BY CHARLES COOPER AND DAVID HENDERSON

Douglas Hooper has photographed hundreds of weddings in the San Francisco Bay Area, including a recent one at Stanford's Faculty Club. The ceremony was over and the couple's 225 guests were enjoying themselves, lost in conversation, food and drink in this upscale university setting. Douglas was preparing to photograph the rest of the reception when the wedding couple, looking harried, explained that they had to leave at precisely 5 p.m. – a time quickly approaching. And leave they did.

The mystery of their sudden departure was soon revealed: they left to avoid paying their limousine driver's fee of a dollar a minute for tardy passengers.

Let's put that dollar a minute into perspective. Assume that, on average, the 225 guests spent $200 for clothing, travel, gifts and lodging – a total of $45,000. Assume the bride and groom spent $30,000 for rental of the club, food, drinks, music and everything else. Then the total cost of the wedding was $75,000, for a cost of $15,000 per hour. Had the bride and groom stayed the extra hour, the cost would have been an additional $60, or 1/250th of the total outlay. Even ignoring what everyone else spent, the additional $60 would have been only 1/100th as much per hour as what the bride and groom had already spent.

If they had stopped to consider the situation differently – if someone had asked them if they would like to extend their party for a mere $60 – no doubt they would have happily agreed.

Our central theme is that a little clear thinking goes a long way. In most situations you'll ever face, whether in your personal or business life, if you use some basic tools to clear your head, you'll do better than if you don't.

INTO THIN AIR – AT THE MARGINS

When the writer Jon Krakauer reached the summit of Mount Everest in the early afternoon of May 10, 1996, he hadn't slept in 57 hours and was reeling from the brain-altering effects of oxygen depletion. As he turned to begin his long, dangerous descent, 20 other climbers were still pushing doggedly toward the top. Apparently, no one noticed that the sky had begun to fill with clouds. Six hours later and 3,000 feet lower, in 70-knot winds and blinding snow, Krakauer collapsed in his tent, freezing, hallucinating from exhaustion and hypoxia, but safe. The following morning he learned that six of his fellow climbers hadn't made it back and were in a desperate

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struggle for their lives. When the storm finally passed, five of them would be dead.

Mountain climbers spend $100,000 and a year preparing to climb Everest. This is reasonable and prudent given the complexity and risk inherent in the climb. Since 1921, there have been 179 deaths. Little help is available in emergencies, for fellow climbers are tired and oxygen-deprived, too, and the summit is far outside the reach of helicopters.

There are 6,000-foot peaks near my house – and far from Mount Everest – that the local newspaper's outdoors columnists recommend to weekend hikers. To climb these peaks, you need little more than good hiking shoes, a bottle of water and sturdy legs.

To spend $100,000 and a year preparing to climb the peaks near my house would be silly and wasteful for most climbers. To climb Mount Everest with only good hiking boots and a bottle of water would be suicidal. The amount of effort applied to the problem should be proportional to the difficulty/importance of the problem.

While this insight directs us to strive for proportionality, it does not tell us how much it is worth spending in an absolute sense. Here, economic theory can help.

Economics tells us to purchase something – anything – if the value at the margin exceeds the cost. If something costs $100 but is worth $101 to us, we should buy it (provided, of course, that we have the cash). We use the word "marginal" here because we are interested in purchasing the next chunk – one extra scoop of ice cream or one more delivery truck, for example – and we want to measure the net effect of this purchase. We also look at marginal purchases because the cost and value can change based on how many we have already purchased.

Perhaps the cost of buying five delivery trucks is $30,000 each. The sixth, however, ends up costing a whopping $230,000 because, with six trucks, we need a bigger warehouse facility. Note that the cost of the sixth truck could be more or less than the cost of the five previous trucks; it depends entirely on the situation.

Just as with cost, the marginal benefit (in the case of a business, the extra revenue it generates) varies as we move from one to six delivery trucks. If we choose wisely, our marginal revenue should decline as we purchase more trucks. In other words, we should go after the low-hanging fruit first. If the sixth truck gets us to a lucrative new customer who was on our radar screens in the first place, we have to ask ourselves why we didn't try to reach that customer back when we had only one truck.

In general, if the things we are purchasing are very similar, marginal costs can go up or down with each purchase, while marginal revenues are likely to decline. If the things are very different – as with hiring new employees, for example – both the marginal revenues and costs will vary on a case-by-case basis.

