

December 2002

# ASSESSING THE IMPACT OF SUPPLY CHAIN MANAGEMENT SOFTWARE ON COMPANY PERFORMANCE

Ravi Patnayakuni  
*Temple University*

John D'Arcy  
*Temple University*

Follow this and additional works at: <http://aisel.aisnet.org/amcis2002>

## Recommended Citation

Patnayakuni, Ravi and D'Arcy, John, "ASSESSING THE IMPACT OF SUPPLY CHAIN MANAGEMENT SOFTWARE ON COMPANY PERFORMANCE" (2002). *AMCIS 2002 Proceedings*. 320.  
<http://aisel.aisnet.org/amcis2002/320>

This material is brought to you by the Americas Conference on Information Systems (AMCIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in AMCIS 2002 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact [elibrary@aisnet.org](mailto:elibrary@aisnet.org).

# ASSESSING THE IMPACT OF SUPPLY CHAIN MANAGEMENT SOFTWARE ON COMPANY PERFORMANCE

Ravi Patnayakuni and John D'Arcy

Temple University

ravi@temple.edu

jdarcy@temple.edu

## Abstract

*This study examines the impact of supply chain management (SCM) software on company performance using a combination of financial and market measures. Specifically, we measure the performance of a sample of 75 companies announcing SCM software investments between 1996 and 1999 against the performance of the companies in the S&P 500 on the following metrics: sales, profits, return on assets, inventory turnover ratio, working capital turnover ratio, current ratio, price-to-book (PB) ratio, and stock market return. Our results suggest that companies investing in SCM software do not outperform the companies in the S&P 500 in their first year of implementation. Further research is needed to assess the long-term impacts of SCM software investments on company performance.*

**Keywords:** Supply chain management, supply chain management software, IT investment, IT evaluation

## Introduction

One of the most significant changes in organizational business models from the technologically led growth in the last five years has been that it is not the individual organizations that compete with each other; rather they compete as a network of organizations that form the supply chain (Evans and Wurster, 1999; Lambert, et al., 1998). The new model calls for effective management of the extended enterprise. As a result, practitioners and researchers alike are paying considerable attention to supply chain management for meeting a variety of organizational objectives; from reducing costs to leveraging the skills of their supply chain partners for competitive advantage (Ramdas and Spekman, 2000). The Global Supply Chain Forum defines supply chain management as “the integration of key business processes from end user through original suppliers that provides products, services, and information that add value to customer and other stakeholders,” (Lambert, et al., 1998). The emphasis is on moving away from the traditional focus of logistics on managing the flow of goods to an outlook that focuses on integration of both transactional and managerial processes across the supply chain.

As with many organizational initiatives today, information technology (IT) plays a critical role in realizing supply chain management objectives. Successful organizations such as Wal-Mart, Dell, Honda, etc. are cutting their inventory holdings down by substituting information for inventory. Supply chain integration is supported by new technologies that enable instant connectivity and visibility across the supply chain (Parekh, 2001). The ability to execute inter-organizational transactions and sharing of access to data across the supply chain are some of the functionalities provided by supply chain management software. This has fueled the market for supply chain management software, which is growing dramatically at a predicted annual growth rate of 41% (AMR, 1999). Supply chain management software provides the platform for integration and coordination of supply chain partners that should result in low cycle time, on-time delivery, high order fill rate, and product-service customization. Improvements in cycle time, and operating costs manifest themselves in improved working capital productivity. Improved productivity and lower costs in turn support a sustainable and profitable business model. An integrated supply chain, an expected outcome of implementing supply chain applications, can provide the organization with the capabilities for improving not only productivity and responsiveness (Kaltwasser, 1990) but also the ability to grow over time (Goldhar & Lei, 1991; Huggins & Schmitt, 1995).

Using a combination of financial and market-based performance measures, this paper examines the impact of supply chain management (SCM) software investments on company performance in the first full year of implementation. Specifically, we want to test whether companies that implement SCM software applications are outperforming the market as a whole in terms of:

Measure	Definition
sales	total revenue or sales;
profitability	income (or loss) reported after all expenses and losses have been subtracted from all revenues and gains;
return on assets (ROA)	income divided by total assets;
inventory turnover ratio	costs of goods sold divided by the average of the current year's total inventories and the prior year's total inventories;
working capital turnover ratio	sales divided by the average of the most recent two years of current assets minus current liabilities;
current ratio	current assets divided by current liabilities;
price-to-book (PB) ratio	stock price per share divided by book price per share or total market value divided by total book value;
stock market return	total return on company stock over a specified time period;

