



# Information Overload, Concept of

David Shenk

Author, Brooklyn, New York, USA

- I. The Surprising Tradeoffs of Information Proliferation
- II. Stress
- III. The Psychology of Overload
- IV. Analysis Paralysis
- V. The Two-by-Four Effect
- VI. Village of Babel

## GLOSSARY

**cultural ADD** The recently observed social variant of Attention Deficit Disorder. The classic form of ADD is thought to be a biologically based condition causing a persistent pattern of difficulties resulting in inattention, hyperactivity, and impulsivity. Cultural ADD attributes the same set of behaviors to the overwhelming speed of information and our increasing culture of distraction.

**data smog** An unexpected and unwelcome new component to the age of information, data smog is an expression for the overwhelming volume of e-mail, voice mail, faxes, junk mail, up-to-the-minute news flashes, and mesmerizing electronic images that we now come into contact with regularly.

**meta-analysis** The study of studies; a method of combining pools of statistics from a wide range of studies and making a comprehensive analysis based on the whole.

**spam** Unsolicited e-mail; the term is derived from a comedy skit by the absurdist troupe Monty Python in which unsuspecting diners are informed that the restaurant menu includes “egg and bacon, egg sausage and bacon, egg and Spam, egg bacon and Spam, egg bacon sausage and Spam, Spam bacon sausage and Spam, Spam egg Spam Spam bacon and Spam” [and so on]. When, in the early 1990s, it was noticed that certain individuals got a kick out of interrupting text-based Net dialogues with useless and irrelevant drivel, the term “spam” seemed apt.

**stat wars** Michael Kinsley’s term for the exhaustive, constant policy arguments fueled by seemingly unlimited amounts of data. Factionalism gets a big boost from the volleys of data, while dialogue and consensus—the marrow of democracy—run thinner and thinner every year.

Just as fat has replaced starvation as the number one dietary concern of the United States, information overload has replaced information scarcity as an important new emotional, social, and political problem.

We have quite suddenly mutated into a radically different culture, a civilization that trades in and survives on stylized communication. And as we enjoy the many fruits of this burgeoning information civilization, we also have to learn to compensate for the new and permanent side effects of what sociologists, in an academic understatement, call a “message dense” society.

*If scientific discovery has not been an unalloyed blessing, if it has conferred on mankind the power not only to create but also to annihilate, it has at the same time provided humanity with a supreme challenge and a supreme testing.*

—John F. Kennedy, 1963

## I. THE SURPRISING TRADEOFFS OF INFORMATION PROLIFERATION

Something marvelous has been happening to humankind—not just in the past three or four years with computers and the Internet, but more broadly in the past several decades. Information is moving faster and becoming more plentiful, and people everywhere are benefiting from this change.

But there is a surprising postscript to this story. When it comes to information, it turns out that one can have too much of a good thing. At a certain level of input, the law of diminishing returns takes effect; the glut of information no longer adds to our quality of life, but instead begins to cultivate stress, confusion, and even ignorance. Information overload threatens our ability to educate ourselves and leaves us more vulnerable as consumers and less cohesive as a society. For most of us, it actually diminishes our control over our own lives, while those already in power find their positions considerably strengthened.

This is not the first time we have been confronted by the unpleasant side effects of abundance. Those of us who live in the United States, the most sophisticated and successful nation on Earth, also routinely find ourselves burdened by problems of excess. Now, for all the

wonders of the information revolution, a menacing cloud of "data smog" has drifted in. In this article, we will explore its unwholesome properties and suggest some healthful remedies to recollect the critical distinction between information and understanding and to demonstrate why you do not have to feel personally overloaded with information to be a victim of the information glut.

Information used to be as rare and precious as gold. It is estimated that one weekday edition of today's *New York Times* contains more information than the average person in 17th-century England was likely to come across in an entire lifetime. Now it is so inexpensive and plentiful that most of it ends up being remaindered and shredded, as if it is worthless garbage. The first great paradox of information glut is that we are becoming so information-rich that we take much of what we have for granted.

