

Dealing with the Worldwide Decline in Mining Productivity:

A focus on the underlying paradigm and the ERP Budgeting Systems maintaining the decline

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1) Ernst & Young highlights the inability of the mine management system to coordinate activities holistically as the root cause of declining mining productivity

It is acknowledged by miners and economists alike that all is not well in the world of mining, where productivity has been on a steady decline over the past decade. According to a recent report by Ernst & Young (EY) (2014) entitled *Productivity in Mining: Now Comes The Hard Part*, labour productivity in the local gold sector has declined 35% since 2007, while capital productivity in Australia has fallen 45% since 2000. These findings are corroborated by McKinsey in its 2015 report, “Productivity in Mining Operations: Reversing the Downward Trend”, which found that global mining productivity overall has decreased by 29% over the last decade.

The report by EY is, in our opinion, the first that correctly identifies the root causes of the productivity decline. Many mines are closing down or battling for survival as billions of dollars in mining market value have disappeared, and with them the concomitant fall in mining productivity and employee engagement.

The EY report states that executives interviewed agreed that productivity is their number one challenge and that it is firmly on the CEO’s agenda:

“Many have found that productivity decreased as operations got larger and that it was difficult to manage the complexity of these larger operations, particularly given the additional challenge of high turnover and lack of staff experienced in focussing on

driving efficiency. The growth in mining has resulted in complex structures and inadequate functional collaboration.”

The report concludes that the issue of integration in the mining process is a key challenge and needs to be addressed for productivity to improve. This “requires an approach that breaks down silos and adopts an end-to-end perspective while empowering the workforce at the same time.” And, “it is about systems and processes, it is taking a holistic view of the different parts and how they fit together”. Furthermore, the report points out that “Engagement is really powerful. Telling people what is really important is really powerful.”

At Stratflow and TOCE we could not agree more with these views.

Is this not strange? Mining executives know the problems that they have to address, yet, despite employing armies of consultants and spending billions of dollars on respected change initiatives such as Lean Six Sigma, TOC, Values, Leadership, the status quo seems to remain intact.

Anomalies in the data

Over the last 15 years there have been more than 70 very successful implementations throughout Southern Africa’s mining industry where we used an approach that “breaks down silos and adopts an end-to-end perspective”, while simultaneously empowering the workforce.

In implementing our so-called Scrum Production Flow/Productivity Platform approach (originally developed by Arrie van Niekerk of Tavanec as TOC Production Flow) we have seen production increases of between 7–50% and cost reductions of 10–30% per ton within three to five months of the approach being implemented. Other figures are similarly impressive: in the case of an underground narrow reef platinum mine, a 35% increase in output was achieved within one month, while productivity improvements in underground gold mine shafts have been as high as 50 and 60%, and improvements in output in open-cast platinum and iron ore operations range between 45 and 20%. While these results have a significant impact on mine profitability, the impact on human relationships is often of even more value in maintaining the gains and dealing with future eventualities.

This raises many interesting questions. Why have mining companies not been able to turn around the productivity slide, when they spend tremendous amounts of money on solid change programmes, and they know the issues that need to be addressed? If the Productivity Platform is so good, why is everyone not using it?

What prevents us from engaging employees and effective cross functional coordination?

“It is not what we don’t know that kills us, it is what we know for sure that just ain’t so.” —Mark Twain

We believe that the core problems are highlighted in the following section from the EY report (2014):

“Many productivity initiatives to date have focused on cost cutting, which has led to modest short-term results, but our survey participants acknowledged that what needs to be done now is more complex. Our view is that mining companies should move beyond point solutions and adopt an end-to-end solution to transform the business. There is a need to ensure that each part of the business is optimized, not on its own but as part of a business system.”

In the West, we seem to believe that holistic solutions have to be complex and that all parts of a system have to be optimized to ensure that the whole is optimized (in the case of managers trying to minimize costs we call it the Cost World Paradigm). To manage according to these beliefs we have since the time of Sloan at General Motors used efficiency measures of the parts to try and optimize the whole. Systems Thinker Russell Ackoff refuted this line of thinking decades ago. He believed that we effectively have only two choices, either we “can optimize all the parts of the system, but then the system as a whole will not be optimized or, we may optimize the overall system, but then many of the parts will not be optimized.”

