An Information Overload study: 
Using design methods for understanding

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ABSTRACT
Information overload is not a clear-cut concept. To understand the concept we studied knowledge workers in their organizational context applying different design methods. These methods are increasingly used to inspire designers in designing technology solutions. However, for understanding ambiguous concepts they are less common. We compared critical incidents collection, cultural probing and storytelling with respect to their contribution to articulate the concept of information overload and to understand why respondents perceive information overload as problematic. At the same time, these insights will steer us towards practical guidelines and technological solutions bridging the gap between understanding human behaviour and (technological) support.

Author Keywords
Contextual research, cultural probes, critical incidents, design, information overload, knowledge workers, storytelling.

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
The starting point for our research is the so-called ‘knowledge worker’, which typically can be found in an office environment. His work is largely organized around knowledge: acquiring, creating, applying and consolidating knowledge. Most of the work of knowledge workers is invisible. It happens in the heads of the workers. Only end products, such as reports, designs and advice are visible results of the knowledge worker. The knowledge worker largely depends on knowledge and information, and is therefore more sensitive to the feeling of information overload. First impressions show that information overload is related to the complexity and pace of today’s knowledge-intensive society, the technology to deal with this complexity, and the fact that new technology increases as well as reduces information overload. There is too much information to handle and too little time to ‘process’ and ‘digest’ the information. Whatever people perceive as information overload affects decision-making, quality of work, happiness, job satisfaction, and leads to frustration, stress, and loss of time.

THE CONCEPT OF INFORMATION OVERLOAD
What is information overload? Eppler and Mengis (2002) presented an extended overview of definition of information overload. The term ‘information overload’ is often used to convey the simple notion of receiving too much information. “Within the research community this every day use of the term has led to various constructs, synonyms and related terms as for example cognitive overload, sensory overload, communication overload, knowledge overload, or information fatigue syndrome. These constructs have been applied to a variety of situations, ranging from auditing, strategizing, business consulting management meetings to supermarket-shopping to name but a few overload contexts” (Eppler & Mengis, 2002, pp. 3-4).

Next to understanding the concept of information overload these authors tried to make information overload operational. In their review Eppler and Mengis also mention approaches that conceive overload on the basis of subjective experience. In this ‘subjective’ view crucial factors that signal the occurrence of information overload are the feelings of stress, confusion, pressure, anxiety, or low motivation.

Farhoomand and Drury (2002) studied information overload in an organizational context and attributed the phenomenon to channels, noise, time constraints, and volume. Effects found were loss of time, negative effect on work, reduced efficiency, stress, and frustration.

In addition, Hallowell (2005) discusses another factor of information overload, something called ‘attention deficit trait’, or distracters from the environment. It is a response to the hyperkinetic environment we have in the office nowadays. To quote Hallowell: “People with attention deficit trait have difficulty staying organized, setting priorities, and managing time, and they feel a constant low level of panic and guilt”.

Inspired by the many definitions of information overload we use the following working definition for the remainder of this article:

Information overload is the feeling of stress when the information load goes beyond the processing capacity.
As information overload is not a clear-cut concept, we studied knowledge workers in three organizational contexts. Organization 1 was a research organization with a 100 person staff. Organization 2 was a R&D department (1200 person staff) of a high-tech industrial company. Organisation 3 was a multinational petrochemical industry. In order to develop practical solutions for knowledge workers, we took the conceptual ambiguity of Information Overload as the starting point of our contextual research approach.

METHODS FOR UNDERSTANDING

As we argue later on, a combined approach of critical incidents collection, cultural probing methods, and task-oriented storytelling has been used to get closer to normal everyday occurrences of information overload. We opt for these methods as respondents can contribute to the articulation of the causes and consequences of information overload. First, we describe the respective methods used in the contextual research and elaborate on the findings and methods used. Then we present how we came up with practical solutions to deal with information overload.

Critical incidents collection

As a bootstrap to the research we collected critical incidents (Hackos & Redish, 1998) to study how senior managers at Organisation 3 experience information overload. To this end, respondents were asked to recall several recent situations in which they had themselves experienced ‘information overload’ (no prior definition or description of the term had been given to them). We would then take the mentioned situations as starting points for a semi-structured interview where we asked questions about causes, coping strategies, and ideas for improvements. Used in this way, the critical incident collection technique proved to be particularly valuable to gain insight into when and how information overload manifests itself in the daily work of these managers, and to learn about possible causes and solutions.

Using this procedure we collected 75 critical incidents from 14 respondents. After the interviews the incidents resulting were categorized into 9 clusters (Figure 1).

