

# A Study of Supply Chain Management Performs in Indian MRO Paper Mill Problem

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**Abstract**— Supply chains have been ever since businesses organized to convey products and services to customers, the concept of their modest advantage, and subsequently supply chain management (SCM), is a comparatively recent thinking in management literature. Although research interests in and the importance of SCM are growing, intellectual materials continue dispersed and disjointed, and no research has been focused towards a systematic documentation of the core creativities and constructs involved in SCM. The site appointments provided valuable visions that allowed us to understand current MRO supply chain performs. Moreover, the site visits helped us to hone in on the suitable measures of supply chain performance and the primary drivers of MRO supply chain performance. With much effort, we have collected a limited number of responses from the survey. It is not as big a sample as we would hope; however, it provides us a statistical basis to collect visions from the survey and field data on several important dimensions.

**Index Terms**— SCM, MRO mill, quality factor, etc.

## I. INTRODUCTION

“Supply management” can be observed as both a developing field of practice and an emerging academic domain. Neither perspective is completely developed but each has significant promise. The future progress of each will be enhanced and certainly is finally dependent upon the other. Hence, the purpose of this paper is to take typical of growths in theory and repetition to date and to classify barriers and possibilities. Furthermore, given the off-remarked acknowledgement of the vital importance of the interactive and people dimension but the relative desertion of this in any functional form, we give special consideration to this aspect. Supply (chain) management is eventually about manipulating performance in specific directions and in particular ways. The fundamental logics, drivers, enablers and barriers value and require close attention. The economic significances of supply chain problems are even worse when stock price performance is examined from a quarter before the formal announcement of the glitch to a quarter after the formal announcement of the glitch. During this period, glitches are associated with an average loss in shareholder value of about 20%. While many firms in the automotive, consumer goods, and electronics industries have exploited the value creation potential of SCM, firms in the pulp and paper industry are just beginning to recognize the vast scope of the potential opportunities that exist. McLean (1999) argues that SCM is a critical business issue in the pulp and paper industry that offers tremendous potential for improving customer satisfaction, lowering

operating costs, reducing inventory investments, and improving fixed asset utilization.

A number of analysts have already sought to comprehend and substantially redraw the boundaries of, and the essential nature of, this domain of theorising and practice. For example, in one of the more coherent and developed attempts at a reconceptualisation, Harland et al. (1999) present the case for a new expanded body of knowledge and field of practice which they suggest should be labelled “supply strategy”. The supply chain of the pulp and paper industry can be segmented into the following four sub-chains: 1) fiber procurement which includes all the activities that are required to deliver wood chips to a pulp and paper mill; 2) pulp and paper manufacturing; 3) customer fulfillment which spans order taking, production, and delivering of products to customers; and 4) non-fiber procurement which includes the activities required to manage maintenance, repair, and operating (MRO) supplies. While opportunities exist to improve all four components of the supply chain, our focus in this research was to study the MRO (or non-fiber) supply chain for paper mills. Typical MRO supplies in the paper and pulp industry include bearings, power trains, pipe valves, electrical components, lubricants, clothing (felt and wires) and office supplies. We selected the MRO portion of the supply chain as the focus of our research since many in the industry have identified this as a critical area for which very limited research has been accomplished. According to Kapoor and Gupta (1997), business specific purchases (includes MRO) account for 15% to 20% of a company's indirect purchases while indirect purchases account for roughly 24% of the company's total purchases. From discussions with Jim McNutt (2001), a paper mill spends approximately \$60 to \$80 per ton of paper on MRO supplies.

## II. LITERATURE REVIEW

In this section, for each one of the topics used to classify the papers we provide a description of the topic, an analysis of the impact of the Internet on it, a summary of the existing studies and some directions for further research. This section is structured as follows: we first focus on each one of the processes identified by the Global Supply Chain Forum, we, then, continue with the enablers and, finally, we cover the impact of the Internet on the industry structure and competitive challenges, and on the firms' performance.

