Mining differs from other industries in that the location of mining facilities are not the result of the analysis of labor markets or the logistics of delivering the product to customers. In mining, it truly is about location, location, location, except that there is little choice of location: you go where the mineral deposits are. The location largely dictates the labor pool and many of the costs. On the other side, most minerals are traded on the commodity exchanges, and a mining company has limited influence on price. With labor costs dictated by location and revenue dictated by the markets, profit lies in operational efficiency.

As minerals are fundamental to our economies, their prices largely follow economic growth, and mining companies have traditionally focused on economies of scale to meet efficiency goals. Meeting demand by increasing production volume was the name of the game. With the majority of mines operating at or near capacity, sudden increases in demand causes increases in price in the short term as production capacity adjusts in the longer term. The reverse is true when demand is reduced, where we see consolidation and capacity rationalization. Traditionally, the focus has been on production to meet demand, not productivity. This is changing, and the key to unlocking productivity and improving margins is controlling costs and improving operational efficiency.

Asset utilization has long been a key measurement of the mining industry, but there are physical limits to asset utilization, and with a mine running at close to full capacity, adding more assets is a costly business. Without great care, as full capacity is reached, environmental costs can escalate out of control. Miners are great innovators and great analysts, so it is to be expected that they will turn to analytics and automation to drive the efficiency gains they need. In manufacturing, automation and analysis combined with strict maintenance planning and building relationships with suppliers have yielded consistent dividends. We should expect mining to follow the same practices.

Two quotes appear to encapsulate the problem and the solution:

“Mining companies will have to lose the rigid and ironclad business models and practices of old and become fluid, flexible and agile enterprises poised to pounce on opportunity,” Envisioning the Future of Mining, IBM. 2009

“When envisioning the future of mining, everyone has a different idea. Because the public opinion sees mining as an old, dirty, dangerous and environmentally contentious industry, companies have two options: either innovate or stagnate”. Robert Spence Mining Global, Oct 08, 2014.

We all know where stagnation leads, and while mining feeds manufacturing, it cannot control or predict its feeding frenzies or its crash diets: it can only monitor the changing landscapes and plan for it. Miners have always needed to keep an eye on fundamental long term market drivers, but now more than ever, they need to be able to respond faster, they need to be agile. That requires better data.
Today’s mining equipment bristles with sensors, and combined with the latest analytical applications, you get not only preventative maintenance but autonomous vehicles. The mine of the future may be choreographed like a dance performance without a single wasted movement, and it will probably also be operated off-site.

High level financial data in the form of “total cash costs”, “all in sustaining costs” or “all-in costs” are the staple of financial reports, but it is the detail analysis that really matters. Better and more expensive ERP systems are not the answer if they are not matched to sustained efforts to improve and maintain the quality of the master data, yet this is one of the typical weaknesses of most mining operations.

There are two metrics that are useful guides to the quality of the master data. The first is the efficiency of the internal and external requisition process. The second is the number of “off contract” or “free text” purchase orders. Requisition speed is a primary measurement of operational efficiency, as a single part can take most assets out of production. Losing a haul truck for a single shift, for example, can have a financial impact of $35,000 (Maintenance Assistant Inc.)

Requisition speed has all to do with the quality of the material master. Is the material master easily searchable by all requisitioners? In most cases, the answer is no: Searching thousands of 40 character generic or cryptic item names may result in thousands of hits or none at all. Solving the problem by increasing local storage of spare parts can be a very expensive answer to the problem even if is staffed by the proverbial “Mr. Find It”. Resorting to “free text” requisitions or “free text” purchase orders is just kicking the can down the road. What lies “down the road” is at worst inaccurate spend analysis, but most commonly higher “off contract” pricing and bloated, stagnant inventory.

ECCMA performs regular scoping studies for its members in which it assess the quality of their master data and recommends prioritized, cost effective solutions. In a typical study, ECCMA will analyze the existing material and vendor master files as well as three years of purchase order data. The study takes four weeks and the results are always eye opening.
Based on the data ECCMA has analyzed to date, it is safe to say that a typical mining operation will have over 200,000 materials in its material master and upwards of 10,000 vendors in its vendor master file. Purchase order transactions vary based on the size of the operation, but it is common for ECCMA to analyze over 1 million purchase order transactions.

The first level results typically look at the percentage of “free text” purchase orders where the material master is not referenced. This is a serious problem, as “free text” purchase orders are typically poorly classified, and that has a direct impact on the accuracy of spend and maintenance analytics. Zero “free text” is also a red flag, as that is usually caused by software that has been set to require a mandatory reference to the material master. We all know what happens when a data element is mandatory: when we see that 100% of the purchase orders reference the material master, most commonly the first three most common material references will be for “miscellaneous” materials, again another example of kicking the can down the road. In our experience, a target for “free text” should be around 20% as that typically yields the right balance between accuracy and flexibility.

