Easily accessible integrated cost information is not commonly available in mining. Most cost systems are focused on financial reporting and canned reports are the only means of access. MISOM's data warehouse solution can make cost information accessible and integrate with other key data. Listening to clients, we created an integrated cost management system (ICM). Our clients use this system for their managerial cost reports, in the budgeting process and advanced solutions such as Activity Based Costing. We have over a decade of experience creating Activity Based Costing systems, progressively using more complex tools. Our focus on ensuring the platform is built upon a foundation of accurate and automated data flows, separate us from other solutions.

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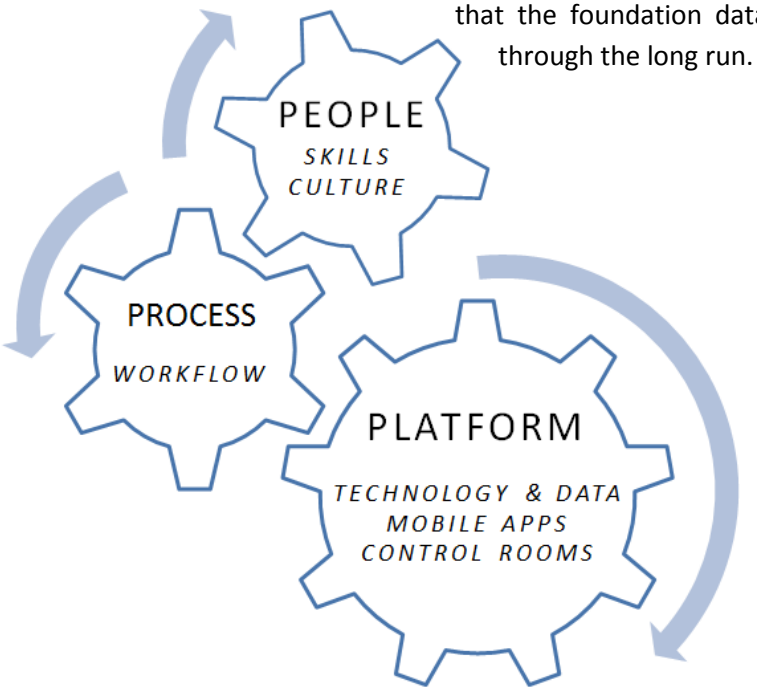
Clear integrated cost information, formatted in a manner meaningful to managers and mining engineers and easily accessible for analysis and custom reports, is often out of reach. MISOM has helped numerous mines to improve their operations and increase reporting accuracy through accessible business intelligence (BI) and change management. MISOM's Integrated Cost Management System (ICM) is one of our most popular and addictive solutions. Our approach to ICM allows companies to execute a variety of cost initiatives from daily cost reports to activity based costing (ABC). ABC is one of MISOM's oldest advanced solutions. Unlike many conventional approaches; MISOM's ABC approach builds upon an integrated BI data layer consisting of ERP, maintenance planning systems, fixed/mobile asset management systems, and other data sets both commercial and custom. MISOM uses business intelligence tools such as data mining to capture, clean, derive, and analyze the data.

1. **The foundation:** the key element to a complex analytical process like Enterprise Asset Management or ABC is a solid integrated data foundation. There are many data sets and processes involved in the supply chain, as illustrated by **Error! Reference source not found.**, each of these activities have one or more databases. MISOM's near-real-time data warehouse, designed specifically for mining, integrates all data involved. Process flow maps are created (see Figure 4) from financial & cost accounting; work orders & production processes. We interview controllers, management, and other key personnel to understand the supply chain and transaction flows within your organization. We have experience with most ERP's and other standard data sources used in the mining industry. Our BI and mining expertise ensure that the foundation data layer is comprehensive, and robust to last through the long run.



2. **Integrated Cost Management System:** While building the foundation we identify how cost are reported internally and identify the current gaps. Our ICM is comprehensive enough to cover all cost and work order reports. Our systems process, clean and organize transactions and work orders.

