Information Overload:
Causes, Symptoms and Solutions

A LILA Briefing by

Joseph Ruff

Learning Innovations Laboratories, Harvard Graduate School of Education

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While there is no universally agreed upon definition for information overload, most have experienced it and few have difficulty recognizing it. Looking back at the Takeaways, Questions Forwarded and Minutes for LILA's June and September meetings, there were nine references to this subject. Clearly, this is a topic on the minds of LILA members. It has long been a concern for knowledge and information management workers. And it is not uncommon to find articles on this topic in the business sections of local newspapers. While many seem to acknowledge information overload's existence, few realize how serious a problem it is. Vast sums of money, time and hard work are being spent to improve organizations, but information overload is neutralizing those efforts. Under the strain of information overload, it becomes difficult or impossible to fashion a learning organization that is maximizing its member's creativity and decision-making ability. Why are we not more alarmed by this serious problem? And why are we not doing more about it? The goals and design of this brief are simple and straightforward. After offering definitions and a model that describes and analyzes information overload, we look at the severity of the problem (symptoms), explore its causes and offer potential solutions.

Considerable research has been conducted on the topic of information overload in a variety of settings and disciplines (i.e. finance, marketing, pharmacology, library science, and technology). A common definition includes the negative impact on performance due to the quantity of (too much) information. Performance usually relates to information processing and is measured by decision-making ability.

As might be expected, with little or no information, individuals have little or nothing to process and consequently make poor decisions. As the amount of information increases, so too does information processing and the quality of decision-making. However, after a certain point is reached, the decision-maker has obtained more information than he can process, information overload has occurred and decision-making ability decreases. Any information received beyond that point will not be processed, may lead to confusion and could have a negative impact on the individual's ability to set priorities as well as remember previous information (Eppler 2002). It is not difficult to imagine the affect this has on both individuals and organizations.

The point where information processing has reached its peak, and just prior to declining, is the individual's capacity for information processing. This definition of information overload is represented by the inverted "U" curve shown below in Figure 1.

Figure 1 Information Overload – A Visual
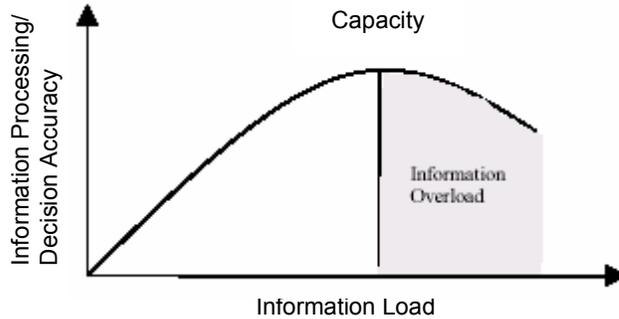
Other definitions consider the quantity of information and the amount of time given to process it. Still, others would add the characteristics of the information itself (i.e. quality and usefulness). These definitions have been used to study the effects or symptoms of information overload. Before investigating these symptoms, we review an aid used to organize the content of this brief.

To simplify the presentation of data, save time and reduce information overload for the reader, the content of this brief will be organized around a simple analytic model. This tool is a modification of Martin J. Eppler's (2002) framework and considers causes, symptoms and solutions (see figure 2). The three components of the tool are presented in a cyclical rather than linear fashion. Any solution introduced to combat a cause and alleviate a symptom will influence other causes. The tool also reminds us that there is no single factor that will eliminate information overload. Rather, it requires a continuous cycle of improvement and refinement (Eppler 2002).