According to the Throughput World Paradigm, to optimize the productivity of the overall system, we need to focus on optimizing the flow through the bottleneck department only, which also makes the system less complex and easier to manage. This was also the thinking of Dr Eli Goldratt, the father of TOC. We call this the Flow/Global Optima mental model. It is diametrically opposed to the Balanced Capacity/ Local Optima/Local Efficiency (trying to achieve high efficiency on all the parts) mental model to which most mining companies subscribe. The Balanced Capacity/Local Efficiency mental model has been driving the mining productivity decline of the last decade and enables the system to resist efforts at improving it.

Balanced capacity leads to stop-start flow and moving bottlenecks. If a mine experiences moving bottlenecks it is highly likely that it has no bottlenecks and most resources will have at least 30% spare capacity. But the average production rate will be substantially less than that of the bottleneck department — this is the only way it can appear that we have bottlenecks that move.

What perpetuates the Cost World/local Optima Paradigm?

Our mines produce exactly what they were designed to deliver. The system will react to any perturbation and attempt to bring it back to the previous equilibrium. For example, on an underground platinum mine, the financial controller on one shaft finally agreed to put in underground stores to enable Flow to improve. The Mining Manager strongly pushed for this and was becoming increasingly frustrated that nothing was happening. SAP flagged the increase in spares held underground immediately. Within an hour the controller got six phone calls, from different parts of the organisation, asking her what she thought she was doing. In the absence of an

alternative mental model to support workers while they embark on actions that go against the current system (Super- flow principles are opposed to balanced chain capacity), there would be no hope for a turnaround.

As facilitators our job is to support workers and managers for the 3-5 months until the step change becomes visible to all.

The issues caused by ERP and budgeting is so critical to our understanding of what is going wrong that we will spend the rest of the article discussing that in more detail.

2) How the ERP and Budgeting systems and the way they are used by the Finance Department conspire to generate suboptimal profits in Mining

The Reality of a Modern Mine Manager

Eugene was sitting in front of his 12 mine overseers. He stared at the pages in front of him willing them to tell him a different story but they refused to change.

Every Monday morning for the last five years, Eugene and his mine overseers gathered in the shaft's meeting room to analyse the figures for the previous week. With a few exceptions, the picture never seemed to change:

- Production tons were stagnating,
- Operating costs were increasing,
- Equipment breakdowns were increasing,
- The safety record was deteriorating,
- Absenteeism was increasing,
- Overtime continued to increase,
- The need to “catch-up” tons on off weekends was increasing,
- The labour force seemed ready to strike at the slightest provocation and for the smallest of issues,

- The mine manager and the HR department seemed to spend far too much time in disciplinary meetings,
- The turnover rate of critical technical staff and supervisory level management was high and increasing,
- It was getting more and more difficult to find good people and if you did manage to find them, you had to pay them an arm and a leg to attract and keep them, and
- The list went on and on.

Eugene was tired and despondent and he really did not know what to do to improve things. He was regularly on the red carpet before the regional manager and felt defeated before he even entered the room. So he blamed anything and everything for the poor performance:

- The shaft is now deeper than it was previously and so it takes longer for the cage and the skip to shuttle people, waste and ore up and down the shaft.
- The stopes are more than double the distance from the shaft than they were 5 years ago.
- The reef is narrower than it was previously.
- The geology keeps giving us new surprises and obstacles to cope with.
- The inspectors from the department are out to get him and to stop the shaft at the slightest hint of something wrong, usually at the instigation of the trade union.
- The equipment suppliers supply the wrong or poor quality equipment and materials.
- Much of the equipment is old and breaks down regularly.
- It takes a long time to get approval for more and new equipment.
- The labour is lazy and unmotivated.
- The overseers do not spend enough time down in the mine.
- The overseers do not plan properly.
- The overseers make production promises that they do not keep.
- And more excuses, as many he could possibly think of.