We chose the S&P 500 as a market benchmark since it is a representative sample of leading companies in leading industries. The S&P 500 consists of 500 companies chosen for market size, liquidity, and growth representation. It is widely recognized as the standard for measuring U.S. equity market performance ([www.spglobal.com](http://www.spglobal.com)). Our initial research question is: On average, do companies that invest in supply chain management (SCM) software outperform the list of companies in the S&P 500 in the first full year of implementation in terms of aggregate financial performance, intermediate performance, and market performance using the following performance metrics: sales growth, profit growth, return on assets (ROA), inventory turnover ratio, working capital turnover ratio, current ratio, price-to-book (PB) ratio, and stock market return.

## Data Collection

We gathered announcements of supply chain management (SCM) software investments from two sources - PR Newswire and Business Wire – using the Lexis-Nexis database. Lexis-Nexis maintains a large volume of both current and historical business news. Our search consisted of all announcements of SCM software investments between 1996 and 1999. Keyword searches were performed using either ‘supply chain,’ ‘supply chain management,’ ‘logistics,’ ‘logistics distribution,’ ‘distribution,’ or ‘B2B’ in combination with ‘application,’ ‘fulfillment,’ ‘software,’ ‘IT,’ and ‘eCommerce.’ Additional keyword searches used the top ten SCM software vendors as reported by AMR Research (AMR, 2001). The initial list was evaluated and refined based on the following criteria: (1) the announcement was for the intention to adopt a supply chain management solution (as against reinvestments or extensions of contracts), (2) the supply chain solution was not simply a transactional EDI solution but had the ability to support managerial decision making with regards to the supply chain, (3) the announcing company had to be publicly traded on either the New York Stock Exchange (NYSE) or the NASDAQ stock exchange, and (4) the announcing company had to have a corresponding entry in the COMPUSTAT database. This yielded a sample of 75 SCM software announcements between 1996 and 1999 for which we had corresponding data in the COMPUSTAT database.

Data on sales, profit, return on assets (ROA), inventory turnover ratio, working capital turnover ratio, current ratio, price-to-book (PB) ratio, and stock market return were extracted from COMPUSTAT for each of the 75 companies in the sample. The same data was collected for each of the firms listed on the S&P 500 for the years 1996 through 2000.

Percent changes in each performance measure were calculated from the year of the announcement to one year following the announcement for both the sample of companies announcing SCM software investments and the list of companies in the S&P 500. This study assumes that all companies announcing SCM software investments have acquired and implemented the software. Therefore, we measured performance for the first full year following the announcement to allow for a lag between the announcement of SCM software investment and implementation. The percent change in each measure was calculated using the following formula:

$$\text{Percent Change in Measure} = 100 * ( \text{Measure at year } t+1 - \text{Measure at year } t / \text{Measure at year } t )$$

Where  $t$  equals the year in which the SCM software announcement occurred and  $t + 1$  equals the year following the SCM software announcement. For example, percent change in return on assets (ROA) for a company making an announcement of a SCM

software investment in November 1996 was calculated as the return on assets for 1997 minus the return on assets for 1996 divided by the return on assets for 1996, multiplied by 100.

All measures, except for price-to-book (PB) ratio and stock market return, are reported annually in COMPUSTAT so year-end numbers were used to calculate the percent change. Price-to-book (PB) ratio is reported monthly so we took the number for December of the year of the announcement and December for the year following the announcement and calculated the percent change. Stock market returns for each company are reported on a monthly basis as year-to-date returns. We took the year-to-date stock return for December of the year of the announcement and the year-to-date return for December of the year following the announcement and calculated the percent change. The same procedure was followed in calculating the percent change in each of the measures for the list of S&P 500 companies.

## Results

Independent-sample T tests were performed, testing the one-sided alternative hypothesis that the mean percent change in each performance measure for our sample of 75 companies was greater than the mean percent change in each performance measure for the companies in the S&P 500 ( $\mu_{\text{sample}} - \mu_{\text{S\&P 500}} > 0$ ). Results are presented in Table 1.

