

# Rethinking Supply Chain as a Driver for Efficient Operations and Strand of Linked Operations in South African Steel Production Plants

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**Abstract**—The aim of the study is to better understand the effectiveness of a fundamental question in supply chain management is: ‘How should supply chains be managed when operations compete in different ways in different markets?’ Demand for the former products will be relatively stable and predictable, but demand for the latter will be far more uncertain. In addition, the profit margin commanded by the innovative product will probably be higher than that of the more functional product. However, the price (and therefore the margin) of the innovative product may drop rapidly once it has become unfashionable in the market. The supply chain policies that are seen to be appropriate for functional products and innovative products are termed by Fisher efficient supply chain policies and responsive supply chain policies, respectively. By contrast, responsive supply chain policy stresses high service levels and responsive supply to the end-customer. The inventory in the network will be deployed as closely as possible to the customer. In this way, the chain can still supply even when dramatic changes occur in customer demand. Fast throughput from the upstream parts of the chain will still be needed to replenish downstream stocks. However, those downstream stocks are needed to ensure high levels of availability to end-customers.

**Index Terms**—Supply chain network, CRM, responsive supply chain, operations performance

## I. INTRODUCTION

IRON and steel industry as a pillar industry has made a significant contribution to our country’s economic development. The steel industry is always an important part of national economy in our country, which is the leading industry to realize speeding up the industrialization. The most countries, which have implemented industrialized in the world, are almost putting priorities to develop basic industries including steel industry.

Supply chain management is a relatively new term. It crystallizes concepts about integrated business planning that have been espoused by logistics experts, strategists, and operations research practitioners as far back as the 1950’s. Today, integrated planning is finally possible due to advances in Information Technology (IT), but most companies still have much to learn about implementing new

analytical tools needed to achieve it. They must also learn about adapting their business processes to exploit insights provided by these tools. The information revolution has accelerated significantly in recent years. Astonishing gains in PC computing speed, e-commerce, and the power and flexibility of data management software have promoted a range of applications. Widespread implementation of Enterprise Resource Planning (ERP) systems offers the promise of homogeneous, transactional databases that will facilitate integration of supply chain activities. In many companies, however, the scope and flexibility of installed ERP systems have been less than expected or desired, and their contribution to integrated supply chain management has yet to be fully realized. Moreover, competitive advantage in supply chain management is gained not simply through faster and cheaper communication of data. Moreover, as many managers have come to realize, ready access to transactional data does not automatically lead to better decision-making (Shapiro, 2000).

## II. PROBLEM STATEMENT

As the global information technology develops and market competition intensifies, steel industry is struggling in recent years with many domestic steel enterprises operating performance declining, and even some appearing huge losses. South Africa’s supply chain is by far the most deficient and costly in the developing world. A closer analysis of existing supply chain shows a very depressing picture. Round about 20 to 40% of South Africa’s supply chain networks is dilapidated and in urgent need for refurbishment. There is no doubt that the unsatisfactory situation exemplified by the fact that most operations in South Africa are insolvent and heavily subsidised by the government, yet the eminence of supply chain remain deprived and coverage partial. For that, steel logistics industry have carried out deep introspection, constantly to find their own problems, and then to get into internal industry structure to do some change. For instance, many companies have established a new management style and business processes under the supply chain, to improve the economic benefit, changing the competitive pressure into the driving force for the development of the iron and steel industry. That is today that it is imperative to improve inventory. Inventory refers to the goods or commodities at the storage state, and all of the raw materials, semi-finished products and finished goods in process of the supply chain

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have the function of integrating supply and demand and maintaining the activities smoothly going (Li, 2006).

Whenever two operations in a supply chain arrange for one to provide products or services to the other, there is the potential for misunderstanding and miscommunication. This may be because simply by not being sufficiently clear about what a customer expects or what a supplier is capable of delivering. There may also be more subtle reasons stemming from differences in perception of seemingly clear agreements. In accordance with the literature, the effect is analogous to the children's game of 'Chinese whispers'. The first child whispers a message to the next child who, whether he or she has heard it clearly or not, whispers an interpretation to the next child, and so on. Therefore, the more children the message passes between, the more distorted it tends to become. The last child says aloud what the message is, and the children are amused by the distortion of the original message. Figure 13.8 shows the bullwhip effect in a typical supply chain; with relatively small fluctuations in the market cause increasing volatility further back in the chain.

