CHAPTER 20

Information Overload

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20.1 INTRODUCTION

Is it any wonder that information overload is such a common complaint these days? Given the prevalence of cell phones, voice mail, e-mail, and instant messaging, as well as endless sources of academic, commercial, governmental, and personal information on the Web, it should hardly be surprising if complaints about a flood, a fire hose, or a blizzard of information are not only common but increasing. Googling "information overload" in early 2007 yielded more than six million hits for the phrase. The first of these was the entry in Wikipedia, which states that information overload "refers to the state of having *too much* information to make a decision or remain informed about a topic."[1] Indeed Google, the wildly successful Internet search service, and Wikipedia, the free, online, collaboratively produced encyclopedia, are themselves attempts at taming the fire hose of information by helping to organize it and make it more manageable.

On the face of it, information overload would seem to be a straightforward phenomenon (an excess of information) with a straightforward cause (the recent explosion of information technologies). Yet closer inspection reveals a number of subtleties, questions, and concerns: What does it mean to have too much information, and, for that matter, what exactly is this substance (information) we can apparently have too much of? Is the phenomenon as recent as our anxious complaints suggest, or does it have a longer history? How does it relate to other seemingly related notions, such as data overload, information anxiety, information pollution, technostress, data smog, and information fatigue syndrome? What exactly are the negative consequences, both practical and ethical, and how can we possibly say without pinning down the phenomenon more carefully?

[1]Retrieved (June 11, 2007).

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I cannot hope to address, or certainly answer, all these questions in this relatively brief article. But I do intend to identify some of the major issues, to wrestle with some of them, and along the way to chart some of the dimensions of the phenomenon. I will proceed as follows: In the next section, I will provide a preliminary definition of information overload and will identify some of the questions surrounding it. In Section 20.3, I will discuss the history of the English phrase "information overload," and in Section 20.4, I will show how industrialization and informatization prepared the ground for its emergence. Finally, in Section 20.5, I will explore some of the consequences, both practical and ethical, of overload, and in Section 20.6, I will briefly consider what can be done in response.

20.2 WHAT IS INFORMATION OVERLOAD?

> **Information overload:** Exposure to or provision of too much information; a problematic situation or state of mental stress arising from this. [OED Online, retrieved (June 11, 2007)].
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> **Information overload** . . . refers to the state of having *too much* information to make a decision or remain informed about a topic. Large amounts of historical information to dig through, a high rate of new information being added, contradictions in available information, a low signal-to-noise ratio make it difficult to identify what information is relevant to the decision. The lack of a method for comparing and processing different kinds of information can also contribute to this effect. [Wikipedia, retrieved (June 11, 2007).]

Information overload, according to these two definitions, is a condition in which an agent has—or is exposed to, or is provided with—too much information, and suffers negative consequences as a result (experiences distress, finds itself in a "problematic situation," is unable to make a decision or to stay informed on a topic, etc.). In a famous episode of "I Love Lucy," the 1950s American television show, Lucy has a job at a candy factory. Her job is to wrap chocolates as they come by on a conveyor belt. She has no trouble doing this at first, so long as the chocolates arrive at a moderate rate. But as the conveyor belt begins to accelerate, Lucy finds it progressively more difficult to keep up, until finally she is doing anything to get rid of the chocolates, including stuffing them in her mouth, her hat, and her blouse. If we think of the chocolates as morsels of information, then as the belt speeds up, Lucy begins to suffer from information overload.

At the heart of this understanding of the phenomenon is a fairly simple conception of human information processing—a three-stage model consisting of *reception*, *processing*, and *action*. In the first stage, information is received in some manner; it is a system input. It may arrive with little or no effort on the part of the person, as when someone opens an e-mail folder to discover that a number of new messages have arrived; or it may be actively sought after, as when someone performs

a literature search and discovers a number of (potentially) relevant sources. In the second stage, the person processes these inputs cognitively to absorb, interpret, and understand. Exactly what this consists of will depend on the nature of the inputs and the uses to which they will be put. In the case of e-mail, for example, processing may include scanning, skimming, reading, and organizing (categorizing, deleting). In the third stage, the person takes some action in response. In Lucy's case, each chocolate arrives in front of her on the conveyor belt (reception), she recognizes it for what it is (processing), and wraps it (action).

While this might seem like a straightforward and unproblematic notion, it raises a variety of questions, concerns, and complexities. I will briefly mention four.

