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PERSPECTIVES

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THE FIVE ELEMENTS OF PROJECT FAILURE

Dick Addison
Principal Process Engineer, PAH

"There is nothing so useless as do-ing efficiently that which should not be done at all." Peter Drucker

Here at PAH we are constantly determining 'that which should not be done at all,' assessing whether mining projects should proceed or not. It seems that many of them fall in the category of those that should not be done at all and they never come into being. The reasons are generally split 50:50: half the time it is because the engineering basis for them (usually the resource) in inadequate; the other half of the time it is because they are not economically viable at the commodity prices used. Yet some that have the resources and appear economically viable, proceed through development and subsequently fail. Why does this hap-pen? Can it be predicted? Can it be avoided? What factors contribute to it? Perhaps the last of these questions is the most relevant.

We are careful these days to be assured that a project does not proceed unless the resource and reserve figures are well established, that it is technically sound, and that the economics appear reasonable. Accordingly, technically and economically, all looks good. Yet there are other factors, mostly non-techni-cal and usually difficult to model, that can trip things up. The

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principal elements that contribute to project failure have parallels in the fundamental elements established by the ancient Greeks:

These elements are so complex that it is exceptionally difficult to define them and predict how they will evolve, no matter how deeply they are inves-tigated. Does this mean we should not attempt to do so? It would seem so initially, it takes considerable ef-fort to investigate these elements, and the results are often conjectural. This is part of risk assessment, where cautionary words are required to serve where quantification is not possible. As engineers, what we cannot easily quantify we have a tendency to consider inconsequential, essentially irrelevant. Yet while these elements are difficult to define, quantify, and link to possible future problems, some general considerations are worth reviewing.

Earth (Geotechnical)

Earth and rock are complex mix-tures, usually tempered by heat and pressure, often mixed and sorted by wind and water. Attempts are made to define them, measure them, and determine how they will react, but so often the unexpected happens. Earth and rock are so complex that we cannot fully know how they will behave and sometimes their be-havior changes with time, as they are exposed to air, or drying, or moisture. Given these circumstances, it is not surprising that geotechnical engineers have the highest professional liability insurance rates of all engineers, similar to obstetricians who have the highest insurance rates in the medical field, and for the same reason: the difficulty of predicting outcomes and the severity of errors.

Though testing is very important historical precedence of difficulties encountered with similar materials, or in similar locations, or in similar circumstance is often as valuable as test data. But such information is not easily obtained, largely because we do not like to report failure, even though it provides so much more useful information than success. We are usually intimidated from doing so by threat of legal action. Still, by digging deeply and dili-gently into the literature, useful information can be found. The time and effort spent in this can be well worthwhile and can save huge amounts of time and money. One useful source of information is that provided by environmen-tal organizations, organizations that are not as constrained in publishing as are mining-indus-try personnel, though their reporting can be biased. Another source is literature (published and unpublished) on mining in the same district, mining which may be related to other elements entirely, but where rock types are the essentially the same; such literature may be more historical than technical, yet can provide useful insight.

Air (Politics & Culture)

If ever there was an enigmatic and difficult-to-define element it is politics and culture. As for most of the elements, it is a function of place, and each place is different and each has particular local, national, and international influence. It is often thought, because technology changes so rapidly, that political and cultural norms change rapidly as well, but this is not the case, they change relatively slowly and they are far from uniform.

Politics and culture, it seems, are impossible to quantify, though perhaps it is time some-body tried to define the components of politics and culture and give them some numeric value. We do have some evaluation of political and cultural influences in some sense in that mining magazines often publish annual rankings of countries or of states and provinces and their hospi-tality to mining projects, but it is very crude. Perhaps it will be ever so.