   We ensure that reports fit with your organizations unique structure (departments, cost accounts, processes (activities), consumable type etc.). We focus on the life of a work order and ensuring that there is consistency

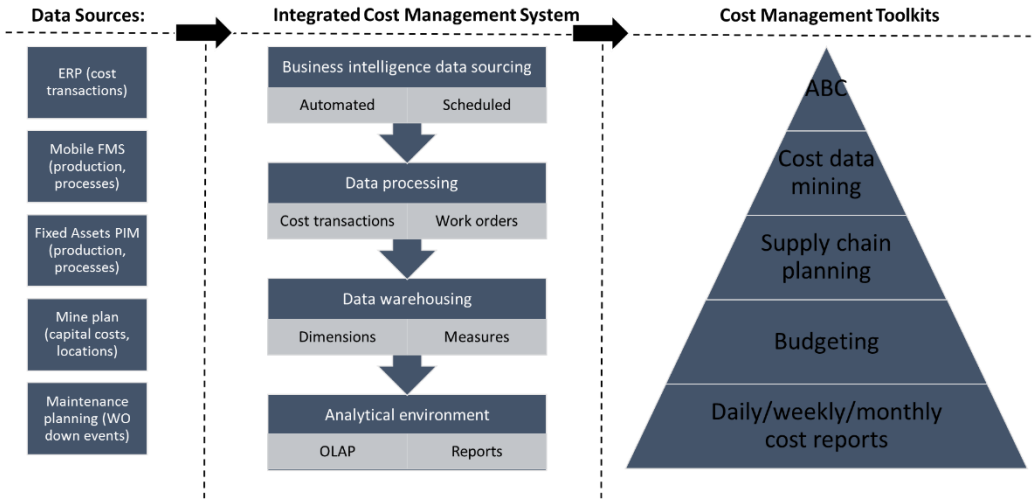


Figure 1: MISOM Integrated Cost Management System used for activity based costs, daily reports, and a variety of transformational cost toolkits

between assets in the ERP, maintenance planning system, asset management and production. Data sources are solidified with data loading automation and integration through MISOM Operational Data Store (ODS). No longer do mine managers have to wait 7+ days into the next month to get monthly cost reports. MISOM's systems can be scheduled to run daily!

3. **DW enabled set of actions**: This phase of advanced analysis is made up from the data and critical metrics (KPIs) that have impact on costs and the supply chain. Our toolkits are set up to monitor performance used for change management and increased focus. Cost reports and scorecards are the foundation of the toolkits. Our ICM allows for more accurate and advanced budgeting and mine/supply chain planning. As these foundational toolkits improve the overall data, more advanced toolkits such as data mining or ABC can be done. These toolkits are not "one-off" projects that take days or weeks to create each time they are needed. With the click of a refresh button reports are loaded with up to date data. All of toolkits built upon the BI layers and can be sustained through personnel & management change.

Case Study: Surface Coal Mine

MISOM has implemented ICM's at operating mines. They have the ability to transform mining companies' bottom line. The following is a case study of some of the steps taken to develop an ICM at a coal mining company in the US and Canada.

Building the Foundation

Any business intelligence activity requires accurate data that loads on a regular, scheduled time table. An ICM is no exception. When doing our standard audit and process mapping of the sources related to the ICM we commonly find the following problems:

1. ERP servers are maxed out with data calls
2. Transactions and work orders are not accurately assigned to the correct accounts or equipment ID (see Figure 2)
3. Some accounts act as "catch all's" for certain types of consumables
4. Manual journal entries & receivables get queued up on controllers desks and are delayed
5. ERP account grouping and aggregations do not fit the internal managerial reporting of controllable costs and are not activity based

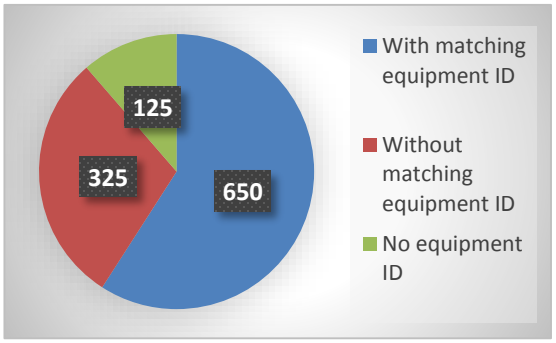


Figure 2: Results of WO processing related to equipment ID's

All of the problems listed above cause havoc on a controllers ability to report on costs. Such was the case at this mine site at the beginning of this initiative. Reports were delayed, inaccurate and built upon unstable spreadsheets that are made obsolete when stressed and overworked controllers leave. Transactions were not organized by activity and a maze of unstable spreadsheets were used to re-align transactions into usually incorrect groups. Our BI tools have been developed to circumvent and address these problems and allow site controllers greater ability to report and fact find rather than scrub numbers.