20.2.1 What is Information?

How can one decide if one is suffering from information overload without knowing the range of phenomena encompassed by the word "information"? In both of the definitions above—as in many of the discussions of information overload in the popular press and academic literatures—the meaning of the word is assumed to be understood. This is presumably because the notion of information is unproblematic in the public mind: we require no explanation because we know what it means. When people say they are suffering from information overload, they most likely mean that they are feeling overwhelmed by the number of information goods or products (such as books, e-mail messages, telephone calls, or some combination of these) they are faced with.[2]

Among scholars who concern themselves with information from a theoretical perspective, however, there is little agreement about the notion. In search of stable footing, some have borrowed the information theoretic approach of Shannon and Weaver, which identifies the number of bits of information content in a signal, despite the fact that this is an abstract measure of channel capacity and not of meaning.[3] (Knowing how many bits of information are contained in the transmission of an issue of the *New York Times* over the Internet tells you nothing about the amount of meaningful, humanly interpretable content.) Others take information to be propositional content, facts, or some other postulated unit of meaningful content. Within library and information science, Michael Buckland's article, "Information as thing" (Buckland, 1991), identifies artifacts (physical documents, for example) as one of the three primary senses of the concept. Among the more radical approaches is Agre's suggestion (Agre, 1995) that information is a political and ideological construct rather than a natural kind; or Schement and Curtis' focus on the role that *the idea of*

[2]They might also mean that they are feeling overwhelmed by the information content of these products, which in their mind would probably amount to the same thing.

[3]Nunberg (1996) quotes Warren Weaver: "The word information, in this theory, is used in a special sense that must not be confused with its ordinary usage. In particular, information must not be confused with meaning. In fact, two messages, one of which is heavily loaded with meaning and the other of which is pure nonsense, can be exactly equivalent, from the present viewpoint, as regards information."

information plays within society, an approach that sidesteps the question of what information is (Schement and Curtis, 1995).[4]

20.2.2 More than Information

The two definitions above seem to suggest that information overload is simply concerned with an excess of information. But excess is a relational notion. As Kenneth Himma puts it,"One has too much of something relative to some (normative) standard that defines what is an appropriate amount" (Himma, 2007). If we have too much information, it must be relative to the tasks or purposes it is meant to serve, or the standards we are expected, or expecting, to meet.

Central to judgments of excess is some notion of *capacity*: a person or organization can only handle so much information in a given period of time. And here, it has been usefully pointed out that human beings have a limited attentional capacity; it is this capacity that is stressed in the face of excess. As Warren Thorngate, a Canadian psychologist, has noted: "Information is supposed to be that which informs, but nothing can inform without some attentional investment. Alas, there is no evidence that the rate at which a member of our species can spend attentional resources has increased to any significant degree in the past 10,000 years. As a result, competition for our limited attention has grown in direct proportion to the amount of information available. Because information has been proliferating at such an enormous rate, we have reached the point where attention is an extremely scarce resource, so scarce that extreme measures—from telemarketing to terrorism—have proliferated as fast as information just to capture a bit of it" (Thorngate, 1988, p. 248). Thorngate proposes a set of principles of "attentional economics." These include the principle of Fixed Attentional Assets, which states that attention is a fixed and nonrenewal resource, and the principle of Singular Attentional Investments, which states that attention can, in general, be invested in only one activity at a time. (Time is in a sense a surrogate for attention. If we can we only attend to so much in a given unit of time, then increasing the amount of time available potentially increases the amount of attention that can be applied.)

20.2.3 Perception or Reality?

Is information overload simply a question of one's subjective state—that one *feels* overloaded—or must there be some objective reality to it? Watching Lucy unable to

[4]Schement and Curtis (1995, p. 2) say: "We propose that the idea of information forms the conceptual foundation for the information society. By that we mean a perspective in which information is conceived of as thing-like. As a result, messages are thought to contain more or less 'information.' Marketplaces exist for the buying and selling of 'information.' Devices are developed for the storage and retrieval of information. Laws are passed to prevent theft of information. Devices exist for the purpose of moving information geographically. Moreover, and equally important, the thingness of information allows individuals to see diverse experiences, such as a name, a poem, a table of numbers, a novel, and a picture, as possessing a common essential feature termed 'information.' As people endow 'information' with the characteristics of a thing (or think of it as embodying material characteristics) they facilitate its manipulation in the world of things, for example, in the marketplace."

wrap all the chocolates coming down the conveyor belt, there is no question that objectively she is failing to keep up. But in the case of a human being or an organization contending with (possibly too much) information, we may not be able to monitor directly and transparently the coping process, and thus may have no way to decide what constitutes too much. On the other hand, with human beings and their social units we can receive direct reports that, at the very least, describe their subjective state: *This is more than I can handle*. The relation between perception and reality is particularly important when trying to decide, for example, if we are *more* overloaded by information today than we were in the past. Is it enough to determine that more people today complain about the problem (if this is true), or must we have some independent way to measure the "load," and therefore the overload, on our human systems?

20.2.4 A Novel, Recurrent, or Ever-Present Phenomenon?

It has been suggested that we conceive of information overload today as a unique phenomenon, "an immediate phenomenon—without a history—that the current generation uniquely faces for the first time" (Bowles, 1999, p. 13). Yet complaints about an overabundance of books stretch back at least as far as the sixteenth century. Indeed, an entire issue of the *Journal of the History of Ideas* was recently devoted to exploring "early modern information overload."[5] The editor of this issue, Daniel Rosenberg, notes "the [strange] persistence of the rhetoric of novelty that accompanies so old a phenomenon" (Rosenberg, 2003, p. 2). Bowles has called this perception of novelty the "myth of immediacy."