### III. OBJECTIVES

1. meet tight delivery schedules
2. handling complicated production sequences, rush orders and unplanned events such as raw material delays
3. Creating optimal plans that meet the needs of your customers, stakeholders and departments
4. reducing complexity and risk
5. creating a sustainable, profitable business model

#### A. Primary Objectives

Meeting the requirements of end-customers requires the supply chain to achieve appropriate levels of the five operations performance objectives: quality, speed, dependability, flexibility and cost.

All supply chain management shares one common, and central, objective, to satisfy the end customer. All stages in a chain must eventually include consideration of the final customer, no matter how far an individual operation is from the end-customer. When a customer decides to make a purchase, he or she triggers action back along the whole chain. All the businesses in the supply chain pass on portions of that end-customer's money to each other, each retaining a margin for the value it has added. Each operation in the chain should be satisfying its own customer, but also making sure that eventually the end-customer is also satisfied.

### IV. REVIEW OF LITERATURE

Supply chain management is a broad concept that includes the management of the entire supply chain from the supplier of raw material to the end-customer.

■ Its component activities include purchasing, physical distribution management, logistics, materials management and customer relationship management (CRM).

Supply chain management is the management of the interconnection of organizations that relate to each other through upstream and downstream linkages between the processes that produce value to the ultimate consumer in the form of products and services. It is a holistic approach to

managing across company boundaries. 'Supply network' refer to all the operations that were linked together so as to provide goods and services through to the end-customers. In this element deals with the 'ongoing' flow of goods and services through this network along individual channels or strands of that network. In large organizations, there can be many hundreds of strands of linked operations passing through the operation. These strands are more commonly referred to as supply chains.

An analogy often used to describe supply chains is that of the 'pipeline'. Just as liquids flow through a pipeline, so physical goods (and services, but the metaphor is more difficult to imagine) flow down a supply chain. Long pipelines will, of-course, contain more liquid than short ones. Therefore, the time taken for liquid to flow all the way through a long pipeline will be longer than if the pipeline were shorter. Stocks of inventory held in the supply chain are thought of as analogous to storage tanks. On the journey through the supply chain pipeline, products are processed by different operations in the chain and, stored at different points. Efficient supply chain policies include keeping inventories low, especially in the downstream parts of the network, to maintain fast throughput and reduce the amount of working capital tied up in the inventory. What inventory there is in the network is concentrated mainly in the manufacturing operation, where it can keep utilization high and therefore manufacturing costs low. Information must flow quickly up and down the chain from retail outlets back up to the manufacturer so that schedules can be given the maximum amount of time to adjust efficiently. The chain is managed to make sure that products flow as quickly as possible down the chain to replenish what few stocks are kept downstream.

#### A. Manufacturing perspectives and strategies

The scope of items firm makes depends on its innovative ability and displaying system. Firm's immaculate manufacturing capabilities on the premise of business sector opportunities and readiness to go for broke. At the beginning, a manufacturing firm makes or designs new item arrangement as its entrance point as a quality included store network member. In the beginning, business sector achievement serves to characterize and clear up association's competency as saw by clients and suppliers. The organizations producing competency depends on brand power, volume assortment limitations and lead time prerequisites.

### V. METHODOLOGY

For producing firm to contend successfully, it must have the capacity to incorporate assembling ability into a significant showcasing esteem recommendation. To a specific degree, an organizations producing ability drives the achievable scope of powerful promoting technique. Manufacturing firms must build up a rationality which when all is said in done will underline the minimisation of the measure of assets incorporating time utilized as a part of operations of the organization.

200 questionnaires were distributed to South African Steel Companies in the KwaZulu Natal, most of which were

affiliated to AcelorMittal. The primary data was complemented by the secondary data gathered from internet searches and reading materials offered by the associated companies.

