



Welcome again to *Capital Strategy*, a private letter to senior management in capital intensive businesses—particularly minerals, energy (coal, oil, gas), power generation, transport, infrastructure, and knowledge-based industries.

Feedback

Knowledge-based industries as *capital intensive* industries? Yep. Take book publishing. Or software development. Almost all of the effort is up-front—true capital ... valued and expended on the expectation of the downstream returns. The marginal cost of an additional sale is very low. And, as I noted in the last *Capital Strategy* letter, 'Capital' does not mean steel and concrete—capital is the *value* of expected future earnings, embodied in a whole set of things.

Knowledge-based businesses are very capital intensive businesses. And worse ... unlike a factory that is still worth something when the world changes and the business folds, the second-hand value of a non-commercially-viable book manuscript or software product is about nil! Now the traditional hard asset type of capital intensive industry is discovering that the second hand value of those hard assets is similarly worth very little when the world changes. We can learn a lot from these knowledge-based industries (the theme of this issue)!

Knowledge new perspectives for competitive advantage

Cash costs... you can measure them.
Market share... you can measure it (maybe ... can you define your market well enough?). Measurable indicators are the sine qua non of efficiency in running a business. Efficiency but not effectiveness. A preoccupation with production and cost targets may not add any value to your business—whilst you have your eye on *this* ball, a competitor might change the rules of the game!

Value stems from things that you can do that your competitor can't do or doesn't understand. These things are frequently non-measurable. If they were, they'd be easier to copy.

Patents, copyrights, and secret formulas give you one advantage that your competitors can't emulate. But you can always sell a patent or copyright. And if you develop some patented or copyrightable thing and *don't* sell it, then you still must take into account the opportunity cost (the foregone sale price) at this valuation before you can genuinely say you are adding value when you use it in some subsequent production process.

The same is true for mineral deposits. They may be a source of competitive advantage, but let's not confuse the value added by finding some orebody, from the value added through exploiting it.

Inventing new devices and patents, composing new songs, finding new orebodies—these are all creative, entrepreneurial skills typically sourced from *individuals* more so than organizations. How then can an *organization* add value?

One answer lies in the way that knowledge is used within the organization ...how ideas from one person get combined with the knowledge and ideas of someone else in a way that:

- ❶ couldn't be done outside the organization, and
- ❷ can't be easily replicated in other organizations.

Skills in knowledge transfer are a major and growing element in building competitive advantage within organizations.

Here is one example: The traditional job of a manager is to *allocate* tasks according to the skills and resources that each person in his team can bring to bear. But in today's world many managers have only a limited understanding of the real skills of the people on their team, and even less knowledge about the hundreds of other people in their organization who could potentially contribute. Lots of value goes begging.



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Issue #99/2

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A database of skills is not the answer. A database doesn't capture someone's enthusiasm for a job. And besides, much of the knowledge is tacit—not how to *do* something, but how to *understand* something.

The problem has to be turned on its head. The manager's job is no longer one of *allocating* tasks. The issue, to paraphrase Nobel-prize-winning economist Friedrich Hayek, is: "how we can set up our enterprise so that the unknown persons who have knowledge specially suited to a particular task are most likely to be attracted to that task!"

The companies that are really adding value are the ones that have the biggest difference between the market value and their book value—the difference is the market's perception of the value added by the company *independent*

of the identifiable hard assets it uses. (Coca Cola is about 17:1) What is the common denominator amongst companies with high market:book valuations? Ease of communication—particularly *informal* communication. It is the hallmark of the best run companies. Easy communication allows the talented people within the organization to gravitate to the task that they are best suited to. And once people are attracted to a task then the best run companies allow them to do it!

Hayek started this idea in the 1930's and 40's, but it has seen a recent resurgence in the business press. There has to be a better way to make money through knowledge based competitive advantage rather than squeezing costs yet again! *ICR*

Unknowledge

Unknowledge? Run that by me again!

The rather enigmatic economist George L.S. Shackle tackled some interesting subjects in his career. One he called: unknowledge (in: *The Bounds of Unknowledge (1983)*). It is the problem of how do you know when you don't know? Like: how to justify grassroots exploration expenditure or R&D expenditure.

If you know the *probability* of finding something you can rationalize the expenditure. But lots of expenditure occurs on things that can never be expressed even in probability terms. Even if it can be expressed in probability terms you have to do a certain amount of sampling just to determine the characteristics of the distribution, and *this* sampling cannot be justified in probability terms.

