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The problem of information overload in business organisations: a review of the literature

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Abstract

This paper reviews the literature on the problem of information overload, with particular reference to business organisations. The literature reveals that although the problem of information overload has existed for many years, in recent years the problem has become more widely recognised and experienced. Both perceptions and the actual effects of information overload have been exacerbated by the rapid advances made in information and communication technology, although it is not clear cut as to whether the Internet has worsened or improved the situation. A theme stressed in the literature is the paradoxical situation that, although there is an abundance of information available, it is often difficult to obtain useful, relevant information when it is needed. Some solutions put forward to reduce information overload are: a reduction in the duplication of information found in the professional literature; the adoption of personal information management strategies, together with the integration of software solutions such as push technology and intelligent agents; and the provision of value-added information (filtered by software or information specialists). An emphasis is placed on technology as a tool and not the driver, while increased information literacy may provide the key to reducing information overload. © 2000 Elsevier Science Ltd. All rights reserved.

Keywords: Information overload; Infoglut; Information fatigue syndrome

1. Introduction

The problem of information overload is widely recognised today. Living in an "information society", we are bombarded with information whether or not we actively seek it. We are all affected by the increasing number of sources from which information emanates. Who does not receive unwanted information through the letter box almost daily? Growing numbers of television

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channels provide more viewing choice and result in burgeoning programme guides to be ploughed through in the often elusive search for an interesting programme to watch amongst the escalating dross churned out. Newspapers, radio and television often disseminate the same news items with such an intensity of coverage that one can soon develop a perception of information overload but here one can choose to ignore that information. In the workplace, however, information is seen as the key to success for organisations and many people have to deal with an overwhelming amount of information from many sources as part of their job. People cannot afford to ignore information in the workplace. "Professional and personal survival in modern society clearly depends on our ability to take on board vast amounts of new information. Yet that information is growing at an exponential rate" (Lewis, 1996).

"The technological developments of the last 50 years have made more information more available to more people than at any other time in human history" (Feather, 1998). While there are obvious benefits from easier access to information, research has found that information overload can lead to stress, loss of job satisfaction and physical ill health (Lewis, 1996).

The machines we have invented to produce, manipulate and disseminate information generate information much faster than we can process it. It is apparent that an abundance of information, instead of better enabling a person to do their job, threatens to engulf and diminish his or her control over the situation. It is now widely recognised that stress can be experienced from a feeling of lack of control. We can unwittingly allow information technology to become the driver instead of harnessing it as tool to enhance rather than diminish our lives. The problem of information overload is obviously not going to recede and solutions need to be found to enable people to reduce the amount of information overload they experience.

This paper reviews the literature on the subject of information overload, with particular reference to business organisations, in order to provide an overview of the growth of the problem and the current situation. References to the problem of information overload are scattered throughout the literature and this review is, therefore, necessarily selective while aiming to present a balanced overview highlighting significant points garnered from extensive reading of the literature. Various solutions that have been put forward in the literature are briefly described and suggestions for further research are made.

2. Defining information overload

The consensus in the literature is that we live in a climate of *infoglut* or, as Shenk puts it, we are surrounded by *data smog* — an expression for the muck and druck of the information age (Shenk, 1997). Two other terms found in the literature that are aptly used to describe the problem of information overload are *analysis paralysis* (Stanley & Clipsham, 1997) and *information fatigue syndrome* (Oppenheim, 1997). Information overload is frequently referred to in the literature of a range of disciplines such as medicine, business studies, and the social sciences as well as in computing and information science. We can all recognise the condition of information overload. However, as Butcher states, there is no universally agreed definition of information overload — it can mean several things, such as having more relevant information than one can assimilate or it might mean being burdened with a large supply of unsolicited information, some of which may be relevant (Butcher, 1998). Klapp states that a large amount and high rate of information act like

noise when they reach overload: a rate too high for the receiver to process efficiently without distraction, stress, increasing errors and other costs making information poorer (Klapp, 1986). Feather describes information overload as the point where there is so much information that it is no longer possible effectively to use it (Feather, 1998, p. 118). However the term is defined, there cannot be many people who have not experienced the feeling of having too much information which uses up too much of their time, causing them to feel stressed which, in turn, affects their decision-making. Concurrent with these phenomena is the anxiety generated by worrying whether an important piece of information has been missed in the volume of material that is being processed.

