After Overload

Invited contribution to *After Shock: The World's Foremost Futurists Reflect on 50 Years of Future Shock—and Look Ahead to the Next 50*, ed. John Schroeter (John August Media, 2020), pp. 306-310.

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DRAFT. Not a reliable version to cite.

August 1, 2019

Place my aged copy of *Future Shock* upright on its spine and it opens to page 301[1], the section titled "Information Overload." As with so much, the Tofflers were ahead of their times with this. But as we exit the Computer Age and enter The Age of AI, the phrase is less heard, less relevant. That's not only because we have evolved ways of dealing with massive amounts of information, but also because our understanding of how the world works is shifting in epochal ways.

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In the mid 1990s when the public was only beginning to embrace the Internet, we were routinely told both that its glory was that it would give us access to untold amounts of information ("the information highway"[2]), but also that our psyches and our civilization were threatened by information overload.

But "information overload" didn't quite mean what it meant in the 1960s and 1970s when Alvin and Adelaide (Heidi) Toffler introduced the concept to the general public. They positioned it as riding on the shoulders of "sensory overload," a concept that arose originally from a late 19th century distrust of cities what with the carriages clattering over cobblestone, the bright lights, the streets crowded with a diversity of people, and, if

you were Charles Babbage, the inventor of what some think was the first computer, those noisy Italian immigrants with their infernal hurdy-gurdy machines.[3]

In the 1960s, sensory overload leapt into public consciousness as a way to raise the fear of what rock 'n' roll was doing to the kids. The noise, the flashing lights, the "primitive" rhythms, and the sensory-heightening drugs! Sensory overload, it was claimed, could cause one to fall to the ground, eyes rolled back, twitching.

Then through the 1950s and 1960s we reconceived everything from telecommunications, to literature, to molecules themselves as information. We inserted information into the cognitive "stack" between more traditional layers such as sensation, perception, and cognition. Led by the Tofflers, we began to worry that too much information would overload our brains the way sensation could overwhelm our sensory receptors. As the Tofflers wrote, "[J]ust as there are limits on how much sensory input we can accept, there are in-built constraints on our ability to process information." "By classifying information, by abstracting and 'coding' it in various ways, we manage to stretch these limits, yet ample evidence demonstrates that our capabilities are finite."[4]

And if we exceed those limits? "[O]verloading the system leads to a serious breakdown of performance."[5] And because information is above sensation in the cognitive hierarchy, the sort of performance that's affected has to do with judgment and reason. In fact, the Tofflers make the case that it can lead to psychopathologies similar or identical to schizophrenia: if you can't process information, your judgment about the association of ideas may be off, and that is a defining characteristic of schizophrenia. "What consequences this may have for mental health in the techno-societies has yet to be determined."[6]

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Arguably, there were no actual consequences of note. Yes, one marketing study found that if 192 "housewives" were given too much information about a product – 16 binary facts about four brands – their ability to make good judgments was diminished. The fact that it played so well into the hands of marketers looking for reasons to limit what customers – those poor low-capacity housewives -- were told about products, is a cause

for some skepticism. In any case, one of the authors of the study later reanalyzed the data and found it to be unreliable evidence for practical conclusions.[7]

But once we were on the Internet, Information overload became an everyday concern, for the Net was the first environment in which we were brought face to face with endless information as we were doing our everyday tasks for many hours each day. This was different from going to a library or bookstore where for a few minutes we are plunged into the immensity of information. On the Net we were confronted with just how much information was available as we did our everyday tasks. Trying to choose a mixer? Here's a list of a thousand comments about them. Trying to find some hip hop? Here's ten thousand tracks. Have a question about begonias, Babylonia, or Red Sonja? There goes your afternoon. Where once we had to amass information by piling relevant books into our study carrel or clipping articles from newspapers, now we found ourselves in a continuous, endless meadow or mall, items always waving in our peripheral vision competing for our attention.

