

## and future trends

### Zoltán Bátor

Óbuda University, 1084 Budapest, Tavaszmező u. 15-17.,  
batori.zoltan@kgk.uni-obuda.hu

*Abstract. Supply Chain Management is a philosophy to manage logistical processes in complex systems, that are very difficult to integrate and analyze. Such systems can be effectively analysed by the use of Business Intelligence applications. The capability to make the right decision at the right time in collaboration with the right partners is the definition of the successful use of BI. This paper explains the need for Supply Chain Business Intelligence and introduces the driving forces for its implementation. New technologies such as data mining, and their role in BI systems are also discussed. Finally, key BI trends and technologies that will influence future systems are described.*

*Keywords: supply chain, business intelligence, data mining*

## 1 Introduction

Because of today's fast changing business environment successful integration and collaboration strategies among supply chain partners are needed. The business environment is influenced by increased outsourcing, new technologies, and e-business. Reduced product lifecycle, built-to-order strategies, pull-systems and uncertainty force organizations to adopt new business strategies.

Companies face pressure to increase profit, decrease cycle times, reduce inventories, improve service and adapt to future changes. Supply-Chain Management (SCM) was considered to be an effective tool for gaining competitive advantage through real-time collaboration with trading partners, and offered a new way to plan, organize, manage, measure and deliver new products and services.

In order to establish connection between customers and suppliers many companies are looking for a solution to implement an electronically operated supply chain management system. This integrated supply chain requires new software solutions and enhanced communication capabilities. The main purpose is to find a system interface that provides the capability to review and analyze varying elements of

**Z. Bátor**

Supply chain intelligence: benefits, techniques and future trends

information. The objectives for analysis of this information are to create a more efficient supply chain.

Despite of the huge amount of money invested in SCM software systems, they did not provided desired Return On Investment (ROI) so far. The main reason is that these systems mostly provide only transactional functionality. They lack the analytical capabilities required to provide an integrated view of the supply chain. This is where Business Intelligence (BI) tools like data warehousing, data mining, and OLAP (On-Line Analytical Processing) can help to analyze operational effectiveness throughout the supply chain.

## **2 Supply Chain Performance Measurement**

Supply Chain Performance Measurement (SCPM) is vital for a company to survive in today's competitive business environment. Performance measurement is one of the key aspects of management.

Measurement is important, because it's result has an impact on supply chain performance. So performance measurement provides the rules by which a company can decide whether it's supply chain has improved or not.

Unfortunately only some leader companies are currently using systems that not only measure the performance of their enterprise but also that of their extended enterprise activities.

The most popular approaches used for measuring the supply chain performance are the following: Balanced Scorecard, SCOR Model, Logistics Scoreboard, Activity-Based Costing (ABC) and Economic Value Analysis (EVA) [1].

## **3 Business Intelligence**

In the past, managers have made strategic decisions based on information concluded from reports that IT compiled by summarizing sets of frequently conflicting data.

Business intelligence systems offer to change that by pulling data from all internal systems as well as external sources to show a clear, simple view on the situation. Then this can be presented to decision makers.

From an other point of view, business intelligence is considered to be the process of transforming the raw data companies collect from their operations into usable information. Since data in it's raw form offer limited use, companies begin to use

business intelligence softwares to find out their data's full potential. So a BI software allows an enterprise easily to aggregate, manipulate and display data as useful information, or information that can be acted upon in making informed decisions.

Some companies think that it is beneficial to share BI capabilities with business partners as well as with employees. To do that, they are building Web-based BI networks to deliver information to suppliers, customers and others.

Business intelligence was once the field of only statisticians and analysts. Nowadays BI capabilities are spreading to all scopes of the organization, as companies try to put critical data into the hands of business users who need it to do their jobs. Users want the following from their business intelligence systems: [2]

- The ability to run ad hoc queries
- Access to multiple databases
- Scalability, affordability and reliability
- Capability of integration with other systems

Many surveys published by the leading market research firms show that BI becomes more important. While other segments of the enterprise software sector are suffering, interest in business intelligence continues to rise [3].

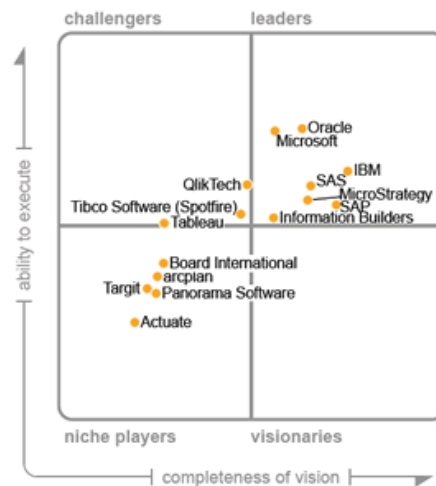


Figure 1.