While it seems wise not to assume that information overload is an entirely new phenomenon, we should also be careful not to assume that the sixteenth century experience of excess is (exactly) the same phenomenon we are dealing with today. What's more, since the phrase "information overload" is less than 50 years old, its application to earlier times is quite literally anachronistic, a point not lost on Rosenberg: "It is worth noting the terminological anachronism deployed by this group of historians in the application of the rubric of 'information overload' to the early modern period. The word 'information' itself appears little if at all in the sources to which these historians refer. Indeed, the use of 'information' to mean something

[5]In the introduction to the issue, Daniel Rosenberg asserts that "During the early modern period, and especially during the years 1550–1750, Europe experienced a kind of 'information explosion.'. . .There is ample evidence to demonstrate that during this period, the production, circulation, and dissemination of scientific and scholarly texts accelerated tremendously" (Rosenberg, 2003, p. 2). In the same issue, Ann Blair quotes Conrad Gesner complaining in 1545 about the "confusing and harmful abundance of books" and Adrien Baillet worrying in 1685 that "we have reason to fear that the multitude of books that grows every day in a prodigious fashion will make the following centuries fall into a state as barbarous as that of the centuries that followed the fall of the Roman Empire" (Blair, 2003, p. 11). Nearly a hundred years after this second complaint, Diderot was still expressing similar concerns in his "Encyclopédie": "As long as the centuries continue to unfold, the number of books will grow continually, and one can predict that a time will come when it will be almost as difficult to learn anything from books as from the direct study of the whole universe" (Rosenberg, 2003, p. 1).

abstract and quantifiable (rather than particular knowledge) does not appear until the early twentieth century, and the usage 'information overload' is even later" (Rosenberg, 2003, p. 7).

20.3 A BRIEF HISTORY OF THE PHRASE

Having briefly explored the concept of information overload, including some of the nuances and questions that surround it, I now want to examine the history of the phrase.

The Wikipedia entry on "information overload" claims that it was coined in 1970 by Alvin Toffler in his book *Future Shock*.[6] Although Toffler, as we will see, did write about the subject, a search of the academic and popular literature of the time reveals that the phrase was already in use by the early 1960s. Consider the following examples:

- In 1962, Richard L. Meier, published a scholarly monograph, *A Communications Theory of Urban Growth*, which applied then-current ideas in information and communication theory to the organization of cities. In a section entitled "The Threat of Information Overload" (Meier, 1962, pp. 132–136), he pointed out that the "expanded flow rates" of communications in dense urban settings would likely lead to "widespread saturation in communications flow. . . within the next half century" (Meier, 1962, p. 132).
- In an article published the same year, "Operation Basic: the retrieval of wasted knowledge," Bertram M. Gross, a professor of political science at Syracuse University, argued that the accelerating rate of publication was threatening science and society with an "information crisis." There was a "flood" of new publications as a consequence of which, "Nobody. . . can keep up with *all* the new and interesting information" (Gross, 1962, p. 70). Indeed, thanks to international efforts "to 'educate' the people of lesser-developed economies," these unfortunate citizens would find themselves moving from "the frying pan of information scarcity to the fire of an information overload" (Gross, 1962, p. 70).
- In 1966 the economist Kenneth Boulding published a journal article in which he declared that "management science. . . is an alternative defense against information overload" (Boulding, 1966, p. B169). The following year, in the same journal, *Management Science*, Russell Ackoff claimed that "most managers receive much more data (if not information) than they can possibly absorb even if they spend all of their time trying to do so. Hence, they already suffer from an information overload" (Ackoff, 1967, p. B148).
- Also in 1967, a paid advertisement appeared in the *New York Times* announcing the publication and sale of a book titled *EDUNET: Report of the Summer Study on Information Networks*, a report by an academic coalition outlining a plan "for a vast interuniversity communications network." The ad bore the title

[6]Retrieved (June 11, 2007).

"EDUNET: Is it the answer to the information overload in our schools and colleges?" The body of the ad copy read:

> "Our contemporary problem is not lack of knowledge or information. Far from it. / Every day there are more and more schools, colleges, and universities. /. . . More books, more journals, more learned papers, more data banks, more symposia, more international meetings, more conference calls—more knowledge and information, in fact, than our present system of scholarly communications can reasonably process. / This is the 'information overload' problem—a problem which EDUNET is designed to relieve" ("EDUNET: Is it the answer to the information overload in our schools and colleges?" 1967).

- In 1969, an article on rock music—"All You Need is Love. Love is All You Need"—appearing in the *New York Times* noted: "The wild images in the song are not, in fact, connected in any logical way. There is no normative meaning, no sirloin for the watchdog. But there is a larger, more important meaning: The quick flashing of disjointed phenomena reproduces the chaos of sensations in our world of information overload" (Murphy and Gross, 1969).

