INFORMATION INTENSIFICATION

THE AUTOMATION OF AWARENESS

THE CHALLENGE

Building human capacity to navigate—individually and collectively—our increasingly high-resolution models of reality

THE SHAPE OF TRANSFORMATION

From information filtering to cognitive prosthesis

The advent of the Internet, personal wireless devices, and vanishingly small networked sensors has meant a massive increase in our access to communication and information. The pace and volume of increased access, however, often overwhelms our capacity to manage it. In 1970, writer and futurist Alvin Toffler coined the phrase "information overload" to describe the anxiety resulting from the growth of broadcast media. In 2012, we grapple with amounts of information many orders of magnitude greater than Toffler might have imagined. Moreover, there's no indication that the volume of information will stop growing, and recent years have seen the rise of a cottage industry of writers decrying the effects of the Internet and related technologies on our ability to concentrate, recall, or just think. While not all of the criticisms have merit, they speak to a growing anxiety about the degree to which information tools have become embedded in personal and social identities.

Over the course of the century, however, such embedded tools will become more powerful, more pervasive, and—perhaps surprisingly—less visible. Systems to automate management of our awareness will be treated like infrastructure, like cities for our minds, rather than discrete tools. Cognition will move into the environment, interconnecting personal perception with a network of sensors and feedback systems that extend our nervous systems—and cognitive powers—into the cloud. In the short term, we will offload memories, filter our views of reality, modify our brain chemistries to change how we think and feel. We will interact with social bots that galvanize us into communities that further define our realities. These are all strategies that are both enticing and vulnerable to abuse by those who would influence us. Over time, these tools will become the foundation for a new kind of prosthetic cognition.

Both the key drivers and the key impacts of this transformation will be societal more than technological. Desires for greater interpersonal connection push the development of methods for maintaining intimacy at a distance, sharing not just ideas but emotions and sensations across networks. A need to maintain a competitive edge pushes the creation and adoption of tools for direct cognitive enhancement. Fears of cultural dilution and confusion demand ways of filtering not just our perceptions of the physical world, but the social world as well. And the more our social cognition comes to depend on our technological environment, the more we will externalize our minds and personalities. Human experience and intelligence have always been a collaboration between ourselves and our tools. As our use of these technologies evolves, this blending of the biological, the social, and the instrumental becomes all the more profound.

—Jamais Cascio

THE CORE DILEMMA

The core dilemma as we transition to a world of automated awareness will be a desire to retain the social norms built around limited and controlled information versus the need to extend our native capacity to perceive complex realities.

Dilemmas typically take shape when short-term benefits mask long-term costs—or when long-term benefits require short-term costs. These are particularly acute when one group experiences the costs while another experiences the benefits.

SHORT TERM

Costs

- Uneven distribution of technology that exacerbates existing political and economic differences

- Narrow focus of attention on preferred beliefs and ideas

- Loss of robust, commonly shared models of the world

- Loss of privacy as a result of pervasive observation

Benefits

- Easier access to information that has immediate value

- Ability to maintain more complex social relationships

- Reduction in social barriers posed by distance, language, and culture

- Improved ability to mobilize groups with shared aims, interests, or values
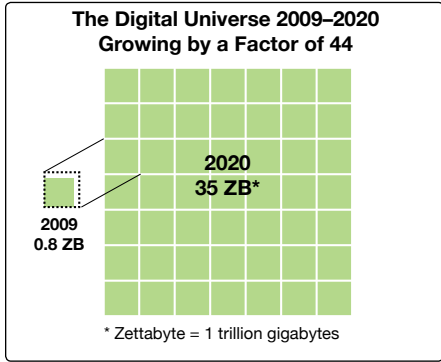
LONG TERM

Costs

- Deep dependency on environmentally defined and externally controlled patterns of cognition

- Growth of deception as a primary method of maintaining privacy

- Potential for system brittleness due to efforts to control efficiency and customer behavior

Benefits

- Increased ability to understand and potentially to manage complex problems

- More nuanced views of reality, with larger solution spaces

- Vastly increased likelihood of being able to grapple with severe global crises

- Greatly expanded reach of human awareness

SIGNALS

The Digital Universe 2009–2020
Growing by a Factor of 44

2020
35 ZB*

2009
0.8 ZB

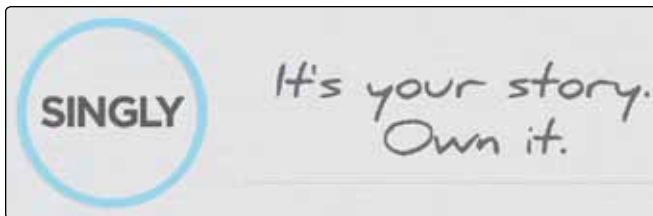* Zettabyte = 1 trillion gigabytes

wired.com

Growth of global information

Alvin Toffler's "information overload" of hundreds to thousands of gigabytes in the 1970s will grow by 2020 to an estimated 35 zettabytes—that is, 35 trillion gigabytes.

INFORMATION INTENSIFICATION

Filters, digital assistants, and bots guide human behavior

SINGLY   It's your story. Own it.

digitaltrends.com

Personal information lockers

Personal information lockers such as the new Singly project seek to corral the masses of electronic data we produce in our lives, from bills to photos to social networks, into one controllable location.

INFORMATION INTENSIFICATION
KEY FRICTIONS

BRAIN ACTIVITIES
Attention vs. Consideration

- Spectacle- and sensation-driven media regularly beat out process- and thought-driven media.

- Tools for blocking information flows evolve and spread more quickly than tools for curating information flows.

- "Spam" advertising spreads to emerging media, driving the need to develop better filters.

- Translation tools decode the meaning of words, not just the words themselves.