2010 Magic Quadrant for Business Intelligence Platforms [4]

### **3.1 BI Benefits**

Implementing a data warehouse and using business intelligence and data mining technology can provide a significant benefit. For example, it can be used to: [5]

- Analyze the performance and quality of the resource, for example, by comparing the process activity duration times across different resources
- Understand and predict exceptions. BI can be used to understand the real cause of problems and, hopefully, avoid them based on knowledge gained from past process behaviour
- Optimize processes. With BI, you can discover conditions under which specific paths of the process are executed, so you can redefine the process
- Improve process execution times. Analyze process execution times and quality testing configurations of the system, assignment of resources and dynamic adaptation of the process

## **4 Supply Chain Intelligence**

Supply Chain Intelligence (SCI) provides the capability to show opportunities to cut costs, stimulate revenue and increase customer satisfaction by utilizing collaborative decision making. SCI takes a broader view of the supply chain in which, using patterns and rules and useful information about the data can be discovered.

The focus of SCM technologies primarily has been on providing operational and transactional efficiencies in the areas of sourcing, manufacturing, and distribution activities within a firm and across the supply chain. Applying the concepts of business intelligence to data from SCM systems, SCI technologies try to provide strategic information to decision makers. Information categories range from what-if scenarios in sourcing, manufacturing and distribution to measuring the ability of a supply chain to produce cost-effective products. The primary source systems for BI are the internal operational systems, while SCI integrates data from partner and supplier information systems. The main difference between SCI and BI is the ability to collect and aggregate data across the value chain. Data is then analyzed and the results distributed to all parties along that chain. SCI also supports supply chain planning when offers more sophisticated tools for related business process changes. To support their supply chain projects, some companies are using BI tools to: [6]

- Improve data visibility so as to reduce inventory
- Analyze customer service levels to identify specific problem areas

- Better understand the sources of variability in customer demand to improve forecast accuracy
- Analyze production variability to identify where corrective measures need to be taken
- Analyze transport performance to reduce costs by using the most efficient transport providers

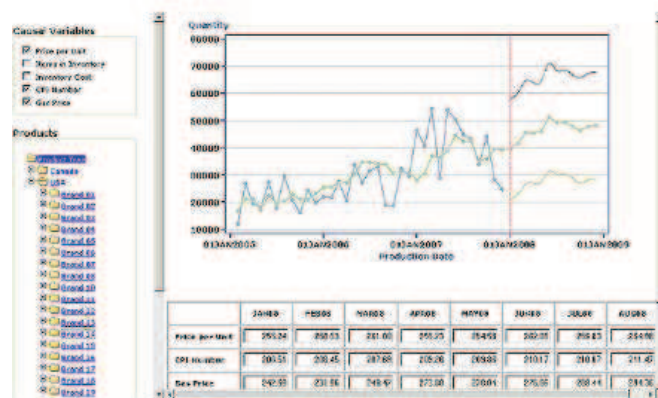


Figure 2.

What-if analysis and simulation [7]

By providing wider visibility to plans and supporting data, BI tools increase the performance of other applications because they help companies understand where and how they depart from their planned objectives.

Demand forecasting is one of the key applications of data mining. Complex demand forecasting models can be created using a number of factors like sales figures, basic economic indicators, environmental conditions. If correctly implemented, a data warehouse can significantly help in improving the retailer's relations with suppliers and can support the SCM application. SCI can have the following industrial applications in the area of supply chain management: [8]

- Sales/Marketing: providing analyses of customer specific transaction data
- Enabling retailers to know not only what's selling but who is buying it
- Strengthening consumer pull
- Forecasting: using scanning data to forecast demand and, based on the forecast, to define inventory requirements more accurately
- Ordering and replenishment: using information to make faster, more informed decisions about which items to order and optimum quantities
- Purchasing/Vendor Analysis: helping purchasing managers to understand the different cost and timeliness factors of each of their suppliers

## Z. Bátori

### Supply chain intelligence: benefits, techniques and future trends

- Distribution and logistics: helping distribution centres manage increased volumes. Can use advance shipment information to schedule and consolidate inbound and outbound freight
- Transportation management: developing optimal load consolidation plans and routing schedules
- Inventory planning: helping identify the inventory level needed, item by item, to ensure a given grade of service
- Stock location planning: helping warehouse planners assign products to locations so as to minimize distances, improve efficiency
- Finished goods deployment: balancing supply, demand, and capacity to determine how to allocate limited quantities of finished goods

