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Growing Pains with Information Overload

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Emotional and cognitive overload with information technology can be caused by more than just too many digital devices.

In these frenetic times we're experiencing a new form of information explosion—one in which torrents of data are delivered over digital media in the form of pop-ups, e-mails, and text messages. These new media are being used to create data smog, storage gluttony, and, in general, information overload, which may be defined as the "state of an individual (or system) in which not all communication inputs can be processed and utilized, leading to breakdown" (tinyurl.com/38tts5q).

Our brains now track more data points than ever in human history (tinyurl.com/22rqddd). In addition, in our daily lives we're deluged by requests to use new digital technologies or online services that tend to bring us even more information that must be processed. Yet we must embrace emerging technologies to remain efficient and effective. Unfortunately, just when we finally feel comfortable with a new digital technology, we're often compelled to learn a newer version or adapt to an altered Web interface. This typically entails unlearning something that has been learned well. To stay current we must update our brain as fast as or faster than our computer.

EMOTIONAL AND COGNITIVE OVERLOAD

Along with the volumes of new data to be processed, requests to use digital technologies and services can overwhelm us. Overload manifests itself in a wide range of dysfunctions—from emotional (frustration, impatience) to cognitive (accepting lower performance levels, making poorer decisions). Over the long term, such dysfunctions mentally exhaust us and cause long-term or chronic stress similar to burnout.

Burnout was first dramatized on the silver screen in the 1936 classic *Modern Times*. In this movie, Charlie Chaplin struggled against the inhuman machine's rhythm. Today, at home and in the workplace, we struggle with different, constantly changing machines—digital technologies distributing information at a lightning pace that requires metaknowledge to operate efficiently.

Only geeks update their technical skills simply because they find it fun to do so (tinyurl.com/34ubmo2). For most mortals, constantly changing interfaces, frequent introductions of new versions, and increasing requests to adopt new digital technologies or online services cause more harm than benefit. We're experiencing a new type of burnout in today's computerized world: emotional and cognitive overload (ECO) with information technology. We define ECO with information technology as the negative manifestations resulting from proposed or actual digital technology usage and the corresponding cognitive and emotional failures to resolve the high mental load with information delivered by technology.

Much has been written about information overload, but little has been said about its real cause. Many researchers point to George A. Miller's pivotal 1955 article in *Psychological Review* (tinyurl.com/3b5rat), which asserts that individuals can handle up to seven bits or chunks of data, plus or minus two bits or chunks. These researchers argue that the short-term memory's inability to manipulate an excessive number of bits or chunks causes the overload.

In contrast, we argue that information overload doesn't arise from the simple limitation of the short-term memory when processing data. Rather, it's a function of individual differences in information processing capacity and, more specifically, the availability of cognitive schemata required to chunk information. The

Table 1. Participants' feelings of being emotionally and cognitively overloaded.	
Cognitive overload	
You cannot process (the number of requests you receive to use new Information Technology)	42.3%
You cannot handle (…)	42.8%
You cannot cope with (…)	47%
You are overwhelmed by the effort it takes to handle (…)	45.9%
Emotional overload	
You feel pretty irritated by (…)	47.8%
You feel emotionally pressured by (…)	36.3%
You feel confused by (…)	37.8%
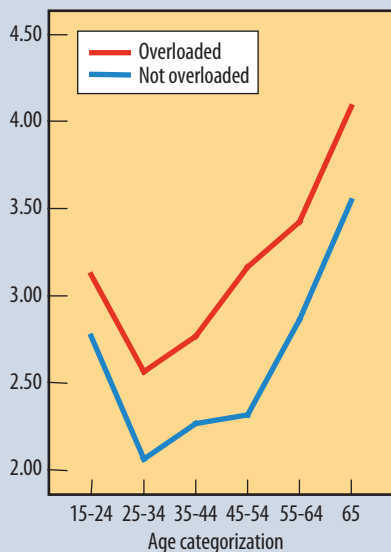
Figure 1. Both young and old suffer from emotional and cognitive overload (ECO).

more organized the schemata, the better the chunking will be.

Thus, the popular conceptualization of information overload simplistically addresses the amount of information rather than the recipient's ability to manipulate data. It also fails to account for how past experiences affect the way we receive and process information. These experiences influence what information we notice and what we want to or can process.

EXAMPLE: EUROPEAN BANKING AND HEALTHCARE

A large European bank asked us to investigate the possible adoption rate of an innovative banking system that would eventually replace the existing one. We believed that this reluctance could be explained by ECO with information technology created from limited information processing capacity, receiving too much information, and receiving too many requests to handle digital information. To test this premise we surveyed a sample of 2,538 people 16 years or older, of whom 1,857 (73 percent) responded.