![Figure 1. Critical incidents of information overload](image)

Examples of clusters are ambiguous e-mail (e.g., incidents that relate to messages that are in some way difficult to interpret), e-mail workload (incidents that relate to the amount of time it takes to process a lot of e-mail), and fragmentation (incidents that relate to information being spread around in too many places).

The largest group of incidents (5 clusters, or 60% of all incidents) relates to e-mail. Analysis of these clusters shows that, in general, too much information is pushed towards the respondents (all complained about excessive use of ‘reply-to-all’). Furthermore, this information is often ambiguous in its meaning or context (‘what does this mean?’, ‘why is this sent to me?’) or difficult to interpret (‘conclusions are hidden away in attachments’). What probably plays a role is that our respondents, being managers, often play a coordinating role within a company. This requires a lot of communication and, in most cases large amounts need to be handled.

The second largest group of incidents (2 clusters, or 28% of all incidents) relates to ‘not knowing where to find’, i.e., not knowing where to find new or important information to stay up-to-date (fragmentation through too many sources) and not knowing where to find specific information within one source (poor accessibility, poor search facilities).

Cultural probing study

A cultural probing study was initiated to get more insight in what the phenomenon of information overload means, to the knowledge workers under study. Although our focus was to get a better understanding of the concept of information overload, the main research questions are ‘why do people perceive information overload?’ and ‘how does information overload come into being’. Cultural probes, a design-led approach to understanding users that stress empathy and engagement, are increasingly used by designers to get more inspiration for the design of (mostly technology) solutions (Gaver, Dunne, & Pacenti, 1999). Here, we used cultural probing to articulate the problem in the first place. The room for ambiguity and interpretation that cultural probing introduces form a fertile terrain for creativity and interactivity on the problem area (Gaver, Beaver, & Benford, 2003).

The initial focus in our cultural probing study was deliberately broad and holistic, aiming to preserve the richness of the data. It allowed us to come up with practical implications to solve or deal with information overload that are valuable to the knowledge workers in context. Instant cameras were used to visualize information overload. Knowledge workers were asked to take a picture of ‘what they perceive as information overload’. The assignment given was purposely open-ended, avoiding influencing the knowledge workers’ perception of information overload. Each person was asked to take up to 5 photos, indicate the degree of information overload, and write down a short motivation. In a relatively short time (within two weeks) we gained 79 photos taken by 27 knowledge workers using 5 cameras (Figure 2).
The photos portrayed all kind of artefacts (containing complex information), scenes around the office corridors, the desks, computer screens, and last but not least the human factor of subjects and their colleagues. The titles subjects had added, referred to time, multitude (n=42), time (shortage) (n=16), the latter two combined (n=12), and unwanted information (n=12). The indicated degree (on a 5-points scale) of overload for each photo provided us with a ‘stress thermometer’. The least chosen was ‘2’ (6%), whereas ‘3’ was most popular (41%). The average degree of overload in our photos was 3.0.

To summarize, the photo assignment provided us with a rapid and fairly rich probing of the complex information overload topic. An additional result was that by using the cameras for data collection fun and interest in the topic increased; for instance respondents frequently asked when results from our study would be published.

Keeping the insight from the literature study on information overload in mind three researchers studied the photos and the comments to the photos. In a first analysis the photos were clustered in four main categories: Task Complexity, which is highly related to the work itself, Environment Distracters such as a nearby coffee corner or noisy machine, Social Pressure, such as requests for assistance, and Information Ambiguity when tasks or requests are unclear. Photos that did not fit in one of these four categories were categorized as ‘Other’. Task Complexity was addressed most frequently (58%), followed by Information Ambiguity (19%), Other (11%), Environment Distracters (8%), and Social Pressure (5%).

<table>
<thead>
<tr>
<th>Cause</th>
<th>Factor</th>
<th>Mental Skill</th>
<th>Emotion / Behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task complexity</td>
<td>Person &amp; his job</td>
<td>Understanding</td>
<td>Cognition</td>
</tr>
<tr>
<td>Information ambiguity</td>
<td>Information</td>
<td>Processing</td>
<td>Uncertainty</td>
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<tr>
<td>Environment distracters</td>
<td>Environment</td>
<td>Attention</td>
<td>Concentration</td>
</tr>
<tr>
<td>Social pressure</td>
<td>Culture</td>
<td>Coping</td>
<td>Affection</td>
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Figure 3. The meaning of information overload

Figure 3 shows that knowledge workers recognized the categories found in the cultural probing study (N=35). Interestingly, 71% of the respondents felt that information overload is intrinsic to their job, although other categories scored high as well. For example, 56% of the respondents associated information overload with distractors.