Although Alvin Toffler neither coined the phrase nor introduced it into the culture, his vastly popular book may well have been the first to discuss the topic at some length in a form that was accessible to the general public. Information overload for Toffler was just one manifestation of a period of unprecedented change Western society was then entering, a movement beyond industrialization to what he dubbed "super–industrialism." In this new era, he claimed, "we have not merely extended the scope and scale of change, we have radically altered its pace. We have, in our time, released a totally new social force—a stream of change so accelerated that it influences our sense of time, revolutionizes the tempo of daily life, and affects the very way we 'feel' the world around us" (Toffler, 1970, p. 17). Human beings, he claimed, were ill-prepared for this new, accelerated rate of change, and were beginning to feel the effects of "future shock," an inability to respond comfortably and successfully to the "overload of the human organism's physical adaptive systems and its decision-making processes" (Toffler, 1970, p. 326).

In the last third of the book, Toffler addressed "the limits of adaptability," arguing that the human organism remains "a biosystem with a limited capacity for change" (Toffler, 1970, p. 342). In Chapter 15, "Future Shock: The Physical Dimension," he described how the stress of change could lead to physical illness as "each adaptive reaction extracts a price, wearing down the body's machinery bit by minute bit, until perceptible tissue damage results" (Toffler, 1970, p. 342). In the next chapter, "Future Shock: The Psychological Dimension," he explained that future shock could manifest itself in psychological as well as physical ways: "Just as the body cracks under the strain of environmental overstimulation, the 'mind' and its decision processes behave erratically when overloaded" (Toffler, 1970, p. 343). Toffler identified three forms of overstimulation: sensory, cognitive, and decisional. Cognitive overstimulation occurs when a person's environment is changing so quickly that he doesn't have sufficient time to think about what is happening, to "absorb, manipulate, evaluate, and retain

information" (Toffler, 1970, p. 350). Toffler pointed to work in psychology and information science concerning human beings' "channel capacity," which suggested "first, that man has limited capacity; and second, that overloading the system leads to serious breakdown of performance" (Toffler, 1970, p. 352). (The title of this subsection is "Information Overload," but nowhere in the five-page section did he use the phrase in a sentence.)

It is a striking feature of these early citations that authors apparently felt no need to define what they meant by "information overload." For Meier writing in 1962 phrases such as "the overloading of communications channels" (Meier, 1962, p. 2), "communications load" (Meier, 1962, p. 79), and the "threat of information overload" (Meier, 1962, p. 132) emerge fluidly and unproblematically to advance his narrative. Although the 1967 EDUNET ad appears to explain what it means by information overload in the body of the advertisement (more books, journals, papers, data banks, symposia. . .), still, the copywriters were comfortable including the phrase in the headline. And even though Toffler devoted five pages to explaining what he meant by cognitive overstimulation (a high-sounding phrase), he felt comfortable labeling the subsection "Information Overload." In the 1960s, we might conclude, the meaning of the words "information" and "overload" were unproblematic, and the meaning of the conjoined phrase could be straightforwardly extrapolated from them.

Much of this linguistic transparency seems to have come from the meaning of the word "overload," and its root word "load." The Oxford English Dictionary defines "load" as "That which is laid upon a person, beast, or vehicle to be carried; a burden. Also, the amount which usually is or can be carried; e.g., *cart-load*, *horse-load*, *wagon-load*," and it defines "overload" as "An excessive load or burden; too great a load; the condition of being overloaded." These core meanings speak to the recognition that a person or an animal (or by extension, a device such as a cart or wagon) is capable of carrying physical materials and second, that this capacity is finite and can be exceeded.

But the OED also identifies various extensions or specializations of these core meanings. In a use stretching back as far as Shakespeare, "load" has been used to mean something specifically negative: "A burden (of affliction, sin, responsibility, etc.); something which weighs down, oppresses, or impedes." And in more recent times, it has been used to designate "an amount of work, teaching, etc., to be done by one person." Particularly noteworthy is the application of "overload" to electrical circuits to mean "an electric current or other physical quantity in excess of that which is normal or allowed for," a use the OED dates to the early 1900s. Moving from the overloading of an electrical system to the overloading of a communication system does not seem like much of a stretch.

The word "information" has a much more complex history. (For an exploration of the word's history and current meanings, see Nunberg (1996); for an exploration of "The concept of information," see Capurro and Hjorland (2003).) Yet the ease with which the word was bandied about in these citations from 1962 to 1970 suggests that its meaning was clear—or at least clear enough—to audiences of the time.

The period from the 1970s to the present has witnessed the explosive growth of information and communication technologies, including personal computers, e-mail,

TABLE 20.1 Number of Articles Referring to "Information Overload" in Several Literatures

	ProQuest Business Press	ProQuest Science & Technology Press	*New York Times*
2000-present	549	172	86
1990–1999	521	150	99
1980–1989	164	21	41
1970–1979	1	3	7
1960–1969	1	0	2
Total	1266	346	235

instant messaging, the World Wide Web, and cell phones. And the use of the phrase "information overload" has equally expanded, in apparent synchrony with these developments. As an example of this growth, Table 20.1 indicates the occurrence of the phrase in three separate bodies of literature, grouped by decade.[7] Data for the first column, "ProQuest Business Press," was collected by searching the following ProQuest databases: ABI/INFORM Dateline, ABI/INFORM Global, ABI/INFORM Trade & Industry, Accounting & Tax Periodicals & Newspapers, Banking Information Source, ProQuest Asian Business and Reference, ProQuest European Business. Data for the second column, "ProQuest Science & Technology Press," was collected by searching the ProQuest Computing and ProQuest Science Journals databases. Data for the third column was collected by searching the *New York Times* online.