THE 80/20 RULE

How do you decide what's important? How do you decide, for example, who your most important customers are, and to which tasks you should apply your efforts? Ponder Pareto's Law and its derivative, Factor 16.

Vilfredo Pareto, born in 1848, is widely known for his law of income distribution. Pareto's Law has been popularized as the 80/20 Rule, which says that 20 percent of the productive inputs yield 80 percent of the outputs, or that 20 percent of the people create and enjoy 80 percent of the total income. More generally, Pareto noticed that many relationships in life are "nonlinear" – that is, effects are not proportional to causes.

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Think about the metaphoric straw that broke the camel's back – the last straw had a very different effect than the straws that preceded it. Heating paper provides another example. As the heat rises, the paper gets hot and perhaps discolors. Then, at 451°, the paper (or, at least, the paper that Ray Bradbury had in mind in his novel) catches fire. The change in temperature from 440° to 460° produces a very different result than the change from 400° to 420°.

By the same token…

- Just 6 percent of Medicare beneficiaries make demands on the system that account for 50 percent of its total costs.
- The top 1 percent of U.S. households hold roughly two-fifths of total wealth.
- Just 20 percent of the customers of fast-food restaurants make 60 percent of total restaurant visits.
- One-fifth of the world's population produces (and consumes) 80 percent of its resources.
- Fully 87 percent of America's home-grown food comes from 18 percent of its farms.
- Just 1.3 percent of the movies released in the 1990s earned 80 percent of all box-office revenues.

Nonlinearities have an enormous impact on business. Consider a hypothetical drug company that is pondering entering the anti-angina-medicine market. It finds that 20 percent of doctors write 80 percent of the prescriptions for this category of drug (yes, these

are the actual figures). Thus, if the company could reach the right 20 percent of doctors, it could tap into the lion's share of the action.

You might reply that these doctors are harder to reach because they are especially busy – and because everyone else is trying to reach them, too. That is entirely true, and as a result, they may be two to three times as expensive to reach. But the value of gaining their attention is not two to three times the value of reaching the less prolific doctors – it is 16 times greater. Think through the arithmetic: among 100 doctors, 20 write 400 anti-angina prescriptions each, for a total of 8,000 prescriptions. The other 80 must be writing a total of 2,000 prescriptions, or just 25 each.

Thus, even if these prolific physicians are twice as expensive to reach, their value is 16-fold greater, which means that marketing a new drug to them is eight times as efficient as going after the low prescribers. This nonlinear phenomenon is so widespread and powerful that we've given it a name: Factor 16.

Examples of the 80/20 rule and Factor 16 abound. IBM found that, on average, 80 percent of the run time of a software application is due to only 20 percent of the lines of code. This motivated it to speed up its applications by working on the lines of code that were 16 times as demanding on computation. In another example, the top 15 percent of households paid 74 percent of all federal income taxes. This means that the top households paid on average 16 times as much as the lower 85 percent of households.

Farm subsidies follow a similar nonlinear pattern. Half of all the subsidy money to farmers in Iowa went to only 12 percent of the farms. The most-fortunate farmers, often large corporations, were roughly 7 times as successful in garnering subsidies as their less-fortunate neighbors.

This uneven gain from a government program raises a more general question. Do 20 percent of Americans absorb 80 percent of the largess of government programs – Social Security, Medicaid, highways and the like? Is it also possible that 20 percent of Americans pay 80 percent of the cost of these programs? If income taxes were the only way of paying for government programs, this would be roughly right, because, as noted above, the top 15 percent of income tax payers pay 74 percent of all income taxes. But, of course, other revenues – payroll taxes, corporate taxes, and excise taxes being the main ones – are used to pay for government programs.

If 20 percent of your employees produce 80 percent of the results, what would happen if you hired only the 20-percent types?

Now an even more interesting question: assuming that 20 percent of Americans get 80 percent of government benefits and that 20 percent of Americans pay 80 percent of the cost of government programs, how much overlap is there between the two 20-percent groups? The biggest gainers from farm programs are likely to be the highest-income farmers, which also makes them the biggest payers of income taxes. But how general is this?

Back to decision-making. You are hiring an employee, and five candidates progress to the interview stage. They all have impressive degrees from prestigious universities and rel-

evant experience. Are they all equally good candidates? Should you just pick one and move on?

There is, in fact, a high probability that, far from being equal, one is 16 times as good as the others. This makes sense intuitively: many of us have been part of organizations where some did little or no work, while a few superstars were working heroes.

