Organizational readiness for implementation of Supply Chain Analytics

Hamid Nemati  
Greensboro, NC, United States., nemati@uncg.edu

Antara Udiavar  
Greensboro, NC, United States., amudiava@uncg.edu

Follow this and additional works at: http://aisel.aisnet.org/amcis2012

Recommended Citation  
http://aisel.aisnet.org/amcis2012/proceedings/DecisionSupport/26

This material is brought to you by the Americas Conference on Information Systems (AMCIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in AMCIS 2012 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.
Organizational readiness for implementation of Supply Chain Analytics

**Dr. Hamid Nemati**  
Department of Information Systems and Management  
Bryan School of Business  
University of North Carolina Greensboro  
North Carolina, USA  
hnemati@uncg.edu

**Antara Udiavar**  
Department of Information Systems and Management  
Bryan School of Business  
University of North Carolina Greensboro  
North Carolina, USA  
amudiava@uncg.edu

**ABSTRACT**

Supply chains today are amassed with data. To remain competitive in a global economy, supply chain organizations need to constantly derive meaningful information from this plethora of data and make critical business decisions. This process is referred to as Supply Chain Analytics (SCA). This paper attempts to measure the readiness of organizations to implement Business Analytics (BA) – a more generic form of SCA. In this paper, we present a framework to assess the organizational readiness to implement SCA. This framework classifies SCA implementation issues in four broad categories – data standardization and integration requirements, infrastructure requirements, technical and non-technical requirements, and organizational culture and strategic requirements. We report the results of a study of 112 respondents in 7 countries from various industries and professional backgrounds.

**Keywords**  
Supply chain, analytics, business intelligence, organizational readiness

**INTRODUCTION**

Supply chain management (SCM) includes the active management and planning of activities involved in the sourcing, procurement, conversion and the transportation of services and goods from point A to point B by collaborating with a number of partners such as suppliers, intermediaries, third part service providers and end customers (Supply Chain Management Definitions - Council of Supply Chain Management Professionals, 2011). Undoubtedly, such an integrated network of channel partners creates a plethora of data (Symeonidis, Nikolaidou, & Mitkas). In spite of this, a number of supply chain companies find themselves “data rich yet information poor” (Stefanovic, Stefanovic, & Radenkovic, 2008). In order to compete with increased local and global competition and well as to gain a strategic advantage in today’s economy, it has become imperative for companies to use this wealth of data to their advantage.

Vaidyanathan et al. (Vaidyanathan & Sabbaghi, 2010) define Supply Chain Intelligence (SCI) (Stefanovic, Radenkovic, & Stefanovic) as a means of extracting and generating meaningful and intelligent data from the vast amount of data available in various SCM processes to improve efficiency, anticipate customer demands, improve product quality and improve supply chain strategies. SCI often results from Business Intelligence (BI) which offers a way to analyze business data for making more informed business decisions and eventually value creation.

Using historic sales data, a company could possibly forecast their future sales. Using Matlab simulations, Tozan (Tozan & Vayvay, 2008) explores the methods of utilizing fuzzy approaches (fuzzy linear regression, fuzzy time series and neuro-fuzzy forecasting models) in forecasting whiplash or the bullwhip effect in supply chain. Utilizing a weighted combination of statistical forecast methods (studying historic data to predict future trends) and “judgmental” methods (judgments from subject matter experts); Kabak et al. devised a fuzzy logic-based aggregation procedure to forecast demands (Kabak & Ülengin, 2010). Utilizing a hybrid system involving Autoregressive Integrated Moving Average (ARIMA) models and neural networks, Weber et al. discovered improvements in the demand forecasting accuracy rates in turn leading to better inventory management and sales failures. Recurrent Neural Networks (RNN) and Support Vector Machines (SVM) forecasting techniques were compared with more traditional techniques and RNN and SVM were found to have the best results (Carbonneau, Laframboise, & Vahidov, 2008).
Better sales forecast translate into better inventory management. Inventory management is a crucial process in SCM in any domain. But in the medical industry, inventory management requires heightened caution given the stringent expirations of the medications yet the urgent medical needs of the customers. Bansal et al. (Bansal, Vadhavkar, & Vadhavkar) explore the options of using neural networks based data mining applications for enhancing inventory management especially in the medical field. They believed that creating a neural network could “learn” customer demands and manage the inventory accordingly. Partovi et al (Partovi & Anandarajan, 2001) confirmed this analysis by stating that the back propagation (BP) and genetic algorithms (GA) methods of artificial neural networks (ANN) had comparable predictive accuracy. And this was higher than the multiple discriminate analysis (MDA) technique. Dhond et al (Dhond, Gupta, & Vadhavkar, 2000) advise that the problem of too few or irregularly timed input data points could be overcome using either techniques of “Linearization” or “Moving Windows”. Aldasorol et al. (Reyes-Aldasoro, Ganguly, Lemos, & Gupta, 1999) took this thought a step further. They compared a “traditional” model of replenishing inventory based on a threshold inventory levels with neural networks which drove replenishment based on predicting future demands and found both to be satisfactory. But they determined that a hybrid model which involved both these methodologies and another parameter – customer satisfaction levels – provided the best results.

