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Effects of Information Overload, #2: Cognitive Disability

Insight from Nathan Zeldes, Oct. 24, 2012

This is one of a series of articles that analyze the negative effects of Information Overload in an enterprise setting (though many of the points noted apply to individual knowledge workers, such as small business owners, as well).

The least appreciated effect of them all

If time loss is the most obvious way that Information Overload affects organizational effectiveness, the destruction of mental acuity is the least obvious one. It is also probably the worst, in terms of actual damage to the bottom line.

What we're talking about here is a reduction in a wide range of mental capacities, all of them highly relevant to the performance of knowledge work. Knowledge is power, but the body of research shows that too much of it makes you – well – stupid. Various researchers have investigated the detailed effects of this problem in multiple areas of cognitive performance, and I highlight their main results below.

Cognitive impact 1: Reflective thought

An overload of real time information leads to a state of distraction that is destructive of people's ability to focus their thinking. Knowledge workers ideally need to devote large continuous chunks of their time to reflective thought, and with telephone rings, PDA beeps, "you've got mail" alerts and so forth they never have a chance to secure such thinking time. The resulting mental state was dubbed "[Continuous Partial Attention](#)" by Linda Stone, then a senior researcher and manager at Microsoft.

David Levy, a professor at the University of Washington, has been voicing concern with the impact on academic activity for some time; I recommend his excellent lecture "No time to think", available [here](#).

One bit of research that has attained high exposure was done by Hewlett Packard in the UK in 2005. People were subjected to IQ tests in quiet conditions and again while distracted by flashing new email alerts and ringing phones (which they were instructed to ignore). The very presence of these distracters was enough to lower the test performance by 10 IQ points. This caused a media stir that was blown quite out of proportion, but the result itself is hardly surprising.

One area where the ability to focus and think is particularly necessary is computer programming. The need of coders to "get in the flow" is well known, and being interrupted every few minutes completely undermines this process.

Cognitive impact 2: Creativity

Creativity is an elusive quality, but this had not deterred Prof. Teresa Amabile of the Harvard Business School. She and her colleagues conducted a study where they tracked daily the work pressures and creative output of knowledge workers in US companies over many months. One of their conclusions: “In situations where time pressure can't be avoided, managers should focus on protecting time-pressured people who are supposed to be doing creative work from interruptions, distractions, and unrelated demands for a significant portion of each workweek.”

Unfortunately the quoted recommendation is rarely followed in real life. The implications for any knowledge-intensive enterprise are quite serious: people are not being inventive and creative – and not because of any weighty reasons; merely because they spend a good fraction of their time (20% or more, as described in the [previous article](#) in this series) handling unnecessary emails and interruptions!

Cognitive impact 3: Error rates

Another adverse effect of the info-glut is the rise in error rates due to the distraction caused by interruptions.

The body of research does not, as far as I'm aware, directly study errors in the enterprise “office” environment, but scientists have studied the impact of overload on errors in some very serious situations.

Prof. Jenny Rudolph of the Institute for Medical Simulation in Boston has researched the impact of high interruption levels on the effective management of simulated medical crises, and has found an increase in levels of treatment errors – basically, this means that patients are dying because medical staff is overloaded with interrupting events.

Prof. Karl Weick of the University of Michigan has studied the causes of the deadliest accident in aviation history, the [disastrous crash](#) of two B747's at Tenerife airport in 1977. Interruptions are cited in his paper as one of the causes, and their effect explained thus: “interruptions trigger activity in the autonomic nervous system. This autonomic activity absorbs information processing capacity, which then decreases the efficiency of complex thought processes.”

I claim no expertise in autonomic nervous processing, but I understand “information processing capacity” and can see why a decrease in the “efficiency of complex thought processes” is not what I'd want my airliner pilot to undergo on a foggy runway; nor would I think it desirable for a knowledge worker in an enterprise. As an Intel veteran I remember well the infamous “Pentium FDIV Flaw” – a bug that had cost the company \$450M in 1995. That fiasco had been caused by a trivial human error – a few missing entries in a lookup table on the chip. Some engineer's “complex thought processes” were not at their best for a few seconds.