Figure 2 Information Overload Analytic
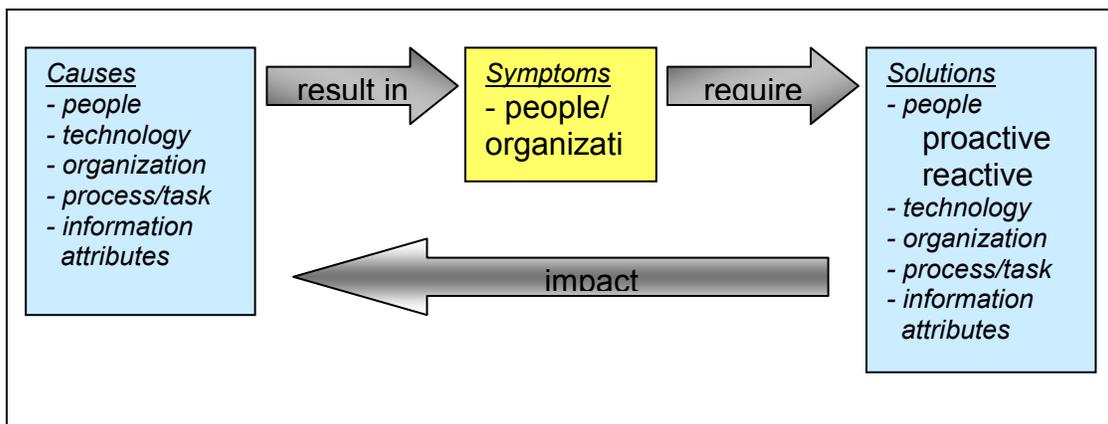
Adapted from Eppler (2002)

The model divides causes and solutions into five categories: people, technology, the organization, processes/tasks and information attributes. Solutions directed towards people are further classified into proactive strategies (an attempt to prevent information overload from occurring) and reactive strategies (combating information overload once it has appeared). All symptoms have been categorized under people/organization because that is where causes of information overload are recognized.

Our model is cyclical, which allows entry at any point. I would first like the reader to grasp the magnitude of the information overload problem, so we begin by looking at symptoms. We will then move backwards (counterclockwise) through the model and look at causes and then solutions.

Symptoms

In his book, <u>Stopping: How to Be Still When You Have to Keep Going</u>, psychotherapist Dr. David Kundtz talks about patients who come to him "at the end of their rope" and in tears. While they are highly successful, very intelligent professionals, they are "in trouble: anxious, stressed, unfocused, irritable, unable to sleep, overwhelmed by life, and frustrated" with their inability to manage it (Kundtz 1998). Often, these patients report that they are not even aware of the cause of their problems. Kundtz finds that these patients have no underlying psychosis, no personality disorder and no family problems. Their lives have simply become more than they can handle. While not the only cause of these feelings and symptoms, information overload can be a significant contributor.

To deal successfully with information overload, we must first recognize the symptoms and determine their causes. We then seek strategies that will resolve the problem. Here are just a few of the symptoms of the information explosion.

What is the practical impact of all this information?

Although there is considerably more information with which to deal, our brain's ability to absorb and utilize this information is no better suited than the people of four or five hundred years ago (Chard 2002). The details below allow the reader to better understand what this additional information means for many workers today.

- 20 million words of new technical information are recorded each day. If one reads 1,000 words/minute and spent eight hours/day reading, it would require six weeks to read the information for that one day. However, at the end of the six weeks, the reader would have fallen behind by six weeks or 5.5 years worth of reading (Jackson 2001).
- 72% of managers in the UK think having too much information sent to them is wasting their time and nearly half of all managers see this as a serious issue. In Europe, up to 85% of managers feel they are drowning in data and being overwhelmed by emails, reports and phone calls (Independent 2002).
- White-collar employees waste an average of 10.7% of their workweek (or 5.5 workweeks per year) looking for information (IBT 1999).

How are expectations changing?

To accommodate for this enormous amount of information and the lack of time to deal with it, "the bar" is constantly being raised. Here are some expectations that workers willingly accept or unwillingly find placed upon them:

- Expectations related to response time have shrunk from a few days ("snail mail time") to a few minutes, or even seconds in the case of e-mail. There is little opportunity to contemplate or judiciously consider decisions or the content of communication (Chard 2002).
- We are spending more hours at work and we are working at home. Tasks requiring more than 30 minutes of coherent thought must wait till the weekend. We spend much of our time reacting to unplanned events and making quick decisions with minimal analysis. Job satisfaction is becoming merely a concept (Baldacchino 2002).

