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MANAGERIAL INFORMATION OVERLOAD

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Information technology (IT) is expected by corporate management to improve the productivity of knowledge workers, enhance the quality of their work lives, and improve managers' decision making skills, along with the bottom line. However, the organizational capacity for producing information far exceeds the human capacity for processing it [10]. Burdened by information overload, knowledge workers feel stress, strain, and anxiety, thus threatening productivity and the adoption of new technology [2]. In a survey sponsored by Reuters International, 1,300 managers in Hong Kong,

Singapore, the U.K., and the U.S. reported that while they needed lots of information to perform effectively, 25% of them also suffer ill health, ranging from headaches to depression, as a direct result of the enormous amount of information they have to absorb. Moreover, most of them (94%) do not expect the situation to improve, and 56% expect the future to be even more stressful [6].

Along with the emergence of information media, including email and the Internet, issues related to information overload take center stage in the lives of millions of knowledge workers worldwide. In a survey of managers in a number of industries by *Computer-world* magazine, more than 40% of them described their work as "extremely stressful," and 67% expected it to get worse as they sought to manage the information they needed to keep up with their counterparts in their own organizations, as well as those in their industries [5].

In general, information overload can be characterized in two broad ways. The first is when knowledge workers are given more information than they can absorb;

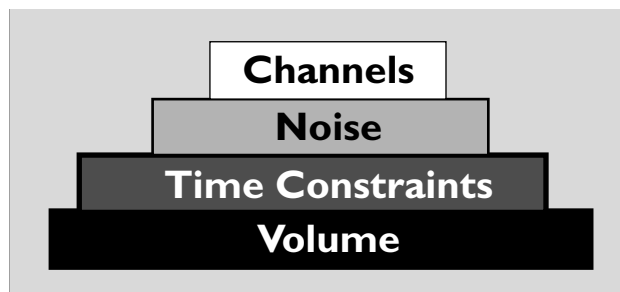
in such situations, information overload is viewed in light of receiving more of it than is needed or wanted to function effectively and further the goals of the individual or the organization [7]. Alternatively, information overload can occur when the information processing demand on an individual's time for performing interactions and internal calculations exceeds the supply or capacity of time available for such processing [9].

Regardless of how it manifests itself, information overload affects decision making in two ways [9]. First, the affected knowledge workers may be unable to locate what they need most due to sheer volume, even causing them to overlook what they themselves would consider critical [3]. Second, information overload may cause these knowledge workers to fail to use the relevant information at hand or known to be available, leading to the inefficient use of decision-making time [12].

An especially difficult challenge facing organizations today is finding ways to use technology to deal with information overload. Unclear is whether it actually helps ameliorate or indeed compounds

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it. On the one hand, technology gives machines the capacity to generate and transmit information to a wide range of recipients regardless of their need. The Web, email, faxes, and other communication technologies have facilitated, even accelerated, information generation and duplication, leading to the expansion of networks both within and outside organizations. On the other hand, in order to combat information overload, organizations acquire, design, and implement search engines, information agents,



**Components of
information overload
in ascending order,
from most to least
problematic, as
reported by survey
respondents.**

and information-customization software [1]. Because it is unclear whether individuals are capable of dealing with information overload themselves or need organizational guidance, the selection of the appropriate technology and the type and amount of support and training are increasingly important. The extent to which technology is actually a solution influences whether solutions might naturally emerge or management has to implement special practices. In any case, can such solutions be applied universally to information overload resulting from either internal or external sources?

Empirical Investigation

In an empirical study, we asked 124 managers in manufacturing, financial services, transportation, and government agencies in Australia, Hong Kong, the U.K., and the U.S. five basic questions:

- What does information overload mean to you?
- How often do you experience it?

- What are its primary sources?
- In what ways does it affect your work?
- When facing it, what do you do to improve the situation?

We also asked several demographic questions, distributing the entire set on floppy disks in Microsoft Word format. Respondents were encouraged to think critically about the issues and use clear and concise prose to describe their views. The documents they returned ranged from one to three pages, depending how much detail we sought in the open-ended questions.

The qualitative data analyses of the written assessments were obtained using a software analysis package called QRS NU*DIST from QRS International of Melbourne, Australia, designed to code nonnumerical text data for indexing, searching, and theory building. Codes and categories were held and explored at nodes in an index system and software database searchable by patterns of coding to help us explore the meanings in the data [8]. The process involved feeding the raw data, in this case the individual text files, into the database, then mapping each question to the nodes in the index system, in this instance a roughly designed index tree, after which each node was examined more closely. We studied individual answers to identify suitable categories, which we then added to the index tree before processing each document again.

Overall, 57% of the study participants had more than five years of business experience, and 55% had been with the same organization more than five years. They worked in a range of industries, from financial services, to manufacturing, to transportation, to IT, as well as in government. Almost 75% were in marketing, finance, and information systems. Most (94%) described themselves as managers or professionals.