Still, the concept of *too much information* seems odd and vaguely inhuman. This is because, in evolutionary-historical terms, this weed in our information landscape has just sprouted—it is only about 50 years old. Until about 50 years ago, more information was almost always a good thing. For nearly 100,000 years leading up to this century, information technology has been an unambiguous virtue as a means of sustaining and developing culture. Information and communications have made us steadily healthier, wealthier, more tolerant. Because of information, we understand more about how to overcome the basic challenges of life. Food is more abundant. Our physical structures are sturdier, more reliable. Our societies are more stable, as we have learned how to make political systems function. Our citizens are freer, thanks to a wide dissemination of information that has empowered the individual. Dangerous superstitions and false notions have been washed away: Communicating quickly with people helps to overcome our fear of them and diminishes the likelihood of conflict.

Then, around the time of the first atomic bomb, something strange happened. We began to produce information much faster than we could process it. This had never happened before. For 100,000 years the three fundamental stages of the communications process—production, distribution, and processing—had been more or less in synch with one another. By and large, over our long history, people have been able to examine and consider information about as quickly as it could be created and circulated. This equipoise lasted through an astonishing range of communications media—the drum, smoke signal, cave painting, horse, town crier, carrier pigeon, newspaper, photograph, telegraph, telephone, radio, and film.

But in the mid-20th century this graceful synchrony was abruptly knocked off track with the introduction of computers, microwave transmissions, television, and satellites. These hyperproduction and hyperdistribution mechanisms surged ahead of human processing ability. In this way, in a very short span of natural history, we have vaulted from a state of information scarcity to one of information surplus—from drought to flood in the geological blink of an eye. In 1850, 4% of U.S. workers handled information for a living; now *most* do, and information processing (as opposed to material goods) now accounts for more than half of the U.S. gross national product. Data have become more plentiful, more speedy (computer processing speed has doubled every two years for the last 30 years), and more dense (from 1965 to 1995, the average network television advertisement decreased from 53.1 seconds to 25.4 seconds and the average television news soundbite decreased from 42.3 seconds to 8.3 seconds; meanwhile, over the same period, the number of ads per network television minute increased from 1.1 to 2.4).

Information has also become a lot cheaper—to produce, to manipulate, to disseminate. All of this has made us information-rich, empowering Americans with the blessings of applied knowledge. It has also, though, unleashed the potential of information gluttony. Just as fat has replaced starvation as this nation's number one dietary concern, information overload has replaced information scarcity as an important new emotional, social, and political problem. With virtually no effort and for relatively little cost, we can capture as much information as we want.

With information production not only increasing, but accelerating, there is no sign that processing will ever catch up. We have quite suddenly mutated into a radically different culture, a civilization that trades in and survives on stylized communication. We no longer hunt or gather; few of us farm or assemble. Instead, we negotiate, we network, we interface. And as we enjoy the many fruits of this burgeoning information civilization, we also have to learn to compensate for the new and permanent side effects of what sociologists, in an academic understatement, call a message-dense society.

Audio buffs have long been familiar with the phrase "signal-to-noise ratio," engineering parlance for measuring the quality of a sound system by comparing the amount of desired audio signal to the amount of unwanted noise leaking through. In the information age, signal-to-noise has also become a useful way to think about social health and stability. How much of the information in our midst is useful, and how much of it gets in the way? What is our signal-to-noise ratio? We

know that the ratio has diminished of late and that the character of information has changed: As we have accrued more and more of it, information has emerged not only as a currency, but also as a pollutant.

