Practical Thought about Practical Thought?

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What I'm going to try to do today is to extend the remarks I made two years ago at the USC Business School. You were assigned a transcript of my USC talk. There's nothing I said then that I wouldn't repeat today. But I want to amplify what I said then.

The title of my talk is "Practical Thought about Practical Thought?," with a question mark at the end. In a long career, I have assimilated various ultrasimple general notions that I find helpful in solving problems. Five of these helpful notions I will now describe. After that, I will present to you a problem of extreme scale. Indeed, the problem will involve turning startup capital of $2 million into $2 trillion, a sum large enough to represent a practical achievement. Then, I will try to solve the problem, assisted by my helpful general notions. Following that, I will suggest that there are important educational implications in my demonstration. I will so finish because my objective is educational, my game today being a search for better methods of thought.

The first helpful notion is that it is usually best to simplify problems by deciding big no-brainer questions first.

The second helpful notion mimics Galileo's conclusion that scientific reality is often revealed only by math as if math was the language of God. Galileo's attitude also works well in messy, practical life. Without numerical fluency, in the part of life most of us inhabit, you are like a one-legged man in an ass-kicking contest.

The third helpful notion is that it is not enough to think problems through forward. You must also think in reverse, much like the rustic who wanted to know where he was going to die so that he'd never go there. Indeed, many problems can't be solved forward. And that is why the great algebraist Carl Jacobi so often said, "Invert, always invert," and why the Pythagoreans thought in reverse to prove that the square root of two was an irrational number.

The fourth helpful notion is that the best and most practical wisdom is elementary academic wisdom. But there is one extremely important qualification: You must think in a multidisciplinary manner. You must routinely use all the easy-to-learn concepts from the freshman course in every basic subject. Where elementary ideas will serve, your problem-solving must not be limited, as academia and many business bureaucracies are limited, by extreme balkanization into disciplines and subdisciplines, with strong taboos against any venture outside assigned territory. Instead, you must do your multidisciplinary thinking in accord with Ben Franklin's prescription in *Poor Richard*: "If you want it done, go. If not, send."

If, in your thinking, you rely entirely on others, often through purchase of professional advice—whenever outside a small territory of your own—you will suffer much calamity. And it is not just difficulties in complex coordination that will do you in. You will also suffer from the reality evoked by the Shavian character who said, "In the last analysis, every profession is a conspiracy against the laity."

Indeed, a Shavian character, for once, understated the horrors of something [George Bernard] Shaw didn't like. It is not usually the conscious malfeasance of your narrow professional adviser that does you in. Instead, your troubles come from his subconscious bias. His cognition will often be impaired, for your purposes, by financial incentives different from yours. And he will also suffer from the psychological defect caught by the proverb "To a man with a hammer, every problem looks like a nail."

The fifth helpful notion is that really big effects, lollapalooza effects, will often come only from large combinations of factors. For instance, tuberculosis was tamed, at least for a long time, only by routine, combined use in each case of three different drugs. And other lollapalooza effects, like the flight of an airplane, follow a similar pattern.

It is now time to present my practical problem. And here is the problem:

It is 1884 in Atlanta. You are brought, along with 20 others like you, before a rich and eccentric Atlanta citizen named Glotz. Both you and Glotz share two characteristics: First, you routinely use in problem-solving the five helpful notions, and second, you know all the elementary ideas in all the basic college courses, as taught in 1996. However, all discoverers and all examples demonstrating these elementary ideas come from dates before 1884. Neither you nor Glotz knows anything about anything that has happened after 1884.

Glotz offers to invest $2 million in 1884 dollars, yet take only half the equity, for a Glotz Charitable Foundation, in a new corporation organized to go into the non-alcoholic beverage business and remain in that business only, forever. Glotz wants to use a name that has somehow charmed him: Coca-Cola.

The other half of the new corporation's equity will go to the man who most plausibly demonstrates that his business plan will cause Glotz's foundation to be worth a trillion dollars 150 years later, in the money of that later time, 2034, despite paying out a large part of its earnings each year as a dividend. This will make the whole new corporation worth $2 trillion, even after paying out many billions of dollars in dividends.

You have 15 minutes to make your pitch. What do you say to Glotz?

