Supply Chain Analytics:
Challenges and Opportunities

Xiuli He
University of North Carolina at Charlotte,USA

Satyajit Saravane
University of North Carolina at Charlotte, USA

Qiannong Gu
Ball State University, USA

INTRODUCTION

Firms at the different stages in a supply chain are becoming more intelligent due to the viability of big data today. Information is voluminous with profound velocity and is now extremely varied. It has become imperative for firms to utilize advanced information in order to make intelligent decisions. The availability of big data provides big opportunities but also presents big challenges in managing a supply chain. Business Intelligence and Analytics (BI&A), among other related fields of big data analytics, have become increasing important for both the academic and business communities over the past two decades (Chen et al., 2012). Globalization has enabled companies to expand their partnerships and build facilities across the globe fairly easily. This expansion has led to extensive use of technology to automate and expedite processes for better decision making in supply chain management (SCM). SCM plays a prominent role in a company's cost structure and ultimately in its profit (Deloitte Debates, 2010). Pioneering companies with significant supply chain capabilities are implementing advanced business analytics to improve forecasting accuracy, demand management, inventory planning and control, order fulfilment rate, and logistic efficiency.

Mass production processes initiated an intense global competition, which led manufacturers to adopt better supply chain strategies along with the Just-In-Time (JIT), Total Quality Management (TQM), and Business Process Reengineering (BPR) practices. Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) have transformed businesses, suggesting corrective approaches to answer "what *has* happened and what *went* wrong." In today's highly competitive market, the technology clock is speeding and product life cycles are shrinking. Companies need to know "what *is* happening and what *might go* wrong" and use analyzed and innovative approaches which are real time and fact driven to resolve those problems before damage is done.

This chapter provides an overview of this exciting and growing field, highlighting its benefits and challenges. We first review the evolution of information management technology in supply chain management. We then elaborate on Supply Chain Analytics (SCA) and review related research. We then discuss the challenges and opportunities of SCA, presenting industry examples to demonstrate how SCA has been implemented. Our final section summarizes the findings and points out future directions.

DOI: 10.4018/978-1-4666-5202-6.ch212

EVOLUTION OF BUSINESS INTELLIGENCE IN SCM

Information technology has played a dominant role in the evolution of SCM. In the 1960s, manufacturers managed their inventories focusing on the process of movement and the accountability of inventory. In the 1970s, manufacturers shifted to Material Requirement Planning (MRP) transactions. Later in the 1980s, Manufacturing Resources Planning (MRP II) came. Characteristic modules in a typical MRP II system include master production schedule, item master data, Bill of Materials (BOM), production resource data, inventory and orders, purchasing management, material requirements planning, and cost reporting/management. In 1990, Gartner Group employed the acronym ERP as an extension of MRP, later MRP II, and computer-integrated manufacturing. ERP systems experienced rapid growth in the 1990s.

ERP systems initially focused on back office operations that did not interact directly with customers. ERP systems are usually designed to record business transactions data, make changes to existing data, reconcile data, keep track of business transactions, run predefined business reports, and manage business transactions (Chou et al., 2005). Thus, traditional ERP systems are not advanced enough for current economic conditions (SAS, 2010). Firms have invested heavily on ERP, SCM, and CRM. These systems collect huge amounts of transactional data to generate reports which drive managerial decisions. The supply chain analytical solutions focusing on specific needs like point of sales (POS) reporting, inventory management, supply chain visibility, merchandise planning, business intelligence, and store size optimization can enhance the value of previous transactional data by providing forward-looking analytical insights.

ERP systems have several limitations. First, ERP systems are not designed to provide real time reports to massive users. Second, ERP, SCM, and CRM systems are integrated only on their respective modules. Third, these systems have limited integration capability with other systems. Due to its complexity, training the users of ERP can be time consuming and expensive. In our increasingly global and competitive economy, most successful companies realize that they cannot simply rely on surface-level data from scattered transactional traditional systems. Chou et al. (2005) identify the challenges of ERP in the areas of reporting capability, budgeting capability, system integration capability, and practical problems. Ritu Jain, the Global Marketing/Supply-chain Manager at SAS, commented on the ERP/SCM:

Traditionally, supply chains have been managed by transactional systems. These ERP/ SCM systems are meant to run operations in automated fashion, not to analyze data for predictive insights. Customarily, supply chains have focused on day-to-day operations: The demand is forecasted, materials are sourced to meet that demand, production plans are created based on available manufacturing assets, and then produced material is shipped per requirement. The focus is on execution, not on improving decision-making, and execution is what the traditional SCM and ERP systems are meant to do.

To overcome the shortcomings of ERP, organizations attempt to integrate ERP systems with business intelligence (BI). The term *intelligence* originated from and was related to artificial intelligence that emerged in the 1950s. BI was introduced by Howard Dresner of Gartner Group in 1989 to describe a set of concepts and methodologies designed to improve decision-making in businesses through the use of facts and fact-based systems. BI became a popular term in the business and IT community in the 1990s. A typical BI system is composed of data warehouse, data sources, data mart, query and reporting tools. BI systems use the data collected by ERP to create Online Analytical Processing (OLAP) and data mining tools to discover meaning trends and patterns. Examples of fact-based systems include executive information systems, decision support