



## TOOLBOX

Each Toolbox presents a different systems tool using relevant business examples. Readers are encouraged to practice using these tools by applying them to issues of personal interest. See page 12 for a symbol key for the diagrams.

# The Supply/Demand See-Saw: A Generic Structure

by Michael Goodman and Colleen Lannon

Using a systems thinking approach can expand our understanding of a particular problem or issue by helping us view our actions in the context of the larger system. We often fail to anticipate the entire series of cause-and-effect relationships that will follow from a particular decision. As a result, when something happens in the "external" world (such as a drop in orders, price pressure, or increased customer complaints), we do not recognize how our own actions contributed to that outcome.

One set of loops that can help us better understand the basic interactions between a company and its marketplace is the supply/demand structure. Most everyone is familiar with the basic law of supply and demand: if demand rises,

price tends to go up (all else remaining the same), and conversely, as supply goes down, price tends to go up (again, all else remaining equal). From a systems thinking perspective, this dynamic can be simply described by two coupled balancing loops that attempt to stabilize around a particular variable—in this case, price.

### Supply and Demand: A Generic View

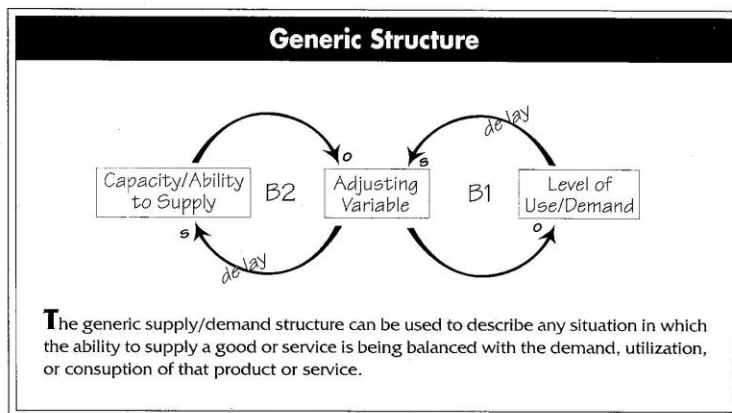
If we look at the supply/demand structure from a more generic perspective, we can use it to describe any situation in which an ability to supply a good or service is being balanced with the demand, utilization, or consumption of that product or service. This structure acts like a see-saw, with supply on one

side, demand on the other, and some pivot point in the middle (such as quality, price, availability, or service) that links the consumer actions and the company's decisions (see "balancing Loops with Delays: Teeter-Tottering on See-Saws," June/July 1990). The central variable serves as the "adjusting variable" because it is the signal that causes players on both sides of the see-saw to adjust the imbalance between supply and demand (see "Generic Structure"). These dynamics can occur between the company and the marketplace or within an organization, where an internal function or unit (such as training or I.S.) is supplying services to other parts of the company.

For example, in the medical industry, one common adjusting process revolves around waiting time to get an appointment with a physician. On the demand side, if the wait time to see a particular physician becomes too long, patients might either try to find another provider, put off receiving care (in the hopes that the problem will "take care of itself"), or, if the problem is serious enough, go to the emergency room. If enough patients find alternate solutions, this leads to a decline in the physician's utilization rate, which then eases the pressure on the physician's schedule so that the wait time is reduced (B1 in "Medical Supply/Demand," page 8). Physicians, for their part, might try to reduce the wait time for care by processing patients faster, adding physicians to their practice, or asking ancillary staff (such as nurse practitioners) to play a more significant role in patient care. All of these actions would increase the patient capacity and reduce the wait (B2).

What is important to note is that both balancing actions are usually happening simultaneously—that is, at the same time that the physicians are looking for ways to ease the patient bottleneck, the patients are already taking action to relieve that pressure by seek-

Continued on next page



Continued from previous page  
ing alternate providers or finding other ways to take care of themselves. Because demand is falling at the same time that capacity is rising, these actions will create another imbalance—this time, with more available capacity for seeing patients than the actual demand for appointments. When this occurs, both parties will once again take action to close the gap (patients will return to their original provider because of the reduced wait time, while the physician's practice might ease scheduling pressure) and the see-saw invariably tips in the other direction.

### Seeking a Balance

This same see-saw structure of balancing capacity and demand shows up in a variety of contexts, such as service quality (hospitals, banks, car-rental shops, fast-food restaurants, I.S., training) or product availability (retail stores, specialty products, manufacturers).