Creating the Toolkit

Once the data foundation is set up, MISOM deploys daily managerial reports such the one shown in Figure 3. What once took a controller days into the new month to complete at month end was replaced with daily reports loaded automatically. These reports lead to questions about spending as well as journal entries. Follow-up questions and data investigations can be started when problems originate not after the month end when it's too late. For instance notice the change that occurred on the 15th in Figure 3. It is obvious that a large "re-imbursement" or some other accounting happened that day. Management can ask questions to the controller as these changes occur.

Site **Cost Report** **December 2013**

Department	Maintenance	Mine Operations	Prep Plant	Safety	Tech Services	Other Costs	Total
Daily Cost	$130,899	$2,005	$302	$0	$0	$72	$133,207
Daily Goal	$122,129	$262,484	$33,484	$2,194	$11,065	$135,710	$567,065
Cost MTD	$1,876,290	$5,562,816	$382,685	$23,862	$845,042	$4,711,759	$13,402,454
MTD Deviation	$688,419	-$50,655	$320,477	$22,203	-$612,687	-$1,861,856	-$1,494,099
Cost YTD	$49,256,378	$93,340,610	$13,401,332	$857,857	$7,125,425	$0	$163,981,602

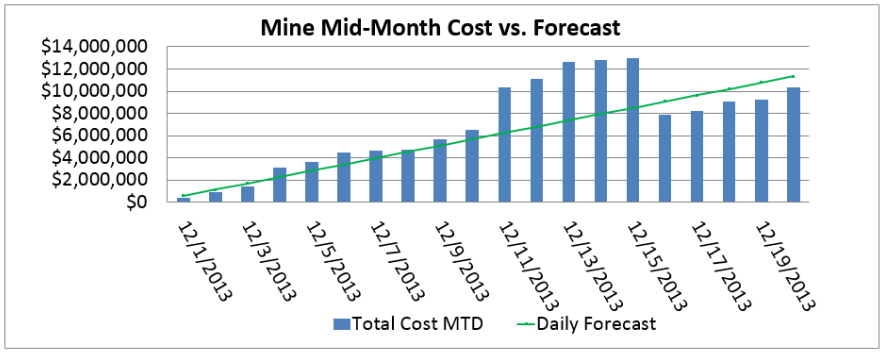


Figure 3: Daily cost report

Activity Based Costing

After the foundational data sourcing, data cleansing, and auditing process are implemented advanced solutions such as ABC can be initiated. These initial foundational steps ensure that the results of ABC are accurate and can be trusted going forward.

ABC requires that equipment and cost transactions be lined up with certain activities. MISOM's mining engineering consultants have significant experience with production processes and are experts in process mapping. Figure 4 is the mining process and equipment mapping used to determine direct and indirect costs at this particular site.