We've seen lots of examples of money lost due to the unknowledge problem ... companies entering into major capital investments unaware of some detrimental characteristic *even though the knowledge was readily available elsewhere in industry.*

Everyone can see the problem with the benefit of hindsight. But how do you come to understand it *before* you make the decision? Some clues to the answer are given in a presentation I made to a mining industry function last year entitled: "How to turn Unprofitable Mines into Profitable Mines." The paper was reprinted in the Dec-98 issue of the AusIMM bulletin and is also on the internet at: <http://www.runge.com/capital> *Check it out!*

Marginal Costs and Knowledge

Ever since the days of the diamond-water paradox, the understanding of marginal costs has been fundamental to just about every economic decision. The marginal cost is the change in total cost. It is the real cost of an additional unit of production. It is *not* the *operating* cost—operating costs have fixed elements too, like electricity demand charges, for example.

In a competitive market, whether you are making motor cars or ounces of gold, you maximize your profits if your production is established at the point where marginal cost equals the price. Maximizing profits is the same as minimizing losses, so this rule applies even if you are making a loss.

Figure 1 shows the theoretical case. At low production rates the fixed costs bear heavily on each unit of production. The average cost is high, but the marginal cost is usually low. As production expands the average costs come down, at least for a while. Increasing inefficiencies cause marginal costs to increase.

In a super-competitive market where everyone has the same technology, prices will be at P , and everyone will be producing at rate M . At M the marginal cost equates to the price which equates to the long run average cost of production. If, for some reason, prices are at P_1 (higher than the long run average cost), or P_2 (lower than the long run average cost) then you should still produce at the rate where the marginal cost equates to the price (M_1 or M_2 in the figure).

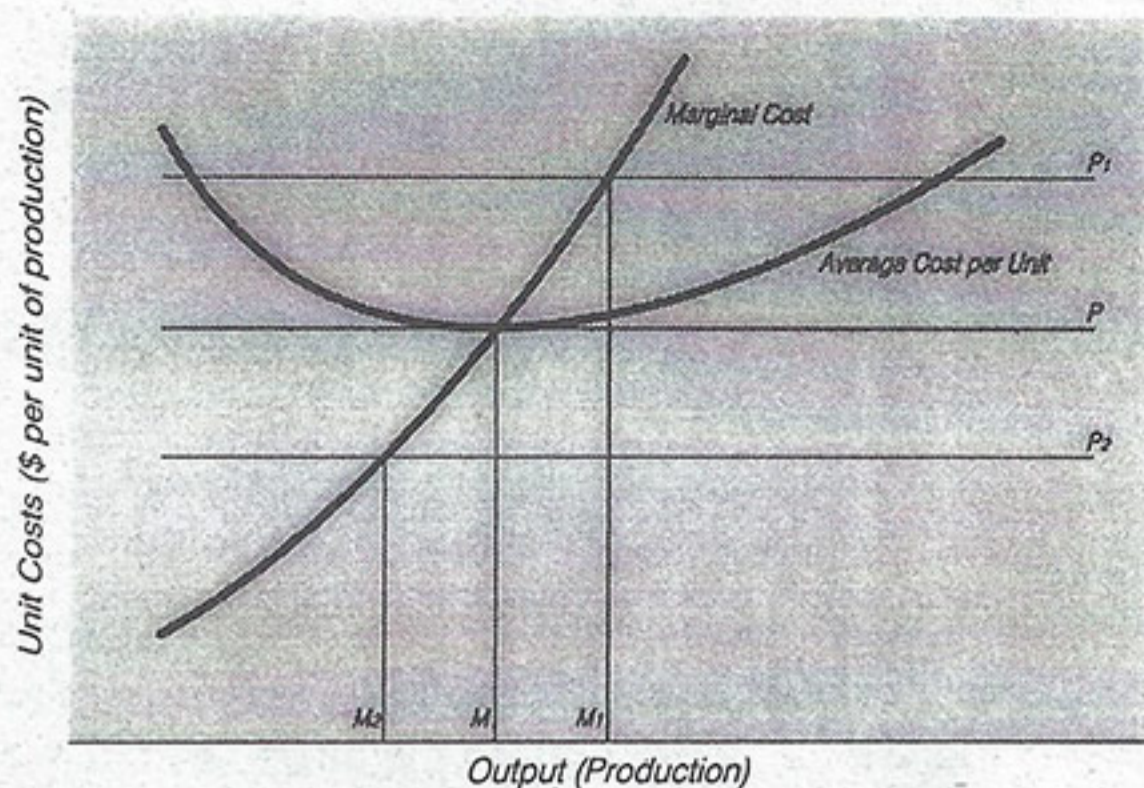


Figure 1

Or so says the theory.

There is nothing wrong with the theory, but in the real world there are lots of uncertainties. Also information is not free, so you also have to expend lots of resources just to discover what your costs are ... keeping in mind that the costs we are talking about here are costs as we understand them *before* we make the decision, not costs incurred after the fact, as added up by our accountant.

Also, many of us live in a world where price cannot be taken as a given. A small increase in production (or even an *expectation* of an increase in production—by ourselves, or by one of our competitors) might impact the price that we receive. The strict rule for optimum production is not “marginal cost = price”, but “marginal cost = marginal revenue” and the extra revenue from the extra production may be greatly different to the average price.