Finally, it should be noted, other phrases are in current use that relate to, or overlap with, "information overload" in various ways, including "data overload," "information anxiety," "information pollution," "information fatigue syndrome," "data smog," and "technostress." While it is beyond the scope of this article to examine the meanings of these phrases, it is worth observing that none of them appears to enjoy anything like the frequency of "information overload."[8]

20.4 CAUSES OF INFORMATION OVERLOAD

For the phrase "information overload" to have been introduced so casually and unproblematically in the 1960s, the groundwork must have been laid earlier. In the early twentieth century, as I noted above, scientists began to talk about the "overloading" of certain kinds of technical systems, namely electrical circuits; from

[7]These literature searches were performed in early 2007. This means that the counts for the period from the decade beginning in the year 2000 are small relative to the counts for earlier decades since the current decade is as yet incomplete.

[8]In Spring 2007, a Google search for each of these phrases found that "information overload" was mentioned in ten times as many web sites as its closest competitor: information overload (1,140,000), data overload (116,000), technostress (87,400), information anxiety (74,100), data smog (42,500), information pollution (34,800), information fatigue syndrome (812).

here it would seem to be a small step to viewing a human being or a human organization as a system that also could be overloaded.

Concerns specifically about an excess or overabundance of information were being expressed in this period, too. Following World War I, Burke (1994) has observed, scientists and librarians began to worry about a "library crisis." Such concerns stimulated various scientists and technologists, including Vannevar Bush, who in 1945 published an influential article in The Atlantic Monthly, "As We May Think" (Bush, 1945), which proposed developing a personal information device called the "memex" for storing and searching one's personal library of microfilmed books and articles. His description of the problem he hoped the memex would solve is information overload by another name: "There is a growing mountain of research. But there is increased evidence that we are being bogged down today as specialization extends. The investigator is staggered by the findings and conclusions of thousands of other workers—conclusions which he cannot find time to grasp, much less to remember, as they appear. Yet specialization becomes increasingly necessary for progress, and the effort to bridge between disciplines is correspondingly superficial."

By the 1960s, then, the language was ripe for use, and the perception existed that there was more information than could be properly handled. While this analysis provides some background for the emergence of the phrase in the 1960s, I would suggest that we look back even further in history—to the Industrial Revolution and its shaping of the Information Society—for insight into the phenomenon. The idea of the information society—or, as it is sometimes called, the knowledge society—can be dated to the 1960s and 1970s. In *The Production and Distribution of Knowledge in the United States* (Machlup, 1962) published in 1962, Fritz Machlup, an economist, noted an increasing reliance on knowledge production, as compared with physical production, in the U.S. economy. (Toffler uses the term "superindustrialism" in much the same spirit.) In the late 1970s, Marc Porat labeled the American economy as an "information economy," and declared American society to be an "information society."[9] Also, in the late 1970s Daniel Bell published *The Coming of Post-Industrial Society* (Bell, 1976). Together these works advanced, for both scholars and the general public, the idea that the balance of the American economy was shifting from the production, distribution, and consumption of physical goods to the provision of information products and services. Many details of the information society idea continue to be debated (see Frank Webster's 1995 book, *Theories of the Information Society* (Webster, 1999)), but its central premise—that there has been a major quantitative and qualitative shift in the use of information products, services, and technologies—is not in dispute.

But when did this shift begin and how did it come about? In his book, *The Control Revolution* (Beniger, 1986), James Beniger argues that the Information Society emerged in the attempt to solve certain problems created by the Industrial Revolution. The Industrial Revolution was essentially a radical transformation of the Western economic system. Steam power made it possible to produce, distribute, and consume

[9]See Porat's *The Information Economy: Definitions and Measurement* (Porat, 1977) and "Communication Policy in an Information Society" (Porat, 1978).

material goods faster and in greater quantity than had ever been possible before. Beniger says:

> "Never before had the processing of material flows threatened to exceed, in both volume and speed, the capacity of technology to contain them. For centuries most goods had moved with the speed of draft animals down roadway and canal, weather permitting. This infrastructure, controlled by small organizations of only a few hierarchical levels, supported even national economies. Suddenly—owing to the harnessing of steam power—goods could be moved at the full speed of industrial production, night and day and under virtually any conditions, not only from town to town but across entire continents and around the world." (Beniger, 1986)

But by the mid-nineteenth century, mass production and accelerated rates of distribution and consumption had precipitated what Beniger calls a "control crisis": both human and technical systems for managing the increased flow were found to be inadequate. JoAnne Yates illustrates one dimension of this crisis in her book *Control Through Communication* (Yates, 1989): the problem of creating organizational structures and management methods that were up to the task of controlling manufacturing and transportation at increased speed. Through the mid-nineteenth century and beyond, most commercial establishments had relied on flat organization and oral, face-to-face communication. But in the new economic conditions, organizations were larger and were more geographically distributed—the railroads were one major instance—and the old management methods no longer worked.