Companies could additionally utilize data mining and business analytics to determine who their most profitable customers are. This will help them to improve their Customer Relationship Management (CRM) strategies and, in turn, lead to increased revenues. Folorunso et al. (Folorunso, Ogunde, Vincent, & Salako, January-April, 2010) hypothesize that “retail data mining” can go a long way in identifying consumer trends, discover customer-shopping patterns, improve customer service and achieve better customer retention. Market basket analysis and formulation of marketing and sales strategies are other direct applications of “retail data mining”. Analytical Customer Relationship Management (aCRM), as defined by Bhattager et al. (Ranjan & Bhatnagar, 2010), involves analysis of customer data sourced from a number of different touch points utilizing analytical tools like data mining to find existing trends in the market and patterns in customer data (Xu & Walton, 2005). Bayer et al. invented a suite of services which can predict which customers are most likely to respond to a future promotional research (Bayer & Collins, Analytic data set creation for modeling in a customer relationship management system, 2001) and perform customer pattern detections based on customer purchases (Bayer & Collins, 2008). Utilizing information such as previous purchase history, accounting data analysis and customer trouble analysis, Sakuma (Sakuma, 2002) recommends a way to satisfy the requirements of a seller while meeting the requirements of the end customer.

Not just can business analytics help the various partners in a supply chain, it can also assist third party logistics (3PL) companies to standardize and improve the service to their clients by providing in-depth analysis and reporting information for the various services while also improving their own support functions by providing an integrated view of the organization (Nwabani). 3PL companies can save between 10% to 40% on operational costs if they improve their decision making such as optimal selection of inventory placements and transportation nodes (Paul, Saravanan, & Thangaiah, 2011).

Manufacturing processes, transportation management, supplier intelligence are the other areas of the supply chain process that can benefit from business intelligence. Öztürk et al. (Öztürk, Kayalıgil, & Özdemirel, 2006) demonstrated that the regression tree data mining model is one of the more superior methodologies in made-to-order manufacturing lead-time estimations. Using clustering, Agard et al. (Agard & Kusiak, 2005) advise that the data generated from the manufacturing processes could be utilized to select the manufacturing process. Transportation costs can be significantly decreased by mining freight data along with vehicle, driver and accident event information (Paul, Saravanan, & Thangaiah, 2011). Kruk et al. (Kruk, Quigney, & Kasravi, 2002) devised a system to use an organization’s procurement data to make intelligent supplier selection decisions. Kasravi et al. (Kasravi, Quigney, Kruk, & Varadarajan, 2002) invented a mechanism to utilize text mining to extract valuable information from a wide array of electronic contracts.

Clearly, Supply Chain Analytics can add significant value to organizations in a supply chain. Yet, according to a recent report by Aberdeen group, only 20% of small and medium sized businesses and 50% of large businesses utilize supply chain business intelligence (Oxford Consulting, 2011). There is a pressing need to formalize the implementation of Supply Chain Analytics (SCA) in a way that it is flexible enough to be tailored to each business’s customized needs and yet be robust enough to provide the array of elementary supply chain processes that can be implemented enterprise wide. But before a sophisticated SCA framework can be implemented, there is a need to determine the organizational readiness for implementation of SCA.

Using survey results, this paper attempts to determine how organizations today are positioned to adopt Business Analytics – a more generic form of Supply Chain Analytics. The research methodology of a survey conducted as part of this research is discussed and the results are presented.
FACTORs INFLUENCING SUPPLY CHAIN ANALYTICS

The belief is that SCA could influence the success of supply chain organizations by aggregating tangible and intangible benefits at an organizational level. The next step is to determine the organizational readiness for implementation of SCA. Nemati and Barko (Nemati & Barko, 2003) identified four main factors influencing success of organizational data-mining (ODM) projects: Data Issues, Technological Issues, People Issues and Organizational Issues. SCA projects are a specific type of ODM projects. Taking that thought a step further; the belief is that the success of SCA projects is determined by: Data Requirements, Technical and Non-Technical Requirements, (Business Analytics) Infrastructure Requirements and Organizational Strategy and Culture. There may, and possibly are, numerous other factors improve the success of SCA projects. But the belief is that these four requirements are the bare minimum necessities to ensure the success of SCA projects. Hence, the readiness of an organization to implement SCA would need to be measured against these four parameters. Figure 1 depicts the primary factors proposed to measure organizational readiness for implementation of SCA.

