Pharmaceutical Supply Chain Management Using Semantic Web Technology: Case Study

The growing product portfolio of **Biogen Idec** (Weston, MA) was resulting in rapid domestic and international expansion, leading to an increasingly complex pharmaceutical supply chain. Harmonized data reporting and real-time information were needed in order to move toward a risk-based model for contractor assessments and batch release. To meet this challenge, the company chose Anzo software from **Cambridge Semantics** (Boston, MA), which allows business users to search for, virtualize, analyze, act on, and make decisions with any internal or external, structured, or unstructured data. Based on the revolutionary flexibility of semantic web technologies, the software provides operational business process integration for just about any formal or informal business activity.

Using the Anzo software suite, **Biogen** was able to leverage existing contract management organization (CMO) metric sheets and synchronize data between spreadsheets for all users. This allowed the company to maintain visibility regarding daily operations while adding the ability to track and create new key performance indicators (KPIs) on demand, all with minimal disruption to existing business processes.

Supply chain management solution

Chris Beganski of the global supply chain management team was tasked with tracking additional key performance indicators (KPIs) and providing real-time visibility to the company's supply chain batch release operations to answer fundamental questions like "What lot releases are due next week?" and "How long does it take us on average to release lots?" The organization wanted to evaluate using more risk-based metrics in their planning process, which

would require new, additional data to be collected and integrated (see *Figure 1*).
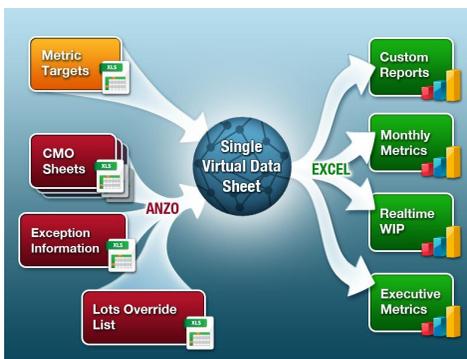
*Figure 1 Information architecture of inputs and outputs utilizing Anzo for the **Biogen Idec** supply chain management solution. Users interact with Microsoft Excel spreadsheets that are connected to Anzo through the Anzo for Excel plugin. As data are entered into the various input spreadsheets such as the CMO spreadsheets, Anzo receives the updates and pushes the updated data to other Excel-based reports, keeping everything in sync. In this way, all reports present near-real time visibility into all supply chain metrics.*

For years **Biogen Idec** had been managing a significant portion of its day-to-day supply chain operations using Microsoft Excel spreadsheets, as is very common in life sciences and other industries. Each supply chain CMO representative had his or her own spreadsheets that contained up-to-date, operational data regarding a specific piece of **Biogen's** global supply chain process. The spreadsheets were tailored to meet each individual's needs, and consolidation of data between sheets (metrics) was time consuming because it required manual processing each time an overview was needed. The system was effective at tracking day-to-day operations and reasonably easy to use since every representative was proficient in Excel, but it was difficult and laborious to determine how the supply chain was performing as a whole. Additionally,

few KPIs were collected or analyzed since, in some cases, the data were so scattered and incomplete.

To tackle this problem, Chris began by standardizing the spreadsheets that were already being used across the supply chain organization. Next, he wrote macros to automatically pull data from the dozens of documents across the supply chain management team into a single report that allowed for the reporting of nine KPIs that management had initially identified as most important. This solution worked for awhile, but eventually started to break down as new CMOs were added, requirements changed, and the amount of data grew.

"The old system was not scaleable," explained Chris. "We went from 10 initial spreadsheets to over 60 with more being needed weekly. With this continuously expanding system, it was basically impossible to track new kinds of information or add new metrics. We considered leveraging the existing Oracle system since some of the data already resided in that system, but were worried that it wouldn't provide enough flexibility as our needs were constantly changing, and we were concerned that it would require too much active maintenance by IT. Plus it would mean a lengthy implementation initiative spanning multiple departments for a process that was really in its initial stages. We really needed something to work yesterday and it was vital the solution would have minimal disruption to the existing operations."

"Another option we considered was Access," Chris continued. "We elected to not take this route mainly because the reporting capabilities in Access are limited and restrictive compared to what you can do in Excel. We needed a platform where we could quickly build ad-hoc reports, adjust them based on end user feedback, and then rapidly distribute them so people can use them to then manage the business. The Anzo system is really the key piece of the solution because it allows us to merge the data from different spreadsheets into one, centralized data set which is absolutely critical."

The company was already using the Anzo suite to store bibliographic data for publications and to manage IT assets. Anzo was

designed to quickly pull together data from multiple spreadsheets and, critically, incorporate additional data and generate new metrics without needing extensive modifications or requiring significant time.