3. Research into information overload

The literature shows that there are different emphases placed upon the effects of information overload. As an example, Butcher sets out three dimensions of management research into information overload which can be broadly categorized as:

- research into personal information overload and the effect upon an individual's ability to cope with solving problems and making decisions.
- research into the problem of organisational information overload whereby, in management terms, information overload is seen as a problem of too much paper. Although in some organisations, information overload is seen as encompassing both paper and electronic information systems.
- research into the problem of customer information overload and how this affects their spending (Butcher, 1995).

4. Information overload or data overload?

Much has been written in the literature about the strict definition of the term "information" which is sometimes used to mean "data". Foskett notes that more care should be used in employing these terms (Foskett, 1990). He provides a graphic illustration of the pyramid of organised knowledge whereby *data* can be identified as the raw material on which the human mind works to make information. Indeed, Meadow and Yuan (1997) argue that it is possible to have data overload but not information overload. They state that the usual meaning of the term information overload is that there can be more messages competing for our attention than we can handle and this causes the feeling of overload but to actually be information the messages have to have been received and understood or appraised. The problem is that in the workplace when one has a pile of paper to read, in addition to an escalating amount of e-mails to scroll through; when faxes frequently arrive and the telephone is constantly ringing; the perception of being overloaded with information is very difficult to avoid. Vickery and Vickery describe the individual's behaviour in this situation as affected in a variety of ways, responses include omission (failing to attend to or assimilate some proffered information) and error (assimilating it incorrectly) (Vickery & Vickery, 1987). They believe that omission is necessarily selective — we may omit what is difficult or

unpalatable to assimilate, even though it may be highly relevant to our current activities. We may pay inadequate attention to what we think is of minor importance and so misinterpret the message. It is also very common for people to allow messages to pile up in the hope that they will be able to catch up later when they have more time, which, of course, rarely happens.

5. Is information overload a new phenomenon?

In 1986, Klapp wrote about the boredom caused by information overload. He described the discovery by social scientists that it was possible to have an overload of information. Klapp stated that one of the first social scientists to notice this phenomenon was Georg Simmel who, in 1950, wrote of the overload of sensations in the urban world that caused city dwellers to become jaded and develop an incapacity ... to react to new situations with the appropriate energy (Simmel, 1950; Miller, 1960). Klapp also referred to Karl Deutsch who noted that communication overload was a disease of cities (Deutsch, 1961) and in 1962, Richard Meier predicted a saturation in communications flow and crisis of overload within the next half century (Meier, 1962; Oppenheim, 1997, pp. 6-7). However, Noves and Thomas have stated that, although it is impossible to know when people first started noticing and complaining about information overload, it is likely to have become a serious problem towards the end of the last century (Noyes & Thomas, 1995). The advent of the telegraph and subsequently the telephone, changed the way in which business was conducted, while developments in transport allowed mail communication to increase. Thus during the last century, developments in communication systems led directly to an increase in the amount of information in the workplace. The rise in paper documentation created the need for the development of organisational and retrieval systems for information. The relatively recent developments of the Internet and the World Wide Web imply that information overload is a recent phenomenon. However, Noyes and Thomas point out that as far back as 1880 a particular desk was advertised as a solution for filing books and papers. Similarly, Haynes recounts the rapid growth of case law as an example where, by the late 1800s, there were too many cases and too many sources (Haynes, 1996). He states that in 1810 there were 18 volumes of reports. By 1845 there were 800. By 1885 there were nearly 3800. The problem then was the same as now — too much information and too many sources. Indeed, the growth of abstracts and indexes also aptly demonstrates the explosion of literature. For example, the 13th Collective Index of *Chemical Abstracts* is circa 150 volumes!

