



Possible solutions to information overload

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1 Introduction

Since the advent of the printing press, there has been increasing pressure on individuals to keep abreast and in control of masses of information. The Internet has compounded the situation by increasing the volume of available information and the speed at which new knowledge becomes accessible. Information reaches the individual from a plethora of sources: television, e-mail, voicemail, faxes, cellular phones, newspapers, magazines, books, etc. This has created the situation where there is no excuse 'not to know'.

KPMG's Knowledge Management Research Report 2000 (Neal 2000) indicates that although companies have started knowledge management initiatives, the investment is at risk due to the impact of information overload. Two thirds of respondents complained that there is not enough time to share knowledge and that inefficiencies develop due to the duplication of processes. This stands in contrast with a Reuters report entitled 'Out of the abyss – surviving the information age' (Lake 2001). The report indicates that many people feel intranets and on-line services decreased information overload and allow them to manage their information activities more efficiently.

Professionals are required to be 'on top of their game' and information overload has added an enormous stressor to this requirement of not missing anything. Information is required to assist businesses in making decisions. However, the volume of available information has had the opposite effect – it has led to inaction in the face of 'analysis paralysis'. As the volume of available information increases, there is less time to make decisions. The primary concern with information overload is the consequent stress, loss of job satisfaction, procrastination, time wasting and physical ill health (Reuters 2000; Edmunds and Morris

2000). This has led to the imperative of developing strategies to deal with the issue.

A secondary concern of information overload, which is often not addressed, is the business costs it brings about. According to Reuters (2000), 38% of managers waste a substantial amount of time trying to locate the correct information, 43% think that important decisions are delayed as a result of having too much information and 44% believe the cost of collecting information exceeds its value to the business.

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2 Definition

No universally accepted definition exists for information overload, but various suggestions have been made. Meyer (1998) defines information overload as a state that exceeds the limited human information-processing capacity. Edmunds and Morris (2000) define the problem as an overabundance of relevant information that cannot be assimilated, or being burdened with large quantities of unsolicited information (which may be beneficial). In quoting Paul Saffo, Owen (1999) identifies our inability to process information: 'Information overload is not a function of the volume of information out there. It's a gap between the volume of information and the tools we have to assimilate the information into useful knowledge.' Another aspect absent from most definitions is the time factor. Perhaps a more appropriate definition of information overload may be as follows: large quantities of varied sources of information (business and personal) received on a regular basis at a rate that limits assimilation and increased by unsolicited information.

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3 Factors contributing to the problem

Information overload is not a new problem. Edmunds and Morris (2000) refer to research conducted in 1950 that discussed the problem. In the Reuters study 'Dying for information? An investigation into the effects of information overload worldwide' (Reuters 2000), a third of the respondents indicated that they received 'enormous amounts' of unsolicited information, while the rest indicated that they required high levels of information to perform effectively. Coupled with this, 49% of the respondents felt that they were unable to handle the volume of information they received.

How real is information overload, and is it solely attributable to the Internet? Information overload comes from all mediums – print, film, optical, magnetic and digital. The global annual production of print, film, optical and magnetic content would require 1,5 billion gigabytes of storage (Pedley 2001). Figures not only show that the number of books published double every 33 years, but also grow exponentially. In the medical field alone, knowledge doubles every 19 years (Hanka and Fuka 2000). It is often said that information has been produced in the last 30 years than in the previous 5000 (Jungwirth and Bruce 2002).

According to Cyveillance (Pedley 2001), 2,1 billion unique, publicly accessible Web pages are on the Internet, while 7,3 million are added per day. The 'deep' or 'invisible' Web (information generally inaccessible to software spiders, for example databases) is 500 times larger than the visible Web. These data are similar to that published by Lyman and Varian (2000). These authors also conducted a comprehensive study on the various forms of published information, including paper, film and digital formats.

It is daunting to know that the world produces about 250 megabytes of information for

every man, woman and child on earth. This refers to stored information and excludes digital, which approximately adds another 11 300 terabytes of information (Lyman and Varian 2000). Another contributing factor has been the impact of e-mail on our lives. Now there are not only piles of paper to wade through, but also e-mails to scroll through, compounded by the interruptions of phones, faxes, meetings, etc. The problem with this is our natural tendency to despair and not taking account of information. This has been proved by research that demonstrated that most users have disorganized inboxes with thousands of messages, containing unread documents and outstanding tasks (Edmunds and Morris 2000). However, the positive spin-offs of on-line information include improved communication lines and knowledge sharing within organizations, which may outweigh the negatives.