Once we have looked at the free text purchase, we identify active and inactive materials based on their use in purchase orders. As a general rule, we find that only a small percentage of the materials are truly active, typically less than 20%, and the same holds true of the vendors. This can often be a serious issue, and one of the main reasons why the material master continues to grow. With so many inactive materials it is hard to find matching materials, and when an existing material is not found, another is added. While identifying the active materials, we also look at the rate new materials are being added. That gives us a good picture of the quality of the material master. The next step in the process is to analyze the risk associated with specific materials as well as the opportunity for savings. This is a supply chain optimization analysis, where a low number of suppliers increases risk, and a high number of suppliers is an opportunity for savings through supplier rationalization. The cost of the individual materials, as well as total spend, needs to be taken into account to come up with the recommendation regarding which materials should receive what level of attention when it comes to improving the quality of the material master and what is the best method to use.

When it comes to improving the quality of the material master, the mining industry is fundamentally no different than any other industry. There are basically two solutions: do it yourself in house or contract out data cleansing. Whichever way you chose, you are going to need the same technical specification templates or cataloging templates (ISO calls them data requirement statements). These templates contain the list of attributes (properties or characteristics) that are needed to identify, describe and differentiate the members of a class (group) of materials. Each material class (bearings, pumps, motors, valves) will have a different template. These templates are the measuring sticks for quality master data. If a master data record contains all the data specified in the template, then it is considered to be quality master data—it really is that simple. The challenge is clearly getting your hands on the templates. The templates tend to be industry specific, as each industry needs more or less data to identify and describe the materials it uses. Having said that, while the templates for direct materials do vary considerably from one industry to the next, most templates for MRO materials vary little from one industry to another.
As part of its scoping study, ECCMA identifies the material classes and provides generic templates from its extensive library of open templates, the eDRR.

An ECCMA provides “open” templates that are based on an “open” technical dictionary. On the other hand, a number of data cleansing applications or service providers license their “proprietary” templates. This proprietary business model creates an ongoing dependency on the application or services, as the proprietary templates are required to create new materials, and worse, they often stop the user from being able to use open authoritative source validation, the clear future of master data quality.

Pioneered by NATO as Codification at Source (C@S), authoritative source validation is a very simple process whereby the end user of a material (you, for example) asks their supplier to provide standardized technical data specification either as a readable document or preferably in XML format in accordance with ISO 22745-40. An increasing number of ISO 8000 compliant Product Data Management (PDM) applications such as Aton PDM and Enterprise Asset Management (EAM) applications such as ABB’s Ellipse EAM are able to utilize ISO 22745-30 standardized technical specifications templates as well as import and export ISO 22745-40 standardized technical specifications.

The good news is that most of scoping studies conducted from mining companies clearly show that improving the quality of the material and vendor master is not the hugely expensive and time consuming project it was initially thought to be. By focusing on the active materials and active vendors, as well as prioritizing the work, most can see real improvements in as little as three months. The projects typically pay handsome dividends in the form of a substantially improved requisition process, which reduces asset down time as well as lowers MRO costs and inventory levels. Cost can vary, but a rough estimate of the cost of an initial effort to bring the quality of an existing material master up to a level where it can support maintenance planning and accurate spend analysis will typically cost between $100,000 and $300,000. A recent ECCMA study recommended spending only $160,000, compared to the initial contractor estimate of over $500,000. The study recommended focusing on improving only the data that needed to be improved and only to the level that it needed to be improved. The $160,000 included the cost of a data governance plan for both materials and services, as well as training and of course the cost of licensing a cataloging application needed to create new materials or to upgrade the quality of existing materials as needed.

Getting the cost of assets and maintenance under control is a first order priority, but there is more. Mining, like many other industries, is increasing its use of PBL contracts. The acronym PBL is probably unfamiliar in mining, but it is well known in Military circles, where it stands for Performance Based Logistics, also known as performance based contracting. In mining it is recognized as an increasing use of contractors to provide an ever increasing range of services. At the extreme it would be analogous to signing a contract per ton of material extracted from a specific location and delivered to another. In the military the goal is to “maximize system availability while minimizing the logistics footprint”, or, as Ashton B. Carter, Under Secretary of Defense for Acquisition, Technology and Logistics stated in 2009, summarizing the assessment of the process, “there remains a strong consensus that an outcome-based, performance-oriented product support strategy is a worthy objective...”. Most contracts for services,
other than those for labor or professional services, are in effect PBL contracts albeit by other names. The key to the success of any service contract is in the detail, and the data clause is probably the third most important clause after the specification of the deliverable and the price. The contracts needs to specify that any telemetric data or data describing the materials used in the operation, maintenance or repair of the equipment used in the performance of the specified task be provided in a timely manner and in a standard electronic form (preferably ISO 22745-40). Quality data is critical in assessing the performance and reliability of the equipment, as well as the performance of the contractor. Without access to this data, mine operators will lose the ability to predict outcomes or make the effective decisions necessary to respond to the ever changing landscape that mining has become.