And, for capital investment choice, we cannot easily learn by trial and error. A coffee shop can each day try different prices, products,

Catgut? or Strategic Misinformation?

There are other kinds of knowledge, including knowledge that isn't!

Why are violin strings called *catgut* when they are really made of sheep intestines? Around 130 AD a strategic thinking Roman named Erasmo started making strings for musical instruments out of sheep intestines. The demand grew. Because it was considered extremely bad luck to kill a cat (but presumably not bad luck to play a musical instrument using intestines from a cat) Erasmo identified his product as *catgut* to limit imitation and therefore obtain higher prices.

and service levels to *discover* after only a few days where this marginal cost / marginal revenue production line is located. You can't do this with a power station, motor car factory, or a mine.

Thus the choices confronting us as managers might be far from the simple formulation of economic theory. Every choice is subject to uncertainty.

What has all this got to do with “knowledge” (apart from wishing we all had more of it)?

Knowledge not only directs us towards some distinct choice, but also establishes the residual uncertainty associated with that choice. 1,000 manhours of study might suggest our optimum production rate is 1 million tonnes per year. 10,000 manhours might suggest the optimum production rate is also 1 million tonnes per year. Is the extra 9,000 manhours of work wasted? *No*. There are, or should be, a lot fewer unknowns associated with the choice after 10,000 manhours of study than after only 1,000 manhours of study.

But how do we know whether the extra uncertainty reduction is worth the extra cost? If it isn't we are just into analysis paralysis.

The pursuit of knowledge should continue until the (additional) cost of the extra knowledge equates to the marginal value. Further, resources should be directed so that each area subject to unknowns makes the same relative contribution to uncertainty reduction.

Thus it is very inefficient to spend money drilling out an orebody to the n^{th} degree when you have no knowledge of what your competitor is likely to do next (assuming, of course, that you can spend resources legally on finding this out). And similarly, analysis in ever-more-detail may be wasted if the more-precise plan has the same marginal cost of capital as the less-precise plan.

These issues are far from simple. But we do them very very poorly. Everyone has got horror stories about money wasted on consultant reports and similar studies that amounted to nothing. Understanding the marginal cost and marginal return on resources spent on knowledge is the key to improving the efficiency of this part of your business.

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Ian Runge undertakes consulting work and presents tailored, in-house courses that focus on efficient use of knowledge and rational decision-making under uncertainty—particularly for large, irreversible capital investment choices.

An outline of a generic course is on our WWW site, or you can call me at: (07) 3210-2788



Rational Expectations? Sounds like the kind of economic mumbo jumbo that business people should steer well clear of. The economic mumbo jumbo part—yes. The idea? No.

“Rational expectations” is the fancy name to describe the many economic situations in which the outcome depends partly upon what people expect to happen. The price of corn, for example, depends on how many acres farmers plant, which in turn depends on the price that farmers expect to realize when they sell their crops. And of course, if one farmer arrives at one conclusion as to what this price will be, rationally he must assume that other farmers will arrive at a similar conclusion and that they will pursue *their* choices similarly. If the process is repeated year-in and year-out, some consistency can result. But for one-off choices, like most capital investment choices, the process may have far less consistency.

Interested in this idea for minerals industry capital investment choices? Ian Runge will be presenting a paper incorporating rational expectations and game theory (the economics field associated with strategy) at a forthcoming

conference. The paper is entitled: “Corporate Strategies and Objectives—where conventional evaluation methods fail for capital intensive industries” and it will be part of the AJM Conference “Strategic Mine Planning - A Financial Perspective” in Melbourne on 26th and 27th August. Don't miss it!

**More
Feedback**

Procrastination

In the last *Capital Strategy* letter I posed the question: “Under what conditions is procrastination entirely rational?” Thanks for the many replies. The bottle of Grant Burge Cameron Vale Cabernet '95 went to Don Henderson of ARCO Coal. But if I was awarding runner-up prizes they would probably go to Glen Mills of QNI who suggested that procrastination would be rational “whenever you are considering an investment in a greenfields project in the minerals industry” or to Gregor Carr of Shell Coal who pointed out that the answer was on page 183 of my *Mining Economics and Strategy* book. (I'd forgotten I had mentioned it!).

About the *Capital Strategy* letter

Capital Strategy is sent at no charge, but it isn't free!

- We want to change the way capital intensive businesses go about making decisions. If you use the ideas (you're welcome!) then at least let us know. Referrals are always welcome.
- Please confirm that you want to stay on the mailing list. If you respond in one form or another, we automatically add an issue or two to your subscription, and visa versa if we don't hear from you.
- More readers, more clients please! Do you know someone in capital intensive industry who might be interested in these ideas? Will you help us connect? Thanks!

Ian Runge

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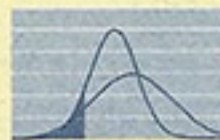
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