The software enabled linking the data from many different spreadsheets as well as other managed systems—including exported deviation information from their quality system as well as performance targets for the CMOs—into a single view. It could then keep each of the spreadsheets synchronized in real time—both with each other and with data from the other systems—providing up-to-the-minute reporting accuracy on the status of material in the supply chain. The end result is a dynamic system in which data are entered in real time and progress can be seen instantaneously (*Figure 2*).
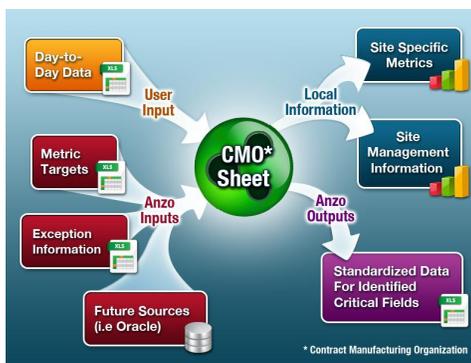

Figure 2 Information flowing into and out of an individual CMO spreadsheet. Each CMO spreadsheet is connected to Anzo via the Anzo for Excel plugin. As information changes in other spreadsheets or in other databases, Anzo updates the CMO spreadsheets to ensure that all spreadsheets always have the most up-to-date data. Similarly, as the CMO user updates a specific CMO spreadsheet, other spreadsheets and databases downstream are kept up-to-date.

"Management has even considered adding one of the spreadsheet reports to the local TV monitors so everyone can see the live data. They've never had this kind of visibility before," said Chris. Anzo's flexible data model has also enabled Chris to make changes as needed—including defining additional KPIs and tracking new kinds of information—without having to upgrade multiple reports and without having to hand-edit the dozens of existing sheets, one

at a time. For **Biogen Idec**, this benefit was very important.

"Just recently, an opportunity was proposed at our weekly meeting to include new information on the individual sheets that would help us better understand and manage the department workload. By the next day, with less than an hour of programming, this suggestion was turned into a functioning report that is now used to help shift resources based upon the needs of the supply chain and team member availability." Chris went on to say, "More importantly, because Anzo links all the CMO data we are tracking, we can use this same report for other sites including our international operations. This is another example of how we are continually sharing best practices across our organization."

Another example of this flexibility was when Chris was able to enhance the process by adding an "exclusions" functionality. When other supply chain representatives started using Anzo with their spreadsheets, management observed that some of the data integrated into the system were incomplete, and were errantly skewing the report metrics. Wanting to leave whatever historical data already existed in the system, Chris was reluctant to remove the data from the original sheets, so he leveraged the capability of data sharing within the Anzo system to include a table that excluded certain lots deemed to be incomplete by the team, and he did this all without having to involve IT. This adaptability is critical to the company's future growth plans.

Semantic web technology
Anzo's data model is the industry semantic web data standard from the W3C, known as RDF. Its key difference as compared to standard relational database models is that the designers of RDF started with a flexible data model and make an Open World Assumption, i.e., one assumes that one never has all the facts. Semantic web data models are expected to change over time, and RDF is designed to be permissive of changes to data with minimal bother.

"All of our customers come to us needing more flexibility than existing data manage-

ment systems or reporting tools can provide," said Lee Feigenbaum, co-founder of **Cambridge Semantics**. "When we started working with RDF around 10 years ago, we knew we had come across something that could provide incredible flexibility to running software systems. The challenge in the intervening years for us has been how to make this flexibility easy to manage for regular users. Integration with Microsoft Excel has been an ideal way to bridge the gap."

Optimized pharmaceutical supply chain management
The flexibility provided by Anzo means that **Biogen Idec** has options when managing its supply chain. In particular, the supply chain team can continually integrate and adjust their risk-based supply chain KPIs and best practices, which often requires new kinds of information at the source level. This is a continuous process that the company expects to adjust and refine; a tool that provides the adaptability needed with as little overhead as possible is thus very attractive to the supply chain management team.

Another key feature is that individual users can create their own metrics. While the overall supply chain process for **Biogen Idec** has certain checkpoints and global KPIs, individual, specific parts of the process also have their own metrics that are of interest. Using Anzo, users are not limited by a single set of global metrics and can adjust to whatever level of analysis is needed.

When asked about the specific ROI related to being able to provide management with new KPIs, Chris replied, "How do you put a value on now being able to know something that you didn't know before?" He then went on to add, "The important thing for **Biogen** is that we've proven we can use Anzo to effectively and efficiently adapt to future changes in our supply chain and feel we are well positioned to successfully meet the challenges to come."

*Mr. Gonzalez is Senior Product Manager, **Cambridge Semantics**, 316 Stuart St., 4th Floor, Boston, MA 02116, U.S.A.; tel.: 617-299-9762; e-mail: rob@cambridgesemantics.com:http://www.cambridgesemantics.com/products/anzo-express*