## VI. RESULTS AND FINDINGS

- There were 150 legitimate study reactions. In the study, 46 percent of South African manufacturing organizations' executives concede that rebuilding has just secured one of their single organizations, and another 6 percent of organizations have not dispatched any rebuilding activity. As indicated by these organizations, the greatest test of pivoting is identified with the far-reaching use of programming in the generation forms, trailed by challenges in the gathering and investigation of framework information.
- One of the reasons for the fluctuations in output is that each operation in the chain - reacts to the orders placed by its immediate customer. None of the operations had an overview of what was happening throughout the chain.
- The turnover of talented assets is high > the average 50% and it is extremely hard to draw in individuals particularly to remote destinations, for example, Newcastle.
- The impact of this is progression is lost and to a great degree worrying and a significant part of the time unfeasible to supplant over the short to medium term.
- It is in addition clear that the holding of limits have been seen as one of the top business dangers of South African steel producing firms/associations.
- Based on the composed work and benchmark study and the issue to pull in and hold aptitudes and change together with the expansion technique, unmistakably the Steel business in South Africa needs to concentrate on the creation and sharing of information and making a learning relationship on a key level.

### A. Analysing the South African steel industry inventory problems

TABLE I  
 THE CHARACTERISTICS OF THE STEEL CHAIN INVENTORY

Logistics form	The main performance of the logistics activity
Procurement of raw materials	A variety of raw material, a large quantity, high cost of material. Need a long-term partnership with key suppliers. Raw material into the furnace pretreatment for third party logistics processing occurs, not allow material shortage.
Raw material storage	Raw material yard with storage field, processing operations at the scene, the output using a yard "the Trinity" function Iron and steel scrap and scrap steel and other waste materials as raw material for production of recyclable
Finished products, semi-finished products storage	Each phase dispersed in the production of semi-finished product inventory, and finished products warehouse at the end or the finished product library management center library
Semi-finished and finished products transport	Company's products are relatively heavy and large volume, but also some semi-finished goods in transit are still in the condition of high temperature, increase the transportation facility The majority of iron and steel enterprises have a fixed customer base, so we need to establish long-term relations of cooperation with large

Based on the characteristics of the steel industry supply chain, we can know the lack of effective supply chain mechanism. The end users of steel products mostly are the manufacturing industries, and the vast majority of products are in need of further deep processing. Users have a clear demand to varieties, specifications, prices of steel product, and iron and steel enterprises transport goods mainly by waterway and railway, with long distance, long time, and high freight price. The increase of product inventory will ultimately affect the steel industry enterprise's business benefit. On the basis of general steel product storage process, we analyze the inventory problem:

1. Steel Industrial Concentrations are Low
2. The Information Asymmetry Between the Companies
3. Lack of Demand Inventory Forecasting
4. Inventory Management Concepts are Backward
5. Inventory Organization Structure is not Reasonable
6. Unreasonable Inventory Control

### B. Improving the External Environment of Inventory Management under Supply Chain of Iron and Steel Industry

1. Adjusting Iron and Steel Industry's Layout, Enhancing the Degree of Concentration of Iron and Steel Industry
2. The implementation of Core Enterprise Inventory Control Suggestions in Agile Supply Chain Environment: A. Improve Inventory Management Set up a Reasonable Organization Structure, B. Strengthening Steel Sales Forecast and Strengthening the Inventory Control. C. Promoting the Information Construction, Implementing Agile Supply Chain Reengineering

## VII. RECOMMENDATIONS

### A. Information-sharing

If information had been available and **shared throughout the chain**, it is unlikely that such wild fluctuations would have occurred. It is sensible therefore to try to transmit information throughout the chain so that all the operations can monitor true demand, free of these distortions. An obvious improvement is to make information on end-customer demand available to upstream operations. Electronic point-of-sale (EPOS) systems used by many retailers attempt to do this. Sales data from checkouts or cash registers are consolidated and transmitted to the warehouses, transportation companies and supplier manufacturing operations that form their supply chain. Similarly, electronic data interchange (EDI) helps to share information. EDI can also affect the economic order quantities shipped between operations in the supply chain.

### B. Operational efficiency

'Operational efficiency' means the efforts that each operation in the chain can make to reduce its own complexity; reduce the cost of doing business with other operations in the chain and increase throughput time. The cumulative effect of these individual activities is to simplify throughput in the whole chain. For example, imagine a

chain of operations whose performance level is relatively poor: quality defects are frequent, the lead-time to order products and services is long, and delivery is unreliable and so on. The behaviour of the chain would be a continual sequence of errors and effort wasted in re-planning to compensate for the errors. Poor quality would mean extra and unplanned orders being placed, and unreliable delivery and slow delivery lead times would mean high safety stocks. Just as important, most operations managers' time would be spent coping with the inefficiency. By contrast, a chain whose operations had high levels of operations performance would be more predictable and have faster throughput, both of which would help to minimize supply chain fluctuations.