The regional manager was tired of hearing these excuses and Eugene knew that his job was on the line. But what was he to do?

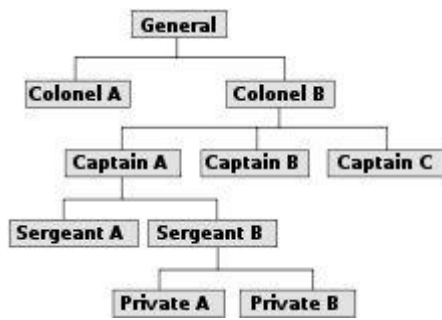
So in this meeting with his mine overseers, he felt that he had no alternative but to do what he knew best. He blamed, he shouted, he bullied, he threatened and glared at the overseers in front of him, one by one. No one was spared. He could find fault with every overseer in front of him using the piles of reports that he had before him.

- Your rate development is too slow and you are going to run out of faces soon.
- You have missed your daily blast for the fourth day in a row.
- Your material costs per ton of ore are way over the standard — the shaft accountant will have to limit or block the materials that you are drawing from the store.
- It took you three days to move the winch.
- The absenteeism in your section is way above the average.
- The face advance from every blast is way below the standard.
- The quality of your sweepings is far from satisfactory — you are leaving more ore in the stopes than you are delivering to the shaft.
- Your safety record is alarmingly poor. You better get your act together or you will have a fatality in your section.
- And on and on.
- The meeting took five hours after which Eugene chased the by now totally demoralised overseers underground to go and manage their people better.

The story of Eugene will be continued but for now we need to digress a bit in order to understand the environment in which he finds himself.

A brief history of the ERP system and how it has become an almost indispensable management tool in large organisations

The Industrial Revolution and the resultant drive for more and more mass production led to the need for methods by which the owners of the capital resources could manage and control what happened on the shop floor. Initially they adopted the organisational structures and the command and control methods that had, for many centuries, been successfully used by the military, and this worked well for some time.



However, as these manufacturing and mining organisations continued to grow and to develop faster and better methods of producing their output, so the complexity of the organisation increased. The organisations added more and more layers of management and reporting structures, and at the same time they required more and more specialised expertise from the people that they employed. This led to the divisions, departments, units and sections of the organisations becoming the conglomeration of silos that we are so familiar with, and regularly complain about, today.

It was at about this stage that managers started to feel that they lacked sufficient information in order to make good decisions. To make things even worse, managers within the silos began to make decisions without understanding the impact of their decision on the organisation as a whole. Organisations were becoming just too complex for their own good.

Just when we thought that we had reached the limit of the human manager's ability to measure and control, along came the "saviour" of our complex organisations: the computer.

The accountants were amongst the first to see the potential that the computer offered to solve their mounting problem of the hundreds and thousands of transactions that needed to be tracked and recorded on a daily, weekly and monthly basis.

It is therefore not surprising that the world's most widely used Enterprise Resource Planning (ERP) system, namely SAP, has its origin as a pure accounting system.

So what is an ERP system and what is its appeal for large organisations?

It is claimed by the ERP vendors that implementing ERP software can improve productivity, increase efficiencies, decrease costs and streamline processes. In particular it is claimed that ERP systems enable the following:

- Complete visibility into all the important processes, across various departments of an organisation (especially for senior management personnel).
- Automatic and coherent workflow from one department/function to another, to ensure a smooth transition and quicker completion of processes. This also ensures that all the inter-departmental activities are properly tracked and none of them is 'missed out'.
- A unified and single reporting system to analyse the statistics/status etc, in real-time, across all functions/departments.
- Individual departments do not have to buy and maintain their own software systems.