5.1. The information climate

Obviously, people gradually learn to cope with developments and change and no doubt in the past it took some time to adapt to increasing amounts of printed information in the workplace. However, in the past thirty years developments in information technology have transformed jobs and whole industries. As Shenk states, in 1850, 4% of American workers handled information for a living, now most do, and information processing (as opposed to material goods) now accounts for more than half of the US gross national product. Computer processing speed has doubled every two years for the past thirty years and today, the speed of change constantly increases the pressure to adapt at a rate that becomes almost impossible (Shenk, 1997). Charles Meadow states that in recent years there has been unquestionably an increasing demand for speed in most business or

administrative activities. Instead of automation gaining us more leisure, it has tended to gain us more pressure to do everything faster (Meadow, 1998). In a climate of downsizing in businesses, leading to fewer staff dealing with rapidly increasing amounts of information, (the rule of corporate fitness described by Charles Handy as the $\frac{1}{2}$ by-2-by-3 rule whereby there are half as many people on the payroll, paid twice as well, producing three times as much (Handy, 1995), the crucial importance of information to businesses means that people often feel they have to constantly keep up-to-date and receive more and more information. The 1997 Reuters Report, *Glued to the Screen*, found that four out of five respondents felt driven to gather as much information as possible to keep up with customers and competitors (Oppenheim, 1997). As Bjorner has stated the unsolvable problem is that human information processing cannot catch up with the speed of mechanical information production (Bjorner, 1998).

5.2. The Internet and information overload

There can be no doubt that the increased availability of information from electronic sources, contributes greatly to the volume of information that can be accessed when seeking any particular information. Some believe that the Internet has undoubtedly become a major contributor to information overload (Swash, 1998), while others dispute the suggestion that the Internet has exacerbated the problem of information overload and state that this problem existed before the arrival of the Internet. Nicholas et al. carried out research among journalists, editors and media librarians and found that most were not concerned with information overload as they are used to dealing with vast amounts of information (Nicholas et al., 1997). Interestingly, the 1996 research report by Reuters reported that 48% of managers believed the Internet would be a prime cause of information overload over the next two years. However, two years later the 1998 research carried out for Reuters revealed that only 19% of respondents said the Internet has made things worse and half believed that it has actually improved the situation (Reuters Ltd., 1998).

5.3. Electronic mail

The largest single use made of the Internet is for electronic mail, which is rapidly becoming one of the main forms of business communications, via the Internet and internal intranets (Bentley, 1998). Undoubtedly, the sheer quantity of e-mails received is one factor cited by many people as a cause of overload. As Whittaker and Sidner state, while e-mail is one of the most successful computer applications yet devised, e-mail overload creates problems for personal information management (Whittaker & Sidner, 1997). From carrying out a quantitative analysis of the mailboxes of twenty users and spending thirty four hours in interviews they found that users often have cluttered inboxes containing hundreds of messages, including outstanding tasks, partially read documents, and conversational threads. Nonetheless, Kraut and Attewell believe that, although the negative effect of e-mail can be a perception of being overloaded, from a survey conducted within a multinational corporation, they found an increased amount of communication received by employees has positive effects on their organizational knowledge and commitment. They believe that, although e-mail increased the amount of information employees received, because it is an asynchronous form of communication it is less likely to interrupt the normal work flow, unlike the

telephone, and the information received can be dealt with at one's own convenience (Kraut & Attewell, 1998).

5.4. Factors leading to information overload

In a recently published book by Helen Butcher seven main reasons why managers obtain so much information that they can become overwhelmed by it all are set out. These are paraphrased here:

- they collect information to indicate a commitment to rationalism and competence which they believe improves decision-making;
- they receive enormous amounts of unsolicited information;
- they seek more information to check out the information already acquired;
- they need to be able to demonstrate justification of decisions;
- they collect information just in case it may be useful;
- they play safe and get all information possible;
- they like to use information as a currency not to get left behind colleagues (Butcher, 1998, pp. 53–54).

