Strategic and tactical mine planning components
by R.M. Kear*

Synopsis
Strategic and tactical planning are both required in the mining industry but have completely different objectives and require different environments. If these are not fully understood, then the best value for a mining operation may not be realized. This paper examines the differences in these approaches and how they interface in the mining environment. The objectives, content, skills required and the implied management issues for these two components are examined with the hope that this will assist management and the planning teams in defining their respective roles and expectations. The opinions are those of the author based on his experience on several mining operations and projects.

Introduction
Compared to most other industries, the mining industry has long cycles between the various stages within mine life. While the immediate and tactical components are reasonably well understood and attended to, the strategic side has often been neglected. Both components are necessary for a successful operation; however, for the sake of brevity, this paper concentrates mainly on the strategic issues.

The opinions are those of the author and the readers are free to draw their own conclusions but it is hoped that the issues raised may stimulate a debate on the need and form of both strategic and tactical components within an operation.

Strategic vs. tactical environments
These environments are distinct and have different purposes and composition. Both environments are necessary to obtain the best value from a resource. That is, they should complement rather than compete with each other.

The following paragraphs attempt to highlight the salient differences between the two.

Strategic environment
This environment is required for the development of a strategy. The strategy is the broad plan required to achieve an objective. This involves ‘free’ or lateral thinking to identify all possible scenarios, which could lead to the objective. Normally, for a mining project, the objective is to obtain the best economics from a particular resource. In summary: ‘define the goal’.

Tactical environment
In this environment the tactics required to achieve a strategic objective are developed and implemented. In the mining sense, this would be the procurement and utilization of resources, such as capital and labour, to achieve the defined strategic plan. In summary: ‘achieve the goal’.

These environmental differences are summarized in Table I.

The mining environment
The mining production environment is predominantly tactical—effort and resources are focused on attaining a goal, normally a production target either as tons or mineral. Most mining operations are reasonably consistent in economics for a particular mining layout or design; the only parameters that can affect the economics are mainly the price, costs, production rates and recoveries. In order to make significant differences to a mine’s economics, it is required to change the design and/or schedule. Underground mines normally have less latitude for schedule changes than open pits.

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Due to these issues, it is generally seen that value changes tend to be greatest in the strategic area (planning), whereas cost and efficiency changes tend to be predominant in the tactical area (the doing).

Value changes tend to have a greater magnitude of influence on the mine economics than cost issues.

Open pits are different from underground mines and some of the major differences between the two are summarized in Table II.

This means that an open pit mine can generally be started in a relatively short time while most underground mines require several years of development prior to production. Scheduling changes can often be quickly adopted within an open pit, while the schedule of an underground mine is largely dictated by the design and, as such, there is normally less flexibility within the schedule. Pit shells have a life of about five years, compared to massive underground mines where a ten-year life of an extraction layout could be expected. A further consideration is the increasing complexity of a mine over time. A mining reserve is a finite resource and the value decreases over time due to depletion. It is normal to exploit higher values and the easiest mined material first, which means that during the mine life one has to work increasingly hard for less value.

Implications

If the previous issues are taken into account, then they have several implications, some of which are enumerated below.

When either component is missing

If the strategic component is missing, the operation will eventually start running into shorter and shorter term problems. The operation will be required to make ad hoc fixes in order to maintain production. This will mean rapid changes, on an increasingly reduced time scale, and eventually the production requirements will not be met. Once this starts to occur, operational standards will drop, which in turn will increasingly exacerbate the problems. Some mines have attempted to mitigate this by adopting medium-term planning; however, this normally will not realize the best value from the resource. No matter how good the tactical team is, without the long-term objectives being clearly defined, best value will not be obtained.

A mine is a finite resource and therefore the value decreases with time due to the depletion of the minerals. Also it is normal to exploit the most payable material first, which means that the remaining material decreases in unit value. To counter this trend, various methods can be applied such as improved efficiencies and cost control. However, these measures have a limit. The stakeholders wish to maintain constant or improving returns and to meet these expectations, once the efficiency issues have been utilized, the trend is to defer capital expenditure. Unfortunately this capital is required to continue mining and because of the decreasing value and the increasing difficulty of mining the resource over time, a ‘bow wave’ of capital builds up which, if not recognized, can become so large as to cause the premature closure of an operation.

If the tactical component is missing then no matter how well thought out the objectives are, they cannot be realized. Therefore a suitable team and required resources are needed to be able to attain these goals. The tactical component is especially useful in applying new technologies, greater efficiencies and economies of scale to counter the decreasing returns experienced at a mine over time. However, as stated above, there is a limit to which these can be applied after which these approaches can negatively affect the ability to operate.