- The ERP systems can provide Business Intelligence functionalities that can give overall insights on business processes and identify potential problem/improvement areas.
- Advanced e-commerce integration is possible with ERP systems — most of them can handle web-based order tracking/ processing.
- There are very few processes in an organisation that cannot be accommodated in the ERP system as specialised modules have been developed to cater for Finance/Accounts, Human Resource Management, Manufacturing, Marketing/Sales, Supply Chain/Warehouse Management, CRM, Project Management, and so forth.
- It is possible to implement either a few modules (or) many modules based on the requirements of an organisation. If more modules are implemented, the integration between various departments may be better.
- There is a Database system on the backend to store all the information required by the ERP system, and this enables centralised storage/back-up of all enterprise data.
- ERP systems can be more secure as centralised security policies can be applied to them. All the transactions happening via the ERP systems can be tracked.
- The ERP systems provide better company-wide visibility and hence enable better/faster collaboration across all the departments.
- Most ERP systems have Application Programming Interfaces (API) that enables specialised systems such as RFDI to be integrated with the ERP system.
- It is easier to track orders, inventory, revenue and sales, and sophisticated forecasting algorithms can be incorporated.
- ERP systems are especially helpful for managing globally dispersed enterprise companies better.

From the above it would appear that the development of the ERP system was the answer to the frustrating problems faced by the management of the large modern day organisation.

Although there are many ERP systems available, the system which has by far the largest user-base in the mining industry is the SAP system.

A brief history of budgeting, the rise of the costing models, and subsequent emphasis on cost control systems and structures

It would appear that budgeting as a concept first began in the public sector in the 18th century.

“The first reference to the expression occurs in a pamphlet called The budget opened 1733 directed against Sir Robert Walpole: ‘And how is this to be done? Why by an Alteration the present method of collecting the publick Revenues ... So then, out it comes at last. The Budget is opened; and our state Empirick hath dispensed his packets by his zany Couriers through all parts of the Kingdom ... I do not pretend to understand this Art of political Legerdemain’. The earliest recorded use of the word non-satirically in this sense seems to be from 1764.”

<http://www.dictionarycentral.com/definition/budget.html>

The budgeting process was eventually adopted by commercial and industrial organisations in order to:

- predict when cash shortfalls may occur, thus enabling the organisation to plan in advance whether it will need to secure financing, tap into a line of credit or make other plans in order to not run out of day-to-day operating cash.
- plan large expenditures (including CAPEX) more strategically.
- reduce interest expense by planning financing needs well in advance.
- have a better handle on the organisation’s cash flow, and hence improve the overall financial control.

From the above it can be seen that the original emphasis of the budget was for predicting and managing the flow of cash in the business, and not on the control of costs.

The need for cost accounting strangely enough seems to have come from the engineers and production managers. Modern cost accounting originated during the Industrial Revolution, when the complexities of running a large scale business led to the development of systems for recording and tracking costs to help business owners and managers make decisions.

As more and more countries began to industrialise, together with the great improvements made in the means of transport and infrastructure, so the competition between industrial and commercial organisations increased. One way that an organisation can survive under these conditions is by ensuring that it is amongst the lowest cost producers in the world. In the mining industry this is even more prevalent/pertinent as mines are producing base commodities with very little scope for differentiation.

Cost control and hence cost accounting has therefore become more and more important within organisations over the years. The epitome of cost accounting is arguably the development and

widespread use of Activity Based Costing (ABC) originally developed by George Staubus, and subsequently promoted by Robin Cooper and Robert S. Kaplan in a number of articles published in Harvard Business Review beginning in 1988. Activity-based costing requires an organisation to understand how every operation is done, what is the main driver of the operation and what role it plays in the overall system that is being analysed.

Why do we go to all this trouble? The aim is to cut out unnecessary steps and any “fat” that we find in the system. Then, in order to gauge how well or how poorly our organisation is doing we benchmark every similar operation within the organisation and against external sources as well. We then top the process off by producing standards against which we can measure the efficiency of each resource. The resource with low efficiencies will become the focus of management’s attention.

With the huge number-crunching power of the modern computer at our disposal, it was the logical next step to use the extensive systems and information developed to support the Activity Based Costing and efficiency control methods, as inputs to the budget, the result being an Activity Based Budget (ABB). Hence the original need for a cost control system (the cost accounting system) and the original need for cash flow forecasting (the budgeting process) were combined into a very powerful management control system. In a large organisation this means that the huge amount of data recording and analysis can be fully utilised to produce reams and reams of standard and customised reports which management can then review and take action against.