New and Payne [5] have described an empirical study investigating the power interplay in supply chain partnerships. They found that the relationships were asymmetrical, depending on whether it was with upstream or downstream organisations.

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Watts and Hahn [7] reported on a survey carried out to assess the extent and success of supplier development programs. They found these programs to be broad in scope and quite prevalent (63%), specially among the larger firms surveyed. The aim of these programs was more to improve the purchased products than to improve the capability of the supplier.

Krause [3] carried out a survey of firms on the extent of supplier development activities and on the benefits accrued from the activities. The responding firms participated more often in limited involvement such as supplier evaluation and feedback, site visits, requests from improved performance, and promises of increased present or future business, than in extensive involvement such as training/education of suppliers' personnel or investment in suppliers' operations. While the supplier development efforts were generally fruitful, the buying firms were not very satisfied with the results.

Galt and Dale [2] studied ten organisations in the U.K., and found that they were working to reduce their supplier base, and to improve their communications with the suppliers urgently.

Fernie [1] carried out an international comparison of supply chain management in grocery retailing industries. He found significant differences in inventory held in the supply chain by the U.S. and European grocery retailers, which could be explained by their SCM adoption. In a similar vein, Tan et al. [6] sought a relationship between firms' SCM practice and their performance. They were able to show positive and significant correlation between certain SCM practices and performances of their respondent firms.

Kwan [4] investigated the use of information technology (IT) in SCM in Singapore electronics and chemical industries, and found that the top two SCM strategies were: 1) to position logistics as one of the core competencies within the company, 2) to produce to demand rather than to forecast. The top barrier to the use of IT was a lack of education and training.

### III. RESEARCH METHODOLOGY

The survey design reflects the relationships uncovered in Phase 1 as well as state-of-the-art knowledge of supply chain management principles. This latter feature is desirable so that we may leverage our knowledge of best practice supply chain approaches in other process industry domains. Phase 2 of the study focused on data collection and the development of prescriptive recommendations to improve performance of the MRO supply chains for the paper mills. Additionally, we asked how and how often procurement and maintenance interacted and coordinated activities, how the department forecasted demand for maintenance activities and parts, and key recent or future MRO improvement initiatives. Finally, we asked about other critical issues or challenges that hadn't been discussed yet. Through these open-ended questions we formed a general picture of industry progress to date, terminology, and critical areas for improvement for the three case study mills.

Characteristic	Mill 1	Mill 2	Mill 3
Age of mill	Original part built in 1954	Machine 1 built in 1962	Built in 1995
Number of paper machines	2	3	1
Number of employees	~800		<50, outsourced maintenance
Annual amount of paper (tons) produced	~472,000 per year	1450 tons/day of kraft paper, 900 tons/day of TMP, and 760 tons/ day of market pulp	275K tons/year
Amount of capital investment		\$66 Million in 2002	
Type of paper produced	Kraft brown paper	Coated and uncoated paper, kraft paper	Linerboard
Source of paper fiber (wood chips or recycled paper)	Wood chips	Wood chips	Recycled paper
Union or non-union maintenance employees	Union		Non-union

Table2: properties of mill Visited in SCM

These practices define how a specific mill obtains and stores MRO items and manages the maintenance function. The collection of mill practices within a firm will influence the corporate office's MRO strategy since corporate will want to make decisions that help the mills and the company as a whole. A mill obtains MRO items through a procurement process, characterized by how MRO items are categorized, the extent of forecasting used to predict MRO requirements, the use of reorder points to maintain optimal inventory levels, and the overall value of inventory kept at the mill. These specific tasks are measured within the survey in order to give an overall picture of the procurement process.

### IV. DATA COLLECTION AND ANALYSIS

To achieve this, we developed two standardized and psychometrically sound research survey instruments: one instrument is to be completed by the maintenance manager and the other by the procurement manager. The research instruments reflect the in-depth understanding developed in Phase 1 of MRO supply chains based on site visits. We collected data in two phases. The first phase started in August 2003 when we sent out the survey instruments, along with letters of support for this research from Paper Management Industry Association (PIMA) and CPBIS, to over 500 mills listed in the Lockwood database. Each mill received two surveys in each envelope (one survey for procurement, one for maintenance), so we sent out a total of over 1000 surveys.