In reference to work of Helen Butcher, Edmunds and Morris (2000) list seven factors that contribute to information overload:

- Information is collected to illustrate a commitment to rationalism and competence in decision-making.
- More information is sought to verify the information already collected.
- Vast amounts of unsolicited information is received (e.g. conference notices and marketing mailshots).
- Managers require information to justify decisions made.
- Information is collected just in case it is useful.
- Managers play safe and obtain all information possible.

Information is used as a currency to keep ahead of colleagues.

The Reuters report (Lake 2001) also identifies other factors that inhibit managers' ability to retrieve the information they require, for example not knowing how to get the information, time constraints, limited access to the Internet, financial constraints and censorship. The speed of information generation and publishing has also increased. Computer processing speeds double every two years and the automation of systems has become the norm. In an attempt to deal with the quantity of information in the face of limited processing capacity, people have developed the following adaptive mechanisms (Meyer 1998):

- Chunking: gathering information on the basis of generic terms
- Omission: skipping of information
- Queuing: deferment of processing at peak times
- Filtering: neglect of irrelevant information
- Capitulation: escape from the task.

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4 Solutions

4.1 Technology

Personal information management technologies

The uptake of this technology appears to be slow, since the use of electronic organizers is usually backed up by the use of a pocket diary or personal organizer (Edmunds and Morris 2000). This may be due to a lack of trust in the reliability of electronic equipment.

Push technologies

Traditional methods of information retrieval have relied on 'pull' strategies. This means the information user requires information and uses his or her own time and resources to search for and retrieve it. Push technology involves the proactive dissemination or 'pushing' of

preselected information to the user. Information is delivered automatically to the user, who does not have to search for it (Berner 2001). E-mail lists, including discussion and announcement lists are some examples of push technology. Lists can either be closed (limited access), moderated (reviewed prior to forwarding) or self-moderated (specific topic or theme). These are not mutually exclusive formats.

The person 'pushing' the information must have a good understanding of the information requirements of the recipient to ensure that unsolicited information does not add to the information overload. An important aspect in developing appropriate search profiles for the recipient is the information audit, which aims to obtain a full understanding of the information requirements of the user to ensure that the 'pushed' information is tailor-made.

Intelligent agents

These are technologies that scan and comprehend text, summarize it and automatically route it to the end-user (Edmunds and Morris 2000). The agent makes decisions about the relevance of the information based on data that it has acquired on individual preferences. It then predicts what would be of interest to the user and is therefore not necessarily under control of the user. At present, most of these agents are in their development stage. It is therefore still time consuming to set them up to be robust and reliable. One type of intelligent agent is URL minders that track changes on marked Web sites and notify the user, usually via e-mail, of any changes to the site (Berner 2001). An example of this application can be found at <http://minder.netmind.com/>. One proposed strategy (Krill 2001) is the use of filters to screen out less critical e-mail messages. This may also involve the removal of a subscription to a list server to limit the quantity of inbound messages.

Other

Various other technologies, including off-line browsers, customized and personalized news filters and multiple Web browser programs have been developed to cure what Tudor (1997) calls Internet-induced information overload (III). Three such technologies are Farcast, WebCompass and WebWhacker (Tudor 1997). Farcast is a personalized news service that delivers retrieved information via e-mail. It is reasonably priced, easy to use and a quick link to the latest news. It uses 'droids' or electronic agents to search the text of the newsfeeds from Associated Press. However, according to Tudor, the system shows a preference for industry-related rather than general news broadcasts and duplicates news items.

The second program, WebCompass, is a search manager that comprises 45 preconfigured search engines (e.g. Alta Vista, Infoseek, Lycos, etc.) to search the Internet for user-defined search inquiries. However, as each individual search engine processes a query differently, some of the results may be distorted. It is therefore advisable to select search engines that use the same Boolean operators and search syntax to return more meaningful results.