The disastrous combination of the cost control mind-set when combined with the power of the ERP system

It does not require any stretch of the imagination to see that the ERP system would appear to be the ideal means to accomplish virtually all of management’s recording, tracking, analysing and reporting needs in one super powerful system.

So what’s the rub? *Focussing on everything is an oxymoron.*

With all this information, up-to-date and easily accessible, managers fall into the trap of trying to monitor and control the whole system (or at least that part of the system that is under their control). And as everything ultimately results in some form of revenue or expense which comes together in the finance/accounting department, the accountants in particular think that they can best influence and control the profitability of the whole organisation by controlling the expenditure of every department through strictly applying the budget. That is, the performance of the managers of departments and sections is measured by their variance to budget. The operations management, in turn, believes that the only way to control costs is by monitoring and managing the efficiency of every resource under its control. With tens if not hundreds of operations under the control of a given manager, it is easy to see how easily they become overwhelmed by the huge amount of

information at their disposal and they fall into the trap of losing focus by reacting to every negative change in the efficiencies of the resources.

The problem is even more serious than depicted above. It starts at the time that the budgets are initially drawn up and approved. But in order to properly explain what is meant, we need to take you into the world of Flow.

Imagine a production flow of some sort such as sand mining.



(This model courtesy of Arrie van Niekerk of Tavanec cc)

If you were told that each resource in the above production flow chain has the capacity of 10 tons per hour and is normally available for at least 80% of the time, how many tons on average would you expect out of the system?

10 tons per hour?

8 tons per hour?

Some other number?

Most people would say that on average you can expect 8 tons per hour from the system.

However, this would be incorrect as it does not take into account the dependencies between the resources. For instance, if the first loader breaks down for 3 hours, the system as a whole will produce zero for those 3 hours.

Therefore the correct answer is actually $.8^6 (.8 \times .8 \times .8 \times .8 \times .8 \times .8) = .264$

In other words, we cannot expect more than an average of 2,64 tons per hour from the above system. This is for a chain with only 6 inter-dependent resources, most of our chains in mining have many, many more inter-dependent resources.

This is what we refer to as a “balanced capacity chain” and on the face of it, most people would say that this is the ideal situation, including the accountants.

In fact this is the way the managers are expected to budget.

In developing our budget we start with the desired output (sales) and then we work back to establish how much of every resource we require in order to produce the desired output. Using the standards developed by the cost accounting system what we end up with is:

- Just enough people, workmen, supervisors
- Just enough tools,

- Just enough machines
- Just enough parts
- Just enough consumables
- Just enough of EVERYTHING.

In other words we budget for a balanced capacity chain.

Now do you see that Eugene is doomed before he even starts.

Since the standards and the budgets as well as the daily performance of every resource is captured into the ERP system, Eugene's "lack of performance" is highlighted easily, regularly and virtually up-to-the-minute with every report that is produced.

The usurping of the management of operations by the accountant or to put it another way, the abdication of their power by the operations management

As you can imagine, the ERP system has given the accountants a very strong tool for monitoring what happens in the operations, and indirectly, although sometimes directly, the ability to control what happens in operations. You may think that we are exaggerating but we see many cases where operations management is prevented from hiring people, purchasing equipment or materials, purely because it is not in the budget. In fact, the ERP system has built-in checks and balances which have to be overridden by a senior manager or the accountant before it will allow deviation from the budget.

The accountants, through the ERP system, have effectively "captured" operations.

However, it must be said, that the operations management "allowed" and maybe even condoned this in the mistaken belief that the ERP system would solve their problems.