Timing

Strategic planning should look at least ten years ahead for open pits and at least fifteen years ahead for underground mines. Therefore the resource information, including the modifying factor information, should be known to a reasonable level 15 to 20 years ahead. Due to the decreasing

| Table I |
|------------------|------------------|
| **Strategic and tactical environments** |
| **Strategic** | **Tactical** |
| To determine the objectives | To attain the objectives |
| Obtain best value | Obtain lowest costs |
| Design | Implementation |
| Determine limitations and constraints | Identify the resources to achieve the plan |
| Match the components to maximize the objective, i.e. max NPV, IRR, etc. | Allocate the resources to particular tasks |
| Test the effect of various strategies and scenarios | Test the effect of various operating practices |
| Identify variances and develop corrective strategies | Identify variances and develop corrective practices |
| Loose structure | Tight structure |

| Table II |
|------------------|------------------|
| **The mining environment** |
| **Open Pit** | **Underground** |
| Schedule sensitive | Design sensitive |
| 5 year cycles | 10 year cycles |
| Quick to implement | Long implementation |
| Visual control | Systems control |
| Lower mining capital | Higher mining capital |
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Margins and longer access times during the mine life, the length of period and the data required will probably increase over the life of the mine.

Most mines do not have this information and therefore full value cannot be realized. However, it must be stated that it would be foolish to collect information just for the sake of having it. Exploration should be targeted by the extrapolation of present data and conceptual studies, which will target the information required and also justify the expenditure.

It is also suggested that long-term time lines be developed to indicate when and what must be done to keep ahead of the present mining. This should identify when the ‘what’s next’ has to be determined and follow a logical process, which has been discussed in the paper ‘Mine Project Life Cycle’ (see references).

Management implications

In general the mining industry has been operating in a ‘cost-cutting’ mode for many years. Often this has resulted in the long-term data gathering and planning being deferred. Unfortunately the industry is now so anorexic that it will take many years to restore a level of strategic planning and ultimately realize the best value from the resources. One result of this extended ‘cost-cutting’ period is that, in some companies, a whole generation of management has come through the ranks without being exposed to strategic planning and therefore has little awareness or expectation of the outputs. This, coupled with the present practice of a short-term period of tenure of senior management, does not auger well for the industry and it would appear that this is not unique to mining.

In order to address this problem, it is required that somewhere in the senior levels of management a person has to be made responsible for the long-term strategy to realize the corporate requirements, normally best value. Suitable levels of strategic related skills will be required to carry out this function. Presently these skills are extremely scarce, and time and money will be required to develop these capabilities. This issue alone is worthy of a separate paper. Once this is in place, a strategy developed and long-term plans are accepted then a second issue of remaining on plan becomes important. This issue alone is worthy of a separate paper. Once this is in place, a strategy developed and long-term plans are accepted then a second issue of remaining on plan becomes important.

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Some mining groups do have the remnants of such structures and systems, but most suffer from being depleted and/or are incorrectly staffed. These departments are often reactive rather than proactive and are most often used in a governance role rather than in evaluating strategies for adding value. To be fair, at least one mining house has realized this shortcoming and is in the process of setting up a structure to cater for these issues.

Long-and short-term planning

The long-term planning function should examine and evaluate possible alternatives for the depletion of the resource. This work should generate options for senior management to consider. When an option has been selected the long-term planners should then develop a long-term series of plans, which should be presented to the production team for acceptance as a practical and achievable sequence of mining. Once accepted, these plans become the scope of work for the production team. The long-term planners should routinely reconcile actual progress with the plan and report on the deviations and the consequences of these deviations.

Short-term planning (tactical) is a service to the production manager the function of which is focused on the allocation of resources to meet the long-term plan.

Long-term planning is a service too and therefore should report to senior management.

Auditing and assurance

There is an increasing call for assurance and auditing within the mining industry. This is to be commended and as major projects and expenditure often affect mine sustainability, a review by suitably qualified persons is essential.

Risk analysis is a relatively recent addition to the auditing tools for mining projects. One of the reasons for the adoption of this tool has probably been an attempt to counter an increasing number of disappointing projects. Suitably applied, it can be a useful tool but unfortunately in most cases the purpose for which it is required is not fully understood. In many cases only the tactical risks associated with a particular design are assessed and this should give an indication of the probability of the plan being achieved. However, it normally does not address the strategic issue of whether or not the plan is the best option for the resource, with the result that one may end up with a low-risk suboptimal project. Strategic work is notoriously difficult to audit as this work comprises ideas and thoughts. It therefore is incorrect to apply a ‘tick a box’ type of assessment.