The solution to this control crisis, Beniger explains, was a "control revolution": the development of a whole series of innovations in information technologies and practices. In the case that Yates explores, gaining control of the new industrial organizations meant developing new, more sophisticated bureaucratic methods of management and accountability, as well as new technologies (the typewriter, vertical files, carbon paper) and document genres (the memo, the executive summary, graphs, and tables) to support these methods. Since the late nineteenth century, a stunning series of technical innovations has not only helped to control the material economy but to further accelerate it. This has led to a radical informatization of Western culture—a much greater presence of information products, services, and practices serving a control function; it is this process of radical informatization that led to, and in fact constitutes, the Information Society.

As a result of this transformation, American society, as well as other industrial economies, has witnessed a fairly steady increase in production: more products circulating more quickly. There has been a steady increase in traditional material goods, such as cars, washing machines, and refrigerators. And there has been a steady increase in the production of information goods, which have served two purposes: as end-user commodities, such as books, newspapers, movies, and television shows, and as agents of control in the sense Beniger identifies, such as telephone calls, e-mail messages, and advertisements. (Some of these information goods have served both functions at once.)

Hanging over the economy, however, has been the inevitable double fear—of overproduction and underproduction. Beniger's account provides a useful way of

seeing how these threats have been dealt with. In the 1920s, for example, concern grew among American business leaders that the market was becoming saturated—that more goods were being produced than consumers wanted or needed; the very success of the late nineteenth century in learning how to manage accelerated flows of goods seemed to be leading to a crisis of overproduction. There was serious talk of reducing working hours and slowing production. But fortunately (from the perspective of the business leaders) another solution was found, which was nicely summarized in the findings of a national Committee of Recent Economic Changes, chaired by Herbert Hoover while he was secretary of commerce: "The survey has proved conclusively what has long been held theoretically to be true, that wants are almost insatiable; that one want satisfied makes way for another. The conclusion is that economically we have a boundless field before us; that there are new wants which will make way endlessly for newer wants, as fast as they are satisfied" (quoted by Hunnicutt, 1988, p. 44). From this understanding, the modern advertising industry was born, an industry devoted to producing new forms of information goods—advertisements—that would stimulate desire, and thereby consumption.

There is an irony in the increased production and use of information goods, however, an irony that has become increasingly clear throughout the more than century-long process of informatization. Information goods—whether newspapers, television advertisements, books, or e-mail messages—are themselves circulating products; they too need to be managed and controlled, just as much as do traditional material goods. But the more information that is produced to manage and control other forms of production, distribution, and consumption, the greater the need to manage this new information as well. These new needs have led, seemingly inevitably, to further innovations in information practices and technology, which have produced more, and new forms of information, which have led to further needs for control, and so on.

The World Wide Web provides an interesting example of this phenomenon. Writing in 1945, Vannevar Bush hoped that the memex would solve the post-war problem of information overload. The most innovative feature of the memex was to be the establishing of "associative indices" between portions of microfilmed text—what we now call hypertext links—so that researchers could follow "trails" of useful information through masses of literature. Bush never foresaw that a worldwide system of digital links would itself become a source of further overload, or that whole new methods and technologies would be required to manage the links that he thought would help solve the original problem.

From this perspective, then, information overload is simply an inevitable consequence of certain economic conditions and the philosophy of life that underlies them—a philosophy I have elsewhere called "more-faster-better" (Levy, 2006), which gives priority to producing and consuming more and more material and information goods ever faster. Now that digital video is within the reach of ordinary consumers, for example, we are seeing an explosive growth of its production and distribution (witness the YouTube phenomenon), and new technical schemes to manage this explosion (how do you index or search video?); it won't be long before

these capabilities are increasingly used within corporations and other complex organizations to effect what Yates calls "control through communication." But the larger point is that systems of control for increased quantities and new forms of information will inevitably lag behind, leading in many cases to a sense of excess and an inability to handle it all.

What then is truly novel about today's sense of information overload and what is simply the recurrence, or the ongoing presence, of an older phenomenon? There is no question that people at other times and in other places have experienced a problematic excess of information goods. Roger Chartier (Chartier, 1994), the French historian of the book, for example, has suggested that after the invention of the printing press, it took an "immense effort motivated by anxiety" "to put the world of the written world in order." This vast, centuries-long effort, he points out, included the development of title pages, cataloging schemes, and the invention of the author. Here, it would seem, is a case that parallels our own, in which innovations in the control systems and practices needed to manage an increased production of information goods (in this case of books) were one step behind innovations in production. In this respect, today's experience of overload might be seen as a recurring phenomenon.

But at the same time, we might note certain features of the current experience that may be unique to this period of informatization. Never before have people had such widely available and powerful tools for communicating and managing affairs at a distance; we now live lives *mediated by* information and communication technologies to a degree that is clearly unprecedented in human history. Over the course of the last 150 years, the use of such technologies has spread to most, if not all aspects of human life: commerce, health care, education, family life, entertainment, and so on. It isn't uncommon for many of us to spend the better part of our days conducting many—in some cases, most—aspects of our life through e-mail, instant messaging, cell phones, and the Web.