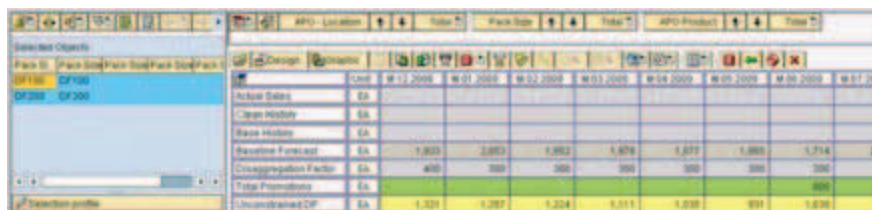


Figure 3.  
Demand forecast [9]

## 5 Data Mining

Data mining allows us to comb through our data, notice patterns, exceptions and making predictions about the future. It can be defined as the analysis of observational data sets to find unsuspected relationships and to summarize the data.

Data mining applies algorithms, such as decision trees, clustering, association, time series to a dataset and analyzes it's contents. This analysis produces patterns, which can be explored for valuable information. Depending on the underlying algorithm, these patterns can be in the form of trees, rules, clusters, or simply a set of mathematical formulas. The information found in the patterns can be used for reporting, as a guide to supply chain strategies, and for prediction [10].

The main characteristics of data mining intelligent applications are:

- Make decisions without coding: data mining algorithms learn business rules directly from the data, freeing you from trying to discover and code them yourselves

- Customized for each client: data mining learns the rules from the client's data resulting in logic that is automatically specialized for each individual client
- Automatically update themselves: as client's business changes, so do the factors that impact their business. Data mining allows application logic to be automatically updated through simple processing steps. Applications do not need to be rewritten, recompiled or redeployed and are always online

Data mining techniques can be applied to many applications, answering various types of businesses questions, such as demand forecasting, inventory prediction, customer and product segmentation, risk management.

Over the next few years, data mining technology should significantly grow, thanks to business applications and database software vendors.

## **6 Conclusions**

Organizations working together as part of a collaborative supply chain have resulted the need for better information exchange.

To succeed in a competitive marketplace, a successful supply chain requires business intelligence (BI) systems to quickly anticipate, adapt, and react to changing business conditions. BI systems provide sustainable success in a dynamic environment by empowering business users at all levels of the supply chain and enabling them to use actionable, real-time information.

Supply chain intelligence offers opportunities to reduce costs and stimulate revenue growth and it enables companies to understand the entire supply chain from the customer's perspective.

In this paper the latest supply chain management issues and the drivers for the implementation of business intelligence systems were discussed.

BI challenges and benefits, as well as applications of BI technologies in the supply chain management domain were also presented. Finally, the main BI trends and advanced IT technologies that will affect future BI systems were introduced.

**Z. Bátori**

Supply chain intelligence: benefits, techniques and future trends

### References

- [1] Lambert, M.D., Pohlen, L.T.: Supply Chain Metrics, The International Journal of Logistics Management, 2001, vol. 12, 1–19
- [2] Mohamed Z. Elbashir, Philip A. Collier, Michael J. Davern: Measuring the effects of business intelligence systems: The relationship between business process and organizational performance, International Journal of Accounting Information Systems, Volume 9, Issue 3, September 2008, 135-153
- [3] Olszak, Ziemba: Approach of building and implementing business intelligence systems, Journal of Information, Knowledge and Management, 2007, vol. 2, 137-145
- [4] <http://www.microstrategy.com/company/gartnerquadrant.asp>
- [5] Steve Williams, Nancy Williams: Business intelligence readiness: Prerequisites for leveraging business intelligence to improve profits, The Profit Impact of Business Intelligence, 2007, Pages 44-64
- [6] Mircea, Andreeascu: Using business rules in business intelligence, Journal of applied quantitative methods, 2009, vol. 4, 382-390
- [7] <http://www.sas.com/solutions/sci/ddf.html#section=4>
- [8] Martin Verwijm: Software component architecture in supply chain management Computers in Industry, Volume 53, Issue 2, February 2004, 165-178
- [9] <http://www.sas.com/solutions/sci/forecastSAP.html#section=4>
- [10] Sigurdur Olafsson, Xiaonan Li, Shuning Wu: Operations research and data mining, European Journal of Operational Research, Volume 187, Issue 3, 2008, 1429-1448