Suggested approaches

If there is a desire to improve the present situation then the following suggestions could be considered.

Longer-term view

It is relatively common to see presentations to senior management and company boards comprising three or sometimes five year cash flow projections. In view of the typical mining cycle of 10 to 15 years, these cash flows are probably inadequate for an appreciation of future requirements. Future potential cash flows and time lines should therefore be added to this information, along with the time and monies envisaged to complete the various study cycles for any projects.

Where a mining company has more than one mine, it is advisable to develop an overall group strategy for these resources. This should assist in the prevention of potential clashes such as several mines constructing new plants or drop-downs at the same time. Once a strategy has been selected, senior management can assess whether any new proposed projects fit the strategy and also determine if the company is on track and, if not, take prompt corrective action.
Appropriate performance indicators

Most production managers are tasked with achieving a goal of some description, normally tons, metres of development or quantity of mineral. However, it is important that these come from agreed areas as defined by the long-term plans. Waste stripping, for example, is required to expose future ore and therefore has to be removed at the right time and place. Similarly, tons or ore must come from the correct faces or stopes and not be highly contaminated with waste as a ‘bulking factor’. Most performance indicators do not take these sorts of considerations into account. A suggested approach is to regularly reconcile actual production with the long-term plan. The reconciliation should take cognizance of spatial depletion. This approach allows for deviations to be identified and action should be taken to get back to plan rather than replanning. Such comparisons allow for easier control and it is often possible to generate useful metrics such as a mine to plan index.

Senior management, along with the attainment of short-term objectives, should also be tasked with the long-term sustainability of the operations in some form of strategy, which can be demonstrated as best meeting the company objectives, and report on the progress made compared to this strategy.

Develop technical skills and tools

Most operations have good tactical skills, although, at present, operational conditions appear to be deteriorating. This is most probably due to the ‘quick fixes’ that are required due to a lack of appropriate long-term plans rather than the inability to operate. The main area that appears to be short of skills is in the area of strategic long-term planning. The ‘cost-cutting’ mode has resulted in the industry being spread so thin that the training and mentoring of people ‘on the job’ does not take place. Additionally, strategic planning does not enjoy the attention it should and, as a result, these skills are now extremely scarce.

Strategic planning requires a special sort of aptitude but the emphasis today is more on qualifications than experience. Most industries have become hidebound in requiring certain levels of education before promotion is possible. While not denigrating these qualifications, it does appear that the QBE (qualified by experience) does not properly register in the ranking of candidates. It is suggested that this be reviewed so that the best person for the job is selected.

Once suitable candidates have been selected, it is required to investigate how best to develop the skills required for the strategic planning. This development can take several years and becomes part of an ongoing process. People who take this route should have reasonable career prospects to prevent rapid staff turnover. This subject is worth much further discussion.

Another issue is the availability of tools to assist in the evaluations. Some mines are of the opinion that software will accomplish the requirements so that anyone who can read and write can push a button and get the answers. However, this is not the case, and the aptitude and experience of the engineer is critical to identify and evaluate options. Software is an unintelligent, but essential, tool to assist the engineer. What is required is the correct environment, including hardware and software, to facilitate the rapid evaluation of alternatives. The development of skills in this area is critical and also points towards the need for a low staff turnover.

Utilize the skills

Sometimes a mine or company has an individual or group which has developed strategic skills. However, they are often under utilised by fulfilling a governance role or being involved in detailed tactical planning. Such individuals or groups would be much more gainfully employed in addressing strategic issues. Management should allow such a group to have the space and resources to investigate options and present the promising alternatives to senior management for incorporation into a strategy. Where this has been done, the result has been an increase in value for the group and clashes between operations have been identified.

Achieve then preserve value

In most operations quite a considerable amount of work will need to be completed in order to map out the best strategy, but once this has been accomplished, the work will change to monitoring new options and resources and adding these to the portfolio. The need at this point is to maintain the levels of skills so as to preserve the values obtained. If this is not done, then the operation could be losing value.

Conclusion

This paper has attempted to show the roles of tactical and strategic planning within the mining industry. It is recognized that the major issues dealt with have been within the strategic area as it is felt that this is where the most attention is needed. Due to the long cycle times in the mining industry and the time it takes to obtain the skills and required experience, strategic initiatives will take time before results are shown. This will therefore be a long-term process and will need long-term commitment.

Acknowledgement

This paper has been based on the observations made at many mines and the author would like to thank his clients and associates for the ideas and discussions over the years. The author stresses that this paper is based on his observations and conclusions and hopes that they will form a basis for discussion and may assist in the formulation of a suitable strategy.

Reference