Factor 16 raises other interesting questions. If 20 percent of your employees produce 80 percent of the results, what would happen if you hired only the 20-percent types? Of course, everyone tries to hire the best employees, so it would be difficult to assemble this top team. But what would happen if you lured them by paying four times the going rate?

This is not as straightforward as it sounds. Offering to pay your administrative assistant $120,000 instead of $30,000 would not ensure you'd get the best candidates. If you had 200 people outside your office on Monday morning hoping to fill your assistant slot, could you really pick the best person? Note, too, there are some jobs where productivity differences can't be extreme – a toll collector can grab money only so fast.

But that doesn't mean you shouldn't try. If you could make it work, your employee costs would go up by a factor of three while employee productivity would rise by a factor of 15.

NEW MATH

Nonlinearity compounds in industrial processes. Say you have a manufacturing process with 10 steps. You concentrate on reducing waste and are able to shave 20 percent of materials off each step. What are the overall savings? The intuitive answer is 20 percent. However, with a serial manufacturing process, the savings multiply. And in a 10-step process the savings would be a whopping 89 percent.

Take the case of plywood production. Plywood sheets are made by cutting trees, which are then stripped of bark and cut into lengths. These logs are put on a lathe and peeled to produce veneer sheets. The sheets are then cut into sections. Workers cut out the knots and flaws and fill in the holes with fresh veneer pieces. Sheets of veneer are placed in alternating layers and glued together.

Now consider increasing efficiency.

Starting with the consumer, if we find a way to build our houses with 10 percent less plywood, we can reduce by 10 percent the number of pieces that need to be produced. If we can also press the glued layers together with 10 percent less waste, we can reduce by 19 percent the number of patched veneer sheets that are needed. If patching is also improved by 10 percent, we need 27 percent fewer veneer sheets. If each step through debarking is improved by 10 percent, we find that we can reduce the cutting of trees by 47 percent. In other words, by making modest improvements at each of the six steps of this process, we can build with half as many trees. Seemingly insignificant improvements cascade.

FIFTEEN TIMES AS MUCH MONEY

Time spent on projects is not subject to the same multiplier effect, but our productivity gains from changes in strategy can nonetheless be surprisingly nonlinear. If I have an hour to work on projects A and B, do I advance them both equally? Not likely.

Imagine you have two retirement investments, with $300,000 in a 401(k) plan through your employer and $20,000 in an individual retirement account. Your 401(k) statements come quarterly, while your IRA statements come monthly and can be monitored at will via the Internet. How should you allocate your time between these accounts (assuming that attention generates moneymaking insights

proportional to time invested)?

We know someone in this situation. He puts 90 percent of his attention towards the IRA, when he should be putting over 90 percent of his attention towards his 401(k), because it constitutes more than 90 percent of his retirement savings. A given percentage improvement in the 401(k) account will put 15 times as much money in his pocket as a similar improvement in the IRA. To increase his productivity by this huge factor, all he needs to do is to shift his attention from one account to the other.

KNOWING THE VALUE OF INFORMATION

Earlier, we introduced the idea of using goods and services as long as the marginal revenue or marginal value exceeds the marginal cost. The same principle applies to information. Because time has an opportunity cost, information has a price, whether we dig it up ourselves or purchase it. And if the marginal revenue from information exceeds its marginal cost, we should purchase it.

But sometimes value is hard to quantify, even after a lot of work. We need a cheaper and easier way to determine what information to purchase. Decision analysis can help us solve this problem.

Information has a few components of value:

- The pleasure or entertainment value.
- The long-term educational benefit.
- The ability to change our behavior.

Knowledge is most valuable when it has the power to change behavior. If I'm not going to sell my house or increase my home equity line of credit, its appraised value is of little interest. If I'm thinking of selling, knowing its appraised value will help me set the asking price. One value is a "nice to know," while the other directs my behavior. When I read about the world's record for the number of clowns stuffed into a Volkswagen Beetle, I am entertained, but it doesn't change my life in the slightest. (Incidentally, the answer is 25, if you're talking about the New Beetle.)

Or consider back pain. Doctors treating such pain often order X-rays and magnetic-resonance-imaging scans as diagnostic aids. But there are four problems:

- The tests cost money.
- The tests themselves can expose the patient to harm.
- The tests sometimes lead to unnecessary treatment for harmless abnormalities.
- The treatment for back pain rarely varies, regardless of the test results.

In other words, the tests rarely influence the choice of treatment and thus have very little direct value even though they clearly have costs.

