

Feedback in Business and the Economy  
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I'm a sucker for factory tours. Though this plant was noisy and humid, I learned a little about extruding plastic film, and a lot about the value of feedback. The plastic film made by this firm let ions flow from one side to the other, with nothing else flowing either way. That's all the chemistry that I understood, despite the owner's best efforts to rectify time I had spent snoozing in high school.

The company's customers specified the quality of the film in terms of defects per roll. The rolls were large, with hundreds of feet of yard-wide film, and the defects were microscopic. The customers were demanding no more than 4000 defects per roll, and producers had been having difficulty meeting that quality benchmark consistently.

The company I visited had a defect counter. The film came out of the plastic extruder onto a drum. When the drum was full, it was carted over to the defect counter. The film came off of the drum, through the defect counter, and onto another drum. The good rolls were shipped, the bad rolls were tossed out. It obviously pained the owner to toss out rolls because of poor quality. But that was the old way, he explained.

Someone had the bright idea of saving a bit of work. The defect counter could be mounted on the outflow end of the extruder, just as the film was going onto the drum. That would eliminate a step in the production process, saving a few minutes of time each roll. The defect counter was sophisticated in its detection of flaws, but low-tech in its counting of them: it had a mechanical counter, like the ones that are sometimes used to count customers entering a store. Each defect registered with a little "click."

In the new configuration, the clicks were annoying to the extruder operators. Their job was to continuously monitor the conditions inside the machine, such as temperature, pressure and humidity. Each important condition had its own meter, with a minimum and maximum noted on the dial. The operators had controls that would change these factors.

Like anyone would be, the operators were bothered when the clicker started sounding off. But they learned that a long series of clicks meant that something was out of line, and they would quickly adjust their controls. Pretty soon, the counter was generally quiet. The operators began reacting when they heard just a few clicks. The dials would show that everything was within tolerances, but perhaps not at the ideal levels. Over a few months time, the operators learned that if they reacted as soon as they heard a click, they could reduce successive clicks. They also learned the "sweet spot" on each dial to prevent clicks. It required them to monitor their gauges more closely, but it also made the job more fun. Friendly competition developed to see who would have the fewest defects per roll.

By the time I visited, the number of defects had fallen from 4000 per roll to less than 20. That staggering improvement in quality all came about because the operators were getting immediate feedback as to their performance. No foreman was berating them to

do better. No bonus system offered incentives. They just wanted to do good work, and now they had to the feedback they needed to do their job well.

Before the defect counter was installed next to the extruder, an engineer might have been able to predict that, with excellent operators, defects should be as low as 20 per roll. But the operators would have scoffed at the ivory tower approach. “He just doesn’t know what it’s like to run the extruder all day long,” they would likely have said. And they would have been right. It’s very difficult to do one’s job at the peak level without feedback.

Feedback often sounds like an engineering concept, but it’s central to the working of a competitive economy. A business uses various resources to produce a finished product. Is that endeavor worthwhile? If the value of the finished product is greater than the value of the resources used, then the company has created additional value. It’s doing something right and should be given positive feedback. In a free market economy, that positive feedback is called profit.

Similarly, a company that uses highly valued resources to produce a product that is not very highly valued should get negative feedback. It’s called a loss.

The case of the plastics extruder is fairly easy. A defect is a defect, it can be counted, and it is tied to the operator’s attentiveness. Not all desired results are so easily quantified. The principle of feedback improving quality, however, still applies.

Like many business owners, I find that the best feedback I get is from my profit-loss statement. Black ink is good, red ink bad. But feedback is available in more ways than aggregate profits.

Although the bulk of my work is economic research for businesses, I also give speeches to trade associations and other groups. The price I set for my speeches a year ago about matched the value of the time that I put into preparation and presentation. There was no extra value created on direct terms, but I was hoping for some indirect value as a marketing tool. That is, I hoped for more consulting projects because of my exposure to more business people. Over time, however, it seemed that all I was getting from the speeches were more speeches. But as a break-even proposition, there wasn’t much reason to sell more speeches.

In other words, the feedback suggested that the resources I was putting into the activity just equaled the value of the activity. It wasn’t harmful, but neither was it generating extra value.

Then I tried raising my price, at the suggestion of a professional speaker. (Funny that an economist should get pricing information from a motivational speaker, but sometimes an outside opinion helps.)

The first feedback I watched was sales level. It turned out that the volume of speeches didn't change. (It is possible that the volume would have grown in the absence of the price increase, but at least it didn't fall.) And the second feedback was significant: the time I was spending giving speeches was definitely more valuable than other possible uses of my time. I was adding value. That feels good in the abstract, and especially good in the wallet.

Although we often think that low prices are good, prices that are too low generate improper feedback to the producers. Producers don't realize just how valuable their goods or services are, so they don't produce as much.

Feedback is important not just because it gets us producing the right products at the right prices, but because the world is changing. Demand goes up, demand goes down. Technology improves, the price of key supplies changes, human abilities change, and only a feedback process can get our activities in line with the new reality.

Writing a tribute to feedback may seem as useful as a tribute to gravity or the beauty of rainbows. But feedback can be stymied, to the great detriment of the people who consume and work. In the plastics company, it would not help at all to muffle the clicker. It would make for a quieter work environment, but product quality would certainly fall. Neither would it help to have extra clicking noises added when there were no defects. That would lead operators to adjust their equipment at the wrong time, possibly lowering quality. In other words, the feedback signal has to be undistorted.

In my business, like all other businesses, there are various government-mandated distortions of the feedback process. First, the taxes I have to pay on my income tell me that my time isn't very valuable to others. After federal and state taxes are paid, I get only \$60 for every \$100 that others are willing to pay me. When I compare the value of my time to other people, against the value of the time I spend sitting on my boat, the tax system gives me improper feedback. Thus, I spend more time on my boat than I should (which is exactly the conclusion my wife reached without economic analysis).

Price controls on the services I sell would similarly distort the feedback I get; controls would lead me to think that my services were not very highly valued. Were I to receive a subsidy, I would get the feedback distorted to indicate the resources I used were not very valuable. Thus, I would overuse those resources.

Businesses are going to great lengths to increase and speed up feedback. New information systems are getting data to the employees responsible for the results. At many companies, sales people get immediate information on new orders, corporate buyers are getting immediate information about what products customers are purchasing, inventory managers are getting immediate information about what products need to be restocked. The value of feedback has helped to fuel a large increase in information technology used by businesses.

Unfortunately, we have not been so fast to eliminate the distortions to feedback caused by government interference in the economy. But there is yet one other feedback mechanism at work. Countries whose governments have less involvement in the economy tend to grow faster, making their populations wealthier. That feedback process may come to dominate global economics. That sounds as good as a silent clicker.

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