What is the impact on performance?

As stated earlier (and shown in Figure 1), decision-makers increase their information processing as the result of an increase in information load. Once capacity is surpassed however, additional information becomes noise and results in a decrease in information processing and decision quality (Hwang 1999). In a study of bank loan officers predicting bankruptcy, it was found that operating under information overload, officers required more time to make predictions that were less accurate than when information overload was not experienced (Chan 2001). It is interesting to note that when making complex decisions, we may feel the need to have, and therefore request, massive amounts of data. But, having too much information is the same as not having enough.

Information overload also interferes with learning and creative problem solving. Having too much information prevented venture capitalists from making accurate adjustments to their evaluation process which in turn, impeded learning (Zackaruis 2000). At Bernholz in Canada, the introduction of computers required that employees increase their decision making rate by 1800 or 1900%. This caused a decrease in the ability of workers to solve new problems creatively. Researchers watched, as creative problem solving decreased by 30% in the first hour, 80% in the second and continued to diminish thereafter (Cooley 1980).

What is the impact on physical health and social relationships?

One can easily imagine how these changes have also increased the level of stress experienced by workers. It is common knowledge, that stress, over an extended period of time, has a negative impact on health and in particular can cause heart disease (Jackson 2001). Chard (2002) cites a study where 25% of workers experience poor health or significant stress due to the volume of information they are required to manage in their jobs. Thirty-six percent of the managers reported ill health as the result of excessive information in the workplace. And 68% of those managers feel that information overload has a negative impact on personal and collegial relationships. A similar study (Weil 1997) was conducted with 1,313 senior, middle and junior business managers from the United States, England, Hong Kong, Singapore and Australia. Seventy-three percent

indicated that they needed enormous amounts of information to be successful in their job. Yet, they also believed that information overload was responsible for the following:

- 33% felt they were suffering from ill health.
- 66% reported tension with fellow workers and diminished job satisfaction.
- 62% admitted that social and personal relationships were suffering.

What is the impact on mental health?

One questions how organizations function when staff and managers are so influenced by the stress of information overload and its associated effects. Mental health practitioners have a term for health related maladies connected to information overload. It is called Information Fatigue Syndrome (IFS) and includes the following symptoms:

- Poor concentration due to the overloading of short-term memory
- Polyphasic behavior or multi-tasking often resulting in diminished rather than increased productivity
- Hurry sickness, which is the belief that one must constantly rush to keep pace with time
- Pervasive hostility resulting in a chronic state of irritability near anger or even rage
- Habituation or over stimulation which causes the brain to shut down and enter a trance-like state
- "Plugged in" compulsion is the strong need to check email, voice mail and the Internet in order to stay "in touch"
- Traditional stress including lowered immune response, endocrine imbalance, depression and the experience of "burn out" (Chard 2002)

How are we adapting?

To alleviate information overload, we find ways to cope. Managers cope with information overload in a variety of ways, but not all of them are productive. One study revealed seven different response types to information overload.

- Hoarder – accumulates information for information's sake
- Deleter – destroys information without evaluating it
- Time-waster – requests and seeks for all information but does nothing with it
- Analyzer – examines everything but can't make a decision
- Luddite – opposes all innovation
- Power-user – uses information to seek opportunities, but requires it in highly customized form
- Leader – recognizes the value of critical information and uses it for maximum benefit (Independent 2002)
- Reframer – actively seeks and finds the positive side; recognizes how much we benefit from information (i.e. sees the glass as half full rather than half empty)

What is the impact on organizations?