What's more, many aspects of these interactions are bureaucratic in nature: filling in forms, pushing buttons to interact with voice mail phone trees, sending task-oriented e-mail messages around the globe. Bureaucratic methods born in the late nineteenth century to effect communication and control within large, distributed organizations have become the norm for communicating with friends and colleagues, for shopping, for interacting with corporations and other large and impersonal organizations. Memos, "fill-in" forms, and elaborate charts and tables were invented to systematize communication *within* organizations. But over the decades these same methods have been adopted for communication *with* corporate organizations, and among citizens. Today, one is just as likely to communicate with one's phone provider or gas company via a Web form or an automated phone tree as by talking with a customer service agent. Many people now find that a detailed calendar is an essential tool for managing not only their professional but their personal activities.

So it may be that some of the concerns being registered as information overload don't simply have to do with the amount of information we are dealing with, or the inability of our current control systems to handle them. Rather, or in addition, they may be the expression of discomfort with our *mode* of operating in the world through

information technology. We may feel frustrated not just with the amount of e-mail we receive but with the fact that we are living so much of our lives through such a medium. To this might be added one further irony of the current phenomenon: Thanks to the very media and technologies that are contributing to our sense of overload—newspapers and magazines, radio and television, e-mail, blogs, and so on—we now have more opportunities than ever before to give public voice to such complaints.

20.5 CONSEQUENCES OF INFORMATION OVERLOAD

Information overload, as we have seen, involves more than just the exposure of an agent to excessive amounts of information: that agent must also suffer certain negative effects as a result. One of the most obvious, and straightforward, consequences is a failure to complete the task at hand, or to complete it well. As the conveyor belt speeds up, Lucy is unable to wrap *all* the chocolates passing her station (which is a clear criterion of success); by the end, she isn't wrapping *any* of them.

Faced with more information than we can handle in an allotted time, we find various ways just to get by. Steven J. Bell, library director at Philadelphia University, has noted how students, having pulled up hundreds of articles in response to a Google search, "print out the first several articles—making no effort to evaluate their quality—and then run off to write their papers" (Carlson, 2003). Barry Schwartz, a professor of psychology at Haverford, presents various heuristics people use to choose among a large range of options, and argues that as the number of choices increase, decisions require more effort and errors become more likely (Schwartz, 2004). Paradoxical though it may seem, having access to more information may lead us at times to be *less well* informed, and to make *less* effective choices.

Information overload may have consequences not only for the task but for the well-being of the person performing it, who may experience a diminished sense of accomplishment and a heightened degree of stress. In 1970, Toffler noted the link between increased stimulation and stress, making reference to Hans Selye's groundbreaking work on stress as a contributing factor in illness (Selye, 1956). In the intervening years, scientific evidence has incontrovertibly demonstrated that stress is a contributor to both physical and psychological ailments, including high blood pressure, depression, and anxiety. A certain amount of stress, of course, is inevitable in life, and not all of it is bad. The tensing of major muscle groups, along with increased heart rate and respiration, was, and still is, an appropriate response to physical threat. But living essentially full-time in fight-or-flight mode is bound to wreak havoc on health. As Peter C. Whybrow, a UCLA neuropsychiatrist and the author of *American Mania* (Whybrow, 1989), has observed: "today, it is no longer the life-threatening chance encounter that triggers physiological stress. Now stress is tied largely to social relationships and to the way in which our technology aids or hinders those relationships. The mechanisms of bodily defense that once gave short-term physical advantage are not well suited to the time-starved chronic competition of the Fast New World" (Whybrow, 1989, p. 79). The consequences of this unchecked and unbalanced striving may include "a competitive, unstable workplace, diminished time for family and

community life, fragmented sleep, obesity, anxiety, and chronic stress"[10] (Whybrow, 1989, p. 106).

It should hardly be surprising if information overload also has negative consequences for ethical behavior. Nearly 30 years ago, Herbert Simon, a Nobel laureate in economics, observed: "In a world where information is relatively scarce and where problems for decision are few and simple, information is always a positive good. In a world where attention is a major scarce resource, information may be an expensive luxury, for it may turn our attention from what is important to what is unimportant. We cannot afford to attend to information simply because it is there" (Simon, 1978, p. 13). Simon's concern might be understood as simply applying to the cases just discussed above, where inadequate time and attention diminish the likelihood of choosing the most appropriate car or writing the best literature review. But Simon's choice of words —"turn[ing] our attention from what is important to what is unimportant"— might also alert us to the risks that information overload poses to ethical action as well; for an excess of information and the frenzy to which it contributes may easily distract us from adequately taking ethical concerns into account. Josef Pieper, a Roman Catholic philosopher and theologian, makes just this point when he argues that it is the workaholic who may be lazy insofar as his engagement in "the restlessness of a self-destructive work-fanaticism" (Pieper, 1998, p. 27) distracts him from his deeper responsibilities as a human being.