Here is my solution, my pitch to Glotz, using only the helpful notions and what every bright college sophomore should know:

Well, Glotz, the big no-brainer decisions that, to simplify our problem, should be made first are as follows: First, we are never going to create something worth $2 trillion by selling some generic beverage. Therefore, we must make your name, Coca-Cola, into a strong, legally protected trademark. Second, we can get to $2 trillion only by starting in Atlanta, then succeeding in the rest of the United States, then rapidly succeeding with our new beverage all over the world. This will require developing a product that has universal appeal because it harnesses powerful elemental forces. And the right place to find such powerful elemental forces is in the subject matter of elementary academic courses.

We will next use numerical fluency to ascertain what our target implies. We can guess reasonably that by 2034 there will be about 8 billion beverage consumers in the world. On average, each of these consumers will be much more prosperous in real terms than the average consumer of 1884. Each consumer is composed mostly of water and must ingest about 64 ounces of water per day. This is eight 8-ounce servings. Thus, if our new beverage, and other imitative beverages in our new market, can flavor and otherwise improve only 25 percent of ingested water worldwide, and we can occupy half of the new world market, we can sell 2.92 trillion 8-ounce servings in 2034. And if we can then net 4¢ per serving, we will earn $117 billion. This will be enough, if our business is still growing at a good rate, to make it easily worth $2 trillion.

A big question, of course, is whether 4¢ per serving is a reasonable profit target for 2034. And the answer is yes if we can create a beverage with strong universal appeal. One hundred and fifty years is a long time. The dollar, like the Roman drachma, will almost surely suffer monetary depreciation. Concurrently, real purchasing power of the average beverage consumer in the world will go way up. His proclivity to inexpensively improve his experience while ingesting water will go up considerably faster. Meanwhile, as technology improves, the cost of our simple product, in units of constant purchasing power, will go down. All four factors will work together in favor of our 4¢ per-serving profit target. Worldwide beverage purchasing power in dollars will probably multiply by a factor of at least 40 over 150 years. Thinking in reverse, this makes our profit-per-serving target, under 1884 conditions, a mere one-fortieth of 4¢ or one-tenth of a cent per serving. This is an easy-to-exceed target as we start out if our new product has universal appeal.

That decided, we must next solve the problem of invention to create universal appeal. There are two intertwined challenges of large scale. First, over 150 years, we must cause a new-beverage market

to assimilate about one-fourth of the world's water ingestion. Second, we must so operate that half the new market is ours while all our competitors combined are left to share the remaining half. These results are lollapalooza results. Accordingly, we must attack our problem by causing every favorable factor we can think of to work for us. Plainly, only a powerful combination of many factors is likely to cause the lollapalooza consequences we desire. Fortunately, the solution to these intertwined problems turns out to be fairly easy if one has stayed awake in all the freshman courses.

Let us start by exploring the consequences of our simplifying no-brainer decision that we must rely on a strong trademark. This conclusion automatically leads to an understanding of the essence of our business in proper elementary academic terms. We can see from the introductory course in psychology that, in essence, we are going into the business of creating and maintaining conditioned reflexes. The Coca-Cola trade name and trade dress will act as the stimuli, and the purchase and ingestion of our beverage will be the desired responses.

And how does one create and maintain conditioned reflexes? Well, the psychology text gives two answers: 1) by operant conditioning and 2) by classical conditioning, often called Pavlovian conditioning to honor the great Russian scientist. And since we want a lollapalooza result, we must use both conditioning techniques, and all we can invent to enhance effects from each technique.

The operant conditioning part of our problem is easy to solve. We need only 1) maximize rewards of our beverage's ingestion and 2) minimize possibilities that desired reflexes, once created by us, will be extinguished through operant conditioning by proprietors of competing products.

For operant conditioning rewards, there are only a few categories we will find practical:

1) Food value in calories or other inputs

2) Flavor, texture, and aroma acting as stimuli to consumption under neural preprogramming of man through Darwinian natural selection

3) Stimulus, as by sugar or caffeine

4) Cooling effect when man is too hot or warming effect when man is too cool

Wanting a lollapalooza result, we will naturally include rewards in all the categories.

To start out, it is easy to decide to design our beverage for consumption cold. There is much less opportunity, without ingesting a beverage, to counteract excessive heat compared with excessive cold. Moreover, with excessive heat, much liquid must be consumed, and the reverse is not true.

It is also easy to decide to include both sugar and caffeine. After all, tea, coffee, and lemonade are already widely consumed. And it is also clear that we must be fanatic about determining, through trial and error, flavor and other characteristics that will maximize human pleasure while taking in the sugared water and caffeine we will provide.