Yet if the Internet's information overload left us on the verge of psychosis, why did we flock to it, and tout it as a positive transformative abundance? From the point of view of the Internet's enthusiastic inhabitants, the problem wasn't that the Internet overloaded us with information but that there was too much good stuff to see, read, hear, and experience: the Internet manifested itself less as an overload than as a constant, near irresistible temptation.

But for those who by profession or tradition had been charged with curating information for us, the Net was far more likely to look like a disabling overload. For them the issue wasn't our mental health as the Tofflers' thought: "Sanity itself" depends on avoiding information overload, wrote the Tofflers.[8] For the traditional curators and arbiters it was obvious that without their help, we wouldn't be able to tell good information from bad. With information so easy to come by, we wouldn't bother learning the habits of cultivated people and informed citizens. In the Internet Age, the problem with information overload wasn't the overload itself but the diminishment of control by the gatekeepers who had always kept us on the path of truth.

Why does what seemed like such a pressing problem – information overload in the Tofflers' sense – now seem to worry us much less? There are undoubtedly many reasons, but I want to point to two, both speculative.

First, Clay Shirky was right when he wrote, "There's no such thing as information overload, only filter failure,"[9]and now our filters have gotten exponentially better. Algorithmic filters often serve us quite well, although they can also be insidiously subversive of our agency, dignity, and rights. Social filtering sites such as Reddit and StackOverflow also have gotten far more sophisticated, particularly in their community management.

At the same time, we have adopted an entirely different approach to filtering. Traditionally, we have filtered things out, so that all you see is what made it through. When you wander through your local public library you perhaps feel overwhelmed, but you are not seeing the vast bulk of books that didn't make it through the library's acquisition filters. Likewise, when book publishers filter out a manuscript by deciding not to publish it, that manuscript is likely to become unknown and inaccessible.

But on the Internet we quickly and rather naturally figured out that we don't have to filter things *out* because we can filter them *forward*. If I post about five sites that talk about *Future Shock*, my act of filtering does nothing but shorten the number of clicks it takes you to get to those sites. All the thousands of other sites and posts about *Future Shock* are still completely available and might show up in someone else's Facebook feed, blog site, or Google search. Filtering forward removes the imperative presupposed by the old concept of information overload: However, will we filter out all the noise?! It turns out that on the Internet, you don't have to. You can instead filter the signal forward.

This notion has enabled some of the most important repositories of information on the Net. Wikipedia can be as large and inclusive as its self-chosen guidelines let it. eBay can have 1.2 billion items on sale at the same time.[10] Reddit can have well over a million subreddits (discussion topic pages) even if the majority of them are unused:[11] there's plenty of room, and perhaps someone someday will want to strike up a discussion on a topic so far no one has found interesting.

This strategy of including everything and allowing users to filter on the way out only succeeded because we have developed tools for finding the needle we want within the largest haystacks humans have ever raked together. The power of our search tools would have been unimaginable even thirty years ago. No sane person could have imagined them back when the Tofflers were writing.

But †here's a second reason why information overload is no longer the problem we thought it was both in its nature and its urgency. This second reason is far more sweeping in its scope and importance: the rise of AI as a model of how things happen.

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> *In the technological systems of tomorrow—fast, fluid and self-regulating—machines will deal with the flow of physical materials; men with the flow of information and insight…Machines and men both, instead of being concentrated in gigantic factories and factory cities, will be scattered across the globe, linked together by amazingly sensitive, near-instantaneous communications."*[12]

While *Future Shock* is incredibly prescient, it is inevitably of its time; as the philosopher Martin Heidegger once said about our all being grounded in our time, and culture, "No one can jump over their own shadow."[13] But the Tofflers did get some impressive altitude. In the above quotation they foresaw not only the Internet, but also the Internet of Things.