Measure	Group	N	Mean	Std. Deviation	Std. Error of a Mean	T - Test for Equality of Means	Sig. (1 - tailed)
Sales	S&P500	1956	22.015	44.462	1.005	-2.370	0.991
	sample	75	9.810	16.960	1.958		
Profit	S&P500	1957	67.543	2028.666	45.858	0.121	0.452
	sample	75	95.899	898.175	103.712		
ROA	S&P500	1956	20.607	1738.256	39.303	0.243	0.404
	sample	75	69.699	843.134	97.357		
Inventory Turnover	S&P500	1650	11.043	57.163	1.407	-1.593	0.944
	sample	74	0.428	19.048	2.214		
Working Capital Turnover	S&P500	1583	8.159	2025.756	50.915	0.014	0.494
	sample	73	11.451	57.656	6.748		
Current Ratio	S&P500	1612	2.324	44.743	1.114	-1.390	0.918
	sample	74	-4.934	17.088	1.986		
PB Ratio	S&P500	1859	9.967	86.209	1.999	-0.731	0.768
	sample	72	2.473	58.709	6.919		
Stock Return	S&P500	1922	28.230	97.068	2.214	-1.575	0.942
	sample	74	10.308	63.990	7.439		

The combined results for 1997 through 2000 indicate that our sample of companies announcing SCM software investments did not outperform the companies in the S&P 500 in their first year of software implementation, as none of the performance measures had percent changes that were significantly higher than those of the companies in the S&P 500. Mean percent changes in profits, return on assets, and working capital turnover ratio were higher for our sample of companies than for the companies in the S&P 500. However, based on the high standard deviation in the S&P500 data, the results were not statistically significant.

The results for the individual years (Table 2) indicate that only the mean percent change in profits in 1999 was significantly higher for our sample of companies announcing SCM software investments compared to the companies in the S&P 500. On average, 1999 profits increased by 260% for our sample of companies compared to a 21% decrease for the companies in the S&P 500 ( $t = 1.457, p\text{-value} = 0.073$ ). Consistent with the combined results in Table 1, the mean percent changes in all other measures in each of the years were not significantly higher than those of the companies in the S&P 500. However, the results for the individual years do reveal some interesting patterns. The sample of companies announcing SCM software investments had a higher mean percent change in profits and return on assets in two of the four years studied (1997 and 1999) and a higher mean percent change

in working capital turnover ratio in three of the four years studied (1997, 1999, and 2000). In 1998, the sample of firms announcing SCM software investments outperformed the companies in the S&P 500 in terms of price-to-book (PB) ratio and stock market return.

Table 2. T-Test Results by Year

Measure	Year	Sample Mean	S&P 500 Mean	Mean Difference	Std. Error of Diff	T - Test for Equality of Means	Sig. (1 - tailed)
Sales	1997	7.428	21.095	-13.668	10.341	-1.322	0.907
	1998	7.658	20.752	-13.095	13.095	-1.063	0.856
	1999	13.914	18.087	-4.173	6.253	-0.667	0.748
	2000	7.432	28.017	-20.585	12.610	-1.632	0.948
Profit	1997	12.418	-0.494	12.913	68.755	0.188	0.426
	1998	23.629	145.323	-121.695	616.674	-0.197	0.578
	1999	260.798	-21.061	281.859	193.479	1.457	0.073
	2000	-18.250	145.596	-163.847	696.623	-0.235	0.593
ROA	1997	4.437	-7.006	11.443	60.032	0.191	0.425
	1998	10.802	41.143	-30.341	315.643	-0.096	0.538
	1999	229.766	3.421	226.345	186.899	1.211	0.113
	2000	-59.797	44.387	-104.184	692.008	-0.151	0.560
Inventory Turnover	1997	0.707	8.534	-7.827	12.091	-0.647	0.741
	1998	4.495	5.024	-0.528	9.790	-0.054	0.522
	1999	0.248	10.529	-10.281	14.614	-0.703	0.759
	2000	-2.570	19.813	-22.383	14.374	-1.557	0.940
Working Capital Turnover	1997	-3.592	-117.493	113.900	587.951	0.194	0.423
	1998	4.296	165.749	-161.453	882.419	-0.183	0.573
	1999	16.288	16.069	0.219	63.908	0.003	0.499
	2000	20.772	-31.301	52.074	136.027	0.383	0.351
Current Ratio	1997	-5.639	0.332	-5.971	8.483	-0.704	0.759
	1998	-7.693	1.716	-9.409	17.130	-0.549	0.708
	1999	-3.923	1.880	-5.804	5.340	-1.087	0.861
	2000	-3.709	5.248	-8.957	10.284	-0.871	0.808
PB Ratio	1997	7.929	14.494	-6.565	28.538	-0.230	0.591
	1998	18.410	13.029	5.381	22.617	0.238	0.406
	1999	7.520	14.461	-6.940	20.265	-0.342	0.634
	2000	-19.062	-1.803	-17.259	11.299	-1.527	0.936
Stock Return	1997	29.945	35.529	-5.585	12.053	-0.463	0.678
	1998	27.157	26.236	0.921	17.074	0.054	0.479
	1999	8.837	39.525	-30.689	33.409	-0.919	0.821
	2000	-13.180	11.903	-25.082	11.118	-2.256	0.988

