

Chapter 78

Big Data and Predictive Analysis Is Key to Superior Supply Chain Performance: A South African Experience

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ABSTRACT

The study considers samples from the South African engineering companies who are strategic suppliers to mining and minerals industry and further explores the uncertainties persisting in the supply chain network. Further investigation was done to understand the role of big data and predictive analysis (BDPA) in managing the supply uncertainties. The paper finally uses partial least square regression analysis to study the relationship among buyer-supplier relationship, big data and predictive analysis and supply chain performance. The analysis supported the second and third hypothesis. Therefore, it is established that firstly, there is a positive relationship between big data, predictive analysis and supply chain performance and secondly, there is a positive relationship between and big data, predictive analysis and buyer-supplier relationship. The study is a unique contribution to the current literature by shedding light on the practical problems persisting in the South African context.

INTRODUCTION

Supply chains are constantly subject to unpredictable events that can adversely influence its ability to achieve performance objectives (Datta and Christopher, 2011). Let us first understand the current supply chain problems prevalent in South African engineering companies.

Here, the study shall limit only to “Engineer to Order” companies present in South Africa who are strategic suppliers to mining and minerals industry. “Engineer to Order” is a manufacturing process defined by demand driven practices in which the component is designed, engineered, and built to specifications only after the order has been received. It is a more dramatic evolution of a “Build-To-Order” supply chain.

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Manufacturing after receiving customer's orders means a pull-type supply chain operation because manufacturing is performed when demand is confirmed, i.e. being pulled by demand.

The problem in such supply chains become complex when there is involvement of multiple product lines. There is requirement of multiple inputs (raw material) for manufacturing process and several raw materials may also fall under bottleneck categories. For bottleneck categories there are only few suppliers who manufactures or trade with these items and these suppliers generally dictate the market.

The other problem is that for past few months the mining business is quiet. Generally, in the mining business the sub vendors (here the Engineer to order companies) get orders with shorter lead times and thus they need to always keep high safety stock of certain non-standard items such as steel reinforcements, castings, hardware/fasteners to bag the actual order and execute the job well in time to easily beat competitors. So basically the low mining business leads to rise of inventory in these Engineer to order companies. To sustain in this low order booking scenario there is always a concern for such Engineer to order companies to at least achieve break even in every month till the market actually improves. Every sales person working in these companies try to bag every single order even if the cost to profit ratio (C/P) is not attractive. The main target is always to bag orders for the mining division for products such as mill liners, trommels and dischargers where the C/P is very attractive. However, in these situations generally we find more orders for non-core products such as screen panels, cross rubbers, seals, sand nozzles etc. related to the industrial division where profits margins are less and hassles are more in terms of number of operations.

Multiple new product developments are also a source of uncertainty due to multiple times variation in the specifications during the trial stage. There are risks involved in terms of supplier disclosing the confidential information or product manufacturing recipe.

Every Engineer to order companies are nowadays doing most of the jobs on the basis of outsourcing and only performing certain specific activities in-house. The outsourcing involves laser cutting of reinforcements, bending, rolling, fabrication etc. as per provided drawings. Moreover, in some cases the injection moulding of components is also done outside. These increase the uncertainty again in terms of maintaining confidentiality and disclosure of designs and manufacturing process to competitors. Secondly there is also uncertainty related to timely delivery of items from tier one and two suppliers.

The biggest challenge for Engineer to order companies catering to mines is the demanding nature of customers. The problem in mines is that all mining companies systematically schedule their shut down period but they hardly place order in advance. This is to gain better control of cash flow in the company. They generally finalize order at a late stage even after knowing that lead times are sixteen weeks for delivery of liners for one complete mill. There is always high uncertainty for new projects where cases of product failure (de-bonding, high wear of liners) frequently happen. It leads to free replacement of liners in shorter lead time through day and night production on war footing basis. These lead to tremendous pressures on these Engineer to order companies.

The mining customer does frequent follow ups and conduct stage inspection every week to ensure that delivery date does not fail. They always push the suppliers hard to meet the deadlines even if the target date is not realistic. Representatives from mining companies visits and interact with supplier's operations team and take feedback on a regular basis. In case of any delay they cancel the order without caring that the inventory of finished goods will accumulate at supplier premises. So, there is high uncertainty at every stage of the supply chain.

The other interesting thing to note is that most of the sub-suppliers of these Engineer to order companies dictate the business and shows low level of flexibility in terms of pricing and delivery. Moreover,

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