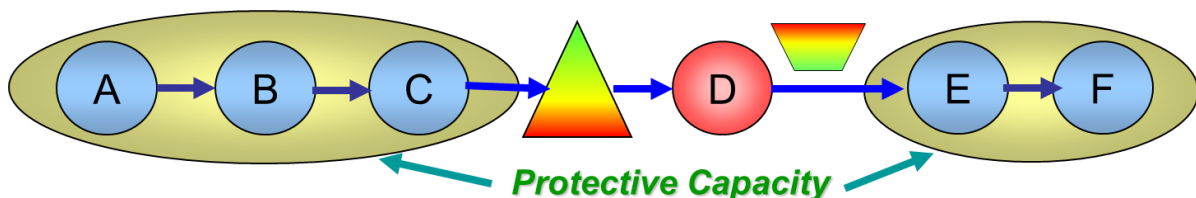
The missing measurements

If we are going to solve the issues that Eugene faces, then we need to go back to our model of Flow and see how best we can solve the problems of the "balanced capacity chain". We need to help Eugene to focus on the one or two critical things in his chain, which, if closely monitored and controlled, will dramatically improve the flow through the chain of resources.

The answer lies in the Five **Focussing** Steps of the Theory of Constraints as developed by Dr Eliyahu Goldratt.

1. Identify the constraint of the system (This is the resource with the least capacity versus the demand that is placed on it)
2. Exploit the constraint (The constraint should never be starved for work, or blocked from producing and it should have the maximum up-time possible)
3. Subordinate everything else to the needs of the constraint (all other resources must have protective capacity with which to support the constraint)
4. Elevate the constraint (If you still cannot produce enough from the system after having done step two and three above, then you need to increase the capacity of the constraint, and in many cases, other resources as well)
5. Repeat the above process in a continual process of ongoing improvement.

The result is a production chain that looks something like the following:



(The above image courtesy of Arrie van Niekerk of Tavanec cc)

In the above diagram it is easy to identify the minimum essential measurements that are necessary in order to know the health of the system and to be able to have focussed control over it.

1. It is critical to measure the rate of production and efficiency of the constraint, in this case, resource D.
2. A buffer of material must be established in front of resource D and this must be dynamically measured and controlled so that it is never allowed to run empty.
3. Sufficient space must be created after resource D and must be monitored so that resource D is never blocked from producing due to lack of space.
4. Monitor the protective capacity of all other resources in the system and take corrective action when it jeopardises the ability of the system to support the maximum output of resource D.

You can see that this means far fewer measurements than we normally have in our efficiency control systems and thus allows management to know what to focus their attention on, normally one or very few issues at any given time.

What does this mean for Eugene?

At the very least Eugene should:

- Know where the constraint is in his system.
- Put measurements in place as described above.
- Ignore the balanced capacity budget and do what is good for maximizing the flow through the operations even if it creates what the accountants will refer to as “fat” in the system but what we call protective capacity on non-constraints.
- Forget about measuring efficiency of resources (except for the constraint).
- Prepare and arm himself for the fight with the accountants by producing at least 30% more than he did previously. (This is usually the minimum increase in output that we see operations achieve when they take back their power.)

What happens when operational management reclaims power: The New Mine Manager

It is unlikely that Eugene will be able to create a system as depicted in the image above overnight. So where should he start?

The first step is for Eugene to decide where the constraint is in the chain. There are a number of ways of doing this which we will not detail here but suffice it to say that the moment we have chosen to treat a resource as the constraint, we start to bring focus and order to the system.

The next step is to decide what measurements are needed in order to show the health of the system at any point in time, and remember that these are not the normal measurements that the ERP system is monitoring. They may even be things like an estimate of how many hours of production ore is stockpiled in front of a crusher, and many other similar measurements.

These measurements then have to be reported on at least a daily basis in a “scrum” room where Eugene and the managers reporting to him will meet for about 30 minutes to review the state of the system. The idea is that the measurements are reported in such a way that it becomes very clear to everyone in the meeting how the constraint is performing, and which resources are struggling and may jeopardise the ability of the constraint to keep performing at maximum in the next 24 to 48 hours. Decisions are made by the team as to what are the critical focus areas for the next day to two days.