And, to counteract possibilities that desired operant-conditioned reflexes, once created by us, will be extinguished by operant-conditioning-employing competing products, there is also an obvious answer: We will make it a permanent obsession in our company that our beverage, as fast as practicable, will at all times be available everywhere throughout the world. After all, a competing product, if it is never tried, can't act as a reward creating a conflicting habit. Every spouse knows that.

We must next consider the Pavlovian conditioning we must also use. In Pavlovian conditioning, powerful effects come from mere association. The neural system of Pavlov's dog causes it to salivate at the bell it can't eat. And the brain of man yearns for the type of beverage held by the pretty woman he can't have. And so, Glotz, we must use every sort of decent, honorable Pavlovian conditioning we can think of. For as long as we are in business, our beverage and its promotion must be associated in consumer minds with all other things consumers like or admire.

Such extensive Pavlovian conditioning will cost a lot of money, particularly for advertising. We will spend big money as far ahead as we can imagine. But the money will be effectively spent. As we expand fast in our new-beverage market, our competitors will face gross disadvantages of scale in buying advertising to create the Pavlovian conditioning they need. And this outcome, along with other volume-creates-power effects, should help us gain and hold at least 50 percent of the new market everywhere. Indeed, provided buyers are scattered, our higher

volumes will give us very extreme cost advantages in distribution.

Moreover, Pavlovian effects from mere association will help us choose the flavor, texture, and color of our new beverage. Considering Pavlovian effects, we will have wisely chosen the exotic and expensive-sounding name "Coca-Cola" instead of a pedestrian name like "Glotz's Sugared, Caffeinated Water." For similar Pavlovian reasons, it will be wise to have our beverage look pretty much like wine instead of sugared water. So we will artificially color our beverage if it comes out clear. And we will carbonate our water, making our product seem like champagne, or some other expensive beverage, while also making its flavor better and imitation harder to arrange for competing products. And, because we are going to attach so many expensive psychological effects to our flavor, that flavor should be different from any other standard flavor so that we maximize difficulties for competitors and give no accidental same-flavor benefit to any existing product.

What else from the psychology textbook can help our new business? Well, there is that powerful "monkey see, monkey do" aspect of human nature that psychologists often call social proof. Social proof—imitative consumption triggered by mere sight of consumption—will not only help induce trial of our beverage, it will also bolster perceived rewards from consumption. We will always take this powerful social proof factor into account as we design advertising and sales promotion and as we forego present profit to enhance present and future consumption. More than with most other products, increased selling power will come from each increase in sales.

We can now see, Glotz, that by combining 1) much Pavlovian conditioning, 2) powerful social proof effects, and 3) a wonderful-tasting, energy-giving, stimulating, and desirably cold beverage that causes much operant conditioning, we are going to get sales that speed up for a long time by reason of the huge mixture of factors we have chosen. Therefore, we are going to start something like an autocatalytic reaction in chemistry—precisely the sort of multifactor-triggered lollapalooza effect we need.

The logistics and the distribution strategy of our business will be simple. There are only two practical ways to sell our beverage: 1) as syrup to fountains and restaurants and 2) as a complete carbonated water product in containers. Wanting lollapalooza results, we will naturally do it both ways. And, wanting huge Pavlovian and social proof effects, we will always spend on advertising and sales promotion, per serving, over 40 percent of the fountain price for syrup needed to make the serving.

A few syrup-making plants can serve the world. However, to avoid needless shipping of mere space and water, we will need many bottling plants scattered over the world. We will maximize profits if, like early General Electric with light bulbs, we always set the first-sale price, either 1) for fountain syrup or 2) for any container of our complete product. The best way to arrange this desirable profit-maximizing control is to make any independent bottler we need a subcontractor, not a vendee of syrup, and certainly not a vendee of syrup under a perpetual franchise specifying a syrup price frozen forever at its starting level.

Being unable to get a patent or copyright on our super-important flavor, we will work obsessively to keep our formula secret. We will make a big hoopla over our secrecy, which will enhance Pavlovian effects. Eventually, food chemical engineering will advance so that our flavor can be copied with near exactitude. But by that time, we will be so far ahead, with such strong trademarks and complete, "always available" worldwide distribution, that good flavor copying won't bar us from our objective. Moreover, the advances in food chemistry that help competitors will almost surely be accompanied by technological advances that will help us, including refrigeration, better transportation, and, for dieters, the ability to insert a sugar taste without inserting sugar's calories. Also, there will be related beverage opportunities we will seize.