Excessive Volume

The most frequently cited meanings for information overload were an excessive volume of information (79%), difficulty or impossibility of managing it (62%), irrelevance or unimportance of most of it (53%), lack of time to understand it (32%), and multiple sources of it (16%), as reflected in the figure.

Unlike earlier eras of technology innovation and their influence on management theory and practice when, say, the printing press replaced copying manuscripts by hand, new technologies today do not replace their older counterparts but only add to the host of media options. With these multiple channels, the information flow has become simultaneous and

multidirectional. The sheer quantity of information through multiple channels and the speed with which it can be sent and acquired give knowledge workers the illusion of accomplishment [11].

Frequency. Over 50% of the study's respondents reported they encounter information overload regularly (see Table 1). Just over 33% reported experiencing information overload every day. We found the frequency of information overload to be statistically independent of subject gender, age, organizational level, or years of experience.

Sources. Though widely praised as a source of infinite amounts of information, the Internet and the Web are also most commonly cited in the news media as key sources of managerial information overload. The most immediate cause of Web-related information overload has been ascribed to the Web trying to play the dual role of private and public information and communication medium [1]; the focus of this

Frequency	Number	Percentage
Everyday	46	37%
Often	33	27%
Sometimes	28	23%
Seldom	15	12%
Never	1	1%

Table 1. Frequency encountering information overload.

view is that these sources are external to the organization.

About 40% of the study's respondents cited external sources as the number one contributor to information overload, in contrast to 60% citing internal sources. Information from external sources includes print correspondence, faxes, email, business-related news, advertising, and promotional material. However, the main internal causes of information overload are email (interpersonal, interdepartment, and interoffice), announcements, memoranda, and reports for and minutes from meetings. The inability of IS/IT departments to understand user requirements for designing search and sort interfaces is another internal source of information overload. Users are not always clear about their information needs, and system designers are often confused about which information they need for making business decisions. One respondent wrote, "The system designer is not sure about what information is vital to us, so he puts all the data in the system and lets us choose the useful information. Some of it is redundant, some is new, some even conflicts with each other." Informal information, including gossip and opinions, also contribute to information overload, as managers have difficulty evaluating it, along with the trustworthiness of people's opinions.

Study respondents generally (60%) pointed to the Internet and email as the number one external sources of their personal information overload. A notable complaint relates to their own inability to sift through extraneous information when searching the Web. Almost 25% of the respondents cited improper use of email as the number one source of their personal information overload.

Effects. Table 2 outlines the effects of information overload experienced by the knowledge workers in our sample. A majority (72%) complained about loss of time. However, we again found no direct association between the effects of information overload and subject gender, age, organizational level, or years of experience. One respondent wrote, "Information overload causes delays, mistakes, and nonperformance. Eventually it erodes the quality of work. My efficiency is decreased, and I find it hard to prioritize my tasks." Nevertheless, few respondents (3%) thought that work overload caused by information overload damages their personal lives, though 16% did report being frustrated, tired, stressed, even panicked when facing the daily flood of information. Another respondent wrote, "It leads to frustration and confusion. It can make me feel restless, anxious, sometimes panic. The worst is the discouraging effect on my commitment to my job."

Solutions. Table 3 outlines the solutions respondents employed or recommended. They can be divided into four categories: personal, technological, organizational, and ignore. The first four solutions in the first category, labeled P1 to P4, are personal

Effect	Number	Percentage
Loss of time	87	72%
Negative effect on work	48	40%
Reduced efficiency	19	16%
Frustration, tiredness, stress	19	16%
Negative effect on decision quality	16	13%
Reduced productivity	10	8%
Effect on department or whole organization	9	7%
Damage to personal life	4	3%
None	4	3%

Table 2. Effects of information overload.

attempts at dealing with information overload. Information filtering was cited most frequently, followed by eliminating the source, delegating, and prioritizing. About 50% of the respondents try to filter, say, incoming documents and email. One wrote, "I try to be objective in selecting the appropriate information. It is screened until the appropriate amount and quality is reached. Consulting other colleagues and my supervisor is also helpful in providing insight in getting the right information." Elimination

Rather than needing less information, we actually may need lots more, specifically information about information, or metadata.

of sources is one response to excessive email. Delegating work, especially for screening and filtering information, was another popular response. Almost 25% of the respondents delegate routine work to assistants, secretaries, and other subordinates. One wrote, "I delegate part of the screening job to my assistant and ask my colleagues to read my email and brief me on what is important." Prioritizing information and work tasks was viewed as important by 22% of the respondents.

Though information overload results from both internal and external sources, it is unclear whether the various strategies are equally effective in handling the problem from both sources. The second solution category in Table 3, labeled T1, reflects the use of technology. Although computer systems are often viewed as the source of the problem, few respondents (14%) suggested using them to solve it. Their experience seems to indicate they have little faith in the ability of the organizational IT department to resolve their problems.