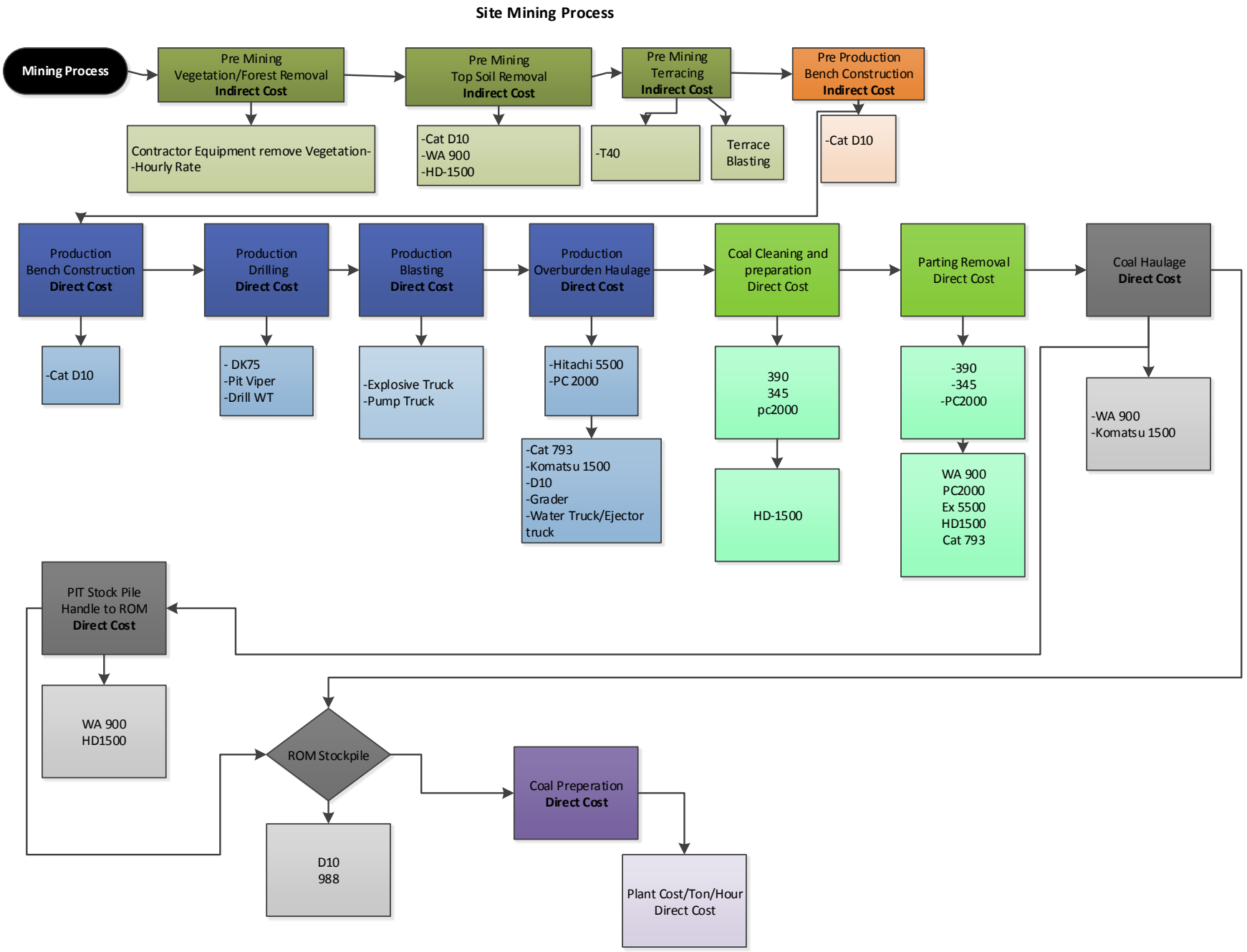


Figure 4: Mining activity and equipment process map

This process map guided the operational and maintenance data flows and organization. A series of tables were created to populate the ABC as shown in Table 1. Each of these data sources were sourced previously into the MISOM DW ensuring accuracy and stable loading.

Table 1: ABC Information

Information Table	Data Source	Description
Activity table	Mine Plan	Alignment of activities to pit locations and schedule
Production table	Production DW	Equipment productivity, equipment hours, material moved, etc.
Cost table	ICM	Labor, consumables, contractors, capital costs, WO
Equipment table	ICM, Mine Plan	Equipment hierarchies, purchase date, etc.
Stockpile table	Production DW	Tonnage and schedule of stockpiles etc.

Once the foundational data layer is in place, the required process mapping is finished and information is organized the ABC can begin to be populated.

Activity	Total direct $	Total indirect $
Pre-Mining		
Top Soil Removal	$140,897	$182,896
Vegetation Removal	$0	$105,642
Pre-Production		
Bench Construction	$1,643	$76,378
Production		
Drilling	$544,516	$555,039
Blasting	$1,250,383	$638,250
Overburden Haulage	$5,262,258	$2,294,259
Coal Cleaning and Prep	$98,137	$200,336
Coal Haulage-In Pit	$148,161	$400,671
Parting Removal	$98,137	$308,851
Coal Stock Pile	$26,706	$125,210
Coal Preparation		
Clean Stock pile	$75,559	$46,197
Load out	$75,559	$46,197
Plant	$321,307	
ROM Stock pile	$103,561	$46,197
Grand Total	**$8,146,825**	**$5,026,122**

Table 2 shows the results for an auxiliary pit of ABC of this mine site. As seen it provides the direct and indirect costs for each process and sub process.

