Improving Supply Chain Management for the Mining and Metals Industry

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The mining and metals sector is among the last significant industrial area to begin to move forward aggressively with the use of integrated computer systems to renew and improve all areas of the enterprise. These areas include financial management, materials management, maintenance, processing/production, and the supply chain. Momentum is beginning to build now in the mid-1990s, to embrace the information technologies available off-the-shelf to significantly renew these and other business processes across the value chain that, in many cases, have remained unchanged for decades. The impetus for this movement is rooted in the belief, on the part of early adopters, that there is a solid business case for change, a business case which helps to significantly address executives’ long-term business concerns about maximally leveraging corporate assets and stakeholder/shareholder value.

In prior years, the business case for change enabled by integrated systems was questionable. Today, each company and sector situation is different, and unique economic or operational complexities greatly can influence whether major investments in information technology (IT) truly make sense given investment constraints. The very recent advent of powerful, flexible and more cost-effective integrated system platforms from reputable vendors has changed the dynamic and created a new window of opportunity that merits a business, not technology-driven, analysis.

It is important to start by examining three key issues facing mining and metallurgy companies today.
• Volatility of commodity prices. Predictability of the factors affecting the balance between supply and demand is becoming increasingly complex. Witness the impacts of recent events such as the Asian flu, major banks selling off massive amounts of their gold reserves, and copper prices over the last year.

• Operating efficiencies and cost control. In today’s competitive global economy, base metals producers continue to be price takers. Pressure will continue to build on producers’ abilities to provide superior customer service, with the necessary speed and agility, at the lowest possible cost structures.

• Management information systems and technology. The past 5 years have produced an explosion in the power and availability of tools to provide strategic, tactical, and operational decision support to companies.

Our surveys also provide some insights. For example in the contexts of operating efficiency, process changes and decision support, 66% of CIOs surveyed expect an increase in business process reengineering (BPR) activity, including supply chains. Today, of all the drivers of organizational change, one of the largest is supply chain reengineering. And almost invariably, the results of that process mean significant pressures on IT. Remarkably though, a surprising number of BPR projects still take place without IT involvement, approximately one in four, either because IT is out of touch with the business or simply is excluded.

Still the question remains: how can a company achieve its business objectives without IT involvement? Or similarly: how can IT deliver value when it inherits other people’s systems or decisions?

Analysis of the survey shows that in the context of IT expenditures, companies have four areas they must evaluate if they are to improve their supply chain operations.

1. Control the duplication of technology. Simplicity is better. Conversely, complexity is expensive.

2. Manage build vs. buy decisions for technology solutions. With the availability of new and powerful packaged solutions, companies need a compelling reason to justify building their own systems.

3. Deploy technology strategically. Before buying, first build a clear business case. The alternative is a technological Tower of Babel; more to support, more confusion, more to go wrong.

4. Manage the human resources aspect of technology. Poor IT supply chain decisions manifest as unfavorable human symptoms: increased training needs, stress on the job, recruiting problems, unchecked outsourcing, and so on.

Supply chain management encompasses a number of key business processes. These include managing the flow of materials, funds, and informa-
tion from suppliers through manufacturing, transportation, and distribution to customers. It also supports the revenue-generating activities of the company.

Our survey highlights a major challenge in supply chain management today: leveraging advances in technology and systems to manage the flow of information within the supply chain. Managing this complex network requires timely access to information to facilitate rapid decision making.

Production must be optimized to realize maximum efficiency, responsiveness, and throughput. Inventories need to be reduced to the minimum levels necessary to support customer service objectives. Distribution must be planned carefully to ensure product is delivered at the right place, on time. The supply chain manager must be able to see everything, change anything, and to consider all aspects of the supply chain when making major decisions.

This year almost 200 North American manufacturers representing a broad spectrum of industry segments participated in our annual survey, which focused on supply chain systems and technologies. Insights provided include:

• Senior management’s perspectives on the overall business environment for North American companies.
• Development of supply chain management in North America, including current industry dynamics, and their impacts on the supply chain.
• Current and planned use of supply chain systems and supporting technologies to improve supply chain operations.
• Increasing focus on formal partnerships with customers and suppliers
• Challenges of information sharing among all supply chain entities through the Internet or other means.

The supply chain is a key area of executive management focus. Ninety-seven percent of respondents rated efficient supply chain management as critical to the long-term success of their business. However, only 33% believe that their supply chain capabilities are above average for the industry. Accordingly, 80% of respondents have supply chain improvement initiatives either planned, or currently underway. Additionally, 80% of respondents plan to increase their supply chain technology budget significantly to support these initiatives and to attain competitive advantage.