Should we then ignore this element? If not, how can it be assessed and given due consideration? Historical precedence is helpful. In contrast to Henry Ford's remark: "History is bunk," it is surely better to follow Churchill's edict: "Those that ignore history are doomed to repeat it." History provides insight into politics and culture, and glimpses of it its effects and clues to it can be found in non-fiction books about the region and bi-ographies of local people. How people think and what is impor-tant to them is well worth finding out in developing an appropriate policy and strategy. Interviewing local residents can also be very helpful, and engaging public re-lations firms can be productive, though their forte is primarily put-ting the appropriate 'spin' on negative news

Fire (Markets)

Commodity prices can swing wildly, some more mercurially than others. For the most part they swing from high to low and back again and do not seem to stay in the middle too long. The cycle times are also variable. Can they be predicted? To some degree, but usually only in the short term, a few years perhaps. The trouble is that mining projects often take a decade or more to go from exploration to production. It has sometimes been sug-gested that it would make sense to develop projects when metal prices are low so that they will come into production when the prices peak. In reality, few have the courage or will to do this, or perhaps more correctly, can find financial backing for projects when markets are down. Much more often the reverse is true: projects are developed when metal prices are high and come into production when prices are low.

These days there are specialist companies that research the markets and make predictions. But which ones are correct? Some companies assemble the collective wisdom of several and come up with an average expectation. This seems to be a wise strategy, but quirks seem to happen as often as not, both providential and detrimental. Selling forward is one way to minimize risk but this itself can be risky if, as often happens, costs rise as commodity prices rise. Fortunately, market price risk is one that lending institutions will usually accept, making it less of a concern than it would be otherwise.

Water (Weather)

This is another complex element which, though it can be reasonably well modeled based on historic data, interacts with the many facets of a project that often defy predictability and can spell failure. While a suite of historic measurements can be provided for weather and the changes on annual cycles, the interaction of temperature, rain, snow, wind, and fog is exceptionally difficult to define and the effect of these interactions on earth and rock, on machines, on people, and on structures, is difficult to quantify.

Historical precedence is probably as important as measured values. Yet it is about impossible to find collected works on weather-related failures applied to mining projects. Part of the problem is that project failures are usually a combination of factors and it is difficult to determine how these factors contributed to the failure. Weather-related matters are of short duration and time dependent so that it is dif-ficult to isolate them and give adequate weighting to their contribution to failure. Local people living in the vicinity of the project can be a very useful source of climatologic information, but are usually given short shrift. Freezing and flooding are the two principal weather worries. Examples are freezing of wet rock on outdoor conveyor belts, freezing of heaps and dumps, and periodic flooding that washes away roads and pipe-lines.

Quintesence (Money)

Is there ever enough money? No. It seems that the estimates are almost always less than re-ality, particularly in recent years. The trouble is that money runs short just at startup time, just when it is vital to have enough to fix all the things that are not working properly. So the startup drags on, production is less than projected, costs are higher, and the project sinks deeper into the mire. There has to be one of those Murphy-type laws that project costs will always rise to absorb the available cash. What can you depend on if the estimators cannot estimate correctly, the contingency is never enough? One strategy is to have a hidden contingency, un-known to all but top management.

Should one keep pumping money into a floundering project? It depends. It is not an easy decision, and whatever decision is made it seems to have equal chances of being correct or erroneous.

Once again, history is worth studying. But it is difficult to find the information, particularly since it is usually embarrassing. The press does provide some reporting of project cost in-creases, particularly of late, with inflation jumping and exchange rates gyrating, but it is often dif-ficult to make much sense of it as it is often accompanied by changes in project scope. An extensive collected assemblage of original estimates and actual costs does not exist, at least not in the public domain. Another problem is that estimates change as projects progress and it is difficult to know the original estimate, even on a specific project.

Conclusion

In essence, one has to beware of Greeks bearing gifts: that glorious project may well contain the elements of disaster hidden within it, though the bearer of the gift is often unaware of it, or so it seems.

In assessing projects it is helpful to remember that failure is concomitant with action; inevitably, some projects will go awry, though it is relevant to note Laurence J. Peter's statement:

"There are two kinds of failures: those who thought and never did, and those who did and never thought."

As Peter has stated, it can mean that the project never gets off the ground, yet plunging ahead without thinking is equally lamentable. Balance is needed and, hopefully, it is a reasonable balance between successful and failing projects.

For all the doom and gloom discussed thus far, there are many projects that are well worthwhile, and there are some where serendipitous circumstances make them even better than projected. One needs an evenhanded perspective, keeping in mind the philosophy of Dr. Murray Banks:

"As you wonder on through life, brother, whatever be your goal, keep your eye upon the doughnut and not upon the hole."