- In 1971 the average American was targeted by at least 560 daily advertising messages. Twenty years later, that number had risen sixfold, to 3000 messages per day.
- In the office, an average of 60% of each person's time is now spent processing documents.
- Paper consumption per capita in the United States tripled from 1940 to 1980 (from 200 to 600 pounds), and tripled *again* from 1980 to 1990 (to 1800 pounds).
- In the 1980s, third-class mail (used to send publications) grew 13 times faster than population growth.
- Two-thirds of business managers surveyed report tension with colleagues, loss of job satisfaction, and strained personal relationships as a result of information overload.
- More than 1000 telemarketing companies employ 4 million Americans and generate \$650 billion in annual sales.

I call this unexpected, unwelcome part of our atmosphere "data smog," an expression for the noxious muck and druck of the information age. Data smog gets in the way; it crowds out quiet moments and obstructs much-needed contemplation. It spoils conversation, literature, and even entertainment. It thwarts skepticism, rendering us less sophisticated as consumers and citizens. It stresses us out.

Data smog is not just the pile of unsolicited catalogs and spam arriving daily in our home and electronic mailboxes. It is also information that we pay handsomely for, that we *crave*—the seductive, mesmerizing quick-cut television ads and the 24-hour up-to-the-minute news flashes. It is the faxes we request as well as the ones we do not; it is the misdial numbers and drippy sales calls we get during dinnertime; but it is also the Web sites we eagerly visit before and after dinner, the pile of magazines we pore through every month, and the dozens of channels we flip through whenever we get a free moment.

The blank spaces and silent moments in life are fast disappearing. Mostly because we have asked for it, media are everywhere. Televisions, telephones, radios, message beepers, and an assortment of other modern communication and navigational aids are now as ubiquitous as roads and tennis shoes—anywhere humans can go, all forms of media now follow: onto trains, planes, and automobiles, into hotel bathrooms, along

jogging paths and mountain trails, on bikes and boats.

We have heard a lot lately about the moral decay evident in our entertainment packaging. But it is not so much the content of the messages that should worry us as much their ubiquity, and it is critical to realize that information does not have to be unwanted and unattractive to be harmful.

## II. STRESS

Perhaps the greatest story of acquisition and regret is that of the mythical Greek god Prometheus, whose punishment for stealing fire and passing it down to human beings was to be chained naked to a pillar where each day a vulture tore out his liver. The liver was divinely replenished each night, and the vulture would return to eat it out again the following day. In his dialogue *Protagoras*, Plato puts this story in more contemporary perspective. It was not just fire that Prometheus took. It was *techne*, the knowledge of how to make things. The moral is that the price of technological know-how includes a pound of flesh.

Today, the vultures still feed, occasioning a billion-dollar market for antacids such as Tagamet and Pepcid AC. For all of our abundance, ours is also an age of unprecedented stress, strain, headaches, and digestive problems—so much so, in fact, that tension has become one of our most vibrant industries. Three out of four Americans complain of chronic stress. Two out of every three visits to the family doctor are thought to be stress related, and the three top-selling prescription drugs are for ulcers, depression, and hypertension. Stress is also partly to blame, psychologists say, for the startling 300% increase in depression over the course of the 20th century.

Stress can have many different sources, of course: financial strain, family pressures, medical problems, and so on. But in a society that has come to be so broadly defined by information technology, it is becoming increasingly clear that the information revolution sweeping us into a new realm of communication is also serving as one of our greatest stressors. Our fast-paced, high-stimulation society leaves many people complaining about being overwhelmed, while many others are becoming unhealthily addicted to the mania. "People seem to be developing a form of attention deficit disorder without inheriting it," says Dr. Theodore Gross, an expert on attention-span disorders. "The information explosion has something to do with it—all the faxes and e-mail and calls come in, and people cannot keep up with it."

Attention deficit disorder (ADD), an increasingly common brain imbalance, causes acute restlessness and a propensity toward boredom and distraction. Victims of ADD often find it extraordinarily difficult to concentrate on any one thing for more than a few moments. Their minds wander, and they frequently find themselves involved in several things at once. If these symptoms sound eerily familiar, it is because we may be on the verge of an ADD epidemic. While millions of Americans are thought to suffer from an inherited form of ADD, experts are now seeing a whole new manifestation of what they call culturally induced ADD.

