.[4], Nicolaou[9]). These studies have examined important organizational factors such as financial health, firm size, industry, number of ERP modules, vendor choice. However, the influence of the CIO on the ERP contribution to business performance has not been researched.

The effect of top management support on ERP implementation has been consistently found to be one of the most critical ERP implementation success factors (Nah, et al.[8]). In addition, the close CEO-CIO relationship is key to get top management support to IT initiatives (Jarvenpaa and Ives[5]). On the other hand, the upper echelons perspective views the organization's actions and outcomes as reflections of its top managers (Hambrick and Mason[2]). Thus, we believe that composition of the TMT influences the extent of top management support on the level of ERP contribution to business performance. TMTs with more technological savvy should be more effective on resource allocation, ERP implementation, and post-implementation. Thus, those TMTs with a CIO might help make the assimilation of ERP systems more effective. Accordingly, the following hypothesis is proposed:

H1: organizations whose CIO is a member of the TMT will experience a higher ERP contribution to business performance than organizations whose CIO is not included in the TMT.

METHODOLOGY

Data Collection

Firms that already implemented any type of enterprise system in the period between 1995 and 2001 will be identified through media announcements using wired news from Lexis Nexis. Annual financial information for each firm will be pulled from Compustat. The composition of the TMT will be examined using the ExecutiveComp database, which includes the highest top five executives..

ANALYSIS

Previous research has used both market (Hayes, et al.[3], Ranganathan and Brown[12]) and accounting metrics (Hunton, et al.[4], Nicolaou[9], Poston and Grabski[11]) to measure the extent to which the ERP contributes to business value. However, few of these studies have controlled for important factors such as firm performance and industry. The studies that have used accounting metrics simply compare financial ratios before and after the ERP was adopted.

This study investigates the contribution of the ERP in two steps. First, an expected financial performance of the firm will be computed at the year t+3, being t the year when the firm finished the ERP implementation. The ERP business value literature has suggested that the ERP benefits are more likely to be observed after two or three years after the implementation (Poston and Grabski[11]). This estimate will be based on both past firm performance and past performance of companies from the same industry and similar size. To do this, regression analysis using a composite score based on accounting fundamentals (Lev and Thiagarajan[7]) for t and t-1 will be used. The dependent variable will be the financial performance at t+3 measured by return on assets (ROA). The method to compute this composite score will be the F-score version of Piotroski (2000) (see Appendix A). Components of this score include annual improvements of firm profitability, financial leverage, and inventory turnover. The F-score measure has been found to be significantly associated with future firm performance (Piotroski[10]).

In order to control for firm size, industry and industry tendency, the following regression model is proposed for each firm in the sample:

$$ROA(i)(j, t+3) = \beta o(i) + \beta 1(i) * FScore(i), (j, t) + \beta 2(i) * FScore(i)(j, t-1) + \varepsilon(j)$$

Where:

ROA i (i, t+3) = ROA of firm j from the sub-sample i at t+3; t= year of implementation
FScore (i), (j, t) = F-Score at t for firm j from the sub-sample i
FScore (i), (j, t-1) = F-Score at t-1 for firm j from the sub-sample i
i = [1.. N]
N = Number of firms

To compute the β parameters for the regression function i, one sub-sample composed of firms that are similar to the firm i in terms of size and industry will be extracted from Compustat, which is consistent with previous research that have used the matching sample method (Barber and Lyon[1]).The error term of the function i, which is the difference between the actual future ROA and the predicted future ROA, will be the ERP contribution to performance for firm i.

Finally, an ANOVA analysis will be performed to test which group has higher ERP contribution to long-term financial performance.

PRELIMINARY RESULTS

The following results are based on the period from 1995 to 1999. Descriptive sample statistics are shown in Table 1.

From 276 announcements, public firms with a CIO right after the implementation were reduced to 16. A matching sample of 16 cases was selected out of the remaining firms considering firm size, industry, and number of modules implemented. With these 32 cases, 32 sub-samples where constructed. Then, regression analysis was performed to calculate the ERP contribution to business performance using the error term of the regression for each sub-sample. Table 2 describes the mean differences between two groups.

Although the mean of ERP contribution for firms with CIO is higher than those without a CIO, this difference was not significant. We believe that it might be due to the small sample size. Once we include announcements from year 2000 to 2001, we can validate our findings.

To further explore this result, we did another analysis using all firms without CIO and those without a CIO.

We can see that the mean of ERP contribution for firms with CIO was still greater than those firms without a CIO. This might be a sign of a possible significance difference once we finalize the analysis.