Cognitive impact 4: Decision quality

Quality of decisions is a critical parameter for any business, and it too is impacted by information overload.

Prof. Cheri Speier and her colleagues at Michigan State University tested the effect of interruptions on the quality and speed of business decision making in controlled laboratory experiments. They found that interrupted work environments lead to lower-quality decisions and reduced speed on complex

intellective tasks such as “what if” production scenario planning based on analysis of dozens of interrelated data points. Interestingly, the converse was true for simple tasks, ones requiring processing of only a handful of numbers. Clearly it’s the deeper thought that requires quiet.

These findings are affirmed by a Reuters survey of 1300 managers worldwide, which found that 43% of them think important decisions are delayed, and the ability to make decisions is affected, as a result of having too much information.

Multitasking, Generations and Cognition

Most of the mechanisms discussed above deal with interruptions, and therefore one must wonder: can people learn – or evolve – to handle these interruptions through Multitasking?

The first question about Multitasking is, does it even exist? Can the human brain do two tasks at once, or is it just switching attention back and forth, wasting time in the process (see the [previous article](#) for more on that)? We aren’t talking here about walking and chewing gum; we need to know whether you can do two cognitively complex tasks at the same time. The technical answer is no: the brain really sucks as a multi-core processor. We know this because Prof. M. Just of Carnegie Mellon University and his colleagues used MRI scans and found that neural activation in non-overlapping brain areas devoted to the two tasks was substantially less than the sum of the activation when the two tasks were each performed alone. This may underlie the many laboratory results showing longer cumulative completion time in interrupted tasks. And of course, it means that even Gen Y Millennials can’t truly multitask, since they use the same brain hardware as their elders.

There remains nonetheless the question of whether Multitasking is always a bad thing. There is research that shows that some interruptions – notably those related to the task already in process – are useful in a work setting, while others are harmful. Meanwhile Prof. Sheizaf Rafaeli of the University of Haifa argues that the new capabilities of the Internet age, notably ubiquitous connectivity and massive access to data and social conversation, open entire new ways of study, collaboration and getting things done that benefit from a degree of multitasking. He challenges us to differentiate good and bad multitasking and leverage the former. And here, of course, the Millennials have a head start.

Another angle on this matter is to ask whether multitasking affects the brain. Prof. Clifford Nass and his colleagues at Stanford University have demonstrated the surprising fact that heavy media multitaskers are poor at task-switching and at a number of other cognitive control processes, likely due to reduced ability to filter out interference from the irrelevant task set. In other words, if you’re a chronic multitasker, you lose some useful cognitive abilities. Further research is certainly needed here.

Conclusions and recommendations

My own take on all this is that we need to be discriminating in how we define multitasking and where we apply it. It’s obvious to me that working indiscriminately in a mode of *continuous partial attention* the *whole* time is bound to make knowledge workers less effective. However, I agree with Prof. Rafaeli that not all multitasking situations are created equal in this respect, and it behooves us to find out which of them are beneficial and which should be avoided.

On the academic side, there is need for more study. We need a research agenda that will examine multitasking and interruptions in the new media-rich environment of the 21st century (most of the

existing research dates to the end of the pre-Facebook, pre-iPhone era). Until the data comes in, however, I strongly recommend to my clients to take effective means to secure their employees some defense from 24x7 interruption, so they can have at least some quiet, distraction-free reflection time in which to exercise their thinking at its best and to convert it to business value.

I recommend it to you too!

Nathan Zeldes has been working on Info Overload for 18 years, during which he's developed and deployed original solutions at Intel and other companies. He's exchanged knowledge and solutions with scores of organizations worldwide, and has founded the Information Overload Research Group, which he chairs. He now [advises managers](#) on solving this problem in their groups.

For more insight on Information Overload, check out Nathan's blog at www.nathanzeldes.com and consider subscribing to his RSS feed and to his Newsletter on that site.

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