- Contextual assistive systems, initially built for individuals with Asperger's Syndrome or autism, reach a wider audience.

- "Participatory panopticon" life documentation provides a mechanism for better understanding of personal behavior—and advertisers rejoice.

- Social bots use social relationships to filter experience.

- Digital painting of physical spaces creates alternative contexts—with augmented realities automated by personal histories of those contexts.

- Market grows for bio-pharmaceutical products to improve brain functions, including cognition, memory, and empathy.

- Direct brain-to-brain or machine-to-brain interfaces gain traction.

TECHNOLOGICAL NORMS
Augmentation vs. Prosthesis

- Technologies initially seen as augmentations to extend selectively beyond cognitive norms rapidly become essential prosthetics, creating new norms.

- Acrimonious cultural debate grows, within and between countries, over the acceptability of cognitive technologies.

- Schools and workplaces become a focal point of cognitive technology controversies.

- Debates over cognitive technologies center on social and economic impacts, not on technological details: rights versus privileges, access, privacy, and liability.

- Nations, regions, and cultures that reject cognitive augmentation technologies rapidly fall behind those that adopt the technologies.

- Social interfaces—human-computer interaction via conversation and contextual awareness—blur the lines between technological augmentation and social companion.

- Divergent cognitive capacities drive extremely divergent perceptions of reality and even the ability to perceive a reality.

POLITICAL CHOICES
Brittle Efficiency vs. Resilient Complexity

- Technological monocultures become increasingly vulnerable to viruses and similar single-point-of-failure attacks.

- Communities that rely solely on cloud infrastructure see sporadic system failures resulting in significant losses of context awareness.

- A "cognitive arms race" develops between economic competitors over the use of brain augmentation technologies.

- Belief-based filtering tools increase the potential for political, cultural, and religious divides—with divergent mental models of reality.

- Markets that rely on involuntary transparency drive user strategies for regaining control of information, ranging from active removal of their data to strategic deception.

- Social bots are actively used to sway political opinions and influence voting.

- "Denial of service" attacks target contexts such as the Tea Party, the Occupy movement, specific neighborhoods, and open-fabbing as well as institutions.

- Social filtering tools proliferate but are subject to fraud, score "gaming," and social violence.

Dark clouds

In 2009, the T-mobile Sidekick device—a pioneer in cloud technology—suffered a failed database migration that left all Sidekick users without any of their data, while the Blackberry suffered a multi-day outage in late 2011.

nexus404.com

INFORMATION INTENSIFICATION
Cognitive prosthetics expand the range of human perception

Alternative social realities

The Quantum Parallelograph— an exploratory public engagement project that uses online sources to connect simultaneous parallel lives of users, helps individuals expand their awareness of connections beyond a single personal identity.

pstevensonkeating.co.uk

Over the next decade, the infosphere will continue to grow, reaching levels in the early 2020s that are 40x those of today. Established tools to organize, manage, and access information are already ill-suited to present-day levels of information. They will be close to useless in a decade. Software assistants that help individuals curate the information they need will be ubiquitous in ten years, as will social bots designed to help navigate exponentially growing social networks. Bio-pharmaceutical advances to speed cognition, boost memory, even increase empathy will also become widely available. Although driven by legitimate needs and sensible choices, these technological developments will have pathological side-effects as well. Individuated curation will split communities into divergent bodies of knowledge, creating similarly divergent mental models of the world. People—or governments—will filter the universe of data based on belief and ideology. And efforts by media and advertisers both to shape the filters and break through them will rely on ever more spectacle and sensation to focus attention. These tensions between legitimate need and pathological impact will shape our debates over the coming decade.

BRAIN ACTIVITIES: ATTENTION VS. CONSIDERATION

Recent research suggests that human brains respond differently to rapid, attention-grabbing media (especially those relying on spectacle or violent sensations) than to slower, thought-provoking media (especially those relying on empathy or admiration). Present-day media technologies more readily support the former than the latter, a trait further underscored by competitive media production environments. The arms race of faster/louder/more explosive will continue over the decade, but developments in assistive digital agents may push back against the trend. By providing what could be termed "prosthetic wisdom," these tools might enhance our ability to refocus fluidly from the center of attention to the periphery of awareness for more balance between these two distinct functions of our nervous systems.

TECHNOLOGICAL NORMS: AUGMENTATION VS. PROSTHESIS

The question of augmentation vs. prosthesis will drive social and economic politics by late in the decade: Do cognitive technologies represent an artificial boost of human capacities beyond the norm? Or do they simply compensate for an information environment in which normal human capacities are inadequate. The advent of widespread, inexpensive, and reliable bio-pharmaceutical brain enhancements has already changed the world of education and research. As such technologies spread through the economy, many workers will face a choice between enhancement and falling behind competitors. As these drugs have legitimate and important therapeutic uses, simply banning them will be difficult, especially as they start to exacerbate differences between national and regional economies. Similar cultural and ethical debates will arise over the use of increasingly sophisticated digital assistive devices—as well as the rules of the non-human societies they will create.

POLITICAL CHOICES: BRITTLE EFFICIENCY VS. RESILIENT COMPLEXITY

As our economic and social lives dematerialize, we will encounter outages, disruptions, and cyberattacks on our externalized minds, if only temporarily. Monocultures, where a single "species" of technology holds an overwhelmingly dominant place in our mindspace, will be especially vulnerable to attack, even as they increase the efficiency and usefulness of our collective mental processes. Technologies intended to aid curation and connection through filters and context-aware assistance—required by the rapidly increasing availability of information—will be easily turned into ways of blocking unwanted (or unacceptable) cultural, ideological, or religious discourse. The more that the technologies of awareness (whether via sensors, mobile devices, or shared data) are made ubiquitous and efficient, the more easily they will be abused.