5.5. The paradox — a surfeit of information and a paucity of useful information

A thread that runs through the literature is that, although there is an abundance of information, it is often difficult to obtain useful and relevant information among the vast volumes of information which, at the very least, need to be scanned through to find the nuggets. Martin claims that because of the proliferation of modern information technologies, and of new techniques for searching, accessing and retrieving information, organisations today are even more exposed to the paradox of threatened inundation from irrelevant or unnecessary information and a dangerous paucity of that which is needed (Martin, 1995). Katzer and Fletcher also believe that managers receive more information from more sources through more channels than almost anyone else in an organisation. Unfortunately, managers find themselves bombarded with information — too much, too fast, too late. Interestingly, even with an oversupply of information, managers believe that they do not get all the information they need to do their jobs. The dilemma is clear: on the one hand, managers receive too much information, while on the other hand, they don't get enough of the right information (Katzer & Fletcher, 1996).

5.6. Information literacy

Koniger and Janowitz examine the causes behind complaints made in the business world about lacking relevant information when it is needed and at the same time suffering from a surfeit of information. They believe that information is only valuable to the extent that it is structured. Overload can be suffered because information from electronic media is received in an intangible form and classical methods of information handling are not sufficient for the growing amount and new forms of information. The solution recommended by them are four universal structuring dimensions to provide a more comprehensive system of information management. Although

information technology will play a vital part in new information handling processes, Koniger and Janowitz believe that improved competence of the individual in information processing is crucial (Koniger & Janowitz, 1995).

Mutch also believes that people need to become more information literate to reduce the misuse of information and, thence, the problems of information overload (Mutch, 1997). He feels that there is a problem because of the lack of a definition of the concept of information literacy although there is a consideration volume of discussion of the concept in library and information science literature. Mutch suggests that to be truly literate in the use of information demands a focus initially on the questions one is seeking to ask, rather than on the identification and retrieval of data. It is apparent that to be information literate goes much deeper than becoming proficient at personal information management, advice upon which, Mutch asserts, is often to do with filing and organising — important matters — but little guide to the nature of information creation.

5.7. The extent of information overload

When Reuters published their 1996 report on their research into information overload they revealed that it was becoming a major problem and was seriously affecting people at work and their ability to do their job while impinging upon their relationships and quality of life. These findings have been clearly explained elsewhere by Oppenheim (1997). Two years later, further research published by Reuters paints a somewhat brighter picture. It appears that the problem of overload in the Western world, although still a major issue, is now seen as a problem by 42% compared to 65% earlier. However, in the UK some 47% still state the information overload damages their relationships, while 42% say it reduces their job satisfaction. Information overload is still clearly a major problem, and several measures that can be taken that may help to reduce information overload appear in the literature.

6. Solutions to information overload?

6.1. Maintaining currency

Wilson when writing about the problem of information overload in interdisciplinary research, describes it as always a threat if not a reality and it is perhaps most familiar in the problem of maintaining currency (Wilson, 1997). Laskin has also written on this point and he believes information overload is due to the proliferation of professional journals. As he says, "Even if all the information contained in these various journals was pertinent, one might still feel frustrated by the volume of material that needs to be digested, but at least the time spent in reading them could not be considered wasted. However, when one finds duplication of information and ideas, deficient data and unsupported conclusions that are recognised only after fully reading the articles, then time has been wasted" (Laskin, 1994).