Figure 1 – Primary factors to measure organizational readiness for implementation of SCA

Data requirements

The fundamental input to any analytics implementation is good quality and integrated data (Nemati & Barko, 2003). As mentioned above, any process or industry which is part of a supply chain today is awash in data. The challenge, however, is in acquiring data which is of good quality, fully integrated with the rest of the organization and the supply chain and representative of the process it originates from.

To a certain extent, implementation of SCM/ERP/CRM applications may help in collecting and accumulating this data. However, according to an IW/SAS SCA survey (SAS & IW, Supply Chain Analytics: Beyond ERP and SCM), only 12% of the respondents were satisfied with this mechanism of data acquisition and analysis. Besides, given the number of internal and external partners involved in a supply chain, data tends to be very disparate and unstructured. Bringing together data – be it from point-of-sale systems, online websites, telephone orders, real-time conveyor information from the warehouse or inventory information – in a format that can be effectively utilized by Business Analytics tools can be a challenge.

Infrastructure requirements

Another important aspect of a successful analytics implementation is the infrastructure to support it. While each individual organization’s data and infrastructure requirements may vary, certain standard infrastructure requirements are necessary. If there is already an existing infrastructure of data collection and storage, then some form of data warehousing activity is necessary to clean the data and make it compatible with the Business Analytical tools. If a new set up is required, then the two important activities are organization of data into traditional relational databases and the integration of previously undefined data (nGenera, 2008). In either case, infrastructure to identify the data source, stage and store it, analyze it and finally report it are crucial infrastructural requirements for successful implementation of Business Analytics (Kumar & Deshmukh, 2005).

Technical and non-technical requirements

For an enterprise level activity such as Business Analytics, a team of technically sound professionals such as data warehouse and analytical professionals are required to design and maintain such a system. However, true success of Business Analytics endeavors is experienced when technical knowledge is combined with solid functional and domain knowledge. Equally, if
not more, important is a team of project and business leaders who can set the vision for their respective teams and ensure that their projects receive all the required human and technical resources and the crucial executive support (nGenera, 2008).

Organizational culture and strategy

The culture of an organization plays a very vital role in the success of a Business Analytics implementation. Traditionally, experience, intuition and peer consultation by the senior executives drove a majority of the decisions in organizations. But with mountains of data piling on every minute and the need for quick decision-making, today it has become imperative for organizations to open their eyes to the idea of using their data to make intelligent and effective decisions. Business unit heads now need to identify their distinct capability – one that gives them the required edge in the market place, formulate strategies on how SCA could drive this vision and then carefully execute those strategies (nGenera, 2008).

RESEARCH METHODOLOGY

To determine the readiness of organizations to implement SCA, a survey was conducted to understand the use of Business Analytics (a more generic form of Supply Chain Analytics) in organizations, if any. Broadly, the following categories were evaluated - data requirements, infrastructure requirements, technical and non-technical requirements and organizational culture and strategy. This survey, consisting of 24 questions, was sent out via e-mail to over 150 participants in around 6 countries ranging from North America to Australia. The database of respondents was constructed mainly using personal contacts. A reminder e-mail was subsequently sent out to participants who failed to respond to the original survey request. A total of 112 usable responses were received and analyzed.

The first part of the survey attempted to gauge the organization culture and strategy towards Business Analytics implementation. The users’ agreement was measured on a 5 point Likert scale (1=“Very inclined” to 5=“Very Disinclined”). The second part of the survey contained questions to determine the current state, if any, of Business Analytics in the organization and the infrastructure to support it. The third part of the survey attempted to gauge the success of any Business Analytics projects implemented in the organization. The fourth part of the survey attempted to determine the level of maturity of data management in the organization. And the last section of the survey contains firmographic and demographic questions.