The third product is called WebWhacker. This product automatically searches user-defined Web sites, organizes them into categories and downloads them into a database. Since these activities can be scheduled and browsing can be done off-line at the user's leisure, the product saves time and money.

WaX is another product that organizes information, in the case as pages in books, books as shelves and shelves as a library (Hanka and Fuka 2001). It is based on the concept of 'just-in-time knowledge' to provide knowledge at the right time, when it is required. WaX books automatically generate indices for search and navigational purposes and users can add notes to pages in books. This knowledge management tool has been used in the National Electronic Library for Health. Some technological difficulties have been experienced with data backup. In addition, the system cannot provide the psychological support often required by doctors in terms of affirmation of decisions made.

4.2 Management strategies

Personal and business information management

Working between 60 and 70 hours per week is perhaps one solution to wading through the information glut, but it is not a very practical one and has no long-term sustainability. In addition to this, information technologies also have limitations. A report by KPMG (Neal 2000) confirms this by stating that strategic and cultural issues must be addressed, rather than technological issues. While individuals must create their own information management strategies, the following pointers by Krill (2001) may assist:

- Develop a personal workable information strategy
- Filter information
- Accept that not all the available information will be evaluated prior to decision-making
- Attempt to recognize quality data
- Take control.

Krill also advises to avoid the following:

- Let information take control of you
- Take cellular phones or computers on holiday
Attempt to examine all the available information
- Focus on things beyond your control.

All of these strategies come down to prioritizing and winnowing. E-mails should be read and acted on when received and a 'travelling' file of reading materials will allow individuals to read at the most opportune time. Fox (1998) proposes similar strategies, including:

- acting on information as it is received;
- trashing unnecessary information;
- keeping a 'not to do' list (allowing oneself to stop activities of low priority);
- developing organizing systems, for example weekly planning – this means not to try to remember everything you have to do; and
- improving your information age skills – being able to gather, access, process and share information.

In 2000, Reuters published a comprehensive guide to good information strategy for businesses. It outlined 10 steps that businesses should follow to cope with information overload, namely to:

- appoint a senior person with overall responsibility for information management;
- conduct an enterprise-wide information audit;
- conduct an enterprise-wide technology audit;
- pinpoint information dearths and excesses and define an overall strategy for rationalizing these;
- ensure the information strategy is championed at board level;
- communicate the strategy and its importance to all members of the organization and gain their buy-in;
- train staff in effective information management and systems operation;
- clean corporate data and maintain their veracity;
- incentivize information sharing; and
- implement procedures for continually monitoring the strategy's effectiveness.

Permission not to know

Despite the pressure on professionals to always have up-to-date knowledge, some perspective should be kept in this race. Instead of trying to remember details, professionals should rather aim to familiarize themselves with the concepts and principles of what is available in published literature. There is often duplication of ideas, data and information in professional journals. In effect, the professional must resign him/herself to the fact that he or she cannot know everything about everything (Edmunds and Morris 2000). This concept was developed and discussed by Weinstein in 1996 who proposed that it was acceptable to 'not know', and to feel comfortable saying so. This is encapsulated by the following quotation of Cicero: 'There are three sorts of people: those who know, those who don't know, and those who know where to look.' For this approach to be successful, the barriers to knowledge sharing, namely competitiveness and individualism, must be overcome. Although information technology is the driving force behind why we cannot know everything, it also frees us to concentrate on transforming information into knowledge, and individuals or teams should share the knowledge they gained from individually pursued resources. We can assimilate and use technology to move from inaction to action, but teamwork and collaboration plays an important role in reducing workloads and sharing information.

Information literacy and the role of information specialists

The low level of information literacy compounds the information overload phenomenon. Managers receive vast quantities of information, but not always the right information. This has been demonstrated in observations of user behaviour when using Web search engines. Most users formulate short queries, only follow the links for the first 10 results and seldom qualify their requests (Pedley 2001). One solution to this is for users to approach librarians or information specialists for assistance. These specialists usually have knowledge of available resources on the invisible Web, can conduct target searches or can assist with in-house training on searching techniques.

Edmunds and Morris (2000) suggest another possible solution, namely educating end-users in information processing techniques, including an examination of the search question prior to retrieving data.