## Discussion and Future Research

This paper assesses the impact of SCM software investments on company performance. We choose to measure the performance of a sample of companies investing in SCM software against the performance of a representative sample of leading companies in leading industries, the S&P 500. The results do not provide convincing evidence that companies investing in SCM software outperform the S&P 500 in terms of financial and market performance. The obvious limitation is the large difference in organizational size between the sample of 75 companies announcing SCM software investments and the 500 companies that make up the S&P 500. While the S&P 500 is a useful benchmark, a paired sample analysis may be more appropriate. Furthermore it would be more appropriate to do a longitudinal analysis across several years after the initial announcement.

We are still encouraged by the results of this study as it provides strong evidence of the benefits of SCM software. Between 1997 and 1999, our sample of companies announcing SCM software investments had positive performance in each of the measures studied, except for current ratio and working capital turnover ratio. This suggests that companies that implement SCM software are improving in terms of market performance, financial performance, and efficiency, although they may not be outperforming the market as whole. Further, while not statistically significant, the mean percent changes in profits and return on assets for the sample of firms announcing SCM software investments were higher than those of the companies in the S&P 500 in 1997 and 1999. The mean percent change in working capital turnover ratio was higher for our sample than for the companies in the S&P 500 in 1997, 1999, and 2000. Given that the S&P 500 is composed of leading companies in leading industries, our results suggest that companies implementing SCM software may have a competitive advantage over rivals in terms of these metrics. There is also evidence that the market sees a competitive advantage in SCM software investment, as our sample outperformed the companies in the S&P 500 in terms of price-to-book (PB) ratio and stock market return in 1998. Given the limitations of our study, these results need to be studied further over a longer time period before a conclusion can be reached.

The sample of 75 companies used in this study will be further examined to assess the impact of SCM software investment on financial and market performance. Specific goals of future research are: (1) to study market perception of investments in SCM software using an event study, (2) to examine the relationship between SCM software investment and long-term financial, market, and operating performance across industries, and (3) to study the impact of SCM software implementation on the performance of the entire supply chain, from suppliers to customers.

## References

- AMR. Supply Chain Management Software Report 1998-2003. AMR Research, 1999.
- AMR. The Supplier Management Application Report, 2000-2005. AMR Research, 2001.
- Brealey, R. A. and Myers, S.C. Principles of Corporate Finance, 5<sup>th</sup> Edition, The McGraw-Hill Companies, Inc., New York, NY, 1996.
- Goldhar, J. D. and Lei, D. "The Shape of Twenty-First Century Global Manufacturing," *The Journal of Business Strategy* (12:2), 1991, pp. 37-41.
- Huggins, J. W. and Schmitt, R. G. "Electronic Data Interchange as Cornerstone to Supply Chain Management", Paper presented at the Annual Conference of the Council of Logistics Management, 1995.
- Kaltwasser, C. "Know How to Choose the Right CIM Systems Integrator," *Industrial Engineering* (22:7), 1990, pp. 27-29.
- Evans, P., and T. Wurster. *Blown to Bits*, Boston, MA: Harvard Business School Publishing, 1999.
- Lambert, D. M., M.C. Cooper, and J.D. Pagh. "Supply Chain Management: Implementation Issues and Research Opportunities," *The International Journal of Logistics Management* (9:2), 1998, pp. 1-19.
- Parekh, D.R. "It's Not Just About Software: A Holistic View on Supply Chain Management in the Connected Economy," Plan Central Inc, 2001.
- Ramdas, K., and R.E. Spekman. "Chain or Shackles: Understanding What Drives Supply-Chain Performance," *Interfaces* (30:4), 2000, pp. 3-21.
- Standard and Poor's S&P 500 Index: Description. Available online at ([www.spglobal.com/indexmain500\\_description.html](http://www.spglobal.com/indexmain500_description.html))