The overwhelming amount of information now presented through media outlets, for example, can make it difficult to stay in touch with those stories that require compassionate action on our part—as when the news about Anna Nicole Smith drives the dire circumstances in Darfur off the front page and out of public consciousness. Within corporate, and even scientific, contexts, it isn't hard to imagine that information overload and deadline pressure may lead individuals, or entire groups, to gloss over the ethical implications of their actions. Indeed, a recent study of scientific research observed that "our respondents were clearly worried about the quality of their own and their colleagues' data but they were *not* overly concerned with data that are purposively manipulated. Rather, they were troubled by problems with data that lie in what they see as a 'gray area,' problems that arise from being too busy or from the difficulty of finding the line between 'cleaning' data and 'cooking' data" (DeVries et al., 2006, p. 46).

Clearly then, there are times when information overload may lead people to fail to respond to, or to notice, what is important ethically. Pressed for time, overwhelmed and overbusy, any one of us may fail to reflect carefully and respond empathically. But there is another ethical effect of information overload, which may be even more consequential: when individuals, groups, or even entire societies become so enmeshed

[10]Also see the *New York Times* article, "Always on the Job, Employees Pay with Health" (Schwartz, 2004), which begins: "American workers are stressed out, and in an unforgiving economy, they are becoming more so every day. Sixty-two percent say their workload has increased over the last six months; 53 percent say work leaves them 'overtired and overwhelmed.'. . .Decades of research have linked stress to everything from heart attacks and stroke to diabetes and a weakened immune system. Now, however, researchers are connecting the dots, finding that the growing stress and uncertainty of the office have a measurable impact on workers' health and, by extension, on companies' bottom lines."

and overwhelmed by the amount of information and the accelerating pace of life that they fail to adequately develop the habits and character traits from which ethical action springs. The novelist Richard Ford, for example, has called the pace of life "morally dangerous," suggesting that in today's fast-paced, overloaded world "vital qualities of our character [may] become obsolete: our capacity to deliberate, to be patient, to forgive, to remain, to observe, to empathize. . ." (Ford, 1998).

Whybrow covers some of the same territory. Human empathy, he points out, "functions as the immune system of civil society" (Whybrow, 1989, p. 218). "It is empathy that transcends the interests of the 'selfish' self, promoting shared values among individuals and shaping the collective behaviors we call culture. In short, empathic understanding provides the lifeblood—the psychic immune system—that is the humanity of the civil society" (Whybrow, 1989, p. 219). But human empathy, he goes on to say, is a "delicate" commodity; it requires a kind of ongoing cultivation that is in short supply in a world, where, to quote the subtitle of Whybrow's book, "more is never enough."

A recent scientific study reported in the *New York Times* (Carey, 2006) offers evidence that when people who hold strong politically partisan views are given contravening information, they reject those views quickly and unconsciously using a part of their brain more associated with emotional activity than with reasoning. They never fully hear what doesn't fit their beliefs. "It is possible to override these biases," one of the scientists involved in the study is quoted as saying, "but you have to engage in ruthless self-reflection, to say, 'All right, I know what I want to believe, but I have to be honest." Can there be any question that human beings need time and attention to cultivate the depths of their humanity—to develop their capacity for mature thinking and listening, for insight and empathy? While it would be too simple to suggest that information overload is the sole cause, it must surely be counted as a factor insofar as it is both a contributor to and a symptom of the complex of attitudes and behaviors I have called "more-faster-better."

20.6 CONCLUSION: WHAT CAN BE DONE?

In the analysis I have presented here, information overload is one of the side effects of an information society operating under a "more-faster-better" philosophy of life. For a variety of reasons—some economic, some social, and some spiritual[11]—our society's sense of progress and achievement is tied to the accelerated production of material and information goods. Some of these information goods are end-products (films and video games and newspapers), while others are agents of control (advertisements and e-mail messages) that help to manage the accelerating processes of production and consumption. The result is that more and more information products are being produced faster and faster, and attempts to manage these flows lead to the production of yet more information.

[11]See David Loy's assertion that the Western economic system is a "religion of the market" (Loy, 1997).

Can nothing be done then to stem the tide? In fact, many things have been done, and will continue to be done, to reduce people's sense of information overload. Some of these interventions are technological in nature: the development of e-mail filters, for example, to automatically categorize incoming e-mail and to identify and isolate spam. Other interventions are social, as when people decide to take themselves off certain e-mail listservs to reduce their inbox clutter, or to take "Blackberry-free" vacations. Still others involve the law: recent U.S. legislation instituting "don't call" lists has apparently been very effective in eliminating unwanted telemarketing phone calls to people's homes.

How successful these different forms of technical, social, and legal intervention have been, or will be, depends largely on the specific circumstances within which they are embedded. In some cases—"don't call" lists, for example—the intervention may solve the immediate problem, while in other cases—such as e-mail filters or calendaring programs—the solutions may make the problem worse in the long run, because the ability to handle more information more efficiently may contribute to further acceleration that then leads to the production of more information, and so on. All of which suggests that so long as a "more-faster-better" attitude governs the production of material and information goods, we can expect that information overload—along with more and less successful attempts to mitigate it—will be a regular feature of postmodern life.

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