*C. Channel alignment helps improve supply chain performance*

Channel alignment means the adjustment of scheduling, material movements, stock levels, pricing and other sales strategies to bring all the operations in the chain into line with each other. This goes beyond the provision of information. It means that the systems and methods of planning and control decision-making is harmonized through the chain. For example, even when using the same information, differences in forecasting methods or purchasing practices can lead to fluctuations in orders between operations in the chain.

As demonstrated on the above figure 1, from quarter 1 to quarter 4 the steel items makers from the year 2013 to 2014 were looking for better methodologies for conclusion for settling throughput issues in assembling. The machined fragments and composite parts required for their amassing programs. New inventive contemplations for mix of turnaround systems, for example, utilization of ERP (Enterprise Resource Planning) on a high-exactness frames change the whole store network into a complete assembling cell. This has helped fabricating plants finish a high rate of above 70% volume underway, lessened manufacturing cost.

- Greater labour productivity,
- Greater machine efficiency,
- Improved quality,
- Increased system reliability,
- Reduced parts inventories.
- Shorter lead times
- Improved efficiency
- Increase production rate
- Lower cost per unit produced

VIII. CONCLUSION

Inventory control in iron and steel industry is such an important part of enterprise management, which has a very close relationship with benefits. The actual situation of China's steel industry, implement reasonable inventory control could greatly reduce the inventory of liquidity, shorten the circulation of capital cycle, and help enterprises to gain initiative in the market, \win the market advantages, gradually move out of the woods. Increasingly along with

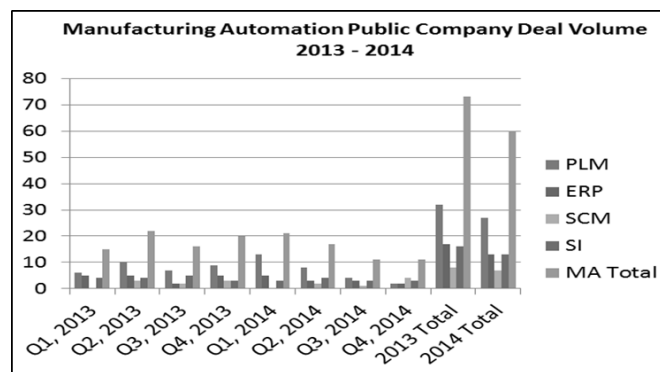


Fig. 1. Manufacturing automation public company deal volume 2013 - 2014 (Adapted from ArcelorMittal, 2014).

the mature supply chain and production technology innovation, there are challenges and opportunities for inventory control of iron and steel enterprise development.

Under the supply chain, the steel Copyright © Canadian Research & Development Center of Sciences and Cultures 98 Measures to Improve the Inventory of Steel Industry in Supply Chain Environment industry should rely on internal training to improve related employees' understanding of inventory management; They should use information sharing, centralized inventory management, IT inventory management method, and the joint inventory optimization management for process and operational efficiency; Strengthen steel sales forecast, make accurate plan for inventory; From the perspective of the supply chain, enterprise should advance the information process, to improve the market reaction speed, inventory flexibility and market competitiveness. Anyhow, iron and steel industry must be based on its own characteristics, which are not only previous supply chain cost optimization requirements, but also rapid response time target for the market. This paper combines the view point of systems engineering with the engineering method, to analyzing supply chain core enterprise inventory control system, putting the cost optimization and time optimization as a modeling way, proposing time-cost model. According to the features of China's steel industry supply chain and actual inventory management, we put forward the suggestions for enterprises inventory control. Of course, the research of multistage inventory control under the agile supply chain environment is still in its infancy. It is still in theory without many successful cases. The author is trying to do the theory research and model building etc. to rise related ideas to improve inventory management with limited knowledge. There are still some problems failed to be solved. How to solve the inventory management problems existing in the iron and steel enterprise need to be further studied and discussed.

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