He asserts that new journals are published when there is no real need for them and, in order to fill them, sub-standard material is used. This is a familiar complaint that has been made for some considerable time. Laskin's solution is to focus on concepts and principles rather than on details and data. Although it is necessary to keep up with the literature to keep a competitive edge, we have

to learn we cannot know everything about everything. Klassen et al. also agree that it is impossible to keep up-to-date with the literature and, in their case with particular reference to medical research literature, they propose that systematic reviews as a scientific process could provide a solution to reduce information overload. The systematic review is compiled from undertaking a comprehensive search for relevant studies which are then appraised and synthesised according to a predetermined and explicit method. This provides the ability to replicate the research (Klassen, Jadad & Madher, 1998).

6.2. Personal information management

A simple pilot study was undertaken by Jones and Thomas to investigate the use of personal information management (PIM) technologies — both traditional and electronic (Jones & Thomas, 1997). As they state, most of us engage in personal information management, however, many of the methods used are little understood, especially in the context of developing new forms of computerbased (PIM) hard/software. Also little understood are the ways in which new technologies change ways of using existing technologies and how the two co-exist. Those surveyed were drawn from organisations in Southwest England where it was expected that the uptake of new technologies would be likely. The findings revealed how little electronic PIM technologies were used and that any use of electronic devices was always in combination with traditional technologies, such as a pocket diary or a personal organiser. Etzel suggests that in order to cope with information overload a personal information management strategy needs to be developed (Etzel, 1995). She suggests that of prime importance is to decide which medium to use, while consideration should be given to the characteristics of tools that appear most favourable to the individual, for example, whether visual or spatial recall is used. This has obvious implications for software design. Etzel states that the strategy she puts forward is an integrated approach rather than a reliance on products which, although necessary, are not a solution by themselves.

7. Push technology

A relatively recent development, push technology works by pushing notices of pre-selected information sources across the computer screen alerting users to new and updated information. Traditionally, the standard method for retrieving information has been to search and "pull" information. However, this can be a very inefficient method and, as Herther states, the benefits of push technology are that this allows for the regular canvassing of selected information sources for new information, then having that information sent to users seamlessly, as they work on other applications or perhaps even as they sleep at night (Herther, 1998). The jury still appears to be out as to whether push technology will help to reduce information overload and while some in the literature believe it may well be the answer, others warn that it may be yet another contributory factor in information overload. As Cerami states, the disadvantages of push may be user unwillingness to have information pushed to them. Many users are already suffering from information overload and view push as an annoying nuisance that provides little of value. Push suddenly then becomes shove (Cerami, 1998). In addition, to be effective, push relies upon users creating accurate

search profiles. Some of the information received will be unwanted and as a further drawback, it displaces serendipity which, as Shenk fears, may lead us to narrower worlds (Shenk, 1997).

8. Intelligent agents?

Intelligent agents that scan and comprehend text and summarise and automatically route the information for users have been proposed as a tool to help reduce information overload as, to be really useful, information needs to have value added to it by way of summary or analysis. Belfourd and Furner suggest that as a radical solution to the problem of information overload, intelligent agents are smarter than average search tools for two reasons:

- an intelligent agent acts with autonomy by making decisions on the basis of data it acquires about the environment, rather than as a result of direct instruction from the user;
- an intelligent agent has the facility to learn about individual personal preferences so that gradually it is able to predict the likelihood of items that will be of interest to the user (Belfourd & Furner, 1997).

A useful explanation and evaluation of an intelligent search agent is provided by Tegenbos and Nieuwenhuysen (1997). They conclude that the search agent evaluated could not (at that time) compete with the power of a solid search engine. The use of concepts to build a search strategy did not produce satisfying search results in comparison with tools that use search terms in Boolean combinations. The benefits of saving time can therefore be outweighed by the lack of control and unreliability in using intelligent search agents.