This brings us to a final reality check for our business plan. We will, once more, think in reverse like Jacobi. What must we avoid because we don't want it? Four answers seem clear:

First, we must avoid the protective, cloying, stop-consumption effects of aftertaste that are a standard part of physiology, developed through Darwinian evolution to enhance the replication of man's genes by forcing a generally helpful moderation on the gene carrier. To serve our ends, on hot days, a con-

sumer must be able to drink container after container of our product with almost no impediment from aftertaste. We will find a wonderful no-aftertaste flavor by trial and error and will thereby solve this problem.

Second, we must avoid ever losing even half of our powerful trademarked name. It will cost us mightily, for instance, if our sloppiness should ever allow the sale of any other kind of "cola," for instance a "Peppy Cola." If there is ever a Peppy Cola, we will be the proprietor of the brand.

Third, with so much success coming, we must avoid bad effects from envy, which is given a prominent place in the Ten Commandments because envy is so much a part of human nature. The best way to avoid envy, as recognized by Aristotle, is to plainly deserve the success we get. We will be fanatic about product quality, quality of product presentation, and reasonableness of prices, considering the harmless pleasure we will provide.

Fourth, after our trademarked flavor dominates our new market, we must avoid making any huge and sudden change in our flavor. Even if a new flavor performs better in blind taste tests, changing to that new flavor would be a foolish thing to do. This follows because, under such conditions, our old flavor will be so entrenched in consumer preference by psychological effects that a big flavor change would do us little good, and it would do immense harm by triggering in consumers the standard deprival-superreaction syndrome that makes "take-aways" so hard to get in any type of negotiation and helps make most gamblers so irrational. Moreover, such a large flavor change would allow a competitor, by copying our old flavor, to take advantage of both 1) the hostile consumer superreaction to deprival and 2) the huge love of our original flavor created by our previous work.

Well, that is my solution to my own problem of turning $2 million into $2 trillion even after paying out billions of dollars in dividends. I think it would have won with Glotz in 1884 and should convince you more than you expected at the outset. After all, the correct strategies are clear after being related to elementary academic ideas brought into play by the helpful notions.

How consistent is my solution with the history of the real Coca-Cola Company? Well, as late as 1896, 12 years after the fictional Glotz was to start vigorously with $2 million in 1884 dollars, the real Coca-Cola Company had a net worth under $150,000 and earnings of about zero. And thereafter, the real Coca-Cola Company did lose half its trademark and did grant perpetual bottling franchises at fixed syrup prices. And some of the bottlers were not very effective and couldn't easily be changed. And the real Coca-Cola Company, with this system, did lose much pricing control that would have improved results, had it been retained.

Yet, even so, the real Coca-Cola Company followed so much of the plan given to Glotz that it is now worth about $125 billion and will have to increase its value at only 8 percent per year until 2034 to reach a value of $2 trillion. And it can hit an annual physical volume target of 2.92 trillion servings if servings grow until 2034 at only 6 percent per year, a result consistent with much past experience and leaving plenty of plain-water ingestion for Coca-Cola to replace after 2034. So I would guess that the fictional Glotz, starting earlier and stronger and avoiding the worst errors, would have easily hit his $2 trillion target. And he would have done it well before 2034.

This brings me, at last, to the main purpose of my talk. Large educational implications exist, if my answer to Glotz's problem is roughly right and if you make one more assumption I believe true—that most PhD educators, even psychology professors and business school deans, would not have given the same simple answer I did. And if I am right in these two ways, this would indicate that our civilization now keeps in place a great many educators who can't satisfactorily explain Coca-Cola, even in retrospect, and even after watching it closely all their lives. This is not a satisfactory state of affairs.

Moreover—and this result is even more extreme—the brilliant and effective executives who, surrounded by business school and law school graduates, have run the Coca-Cola Company with glorious success in recent years also did not understand elementary psychology well enough to predict and avoid the New Coke fiasco, which dangerously threatened their company. That people so talented, surrounded by professional advisers from the best universities, should thus demonstrate a huge gap in their education is also not a satisfactory state of affairs.