They did not predict machine learning, especially the type known as deep learning, but they did point to many of its most salient characteristics. When towards the end of the book the Tofflers are reflecting on how futurists should think about the future, within just a few pages they talk about the importance of recognizing "the interconnectedness of disparate events and trends," about being probabilistic in their predictions ("Determining the probable calls for a science of futurism"), thinking systemically and ecologically, and being aware of long-term effects that may be butterfly-like in being all out of proportion to the initial cause ("The fact that the

[power] plant could trigger devastating ecological consequences a generation later simply does not register in their time frame").[14]

All of these traits are characteristics of the models that machine learning makes for itself, models of various domains of the world. Deep learning in particular creates artificial neural networks in which data points can be connected in vast webs of probability, resulting in configurations that may not reduce to simple, understandable laws, but that nevertheless yield results far more precise than our traditional methods. These webs may find chains of causality that exhibit the "butterfly effect" that Chaos Theory has made a part of the common parlance. The Tofflers' picture of the world conforms to all of this.

The important bit they did not predict – which is really just to say that in 1970 they failed to invent machine learning – is the way machine learning has transformed our attitude toward information, in two important ways.

First, with machine learning we are coming to think that there is no such thing as too much information. It's all grist for our new mills. Let a machine learning system iterate on ridiculously large quantities of data and it may find probabilistic outcomes that are both more accurate and more surprising than what humans would come up with by reducing the data to what we can manage. Information overload now looks like fuel for good decisions, or, more exactly, for computers to augment the still-human decision-making process.

Second, machine learning is teaching us that information overload is in a sense the truth, not a syndrome to be overcome. Traditionally, including up through the Age of Computers, we operated in a world that overwhelms our cognitive capabilities by looking for generalizations, rules, and laws that reduce the complexity of events. But machine learning sometimes comes up with better answers than we do without starting from a model that explains a system through general principles. Rather, it just connects data in all their particularity, without starting from, or necessarily yielding, general principles.

It turns out the overload of information in all of its impossible complexity and interdependence is the truth.

ENDNOTES

[1] Alvin Toffler (with Heidi Toffler, uncredited). *Future Shock*. (NY: Random House, 1970).

[2] For example, Philip Elmer-Dewitt, "The First Cyberspace Nation Is Born," *Time* Dec. 6, 1993, No.49.

[3] The German sociologist Georg Simmel (1858-1918) is credited with the basic idea of sensory overload. See his 1903 *The Metropolis and Mental Life*, discussed in an article of the same name by Matthew Wilsey https://modernism.coursepress.yale.edu/the-metropolis-and-mental-life/ at the Yale CoursePress site. (No date.) Charles Babbage devotes a chapter of his memoir, *Passages from the Life of a Philosopher* (London: Longman, Green, Longman, Roberts & Green, 1864), to "Street Nuisances", pp. 337-362. The book in its entirety is available at the Internet Archive (archive.org) and elsewhere.

[4] p. *Future Shock*, 302.

[5] P. *Future Shock*, 302.

[6]P. *Future Shock*,304.

[7] Jacob Jacoby, Donald E. Speller, Carol A. Kohn, "Brand Choice Behavior as a Function of Information Overload", Advances in Consumer Research Volume 1, 1974 Pages 381-383. For a re-consideration by one of the study's authors, see Jacob Jacoby, "Perspectives on Information Overload, "Journal *of Consumer Research* (March 1984): 432-435.

[8] *Future Shock*, 301.

[9] Clay Shirky in his keynote at the Web 2.0 Expo in NYC, in 2008. The video of the talk is no longer available. Matt Asay, "Shirky: Problem is filter failure, not info overload," CNET, Jan. 14, 2009 https://www.cnet.com/news/shirky-problem-is-filter-failure-not-info-overload/

[10] Kyle Wiggers. "How AI helps eBay connect buyers and sellers across 1.2 billion listings", VentureBeat, Mar. 13, 2019 https://venturebeat.com/2019/03/13/ebay-details-how-ai-improves-user-experience-across-1-2-billion-listings/

[11] http://redditmetrics.com/history

[12] *Future Shock*, 345.

[13] Martin Heidegger, *What Is a Thing?*, Translated by W. B. Barton, Jr. and Vera Deutsch (Chicago: Henry Regnery Company, 1967, p. 150).

[14] *Future Shock*, pp. 394-5.