It goes without saying that the meeting described above is not the normal blame-and-shame type meeting but instead a spirit of open dialogue and cooperation between managers and units develops as they start to experience more and more success.

There are a lot more things that can result from the above meetings such as better medium- and long-term planning, especially in terms of the capacity requirements of various resources, and it is up to the mine manager and his team to exploit this meeting to the best of their ability and to continue to improve the performance of the mine on a continual basis. The scrum meeting will, however, remain the heart of the “new” mine manager’s management system.

How to use the power of the ERP system to really support the efforts of the operations

Very few if any of the measurements reported in the scrum meeting come from the ERP system. However, there are a few exceptions and to illustrate we will take just one such measurement, namely, the status of the material store on the mine.

The stores control system built into the standard ERP system is well designed to give the stores personnel control over the stores that they have responsibility for. In fact, when the stores modules of the ERP system is implemented, in most cases they will accept the standard practice of setting minimum (safety), maximum and re-order levels for each SKU that they keep in stock. This works well enough where the consumption, lead times and other factors are fairly consistent. But when we are talking about thousands of SKU with widely varying rates of consumption, lead times and other factors then, despite the best efforts of the stores personnel and the power of the ERP system, we still experience Out-of-Stock situations on a regular basis. If the Out-of-Stock item is something like explosives, the mine will obviously not be able to blast the rock and the supply of ore out of the mine will grind to a halt.

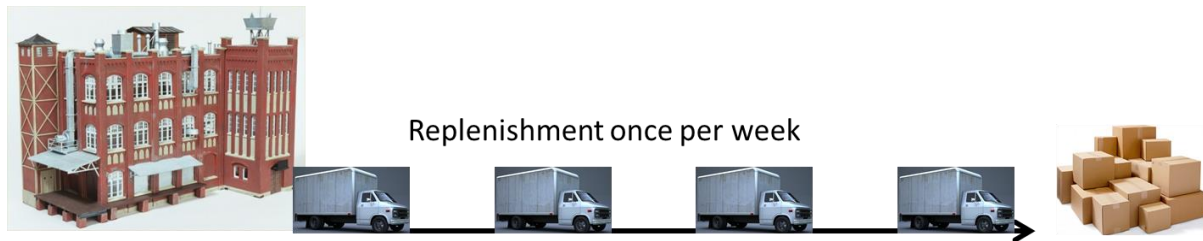
Unlike most manufacturing operations, mines have to be situated where the ore is, which in many cases is far from the nearest source of their required materials, in some cases the replenishment time can be months. In many cases, not only is the distance from the materials suppliers far but there is the added problem of getting the materials through one or more national borders. It therefore becomes necessary for the stores to hold much higher levels of stocks of materials that are required by operations, in order to give them maximum support in terms of availability of materials.

In our experience, we have seen that stores and procurement personnel tend to ignore one of the most powerful factors affecting the level of stock that they need to hold, namely the frequency of replenishment (ordering, shipping and receiving).

To illustrate:



Versus



From the above we can see that if the lead time from ordering to receiving is four weeks and you only get replenished once per month, you will need to hold far more stock than if you ordered and received smaller amounts every week.

You see that stores have a choice to either order based on reaching the reorder point, which is the more commonly used system, or they can make use of a fixed reorder cycle, like once a month on the first Monday of the month they will reorder a certain list of SKUs. That is, whatever was consumed since the last time the SKU was ordered, will be requested.

In one particular mine that is fairly far from its source of supply and that uses SAP, we requested the SAP support team to write an ABAP report that is pulled every single morning that prioritises the SKUs that need stores personnel's attention (ABAP is a report writing language used to extract reports out of SAP).

Each SKU is allocated three zones, namely the red or safety zone, a yellow or orange zone the top of which is the reorder point, and a green zone the top of which is the maximum level.



In order to prioritise the SKUs that require attention, the report monitors two things:

- The level of stock on hand, and
- The amount of stock on order and the time that has passed since the oldest order (that has still not been received) was placed.