As an incentive for filling out the surveys, we offered a free copy of the completed report. After sending out reminder cards two weeks later, we received 12 surveys back from 10 unique mills – a 1.2% response rate. We started a second data collection effort in January 2004, with the goal of improving the response rate.

We combined the Lockwood database with two other databases from CPBIS for an updated mailing list with

contacts at 709 separate mills. Instead of mailing out all of the surveys at once, we called each contact, informed him/ her of the nature of the survey and asked him/ her to fill out or help find the appropriate person to fill out the surveys. We made a maximum of two attempts to Page 14 reach each potential recipient. On the second attempt, we left a voicemail message about our research effort and mailed the surveys. Since some contacts requested we not send them a survey, a total of 616 envelopes were mailed to mills, with two surveys in each envelope for a total of 1232 surveys. From this effort, we received 27 completed surveys. Nine mills completed both the procurement and maintenance surveys, which accounts for 18 of the 27 surveys.

### V. RESULTS

We look at how each capability of a supplier factors into buy/don't buy decision in Criteria for MRO Suppliers. We asked the procurement manager at each mill to tell us the importance of each of the following criteria when selecting suppliers from 1 (none) to 5 (very high).

#### Cost of MRO items

- Quality of MRO items
- Supplier on-time delivery performance of MRO items
- Supplier's ability to change order quantities
- Supplier's ability to change delivery lead-time
- Accessibility of MRO supplier for problem resolution

item	N*	Mean	Median SD	SD
Cost	20	4.15	4.0	0.59
quality	20	4.30	4.0	0.66
On time delivery	20	4.15	4.0	0.67
Change order quantity ability	19	3.05	3.0	0.91
Change order leadtime ability	19	0.84	3.0	1.02
Supplier problem resolution	20	0.85	4.0	0.85
Importance of mill purchases to MRO	20	0.85	3.0	0.99
supplier's total sales base	20	0.89	4.0	1.05
<b>Average Criteria for Suppliers Score</b>	20	3.70	3.67	0.40

The respondents' average overall score for corporate practice suggests that corporate headquarters is not closely engaged in the MRO supply chain process of its mills. However, it is important to note that two trends exist regarding the management of MRO supply chains. The corporate headquarters has actively reduced the number of suppliers that service its mills. Second, corporate headquarters has adopted long-term contracts for corporate wide suppliers.

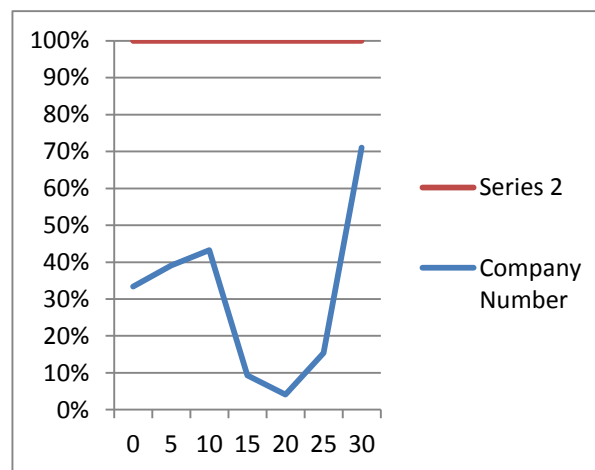


Figure1: Corporate practice Score by company

### VI. CONCLUSION:

This study finally forced firms to reduce costs while maintaining or improving quality and delivery reliability, it is not surprising that procurement managers overwhelmingly responded that the three most important criteria for choosing suppliers were cost, quality, and on-time delivery, closely followed by suppliers' ability to offer solutions to a mill's problems. Mills follow a regular maintenance schedule and on average stick to their schedule and budget. They rely heavily on IT to help the maintenance process, but could probably improve performance by using IT more to facilitate the procurement process and MRO inventory system.

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