The survey revealed that 1,133 participants (61 percent) were concerned about being emotionally and cognitively overloaded with too much information when using new information technologies. About half the participants (42.3 percent) felt emotionally and cognitively overloaded with requests to use new information technologies, as Table 1 shows. The study also indicated that both young and old suffer from ECO with information technology, as Figure 1 shows.

The popular conceptualization of information overload fails to consider the role played by past experiences. The survey results demonstrated that participants who experienced both ECO with information technology and information overload in the past are significantly less likely to adopt a new digital technology. Further, those suffering from ECO with information technology scored lower on self-reported information processing capacity scales such as Need for Cognition. Finally, some participants might be drawn to some digital technologies more than others because past experiences color how they receive their information. For example, some study participants were more willing to adopt a system providing health information than one that dispenses banking information.

OUT WITH THE OLD, IN WITH THE NEW

The old digital technologies with which we're familiar might be similar to new ones, but are still different enough to be confusing. Consequently, we must intentionally forget what we've learned. This can be cognitively taxing (tinyurl.com/35bwvex) and therefore lead to ECO with information technology.

An anesthetist using patient monitoring technology to observe pulse pitch (saturation level) and pulse speed (heartbeat) provided us with a striking example of the need to forget. When interviewed about technology-related overload in the operating room, he noted, "When they released a new version of the anesthetics machine, I was frightened at the beginning because they changed the pitch of the pulses. To me it sounded like the patient was not doing well, but instead he was stable."

The anesthetist had to inhibit reactions to the old sounds and develop appropriate responses to new ones. Thus, overload can be caused not only by being asked to use too many digital technologies, but also by failing to intentionally forget some part of what has already been learned.

PROPOSED SOLUTIONS

We argue that the so-called traditional view of overload results from a cognitive distortion, the "self-serving attribution bias," in which individuals attribute success to their own efforts, skills, and capabilities while attributing failure to situational factors. We rationalize that we're overloaded because technology delivers too much information. We fail to consider that we simply might not be cognitively

and emotionally equipped to handle it. While our survey suggests that both young and old suffer from ECO, older generations must intentionally forget or update more than younger generations because they typically have learned more over time.

To reduce overload with information technology, we could use psychometric tests to identify those special persons who can deal with multiple digital technologies, who like updating their computer knowledge and whose high-information processing capacity lets them chunk information better and faster. We can also treat the symptoms of ECO by offering courses in digital technology overload management. Finally, we could do a better job of designing our systems. For example, we could limit the overloading capacity of the "Reply to All" function in e-mail by making it harder to activate (*The Profession*, July, 2008, pp. 96, 94-95).

This column acknowledges a related problem forced upon us by the computing profession: digital gluttony (The Profession, May 2010, pp.108, 107-106). We implore the computing profession to think differently about information-technology-related overload, reducing its influence and taking responsibility for its causes.

Software designers and computer programmers can alleviate overload in two ways. First, they can make sure that new functionalities added to software or services can be easily processed cognitively. Second, they can avoid creating extra emotional strain for their users. **C**

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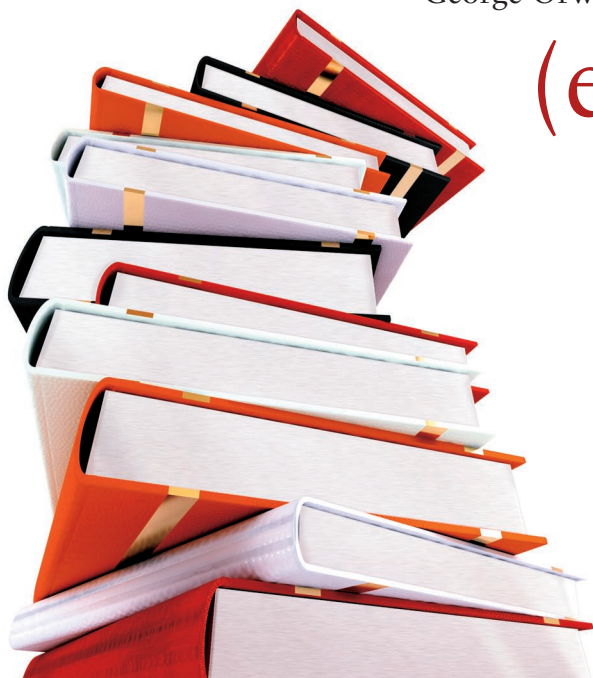
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