To enable a company to make quick and confident decisions, a supply chain management system must be built on the following fundamental principles:

• Constraint management. Businesses require feasible solutions. Plans that fail to consider real-world constraints are of limited use. Effective management means recognizing and minimizing the impact of constraints such as materials, capacity, manpower, transportation, ware-
housing, suppliers, management policies, customer and channel allocations, and others.

- **Concurrent vs. serial planning.** Traditional planning is done sequentially, with separate plans for manufacturing, procurement, transportation, sourcing, allocation, and distribution, which results in unsynchronized plans. Intelligent systems are capable of concurrent planning across the supply chain, resulting in faster plan generation and a synchronized, responsive supply chain.

- **Global insight.** With constraint management and concurrent planning, mining and petroleum companies can grasp the global impact of local changes on all aspects of the supply chain and, thus, can make globally good decisions.

- **Advanced warning.** When a local change occurs, whether it is a material shortage, unscheduled equipment downtime, or a supplier failure to meet expectations, intelligent systems instantly rely on advanced warning to all stakeholders. This warning defines the change in terms of its effects on sales, inventory and work-in-progress (WIP) levels, lead times, due dates, and other key business drivers.

- **Built-in business optimization.** Because business scenarios change constantly, intelligent systems must recommend new operational solutions rapidly that maximize quantifiable business objectives such as return on assets (ROA), profit contribution, and cash flow. The decision support logic available with many tools today accommodates different business optimization criteria.

The goal of intelligent supply chain management is to achieve maximum customer responsiveness at the least possible cost.

Many processes now can be integrated across inter- and intracompany supply chains using new, powerful tools:

- **Forecasting.** Off-the-shelf packages work with forecasts at various levels of abstraction in aggregate, plant-by-plant, or process and perform accurate variance calculations for finished goods, work-in-progress, and raw materials. Impacts of forecast changes on distribution plans and procurement can be calculated instantly.

- **Available to promise.** Concurrent planning and constraint management functionality makes accurate available-to-promise and real-time order quotation possible. Tools now can consider, simultaneously, materials, capacity, transportation, customer allocations, supplier allocations, and related business constraints.

- **Distribution planning.** Technology now can support “what if” and “can do” analysis associated with both upstream and downstream impacts of demand. Traditional distribution requirements planning tools only have been able to communicate demand to upstream operations. Tools now provide for simultaneous planning for transportation, plant
and warehouse sourcing, refining and purchasing, although recommending optimal solutions for lead times, replenishments, consolidation routines, and synchronization of deliveries.

- Sourcing. Available technology now can integrate efficiently both outside and inside suppliers within the demand/fulfillment formula. User-defined algorithms determine the optimal supplier, whether it is another plant, custom-feed operation, third-party vendor, or a warehouse in another country and automatically computes transportation and processing costs, materials and capacity availability, and service performance.

- Allocations. Decisions can be supported quickly now regarding whether raw materials and finished goods available in one country can be allocated to warehouses and facilities in another.

- Inventory planning. Effective management also means modeling different inventory policies at different nodes in the supply chain. Tools now can accommodate varying reorder triggers, days of supply levels, and service levels — individually and in aggregate.

- Plant operations: planning and scheduling. Traditional MRPII systems are transactional tools that calculate requirements based on local demand. Historically, MRPII has been used to compute a “best guess” master production schedule that translates that data into a materials requirements plan, which in turn creates a capacity requirements plan. Such sequential planning typically requires hours or days to complete and, when generated, is often out of date and ignores constraints on capacity. Tools are now available that generate plans for all requirements and resources, looking both upstream and downstream to refining and distribution processes — in real time.

- Procurement. Tools now available can model supplier capacities and provide information required for mining and metallurgical companies to make more prudent outsourcing and procurement decisions.

- Electronic commerce. With the advent of the Internet, EDI, intranet, and extranets, suppliers, manufacturers, and customers now can be linked by a single electronic system. Nodes in the supply chain can plan their business based on the delivery constraints of their key suppliers. Customers can be appraised of critical supply status and lead times before issuing an order.

Collectively, these are the functions that give an organization the ability to respond swiftly to change and to optimize assets across the supply chain. However, as anyone who has fought for a budget knows, there is nothing more sensitive or contentious than spending, which leads to the final and probably most important point of this discussion.

Information technology (IT) is or should be a strategic resource. This means in turn that IT professionals, along with their other business colleagues, must think and act the part, move beyond the day-to-day and the
bornections of technology, and ultimately link information concerning the company’s supply chain performance to its business objectives.