Table 2: Activity Based Costing for an auxiliary pit

Activity	Total direct $	Total indirect $
Pre-Mining		
Top Soil Removal	$140,897	$182,896

Vegetation Removal	$0	$105,642
Pre-Production		
Bench Construction	$1,643	$76,378
Production		
Drilling	$544,516	$555,039
Blasting	$1,250,383	$638,250
Overburden Haulage	$5,262,258	$2,294,259
Coal Cleaning and Prep	$98,137	$200,336
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Load out	$75,559	$46,197
Plant	$321,307	
ROM Stock pile	$103,561	$46,197
Grand Total	**$8,146,825**	**$5,026,122**

Because this system was built upon a data foundation of BI and DW it was be kept up to date with little to no up keep. Trending individual costs can be done as shown in Figure 5. Management decided to focus initially on reducing the cost of blasting at this site for a period of 10 months. With the BI enabled process improvement and change management afforded by the ICM and other DW systems management was able to reduce cost for blasting by about 11% over this time period.

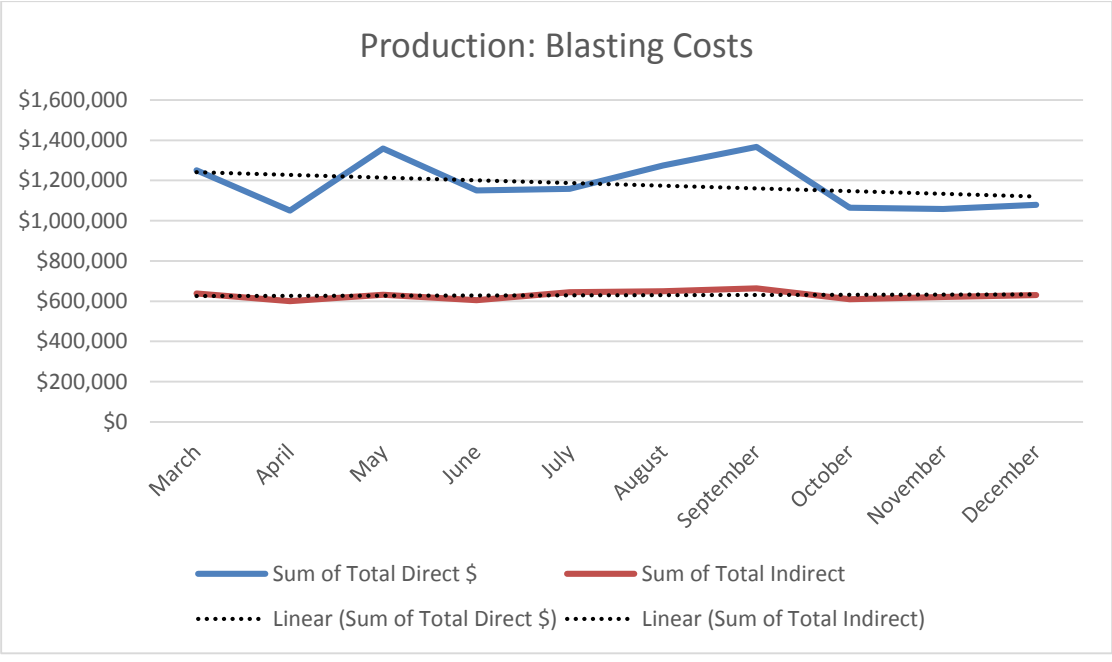

Figure 5: ABC for blasting over time

Conclusion

Mining companies must be more adept to their mining costs and production. BI tools used by MISOM create state of the art ICM and allow easier access and analysis of cost data. Our focus on the foundational layers of data ensure that the ICM is accurate and update as required. A robust data layer allow companies and management to deploy scalable toolkits. Daily reporting of cost is possible and pivotal for data accuracy. An ICM can revolutionize budgeting and planning at mine sites. ABC can provide management the ability to respond economicly to chaning market conditions. Contiued focus on problem activities can improve the bottom line durring softening commodity cycles.

MISOM is proud of the success our clints consistenly find with our systems and services. Please contact us to disucss how we can help your organization. We are the industry standard of BI solutions.