19.2. Daily Stock Status Report Output

Stock Code	Description	Stock on Order	Percentage Lead Time Penetration	Stock Reservations	Stock on Hand	Stock on Hand Percentage Penetration	Stock On Hand Less Reservations	Overall Status (D + G)
345897	Lmn	0	400%	0	0	1	0	500%
965874	Pqr	30	0.78	0	0	1	0	1.78
123456	Abc	50	0.22	10	15	0.63	5	0.85
456487	Stu	4000	1.1	200	1000	0.11	800	1.21
523641	Fgh	150	0.46	0	30	0.35	30	0.81
897583	Xyz	0	0%	0	500	-0.1	500	-0.1

This allows the stores and procurement people to focus their attention on those few items that require some action to be taken.

The items that are critical and may impact on production are reported in the scrum every morning so that everyone is aware and can assist one another to take action to prevent a stock-out from negatively impacting the operations.

In another case, (not a mining operation) even though the lead time from the suppliers was between 30 and 45 days, there were daily container shipments from the supplier and so it was decided to “trick” the SAP system into placing orders every single day for anything that was consumed the previous day. We accomplished this by making the reorder point equal to the maximum with the result that as soon as one item was withdrawn from the store, the SAP system automatically placed an order with the supplier, in this case electronically via the internet.

In both cases, there was a substantial reduction in the amount of stock held in the store, a decrease in the number of “stock-outs” and the stock availability improved to the upper 90% range.

This is just one example where the power of the ERP system can be put to good use in support of the operations. There are many more ways to do this, once we understand the critical measurements that we need to monitor in our system to make it stable, and for its growth.

3) The Productivity Platform Intervention

The Productivity Platform Intervention delivers results by enabling mine managers to lead in a way that is appropriate for the environment in which they operate. In short, it unshackles workers and managers to do what is in the interest of better flow. The Flow mental model enables them to buffer their production system against variability and interdependency, thereby reducing complexity. It also requires them to focus on only a few critical leverage points, reducing pressure on their span of attention. It provides a shared vision for managers and employees alike so that they know at all times what the overall goal and priorities of the system are. Due to the improved visibility managers can delegate decisions on horizontal coordination to lower levels, without losing command of the situation. In this way coordination across different functions become possible.

And most importantly, it shows them why the traditional way of managing and measuring efficiencies leads to suboptimum results. It thus gives them the confidence to undertake critical

interventions that go against measurements designed for a local optima model. Because workers and managers see an updated picture of system flow daily, they become aware of cause and effect and team learning occurs. Having a group of people who are working towards the same visible goal, getting daily feedback, experiencing what it is like to be part of a successful team, builds employee engagement and enables them to contribute their skills and abilities to the enterprise.

It also creates a change platform for managing interdependence and variability, which is much more effective than change programmes driven by consultants. Whenever a change programme is announced, whether it is to introduce Six Sigma, Lean, values based or leadership interventions employees duck for cover and wait for the storm to blow over. A change platform, on the other hand, becomes part of the culture of the organisation and reinforces the new behaviours and opportunities for group learning. It also provides an opportunity for support departments (Finance, Logistics and HR) to get first-hand understanding of their impact on the overall production flow. Often this is the first time that they experience that productivity improvement is not just a production department issue.

By making the production flow visible, it is safe to move decisions closer to where the work is being done and the effective horizontal coordination of work becomes possible. This enables employees to achieve intrinsic motivation, a necessary condition for engagement.

4) Conclusion

Einstein is quoted as saying, “We cannot solve our problems at the level of thinking that caused them in the first place.” Few would disagree with this. However, if we were to ask “What is our current level of thinking” we will not get an answer. Our world view on what constitutes best practice is so set that we are not aware of alternative ways of doing. The Productivity Platform works by making the paradigm under which we work clear and setting up a different mental model from where managers and employees can do what is required for success. We unshackle the mining Gulliver from the thousands of small ropes tying him down. This is how we are able to generate production increases of between 7–50% and cost reductions of 10–30% per ton, within three to five months of the approach being implemented. And with managers and employees who before the implementation were rated as below standard by the wider organisation.