Information specialists play an important role in the management of information overload. Not only do they have to manage available information appropriately (acting as an intermediary to evaluate information prior to dissemination), but they also have to educate and assist people in evaluating their information needs and choosing the appropriate vehicle for obtaining that information. In other words, they are primarily involved with determining content of information and also have a role in ensuring the appropriate use of available technologies. Information specialists can be incorporated into a business either as part of a team within a particular department (perhaps one that has specific information needs or high information demands), or as a separate unit within the organization (Edmunds and Morris 2000). As such, they have a role to play in the development of information strategies within the organization to ensure that information is shared and used.

Value of information

Simpson and Prusak (1995) attribute the cause of information overload to the inability of business people to understand how information processes add value to information. Owing to this lack of insight, they devised a conceptual model that addresses the attributes of information: truth, guidance, accessibility, scarcity and weight. These processes are within the control of the information provider and are used to transform information suitable for use. Truth is the most obvious attribute required for information and can be translated into the quality requirement for information. The combination of available data, which may be irrelevant on their own but create new and original insight when combined, contributes to the value of information in terms of scarcity. Guidance examines the extent to which

information directs action, while accessibility addresses issues of availability in an appropriate form to the end-user. Weight may be a factor closely linked to relevancy and may contribute to the urgency of action on receipt of information. If more value could be recognized for the role of the information provider within organizations and the gap between providers and recipients bridged, a significant contribution could be made to the management of information overload within organizations. This process largely frees the manager from some of the processes involved in retrieving information.

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5 Tools and techniques used at Natal Bioproducts Institute

Natal Bioproducts Institute (NBI) is a section 21, non-profit pharmaceutical company that manufactures biological products derived from human plasma. It promotes itself as a knowledge-based company that is committed to providing safe, effective, quality products that are used appropriately for health care. The company must keep up with national and international developments in health policy, legislation pertaining to medicines and pharmacies, technological developments in the biotechnology arena, clinical developments with respect to plasma-derived medicinal products and quality guidelines. It has a dedicated information department to support its own, as well as its customers' (health care professionals) information needs.

5.1 Information audit

Annual information audits are conducted throughout all departments at NBI to determine the:

- sufficiency and appropriateness of information received, including a review of journal subscriptions and their circulation, regulatory guidance and membership of organizations;
- recommendations for future book purchases or new journal subscriptions; and
- information requirements of current or future projects within a department.

The results of the information audit are used to modify existing search strategies, journal subscriptions, etc.

5.2 Retrieval and dissemination

The information department receives all publications (books, journals, magazines, notices and reports). These are overviewed by the information specialist (in this case a pharmacist, as the information is largely medically-related material) and circulated according to outcomes of the information audit. Employees who may be working on specific projects also receive a publication if it contains relevant information.

5.3 E-mail alerts

The information department subscribes to a number of mailing lists of specific areas of interest, for example, the Food and Drug Authority, Eurosurveillance Weekly and the Weekly Epidemiological record. These lists refer the department to updated guides published in these particular areas. It also subscribes to table of content alerts for a number of journals. All these sources are evaluated prior to dissemination to specific personnel within the organization. This is really a form of push technology that reduces the burden of volume on the end-user. However, there is the risk of the information provider missing vital data that may be pertinent to someone within the organization.

5.4 Current awareness tools

NBI subscribes to a specific current awareness product, namely Current Contents (previously known as Reference Update), which retrieves articles from approximately 1700 life science journals. Weekly updates are downloaded from the Internet and predefined search strategies retrieve relevant articles. These are then obtained via the internal library, which uses the Sabinet request module for interlibrary loans.

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6 Conclusion

It is apparent from the above discussion that information overload is a very real problem in a fast-evolving society. It is also an old problem that is not going to go away. Most people are becoming resigned to information overload being the accepted norm. Similarly, there is no one solution to handling the vast quantities of information that we are faced with on a daily basis. Collaboration between information providers and users should be encouraged to develop the best solution, which may involve one or several of the above suggestions. Such a solution must also address the information needs of a business. The solution is probably best summarized by Lyman and Varian (2000): 'The challenge is to learn to swim in that sea (of information), rather than drown in it.'

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