8.1. Value-added information

The literature highlights the need in businesses for value-added information. As Badenoch states, information by itself is not necessarily useful; it needs a filtering mechanism — whether via a librarian or a piece of software (Badenoch et al., 1994). Simpson and Prusak argue that information overload occurs as a result of a failure of the business community to recognise the ways in which information processes add value to information (Simpson & Prusak, 1995). They produced a conceptual model and examined the roles of both information providers and information users, with particular emphasis on the needs of managers and decision-makers for high value-added, or quality information. They argue that there is a need to bridge the gap between information providers and users in their respective views of each other's roles, competencies and requirements in information terms. The model they devised contained five elements of value in information under the headings of truth, guidance, scarcity, accessibility and weight. The model provides a way for both providers and users to communication in meaningful terms on information issues.

9. The role of information specialists

The role of information specialists in helping businesses to reduce information overload is, not surprisingly, discussed at length in the information science literature. There are fears expressed that

their role is not at the forefront of solutions, implying that the profession may be left behind in strategies employed by business organisations to reduce information overload. This has already been seen in the elevation of IT specialists in organisations whose emphasis may lie more on providing fast access to volumes of information rather than providing access to quality, useful information. It would seem an obvious solution to the problem of information overload in businesses to employ specialists in information handling to carry out the acquisition of relevant information-processing and packaging the information needed as appropriate. Oppenheim draws attention to the total lack of any mention of information professionals in the responses made in the Reuters research and highlights the enormous market niche for the information management profession here (Oppenheim, 1997). Butcher makes the interesting suggestion that the answer could be to have an information worker as part of each team in an organisation rather than working in a separate information unit (Butcher, 1998). She has found that managers often prefer to rely on verbal information and may also be wary of using information services if they believe this will just add to their information overload but if such a person were part of their team there would be fewer barriers and, in addition, the information specialist would have a greater knowledge of the team's information needs. This suggestion appears similar to Allen's model of the technological gatekeeper or "star" in an organisation where, in studies of communication networks in several R and D laboratories some people (the "stars") were found to keep in touch with nearly everyone else in the organisation (Allen, 1977). They also made more use of sources of information outside their organization, they informally kept colleagues in touch with current developments and were sought out by colleagues for information. However, Allen distinguishes the role of the gatekeeper from the role of the information specialist. He states that the former provides depth of content and translation of information rather than range and direction to sources of information. Allen states that the gatekeeper must therefore be an outstanding technical performer.

In some quarters it may be thought that technology is the answer, all the necessary information can be delivered to the desktop computer without the need for any mediation on the part of information professionals. This brings us back to the general need for greater information literacy among those employed by business organisations and the importance of information content. As Martin states, the very availability and bewildering array of information and communication technologies, if not controlled, is a receipe for ad hoc development, system incompatibilities and the worst excesses of information overload (Martin, 1995). Hyams, however, believes that the role of the information professional will be paramount in determining content of information (Hyams, 1997). The role, it is suggested, will also become much more global and involve more in terms of whole organisation strategy, while becoming more political.

10. Conclusion

It is unlikely that one perfect answer can be found to reduce or eradicate the problem of information overload. If it is beginning to be seen as less of a problem, as highlighted by the latest Reuters report, (at least in the Western world), perhaps this may be that people are just learning to live with it and are less likely to complain if it has become an accepted state. Further research carried out among business organisations would be valuable to determine the extent of information overload currently being experienced and what strategies are being used to combat this problem.

For example, intranets are increasingly being viewed as a way to combat information overload, although some in the literature suggest they may just add to the problem. Research into the effects intranets are having upon information management in businesses would provide useful evidence of whether they are one factor that may help to reduce information overload in businesses.

The measures suggested in the literature that may help to reduce the problem of information overload include the adoption of personal information management strategies; further use of push technology, and intelligent agents; an increased use of value-added information (either produced by software and/or information specialists); and the implementation of information management and knowledge-based information management stategies. Evidence suggests a growing recognition of latter which involves sharing and utilising company-wide, valid, valuable information. It is to be hoped that through a holistic approach to handling information, information overload may become less of a burden. Meanwhile, perhaps we can all question ourselves as to whether we too, albeit inadvertently, sometimes add to someone else's overload of information.

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