RESULTS AND DISCUSSIONS

The descriptive analysis of the survey results is as depicted below. Over 60% of the respondents were from US-based organizations (as shown in figure 2); 50% of whom had a total strength of 5000 and more employees (as shown in figure 4). As depicted in figure 9, the majority of the participants (29%) had more than 15 years of total work experience and around 27% of them had between 6 and 9 years of total work experience. A little less than one-third of the respondent’s belonged to organizations which had annual revenues between $500M and $999M (as shown in figure 3). The majority of the respondents (37%) were middle management professionals although there was substantial representation (36%) from analyst-level roles as well as shown in figure 8. As shown in figure 13, nearly 80% of them believed that Strategy and Planning was the area in their organization that would most benefit from using BA followed by SCM/Operations (57%). Figure 11 depicts that a very small percentage (14%) of the respondents believed their organizations already had the right analytics talent; instead 55% of them believed that their organization had plans to increase their analytic talents. As shown in figure 5, nearly a third of the respondents primarily worked in the transportation and warehousing domain followed by finance and insurance domains.
Figure 2 – Respondents’ organization headquarters

Figure 3 – Range of annual revenues of respondents’ organizations

Figure 4 – Principal industries in which respondents’ organizations operated in

Figure 5 – Principal industries in which respondents’ organizations operated in
Figure 6 – Decision making techniques used by senior management in respondents’ organizations

Figure 7 – Culture of respondents’ organizations

Figure 8 – Respondents’ designation

Figure 9 – Respondents’ years of professional experience
Some other interesting results which were derived from this descriptive analysis were that dynamic/entrepreneurial oriented as well as production oriented organizations appeared to have a higher likelihood of organizational readiness for implementation of SCA over the other organizational cultures as depicted in figure 7. This would make sense given that production oriented organizations would like insights on how they can improve their performance and gain advantages over their competitors. Also entrepreneurial organizations having minimal past performance to judge would rather go off a systematic decision support system as against intuition or personal experiences.

Similarly, as can be seen from figure 12, organizations with global operations appear to have greater organizational readiness for SCA over their more localized counterparts. Again, one can see why this may be true. Organizations with international footprints have global competitors and international markets to compete in. And here again, it would make more sense to let a decision support system drive your future business plans instead of going of an individual’s or a certain team’s perceptive or ideas.

29% of the respondents believed that business analytics was utilized across their organization whereas a mere 5% of the respondents believed that their organizations did not implement business analytics at all (figure 10). This indicates the growing popularity of business analytics in organizations today.

Analyzing the survey results by designation (figure 8) as well as the employee's perception of how they believed senior management in their organizations implemented decision-making (figure 6) revealed that all respondents who were at a C-level position believed that personal experience played a crucial role in their decision-making while 80% of them believed that fact-based decision-making drove their decision-making. Only 63.41% of the middle managers believed that decision making in their organization is driven by personal experience while only 56.09% believed that decision making in their organization is fact-based. These numbers, as reported by analysts, were 67.5 and 57.5% respectively. 86% of the

---

**Figure 10 – Current use of Business Analytics in respondents’ organizations**

**Figure 11 – Current state of Business Analytics in respondents’ organizations**

**Figure 12 – The footprints of respondents’ organizations**

**Figure 13 – Departments in respondents’ organizations that will likely benefit most from a BA implementation**

---
respondents who were at C-level positions believed that Business Analytics will improve their CRM strategies and overall profits. These numbers were 58.54% and 51.22% respectively for respondents who were at a middle managerial level and 63.41% and 60.98% for analysts. Nearly 66% of middle managerial level respondents and 58.54% of the analysts believed that Business Analytics will improve their forecasting capabilities. These results highlight how perspectives vary largely across designations and how near-similar designations share similar perspectives about the use and benefits of Business Analytics.

While this survey was focused mainly on generic business analytics projects, the belief is that SCA projects are a specific type of business analytic projects and may have additional factors influencing its successful implementation. These projects are likely affected by the same fundamental factors that most generic BA projects are affected by and hence could serve as a measure of the organizational readiness for implementation of SCA. The belief is that sustained and repeatable SCA success could eventually drive organizational success as depicted in Figure 14.

CONCLUSION

Given the numerous advantages and business benefits that SCA presents, SCA could revolutionize the SCM industry. However, SCA implementation calls for organizational readiness. Using the empirical results from the survey conducted as part of this study, four main factors – standardized and integrated data, well-established infrastructure, sound technical and non-technical expertise and the organizational culture and strategy – were identified which could gauge organizational readiness for SCA project implementations were determined and the level of their influence on project success was measured. Continued and repeatable success in SCA projects could contribute to organizational success. The hope is that this study could contribute to any ongoing research about the factors influencing success of SCA projects and/or organizational success.

REFERENCES


23. SAS, & IW, R. (n.d.). **Supply Chain Analytics: Beyond ERP and SCM.** SAS.