The third solution category, labeled O1–O5, concerns such organizational solutions as devising work processes and operations, consulting top management, and getting help from the IT department. They were ranked lowest in terms of effectiveness. Only 6% reported they would consult the IT manager or the IT department for technical solutions to information overload. This response indicates that, from the users' perspective, the IT department is not effective at dealing with information problems throughout their organizations.

Meanwhile, few people apparently deal with information overload by totally ignoring the information, labeled I1.

Processing Factor

A full understanding of the phenomenon of too much information and only ineffective ways to process it is problematic because it is largely influenced by knowledge workers' personal information processing ability, along with the contextual variables related to individual tasks and work environ-

ments. Despite these difficulties, however, any empirical investigation based on managers' experiences helps paint a more accurate picture of the information overload-related problems affecting the vast majority of knowledge workers worldwide.

These study results improved our understanding of the structural properties of information overload. They enabled us to devise a taxonomy of its major elements: sheer volume of information, irrelevant information (noise), time constraints, and multiplicity of information channels. Recognizing this dimensionality would help organizations better understand the prospective types of information overload affecting their employees and devise solutions to deal with their effects, including wasted time and efficiency, inhibited decision making, and personal malaise

Category	Solutions	Number	Percentage
P1	Filter the information	59	47%
P2	Eliminate the source	30	24%
P3	Delegate work	30	24%
P4	Prioritize	22	18%
T1	Utilize technology	17	14%
O1	Organize work	14	11%
O2	Enhance communication	10	8%
O3	Other	10	8%
O4	Consult top management	9	7%
O5	Help from IS/IT department	8	6%
I1	Ignore information	5	4%

Key: P = personal T = technological O = organizational I = ignore

(frustration, stress, fatigue).

Table 3. Solutions to information overload.

Contrary to the prevailing view in the management literature that external information sources, including the Internet and the Web, are the major causes of information overload, we identified the influential role internal sources also play, including the email, reports, and documents cited in the study.

There seems little interest by those in charge of IT and systems development or top management to resolve these issues. While technology seems to be a source of the problem, most knowledge workers lack faith that technology alone can solve it. Study participants rely primarily on themselves to filter, delegate, and eliminate excess information, rather than seek out organizational solutions. Their personal strategies derive from experience, perseverance, folklore, and trial and error.

The more structured techniques for information handling required to manage information overload can be achieved at three levels of specificity:

Tools and Techniques. Knowledge workers need better tools and techniques to structure and retrieve information more effectively from both internal and external sources. Because the Web has dissolved famil-

iar information structures, new structures are needed. Rather than needing less information, we actually may need lots more, specifically information about information, or metadata. Technical solutions for dealing with information overload resulting from external sources may include information agents, personal software capable of information customization, push technology, or even “repel” technology to prevent unwanted information from finding its way into our machines [1]. These technologies should allow knowledge workers to filter external sources, allowing in only select, high-quality portions of it. However, these technologies are not equally effective in handling internally generated information overload; ignoring or filtering out internal sources can’t be easy under any circumstances.

Such emerging technical solutions are also likely to be insufficient. The problem may be the incompatible nature of the information being retrieved, rather than how it is retrieved [11]. Sometimes generating, acquiring, and managing information are ends in themselves. Users may be enamored of their computer tools just because they are available. It may therefore be possible to retrieve information but be unable to understand it. Time constraints and the convenience of searching and retrieving information may cause people to rely on sources that are immediately available and accessible but do not necessarily provide the best reference.

Organizational Design. Second, because changes in contemporary organizational structure have contributed to the explosion of information overload, organizational management needs to account for information overload in organization design. Fewer supervisors are needed in less hierarchical, or network, organizations to filter information and serve as gatekeepers. Moreover, self-organizing and self-directing teams reflect a need for fast, cross-functional communication. The contemporary corporate goal of flattening management structures, extending each manager’s span of control through team building and delegation of responsibility and empowerment, leads to an increase in the quantity of information to be processed. In response, organizations must devise and implement intelligent distributed IT architectures capable of identifying critical information and passing it along to the appropriate decision makers for immediate processing.

Capacity for Inquiry. Third, these organizations need to address information overload issues at the level of the individual knowledge worker. People may perceive overload because the information they receive does not fit their mental models of reality. Perhaps human consciousness has simply not evolved

quickly enough to keep pace with the rising tide of information [10]. Too many of us still use the classic information retrieval model, attempting to find the best match between mental boxes (questions) and structured information boxes (answers) [4].

One solution is to revise our personal notions of critical reflection and analysis by throwing out the educational paradigm that emphasizes acquisition, access, storage, and retrieval of discrete and fragmentary information, developing instead the capacity for inquiry. The goal of information seeking should be answers to personally meaningful questions through filtering, delegation of information screening, and elimination of redundant information. ■

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