Creating a prosperous and long lasting organization is difficult under the best of circumstance. It requires seeking out and eliminating barriers to success. As we have seen, information overload is a very real and serious threat to an organization's performance. In the stressful state caused by information overload, workers ignore valuable and expensive data banks found on digital networks and instead revert to what they already know and what has worked previously. They look for people and sources with which they already have some familiarity (Leighton-Jones 2002, Jackson 2001).

It is difficult to imagine how such an organization could be preparing and prepared for future challenges. Making business decisions based on what has worked in the past is not unlike driving a car while looking in the rearview mirror. In such an environment, one questions why companies would spend any money on change initiatives, training or developing creativity. The time, effort and money are wasted if workers look to the past for guidance. Workers and organizations falter when they are not strategic and focused. In order to focus, information overload must be addressed (Baldacchino 2002).

Information overload is complex and can be addressed in a variety of ways. The first step is to recognize the symptoms and then admit that it is a serious problem. Once this is recognized, we must explore ways to eradicate, diminish or at least cope with information overload. If we do not, we become the servants rather than the masters of technology and information.

Causes of Information Overload

Recent technology has facilitated the exponential rate at which information is generated, and has also allowed us access to much of it. However, there are other reasons for experiencing information overload. We will organize the causes using the five categories of our analytic model. And although we deconstruct them into five types, it is important to remember that information overload is usually the result of a combination of overlapping factors and not a single one.

People

We consider first, the person or the individual's role in causing information overload. One of the definitions of information overload states that it occurs when the quantity of information to be processed is more than the individual can process in the time available for processing (Jackson 2001). The point at which information overload occurs is not fixed. When and how capacity is reached (see figure 1) is influenced by the education, training, experience and motivation as well as the psychological make up of the individual. Eppler (2002) finds the following "people" causes of information overload:

- limitations in the information processing capacity of the individual
- motivation, attitude and satisfaction
- personal traits (experience, skills, ideology, age)
- personal situation (time of the day, noise, temperature, amount of sleep)
- insufficient screening of outgoing information by sender

I would continue this list with:

- poor writing skills of information sender
- inability to filter/prioritize incoming information
- inefficient use of time
- lack of organizational skills
- requesting too much information
- packrat mentality – saving everything
- joining too many organizations/receiving too many periodicals
- creating monotony by performing same tasks in same way
- inability to maximize technology and software functions
- desire to accomplish all work without assistance
- desire for power through knowledge/information
- hope to escape from personal problems by focusing on and creating too much work
- attraction to technology and using it to add to rather than reduce information overload
- use of information and technology to do more work rather than have more leisure time
- focusing on how technology and information overwhelm us and not appreciating all the ways in which we are helped
- believing that information overload is inevitable
- defining the abundance of information as a problem rather than part of the job

Technology

As already stated, technology plays a significant role in the cause of information overload. It not only helps to create content information, it also gives us access to vast amounts of it. Learning how to use this technology introduces still more information with which to contend. Below are some statistics that give a sense of the magnitude and trajectory of our current situation. None of this would have occurred without help from technology.

- More information has been produced in the last 30 years than in the previous 5,000 (Jungwirth 2002).
- In the 17th century, the average person encountered in a lifetime the same amount of data we pack into the Sunday edition of a major newspaper (Chard 2002)
- The world produces between 1 and 2 exabytes (An exabyte is one billion gigabytes) of unique information per year, roughly 250 megabytes for every person on earth. Printed documents of all kinds make up only .003% of this total. (Jungwirth 2002).
- Every 1.5 years, the amount of worldwide information doubles. Corporate files double every 3.5 years (IBT 1999)

Some of the major sources of information overload include email, intranets, extranets and the Internet. Eppler (2002) found the following "technology" causes related to information overload:

- new information and communication technologies
- push systems
- e-mail
- intranet, extranet, Internet
- rise in number of television channels
- various distribution channels for the same content
- rapid evolution of innovations – shortened product lifecycle

I have added to this list:
- overly complex/poorly designed information systems
- introduction of more technology than is required
- over reliance on technology
- poor integration of various technologies