Developing a business case is critical for the project not only to secure initial funding, but also to help manage change throughout the project and to ensure that business benefits are achieved. To match integrated computer solutions to supply chain needs, a company first must identify the primary areas of the supply chain, which need improvement by asking questions such as the following:

- Is it important to improve manufacturing operations?
- Would the greatest benefit be gained by focusing on logistics?
- Is it more important to focus on the entire supply chain from a strategic perspective?

These questions do not always have obvious answers. A common mistake made by companies implementing packages is to attack the most visible supply chain problem first, without conducting a diagnostic study to identify where the largest potential benefit truly lies. For example, if a company has massive, visible amounts of raw materials, it may determine that an advanced materials requirements planning application will offer the greatest benefits. However, a well-executed diagnostic study might reveal that raw material storage costs are minimal when compared to transportation and distribution costs for work-in-process and finished goods. In this case, the company might benefit most by focusing initial implementation efforts on the strategic and tactical aspects of distribution planning.

Because many software packages offer a wide variety of applications to support different areas of the supply chain, it is important that companies identify where they expect to see benefits, prior to beginning implementation, and what the criteria for success will be. The business case should rely heavily on the supply chain diagnostic to tie expected benefits to areas of the supply chain in which the greatest gains are expected.

When assessing software package requirements, companies must specify what they want the tool to perform, what functionality is required, what type of reporting is needed, how the package needs to work with other applications currently in use at the company, if the package works within the hardware/network constraints of the company, and how customizable the application is. If certain key features are critical to a company, it should define clearly what these are and make every attempt to identify a software vendor that supports them. All these considerations should be built into the business case.

Implementation costs for companies installing either enterprise-wide solutions, such as SAP, Oracle, BaaN, and People Soft, or tailored solutions, such as I2, Manugistics, Numertrix, Indus, Maximo, and others, vary widely. Key factors that ultimately determine the cost are
• Degree of external resources used.
• Investment required for technical infrastructure.
• Scope and scale of the business benefits targeted.
• Overall strategy for implementing the software, including the costs of training and users.

Again, these factors need to be built into the business case.

Just as different packages and applications offer different features, different software vendors work with their clients in different ways. Before deciding whom to work with, a company should agree on specific requirements it has for the software company itself. What type of consulting is needed? What guarantees are required? What experience in specific industries or planning functions are desired? A company planning to implement enterprise requirements planning (ERP), advanced planning and scheduling (APS) packages, or other logistics software should conduct an analysis of vendor capabilities similar to the software requirements process described earlier. By identifying which issues are most important, a company can approach software selection with a clear understanding of what to look for and build these considerations into the business case. Other business case considerations should include vendor demonstrations of a product, site visits where the software has been implemented successfully, and reference checks.

The package selection decision will affect the entire implementation effort. Consequently, provisions should be made in the business case for the use of outside assistance to foster more effective decision making and help assure that the best application is chosen. Qualified third-party system integrators can offer extensive experience in implementing multiple packages, experience in selecting among multiple packages, and knowledge of the types of features offered by the different applications. They also provide significant industry and planning process expertise to help gauge the applicability of a software application to a company’s planning environment. This can speed the selection process and help ensure that the company makes its selection decision with as much information as possible.

Finally, does the business case reinforce the following requirements for a successful implementation?

• Active, visible and strong top management involvement.
• A serious appreciation for the change management requirements.
• Rigorous project and partner management.
• Accelerated decision-making processes.
• Creative project team incentives.
• Plenty of training, education, support, and communication.
• Focused alignment of the organization, team, scope.
• Reengineering in the correct doses at the correct times.
• Strategic and tangible benefits and a program to measure progress toward stated goals.

The business case is a critical tool that helps to manage change throughout the project, to keep people focused, aligned, and moving in the right direction, and to make sure that the expected benefits are achieved.

A question often asked is whether or not it is possible to attribute benefits to the software or to improvements in supply chain processes and whether it might not be possible to achieve the benefits simply with improvements to logistics. The answer to both is yes, in some cases; in most cases, however, the two are linked tightly, and it is not only difficult but also unproductive to try to separate the benefits of each. One company executive explained it this way, “We might have been able to make the process improvements, but we never would have been able to sustain them without enabling software.”

In closing, the following points summarize the key concepts of this chapter:

• Supply chain management and the need to enable improvements through technology is “top of mind” with executive management.
• Integrated and bolt-on solutions with extensive functionality are available off-the-shelf, eliminating the need in many cases for customized solutions that are costly, take a lot of time to develop and implement, lack the necessary support for end users, and fail to cover the supply chain spectrum.
• Executive management continues to be concerned about the levels of spending on technology and the returns for every dollar invested.
• Objective business cases that support the strategic, tactical, and operational goals associated with technology-enabled supply chain initiatives are critical.