Bob Behn's Performance Leadership Report

An occasional (and maybe even insightful) examination of the issues, dilemmas, challenges, and opportunities for improving performance and producing real results in public agencies.

On why every public official needs to understand, remember, and use

"What were they thinking?"
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The Great Sewage Equation

In 1858, the House of Commons of Great Britian charged Joseph Bazalgette, the chief engineer of the Metropolitan Board of Works, with the odious and odorous task of eliminating London's "Great Stink." The smell came from the city's open sewers, which also spread cholera. To fix these problems, Bazalgette created the first modern sewer system.

As a direct and obvious consequence of this innovation, all civil engineering students are required to learn "The Great Sewage Equation":

$$S_i - S_o = S_{sitp}$$

This is as simple as mathematics gets: Just three variables and only two symbols (a minus sign and an equals sign). Moreover, this formula can easily be explained in words:

"Sewage In" [S_i]
minus
"Sewage Out" [S_o]
equals
"Sewage Stuck In The Pipe" [S_{sitp}]

Pretty intuitive, huh?

If more sewage goes into the pipe than comes out, some must have stuck in the pipe. And the amount that is stuck has to be precisely the difference between what went in and what came out. Obviously!

Not really. For unfortunately, this concept is not taught (at least outside of civil engineering) as The Great Sewage Equation. Rather it is called "Stock and Flow."

The objective of this abstract language is to distinguish between the "stock" of sewage that is stuck in the pipe, and the two "flows" of sewage —the sewage that "flows in" and the sewage that "flows out."

Except that—outside of the civil engineer's world of sewage—this idea is hard to grasp or use. And this is not true only for people who did not graduate from high school.

A study of students at MIT's Sloan School of Management—all of whom had taken calculus as a requirement for admission—asked them to describe stocks of (a) water in a bathtub and (b) cash in a bank account.

For example, when a steady flow of water into the bathtub was greater than a steady flow out, 20 percent of the students did not recognize that the water level was rising. And when the task was made slightly more complicated (the flow of dollars into the bank account was declining but still greater than the steady flow out) less than half understood that the funds in the account were still rising.

Maybe thinking of this stock-and-flow problem through the metaphor of a bathtub or bank account fails to provide a mental image that is adequately captivating or illustrative. Maybe the pipe's walls—creating the stuck-in-the-pipe-with-nowhere-to-go image—can help people realize that if more goes in than comes out the amount *stuck* in the pipe must go up.

> The Great Sewage Equation can help solve numerous management problems. If the number of patients whom Veterans Affairs can examine in a day is less than the number who request an exam every day, the back-log will grow. It's just arithmetic.

Regardless of which metaphor people prefer—bathtubs, bank accounts, or sewage pipes—they need to recognize that their metaphorical bathtub, bank account, or sewage pipe comes in many forms.

After all, there are lots of organizational problems that—despite their more obvious features—can be captured by "The Great Sewage Equation." Specifically, lots of organizations—public, private, nonprofit—have stuff going in. Often this "stuff" is requests for assistance.

Think of the checkout line at a supermarket. If the number of people lining up to check out during, say, ten minutes is greater than the number of people who were checked out during the same ten minutes, guess what: The number of people stuck in the line went up. Pretty intuitive.

Of course, the manager of a supermarket doesn't need to stand next to the check-out lines with a stop watch and clip board to calculate what is happening. The manager can *see* the line grow longer.

Sure, over the next ten minutes, the number of people lining up to check out will be random. So will be the number of people who have been checked out. But if the line is growing enough, and if the manager is otherwise preoccupied, a few annoyed customers will point this out loudly.

Sometimes, however, the number of people requesting a service aren't lining up physically so that no one—managers or others—can watch the line grow with their own eyes. Maybe the same applies to those who are checking out. No one *sees* them.

Still, the organization may be keeping good records. There may be a database somewhere that records the number of people who request a medical examination daily as well as the number of people who get their requested exam daily. And, guess what, if the *Requests Made* daily is greater than the *Requests Satisfied* daily, the number of *Requests Stuck In The Pipe* will grow. It's just arithmetic.

Backlogs are not a "government problem." They are a "large-organization problem," affecting retail firms and airplane manufacturers. Any organization that wants to eliminate a backlog has to figure out how to make the outflow exceed the inflow. **B**

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