The Organization

A successful organization must be dynamic. The constant need to change requires intensive communication and coordination. When the change process is implemented well, the information load can be reduced; when handled poorly information load can escalate. Once again, Eppler's review of the research (Eppler 2002) provides us with the following causes of information overload related to "the organization":
- interdisciplinary work
- collaborative work
- centralization (bottle necks) or disintermediation (information searching is done by end-users rather than by information professionals)
- the reward for and accumulation of information to demonstrate power
- group heterogeneity

I would like to suggest:
- lack of standard operating procedures
- no internal communications strategy
- disembodied training and knowledge management departments
- reliance on individual "heroes" who make the decisions and do the work
- downsizing for profit while creating worker shortages

Processes and Tasks

The processes and tasks that need to be performed certainly influence information overload. The more complex a process or task, the greater the information load and the more time required to complete it. Additionally, information overload is more likely if the nature of the work involves interruptions and/or requires the completion of parallel projects. Eppler (2002) finds the following causes of information overload related to "process and task":
- tasks are less routine
- complexity of tasks
- more complex task interdependence
- time pressure
- task interruptions for complex tasks

- too many, too detailed standards
- simultaneous input of information into the process

I have added:

- confusion as to best practices for completing task
- unclear goal of task
- inability to recognize when the task is complete

Information Attributes

The final causes of information overload are the characteristics of the information itself. For example, improving the quality of the information reduces the occurrence of information overload. Eppler's review of research (Eppler 2002) provides us with the following causes of information overload related to "information attributes":

- number of items comprising information
- uncertainty of information (info needed versus info available)
- diversity of information and increase in number of alternatives
- ambiguity of information
- novelty of information
- complexity of information
- information quality, value, half-life
- over abundance of irrelevant information

I add:

- unknown reliability of source of information
- unknown context from which information was derived

It should be restated that this taxonomy does not imply information overload to be the result of a single factor. And just as there is no one cause of information overload, no one solution will solve the entire problem.

We now look at some practical solutions to address these causes. Perhaps the ideas presented would be more accurately termed, "coping strategies". However, I use the term solution because when chosen properly, the right combination of these strategies will greatly reduce or eliminate information overload for individuals and organizations.

Solutions

Some believe that future technology will resolve all of our information overload problems. They mistakenly place their trust in the "power" of technology rather than the ability to think through the causes and determine thoughtful solutions (Brown 2000). Even if the growing power of technology added some relief, many futurists predict that by 2020, information will double about every 70 days (Chard 2002). Moore's Law states that computer power doubles every 18 months. This means information will double almost eight times faster than computer power.

The impact of this information explosion is pervasive, frightening, and unless we quickly do something to address it, likely to get much worse. But as John Seely Brown (2000) writes, "we know that while information and its technologies cannot solve all society's problems, society and social resources can solve many of the problems of both information and technology." I believe the solutions below give us cause for hope.

Although the reader may argue that some solutions could fit in a different or more than one category, to avoid redundancy, they have been placed under the category offering the best fit. And although every solution to information overload will ultimately affect people, we begin by looking at those solutions that influence people directly.

People

As previously discussed, for this section only, we divide the people solution into the categories of reactive and proactive. Proactive strategies attempt to prevent information overload. Reactive strategies are implemented once information overload has occurred.

Reactive

- Filtering – focusing attention only on the most useful and essential information while purposefully ignoring other sources
- Multitasking – performing two or more job functions at the same time
- Queuing – performing initial steps to tasks that will be completed at a latter time
- Escaping – eliminating disturbances by psychologically or physically limiting disruptions from outside world (i.e. not answering phone, closing door)
- Prioritizing – determining and approaching most important tasks first
- Delegating – determining which tasks can be given to other workers
- Refusing – determining which tasks can be left undone
- Limiting – not being seduced by thinking that more information is better
- Satisficing – seeking "good enough" solutions; not perfection (Simon 1979)
- Altering – changing perception of a task by performing it in a different way or place (i.e. view documents on paper instead of a computer screen; move to a lounge or coffee shop)
- Shifting – changing perception of situation by accepting it as just part of the job

Proactive

To prevent or reduce information overload, the solutions below are offered.