Of course, most companies would like to find a way to strike exactly the right balance between the demand in the marketplace and their ability to service that demand. Unfortunately, that rarely happens. As the medical example shows, what is more likely is a pattern of oscillation as the two sides overshoot each

other, adjust, and overshoot again.

In part, this behavior occurs because of several significant delays in the system: customer perception delay, company perception delay, and capacity addition delay.

- **Customer Perception.** It takes time for word to get around that a company cannot provide a particular product or service (this signal usually comes in the form of rising prices, lengthening delivery delays, or declining quality). It also takes time for people to alter their usage or consumption patterns. Similarly, once a company has added capacity, it takes time for that signal to make it into the marketplace and draw customers back.

- **Company Perception.** Just as it takes time for customers to realize that a company can no longer meet their needs, it takes time for the company to recognize that demand for its product or service is declining. This delay is often exacerbated because companies do not act upon the information immediately, believing that the drop off in demand is either temporary or due to factors other than capacity shortfall.

- **Capacity Additions.** Once the company has recognized the imbalance between the marketplace demand and its ability to meet that demand, there is a

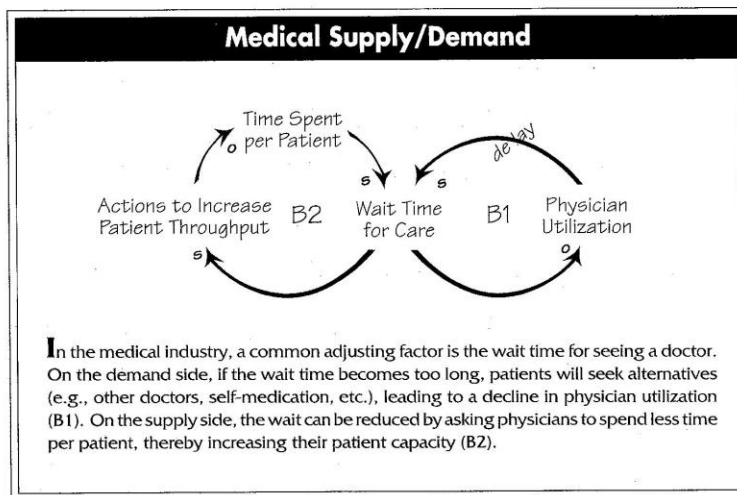
further delay while the company adds the needed capacity. The length of this delay depends on the nature of the capacity being added—for example, it takes a lot longer to add capital equipment than to increase customer service representatives or improve a process.

Understanding when to add capacity, and how much capacity to add, is a tricky process. If the company overshoots the amount of capacity needed to service the marketplace, it can be difficult and costly to cut back (as evidenced by the painful downsizings that began in the late 1980s). However, if the company delays making capacity investments for too long, the demand might not pick up even after the capacity rebounds (as customers find more permanent alternatives). To manage this overall process more effectively, it is important to have a clear understanding of what actions lie on either end of the see-saw, and how each of those actions affects the adjusting variable.

### Using the Structure

The generic supply/demand causal loop structure provides a useful starting point for exploring how internal actions and marketplace decisions are intertwined. To see how the structure can be applied to a specific problem, let's take a look at the example of ZSearch, a research company that specializes in tracking down research articles in the biochemical industry. ZSearch had built its reputation on the quality and timeliness of its response to its customers' inquiries. However, the company's managers have become concerned about two recent trends: customer surveys have ranked the company below its competitors in terms of customer service, and they have noticed a drop-off in the overall number of research requests per day.

**1. Define the Variables.** To begin mapping out the system, first define the different parts of the see-saw: what is being "supplied," what is being "de-





2



At first, ZSearch's managers were at a loss as to how they could have any direct influence on their customer's decision to hang up and call a competitor. But after some thought, they came up with a program that they called the "superior customer service guarantee." They promised that any customer who waited longer than 60 seconds for an available representative would receive a 40% discount on the order. It was a costly gamble, but it paid off—the guarantee not only boosted ZSearch's reputation in the field, but on those occasions that the demand outstripped capacity, customers were willing to wait the extra time (to get the discount) and ZSearch retained the sale.

More importantly, ZSearch received timely, valuable feedback about their response time without risking losing customers. Knowing that they now had a strong system in place for tracking their call volume and service turn-

## Larger Implications

Michael Goodman is vice president of Innovation Associates, Inc. (Waltham, MA) and heads IA's Systems Thinking Group.

Colleen Lannon is co-founder of Pegasus Communications and managing editor of *The Systems Thinker*<sup>TM</sup>.