A small pharmaceutical company was developing a nasally administered drug and needed to select a specialized device that would allow patients to administer precise amounts of medicine. The search ended with a device that was just accurate enough to allow the company to launch its product quickly.

To ensure the success of this less-than-ideal device, the company wanted to conduct market research to get customer feedback and suggestions. For this, it would have paid $40,000 for primary market research. But the managers ultimately realized that they had no choice – they had to choose this device to keep their current development time line. They also realized that because they didn't have any decisions to make for some time, they could wait until they had better information to conduct the research.

This leads us to another rule: delay decisions and expensive analysis, if better information is on its way.

As a rule of thumb, you should spend approximately 1 percent of the value of a decision analyzing it.

LORI LANGILLE

THE 1 PERCENT RULE

As a rule of thumb, you should spend approximately 1 percent of the value of a decision analyzing it. If you go to a week-long seminar that someone else is paying for and that will consume 50 hours of your life, spend half an hour (1 percent) making sure the seminar is right for you. If you buy a $300,000 house, spend $3,000, or 150 hours at $20 per hour, making your selection. If the government is going to spend $100 million building a new sports arena, it should spend $1 million to determine if the arena is a good idea. If you are deciding between two brands of laundry detergent, and the difference in value between them cannot be more than $2, spend only two cents, or less than four seconds at $20 per hour, to make your purchase decision. Time's up. Throw that box in the shopping cart and move on with your life.

THE DATA TRAP

My dad was a professor and a counselor at San Jose State University. He told me about students who would come for counseling and announce that they were going to change majors or leave school altogether. My dad would let them talk at length about whatever they chose. After some closer examination, he often discovered that they had recently broken up with sweethearts – that the root of their discontent was unrelated to school.

My father usually got to the root of the problem, but a less-experienced counselor would have spent a lot of time addressing the wrong problem. This is called framing, and it involves getting to the core of the problem and not falling into what we call the data trap. The key is to look where the student tripped – where his heart was broken – rather than where he said he fell.

Often, if we are called on to help others solve problems, we first get a detailed account of where they "fell" and how it hurts. But to really help solve their problem, we must first ascertain whether they tripped elsewhere.

Economists like to tell the hoary story of a drunk wandering head-down under a streetlight when another person walks up and asks what he is doing. The drunk replies that he has lost his car keys. The stranger offers to help look for them, and searches fruitlessly for a few minutes. Finally, the stranger gives up and asks the man where exactly he thinks he dropped his keys. "Way over there," the man replies. "Well, then why have we been looking over here?!" asks the exasperated stranger. "Because it is too dark to see over there," the drunk replies.

THE RIGHT AMOUNT OF INFORMATION

When a decision must be made, a little bit of knowledge can be dangerous, because it entices you to act with confidence when you are basically ignorant. Too much information is wasteful: think of organizations that perpetually study problems and never gets to the bottom of them. The right amount of information allows you to make decisions with confidence and dispatch.

You could spend the rest of your life studying, say, trash cans, in any area in America. The Monterey Peninsula in California, for instance, has perhaps 100,000 trash cans. If we could ask a thousand questions (What is in them? Where were they made? How much do they weigh?) about each trash can, and each question took 10 minutes to answer, the project would take a billion minutes – hundreds of lifetimes – to complete.

You should never embark on an information-gathering project without first establishing your objective. If you're designing a new garbage truck, perhaps you need only be concerned with the size and weight of a representative sample of trash cans. If you are an environmentalist studying recycling, perhaps you need only study the contents of representative samples. If you are a biologist studying the growth of microorganisms, you can forget about how owners feel about their trash cans. If you are a criminal trying to steal the identities of Monterey's wealthy residents, you can skip checking the trash cans on the poor side of town.

FINAL THOUGHTS

A little clear thinking goes a long way. Thinking can help all of us, in business and our life, clarify problems and make decisions with confidence. Thinking also helps us see that, while we want good outcomes, we don't want to compromise our own principles and ethics to get there.

Although thinking is important, it should, of course, lead to action, so we end this book with an appropriate anecdote:

The teenage son of a colleague was sitting around with his friends talking about how nice it would be to get a job at one of the golf courses in Pebble Beach. They talked about the jobs as if they were unattainable. Then one of them spoke up and said that, as a matter of fact, he had just gotten such a job. "Really?" said one of the others admiringly, "How did you do it?" "Oh, I just went down there and applied." M