Supply Chain Analytics in the Era of Big Data

Ching-Chung Kuo
University of North Texas, USA

Zhen Li
Middle Tennessee State University, USA

INTRODUCTION

Data is a vital raw material of the information economy much as coal and iron ore were in the Industrial Revolution (Lohr, 2011). Business data comes from many different internal as well as external sources. Today, we are living in a world of data explosion where the volume of data doubles about every 1.2 years (Byrne, 2011). According to the McKinsey Global Institute's estimates, in 2010 alone, the new data stored by enterprises exceeded 7 exabytes and consumers added another 6 exabytes, which could fill 60,000 U.S. Libraries of Congress (Manyika, Chui, Brown, Bughin, Dobbs, Roxburgh, & Byers, 2011)!

While the amount of data available can be overwhelming, much of it is noisy or unstructured. As such, an organization must have a set of tools to identify, collect, cleanse, organize, store, analyze, synthesize, and transform masses of data so that the resulting information will be of use to its daily operations. This is of particular importance since the current global market is highly volatile as evidenced by uncertain demands, competitive prices, unpredictable natural disasters, and so forth. To survive and grow in such a hostile environment, a company must rely on quality information to make sound decisions in response to customer needs in a timely and cost-effective manner.

BACKGROUND

Business Intelligence

Business intelligence (BI) is an umbrella term that refers to a collection of tools and technologies for gathering, storing, accessing, and analyzing data to aid in managerial decision-making. Common functions of BI include data mining, online analytical processing (OLAP), query, and reporting. The history of BI dates back to 1951 when the first commercial computer LEO was used for "meeting business needs through actionable information" by determining the number of cakes and sandwiches to make for the next day based on the previous demand in J. Lyon & Co. tea shops in UK (Elliott, 2011). BI began to receive more attention in the late 1960s when computers were used in decision support systems (DSS).

Over the past half century, recognition of the value of BI has led to the development of many software programs and business solution applications including Minitab, Excel, enterprise resource planning (ERP) systems, customer relationship management (CRM) systems, supply chain management (SCM) systems, and others (Kohavi, Rothleder, & Simoudis, 2002). Nowadays, BI is routinely used in virtually all functional areas of a company such as accounting, finance, operations, marketing, human resources, purchasing, and the like (Berry & Linoff, 1999). It also plays a key role in other activities and processes within an organization including fraud detection, supplier

DOI: 10.4018/978-1-4666-5202-6.ch211

relations, and customer attrition to name just a few (Kohavi et al., 2002).

Business Analytics

Traditional software packages such as Excel, ERP, and SCM are valuable for automating operations, but they are incomplete solutions to the enterprise problems today and inadequate for meeting the challenges tomorrow. This is because these systems reflect only what happened instead of what is happening or what will happen. High-performing organizations are currently in search of new approaches that will provide them with real-time information, predictive insights, data visualization, and optimal actions to gain a competitive advantage by mitigating risks and improving profitability. This is the backdrop against which business analytics (BA) emerged as a new area of research.

BA is concerned with the use of computer technologies, statistical techniques, and mathematical models to discover meaningful patterns or relationships in data for the purpose of gaining insights into business operations and making better, fact-based decisions. As a result, it enables organizations to uncover information that may be overlooked in traditional enterprise systems.

According to Evans (2013), BA is the convergence of three important academic disciplines: statistics, business intelligence/information systems, and modeling/optimization. A graphical representation of this concept and the interfaces between the three components is shown in Figure 1, which is adapted from a figure in Evans (2012, p. 6):

Paradigm Shift

BI and BA could mean different things to different people. Hall (2012) argued that intelligence is another word for information, news, and communication whereas analytics is synonymous with examination, evaluation, investigation, and scrutiny. As such, BI provides general reporting capabilities such dashboards but BA has an additional level of functionality such as forecasting and modeling.

A comparison between the traditional BI and the contemporary BA is illustrated in Table 1 (Knight, 2011). Thus, BA may be viewed as the next logical step in the evolution of BI that requires a cultural change to the acceptance of a proactive, fact-based decision-making environment to provide organizations with deeper insights and better answers more quickly.

The transition from BI to BA has significant managerial implications for a business organization. First of all, it is going to foster a company-wide change in employee attitude from being reactive in generating descriptive reports to being proactive in providing predictive and prescriptive analyses. Every decision will be made based on data as well as facts rather than guided by gut instinct, personal bias, intuition, or hunch. Moreover, real-time information is accessible to managers at all levels through a Web-based portal. Instead of holding the institutional knowledge in a few individuals' heads, every internal user of the integrated data has the required skills to perform routine analysis

Figure 1. Three academic disciplines involved in BA