EXPECTED CONTRIBUTION

This study will contribute to the IS leadership research by extending upper echelons theory to the context of ERP systems. Results will shed some light about whether CIO in TMT can influence ERP contribution to financial performance. In addition, the study will contribute to the IT business value literature by providing a robust methodology to measure the financial impact of ERP systems that might be generalizable to other types of large-scale IT systems.

APPENDIX A. CONSTRUCTION OF F-SCORE.

Piotroski (2000) considers nine accounting fundamentals posited to capture annual differences in firm's profitability, financial leverage/liquidity and operational efficiency. The profitability fundamentals are ROA, cash flow from operations, change in ROA and accruals (Earnings – CFO). All variables are scaled by beginning of the year total assets. The financial leverage/liquidity variables are long-term debt to average total asset ratio, current assets to current liabilities ratio, and equity. The operational efficiency fundamentals are gross margin ratio and current year inventory turnover. For each component, if there is an improvement from one year to another, it is assign 1, and 0 otherwise. The composite score is the sum of these binary variables. FScore can range from 0 to 9.

REFERENCES

[1] Barber, B. M. and Lyon, J. D. "Detecting abnormal operating performance: the empirical power and specification of test statistics," *Journal of Financial Economics*, Vol. 41, Number 3, 1996, pp. 359-399.

Table 1. Number of ES implementation announcements

	1991-1995	1996	1997	1998	1999	Total
# ES implementation announcements	24	20	30	55	147	276
# announcements related to public firms	5	5	19	33	88	150
# announcements of public firms with a CIO in the TMT during 1993-2005	2	1	8	6	18	35
# announcements of public firms with a CIO right after the year of the implementation	0	0	3	3	10	16

Table 2. Mean difference statistics using a matching sample

	N	Mean of ERP contribution	Std. Deviation	Significance of mean differences	
Without CIO	9	-0.00445	0.04837	t-value	-0.4
With CIO	11	0.01891	0.17633	Significance	0.71

Table 3. Mean difference statistics using all public firms

	N	Mean of ERP contribution	Std. Deviation	Significance of mean differences	
Without CIO	63	.00139	.11710	t-value	-0.42
With CIO	11	.01891	.17633	Significance	0.67

Note: the sample size was reduced due to lack of data in Compustat

[2] Hambrick, D. C. and Mason, P. A. "Upper echelons: the organizationa as a reflection of its top managers," *Academy of Management Review*, Vol. 9, Number 2, 1984, pp. 193-206.

[3] Hayes, D., C., Hunton, J., E and Reck, J., L. "Market Reaction to ERP Implementation Announcements," *Journal of Information Systems*, Vol. 15, Number 1, 2001, pp. 3-18.

[4] Hunton, J., E, Lippincott, B. and Reck, J., L. "Enterprise resource planning systems: comparing firm performance of adopters and nonadopters," *International Journal of Accounting Information Systems*, Vol. 4, Number 2003, pp. 165-184.

[5] Jarvenpaa, S. L. and Ives, B. "Executive involvement and participation in the management of information technology," *MIS Quarterly*, Vol. 15, Number 2, 1991, pp. 205-227.

[6] Karahanna, E. and Watson, R. T. "Information Systems Leadership," *IEEE Transactions on Engineering Management*, Vol. 53, Number 2, 2006, pp. 171-176.

[7] Lev, B. and Thiagarajan, S. R. "Fundamental information analysis," *Journal of Accounting Research*, Vol. 31, Number 1, 1993, pp. 190.

[8] Nah, F. F.-H., Zuckweiler, K. M. and Lee-Shang Lau, J. "ERP Implementation: Chief Information Officers' Perceptions of Critical Success Factors," *International Journal of Human-Computer Interaction*, Vol. 16, Number 1, 2003, pp. 5-18.

[9] Nicolaou, A., I. "Firm performance effects in relation to the implementation and use of enterprise resource planning systems," *Journal of Information Systems*, Vol. 18, Number 2, 2004, pp. 79-105.

[10] Piotroski, J. "Value investing: the use of historical financial investment information to separate winners from losers," *Journal of Accounting Research*, Vol. 38, Number 1, 2000, pp. 1.

[11] Poston, R. and Grabski, S. "Financial impacts of enterprise resource planning implementations," *International Journal of Accounting Information Systems*, Vol. 2, Number 4, 2001, pp. 271-294.

[12] Ranganathan, C. and Brown, C. V. "ERP investments and the market value of firms: toward an understanding of influencial ERP project variables," *Information Systems Research*, Vol. 17, Number 2, 2006, pp. 145-161.

[13] Smaltz, D. H., Sambamurthy, V. and Agarwal, R. "The antecedents of CIO role effectiveness in organizations: an empirical study in the healthcare sector," *IEEE Transactions on Engineering Management*, Vol. 53, Number 2, 2006, pp. 207-222.