Such extreme ignorance, in both the high reaches of academia and the high reaches of business, is a lollapalooza effect of a negative sort, demonstrating grave defects in academia. Because the bad effect is a lollapalooza, we should expect to find intertwined, multiple academic causes. I suspect at least two such causes:

First, academic psychology, while it is admirable and useful as a list of ingenious and important experiments, lacks intradisciplinary synthesis. In particular, not enough attention is given to lollapalooza effects coming from combinations of psychological tendencies. This creates a situation reminding one of a rustic teacher who tries to simplify schoolwork by rounding pi to an even 3. And it violates Einstein's injunction that "everything should be made as simple as possible, but no more simple." In general, psychology is laid out and misunderstood, as electromagnetism would now be misunderstood if physics had produced many brilliant experimenters like Michael Faraday and no grand synthesizer like James Clerk Maxwell.

Second, there is a truly horrible lack of synthesis blending psychology and other academic subjects. But only an interdisciplinary approach will correctly deal with reality—in academia as with the Coca-Cola Company.

In short, academic psychology departments are immensely more important and useful than other academic departments think. And at the same time, the psychology departments are immensely worse than most of their inhabitants think. It is, of course, normal for self-appraisal to be more positive than external appraisal. Indeed, a problem of this sort may have given you your speaker today. But the size of this psychology department gap is preposterously large. In fact, the gap is so enormous that one very eminent university, Chicago, simply abolished its psychology department, perhaps with an undisclosed hope of later creating a better version.

In such a state of affairs, many years ago and with much that was plainly wrong already present, the New Coke fiasco occurred. Therein, Coke's executives came to the brink of destroying the most valuable trademark in the world. The academically correct reaction to this immense and well-publicized fiasco would have been the sort of reaction Boeing would display if three of its new airplanes crashed in a single week. After all, product integrity is involved in each case, and the plain educational failure was immense.

But almost no such responsible Boeing-like reaction has come from academia. Instead, academia, by and large, continues in its balkanized way to tolerate psychology professors who misteach psychology, non-psychology professors who fail to consider psychological effects obviously crucial in their subject matter, and professional schools that carefully preserve psychological ignorance coming in with each entering class and are proud of their inadequacies.

Even though this regrettable blindness and lassitude is now the normal academic result, are there exceptions providing hope that disgraceful shortcomings of the education establishment will eventually be corrected? Here, my answer is a very optimistic yes.

For instance, consider the recent behavior of the economics department of the University of Chicago. Over the last decade, this department has enjoyed a near monopoly of the Nobel Prizes in economics, largely by getting good predictions out of free-market models postulating man's rationality. And what is the reaction of this department after winning so steadily with its rational-man approach? Well, it has just invited into a precious slot amid its company of greats a wise and witty Cornell economist, Richard Thaler. And it has done this because Thaler pokes fun at much that is holy at the University of Chicago. Indeed, Thaler believes, with me, that people are often massively irrational in ways predicted by psychology that must be taken into account in microeconomics.

In so behaving, the University of Chicago is imitating Darwin, who spent much of his long life thinking in reverse as he tried to disprove his own hardest-won and best-loved ideas. And so long as there are parts of academia that keep alive its best values by thinking in reverse like Darwin, we can confidently expect that silly educational practices will eventually be replaced by better ones, exactly as Carl Jacobi might have predicted.

This will happen because the Darwinian approach, with its habitual objectivity taken on as a sort of hair shirt, is a mighty approach indeed. No less a figure than Einstein said that one of the four causes of his achievement was self-criticism, ranking right up

there alongside curiosity, concentration, and perseverance.

And, to further appreciate the power of self-criticism, consider where lies the grave of that very "ungifted" undergraduate, Charles Darwin. It is in Westminster Abbey, right next to the headstone of Isaac Newton, perhaps the most gifted student who ever lived, honored on that headstone in eight Latin words constituting the most eloquent praise in all graveyard print: "Hic depositum est, quod mortale fuit Isaaci Newtoni"—"Here lies that which was mortal of Isaac Newton."

A civilization that so places a dead Darwin will eventually develop and integrate psychology in a proper and practical fashion that greatly increases skills of all sorts. But all of us who have dollops of power and see the light should help the process along. There is a lot at stake. If, in many high places, a universal product as successful as Coca-Cola is not properly understood and explained, it can't bode well for our competency in dealing with much else that is important.

Of course, those of you with 50 percent of net worth in Coca-Cola stock, occurring because you tried to invest 10 percent after thinking like I did in making my pitch to Glotz, can ignore my message about psychology as too elementary for useful transmission to you. But I am not so sure that this reaction is wise for the rest of you. The situation reminds me of the old-time Warner & Swasey ad that was a favorite of mine: "The company that needs a new machine tool and hasn't bought it is already paying for it."