- Devise a pulse-taking system to form a constantly changing up-to-date mental model of the organization and key stakeholders
- Create a personal system for storing and retrieving information (i.e. notebook, planner, system for filing and organizing email)
- Do not overwhelm yourself with a waste-not want-not mentality; throw it away or delete it
- Time management training

- Business writing training
- Software and technology training
- Information literacy training (Goad 2002)
  - Traditional and digital communication skills
  - Thinking and decision making skills
  - Creativity, innovation and risk taking
  - Computer literacy
  - Subject matter literacy
  - Learning how to learn
  - Electronic resources
- Chunking and mnemonics training
- Perception's role in information overload training

Technology

These strategies focus on the use of technology.

- Offer technology training (i.e. database management, search engines, data storage and retrieval)
- Hire technology coaches and information mentors
- Use soft science professionals to work with engineers, computer experts and accountants (who tend to neglect the human dimensions of the project) when designing IT systems (Pacey 1999)
- Spend more time and money improving user ability to operate technology fully and successfully (as opposed to buying more and better technology)
- Use filters to eliminate spam
- When possible, leave pagers, cell phones and laptops behind

The Organization

- Employ a communications specialist who acts like an air traffic controller by coordinating, organizing, prioritizing, and limiting the amount of internal communication employees receive (Maitland 2002)
- Prevent broadcasting of messages to all employees
- Offer decision-making models or templates that workers can use when experiencing information overload; offer training on how they work and how to best use them
- Standardize communication by creating memo and email templates that allow readers to quickly assess topic, audience, relevance, number of words and approximate read time; insist that they be used throughout the organization
- Use a well-coordinated team approach to share the burden of information processing; have members rotate through various roles for a better understanding of the big picture; the team works very closely with and reports to a leader who puts all the pieces together
- Hire knowledgeable and well-trained secretaries or assistants to help management with information processing load

- Devise, implement and train workers on a standardized organization-wide information storage and retrieval system
- Build small, manageable knowledge repositories that give contribution access to a limited number of experts; institute purging and replacement policies for content

Processes and Tasks

- Don't handle information/work twice
- Discontinue subscriptions to periodicals you haven't time to read
- Limit time with TV (eliminate cable or satellite)
- Limit time on internet
- Limit time following the news
- Request removal from distribution lists delivering undesired mail

Information Attributes

- Use charts, graphs and other graphical representations that allow data to be viewed and assessed more quickly
- As too much information causes noise, don't use charts, graphs and other graphical representations to present more data than required
- Send only necessary email and only to those who need it
- Ask friends and colleagues not to send frivolous email (i.e. jokes, cartoons)
- Write clear, short and succinct memos and email
- Use informative subject line to put message in context
- In first paragraph, state intended audience and purpose so reader can determine relevance
- Introduce most important content first
- Summarize content in the beginning of the communication
- Use executive summaries
- Organize content into logical chunks
- Use headers to introduce and divide content
- Use phone if subject is complex and will require multiple emails
- Use email if phone tag begins
- Limit web page content to one or two screens
- Allow recipients easy removal of their names from distribution lists

The causes of information overload will not disappear by themselves. They require thoughtful solutions. An awareness of the causes, combined with an understanding of the symptoms will allow us to generate useful and practical solutions to the problem of information overload.

Conclusion

The ironic solution to the information overload problem is – more information. But before we are inclined to act, we must first know that a problem exists. We must have an understanding of the magnitude of the problem including symptoms and causes. Armed with this awareness, we can choose to implement the appropriate solutions. An analytic model has been used to present a taxonomy for studying the information overload problem. And an attempt has been made to present likely symptoms, causes and solutions in a way that is concise and quick to read and process. I hope this material will help the reader reduce information overload for himself and his organization.

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