No matter how creatively we name it, however, the effects of information overload do not add up to one single debilitating syndrome that we can easily highlight, recoil in horror from, and muster a simple defense against. A careful review of 30 years of psychological research reveals a wide variety of effects from information and stimulus overload, including, but not limited to increased cardiovascular stress, weakened vision, confusion, frustration, impaired judgment, decreased benevolence, and overconfidence coupled with decreased accuracy.

As data smog changes the scope of our daily lives, our escapist fantasies evolve. Instead of jaunting off to savor intense new experiences, we design vacations of pure void. An editor friend of mine has just returned from a luxurious Caribbean vacation where, he boasts, he had all the extravagances he desired: no television, no radio, no newspaper, no computers. "My idea of pure bliss," he says, "is no information at all."

### III. THE PSYCHOLOGY OF OVERLOAD

How did we come to a point where our own tools of enlightenment would cause such distress? Ours is a culture of knowledge, an age of reason rooted in the 16th- and 17th-century scientific inquiry of Copernicus, Galileo, and Newton. Communications have been the lifeblood of civilization. But in our roaring technological prosperity, we have, so far, ignored the lesson Marshall McLuhan taught us decades ago: that every technology has service effects and disservice effects—positive and negative consequences for society.

Physically, we are what we are. So while we like to think of humans as adaptable creatures, the plain truth is that because of our complexity and longevity, we are not nearly as quick to physically adapt as are many other species. Our brains have remained structurally consistent for over 50,000 years, yet exposure to processed information in this century has increased by a factor of thousands (lately, the volume and speed of

information has been increasing as much as 100% each year). Something has to give. "Because technology can evolve much faster than we can," says psychologist Robert Cialdini, "our natural capacity to process information is likely to be increasingly inadequate to handle the surfeit of change, choice, and challenge that is characteristic of modern life."

Psychological tests reveal a bevy of clinical responses to data smog—confusion, frustration, overconfidence, and so on. But what does information overload look like in the real world? For some more personal snapshots of overload experience, I sent out an electronic query on the Internet. The response was stunning. I heard from scores of people, from Denmark, Sweden, Germany, Britain, California, New Jersey, Minnesota, and Colorado:

- An accountant who files all of her forms on a computer without any difficulty, but who becomes frozen with indecision when confronted with the open-ended world of the Internet
- A lawyer whose progressive addiction to computers culminated in a terrifying nightmare about being trapped in an endless library
- A librarian who has been professionally trained to grapple with mountains of information but who has lately succumbed to the feeling that the information supply is finally getting out of control.

And a vast assortment of others with memory troubles, sore backs, blurry vision, headaches, and so on.

I have also noticed a problem with my own memory and have had countless conversations with others as they tried to recall in vain where they came across some specific piece of information. "We're exceptional at storing information," explains UCLA memory expert Robert Bjork. "But there are retrieval limitations. We get overloaded. We know the name of that high school friend. It is in our memory somewhere, but we can't quite get to it." The specific culprit involved in our increasingly spotty memories, he says, is "cue overload." Memory is stored according to specific cues—contexts within which the information is experienced.

The problem comes when the contexts begin to vanish in the sea of data. Perhaps, like me, you now read nearly everything off the same computer screen, in the same sitting position, in the same spot in the same room. Perhaps the majority of your conversations now take place over the same phone in the same chair. "When many different things get associated with the same situational cues," explains Bjork, "you're going to have a greater difficulty remembering any one of those

things. With information overload, retrieval becomes more difficult.”

This new surfeit of choice also threatens our identities, our spiritual selves. In *Zen and the Art of Motorcycle Maintenance*, Robert Pirsig offers a practical solution to the existential alienation people suffer in modern society: His prescription is for people to reattach themselves to the technologies that they depend on by learning how they work. As “sophisticated” as we are, he argues, we still need to feel connected to our world in a rudimentary way. But Pirsig’s ideas, as sound as they are, are becoming obsolete. As the sophistication of the machinery increases each year, his solution of reattachment is increasingly unavailable to us. Sadly, we are creating a world so complex that each of us will understand less and less about it.

#### IV. ANALYSIS PARALYSIS

*Should you drink coffee? ... Hardly a month goes by without the release of yet another study linking coffee or caffeine to some undesirable health effect or absolving it of a suspected hazard. But almost without fail, such reports are soon followed by studies that fail to confirm either the risks or the benefits.*

—Jane E. Brody, *The New York Times*

The proliferation of expert opinion has ushered in a virtual anarchy of expertise. To follow the news today is to have the surreal understanding that the earth is melting *and* the earth is cooling; that nuclear power is safe and nuclear power is not safe; that affirmative action works—or wait, no it does not. In the era of limitless data, there is always an opportunity to crunch some more numbers, spin them a bit, and prove the opposite. Would jobs have been gained or lost under Bill Clinton’s comprehensive health care plan? Is dioxin as dangerous as we once thought? Do vitamins prevent cancer? With the widening pool of elaborate studies and arguments on every side of every question, more expert knowledge has, paradoxically, led to less clarity.

The *New York Times* aptly calls this phenomenon “volleys of data.” Statistics and hard facts are one of the fundamental ingredients of a just and civil society; but as with other forms of information, it turns out that too much of a good thing can have unwelcome consequences. The dramatic reduction in the cost of information production and distribution has ushered in an era of seemingly endless argumentation. “Much of the Congressional battle about President Clinton’s economic package could come down to a duel

over algebra,” wrote the *Times*’ Steven Greenhouse in 1993.

*Republican mathematicians attack the President’s plan as a tax-and-spend scheme, asserting that it includes \$1.75 to \$18 in tax increases for every dollar in spending cuts. Mr. Clinton’s number crunchers respond that it is a prudent, balanced plan, with one dollar in revenue tax increases for each dollar in spending cuts. Which is right in this battle of the calculators? The answer, in the never-never land of American politics, is that both sides are, depending on how one cuts the deck.*

Journalists and news consumers alike are stymied by the modern tendency of statistics to argue in every direction. Anyone who has attempted to conscientiously research a medical or political issue has confronted this problem directly. The endless analysis is so overwhelming, it is difficult to know how and when to decide.

On National Public Radio’s *All Things Considered* one evening, reporter Chitra Ragavan is trying to make sense of the latest cancer study, which does not comport with previous studies. “If you don’t have some level of confusion about how to interpret this study,” the National Cancer Institute’s Philip Taylor tells Ragavan, “you should.”

Inconclusive results, Ragavan reports. More studies needed. “Other large studies now underway may help clear the confusion,” she suggests hopefully. But in her optimism, she is ignoring the source of contention. It is our tools that have gotten us into this mess in the first place. With a majority of U.S. workers now paid to churn out data, we have generated a morass of expert information that has started to undermine logical approaches to deliberation and problem solving. Responding to a report that there have been more than 100,000 studies conducted on depression, the University of Chicago’s Larry V. Hedges pleads, “Is this a sensible situation? Do we really need more data?”

The studies pour in at such a rate, in fact, that a new field of statistics—“meta-analysis”—has suddenly emerged to make sense of the glut. Meta-analysis, the study of studies, is a method of combining pools of statistics from a wide range of studies and making a comprehensive analysis based on the whole. Data from hundreds of different examinations into whether caffeine causes breast cancer will be pooled together into one giant study. Though the approach dates back to 1904, when English statistician Karl Pearson used data from a range of vaccinations to conclude that they were ineffective, meta-analysis was all but forgotten until the 1980s, when frustrated researchers began to turn to it