We also asked how often information overload was experienced (Figure 4). Although no hard conclusions can be made (N=35), the figures illustrate that people do experience information overload regularly.

Figure 4. Experiences of information overload

Postcards were distributed at the two organizations among their employees and (during a networking event) among their business relations. From the photo probing study and the postcard study it became clear that information overload had a much more practical connotation (comparable to task overload) than suggested by many literature reviews. Even though cognitive overload and the ability to concentrate were part of it, it

The categories where combined with root cause factors, mental skills and emotional state and behavior to create a conceptual framework (Table 1) in which elements of information overload can be constructed. This framework is used to guide the remainder of the information overload study.

<table>
<thead>
<tr>
<th>How often do you experience information overload?</th>
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<tbody>
<tr>
<td>Event</td>
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<tr>
<td>very rarely</td>
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<tr>
<td>once a week</td>
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<tr>
<td>once a day</td>
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<tr>
<td>once a shift (half a day)</td>
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<tr>
<td>once an hour</td>
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<tr>
<td>Continuously</td>
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</tbody>
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Table 1. Elements on information overload

Figure 2. Some results of the cultural probing study

Figure 4. The meaning of information overload

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seemed to be intimately related to the kind of tasks in which knowledge workers are involved.

**Storytelling interviews**

The elements of information overload (Table 1) were used as a guiding principle in a number of storytelling interviews conducted with knowledge workers in the two organizations. More specifically, using a storytelling approach in the interview we aim to have the respondents recall their ‘experiences of information overload’ and express what makes them perceiving it as stressful, or how they dealt with it. At Organization 1 10 persons and at Organization 2 9 persons motivated their personal information overload experiences. The interviews took between 45 and 90 minutes, and were structured by a list of 33 questions that were repeated for each of three types of tasks, well-defined, ill-defined and communication tasks.

In the first part of each interview we addressed the elements of information overload in relation to a given task, such as task complexity, purpose, strategy, sources of information, information quality, the tools used and the number of people that would typically be involved. In the second part, our attention was devoted to distractors and social pressure that could refrain the tasks at hand to be completed. We follow Jett and George (2003) who distinguished intrusions, natural breaks, and distractions. Each subject was asked for the three types of tasks how easily they would be interrupted (intrusions and discrepancies) through the requests of others, how easily they would switch tasks voluntarily (natural breaks) and whether distractors such as voices of others, incoming mails, environmental noise, etc. would grasp their attention in any sense. Each time, we asked our subjects how they harnessed themselves against such ‘task threats’.

The results show a blended picture. Few of our respondents report an overall problem with information overload. Yet, a lot can be improved if we look carefully at the problems they mention. As the task aspect appeared central in the cultural probing study we had our respondents concentrate on three types of tasks; a well-defined task, an open ended (or ill-defined) task, and a communication task. Our hypothesis was that well-defined tasks were: 'deliver', 'plan', 'realize', 'disclose', 'organize everything', 'inform', 'specify costs', 'realizing maintenance', 'organizing booth', 'making architecture', 'maintain overview', 'supervise', 'specify hours' (n=3), 'certify component', 'announce', 'solve problem', and 'request trip'. This has been summarized in 'routine tasks' (n=11), 'organization tasks' (n=4), and 'administrative tasks' (n=4).

**Findings**

Tasks respondents reported differ in character. Well-defined tasks are smallest. They mostly last between minutes and hours, are often conducted alone, and are mostly guided by deadlines. Examples are filling in forms or registrations, distributing information, and compiling progress reports. One respondent reported a case where data were lacking to complete a progress report: this consumed extra time and creativity to compensate. Consequently, the task appeared more open ended than expected.

Communication tasks typically take between half an hour and half a day. These meetings, conversations and conference calls typically involve larger groups. They often recur every so many days, weeks, or months and require some preparation upfront and some follow up actions afterwards. Hence the load for chairpersons and other participants may differ largely.

The ill-defined tasks are longest lasting. They take between weeks and months. Part of their complexity lies in the number of stakeholders involved (often three or more). Various perspectives have to be taken into consideration, the tasks are easily redefined, and deadlines easily postponed.

For well-defined tasks information gathering is clear, often through intranet and personal contacts. Information seldom needs to be stored explicitly. In ill-defined tasks respondents report they exaggerate their information collection. Additional to the intranet and personal sources, external sources are consulted. The majority of respondents store everything according to a personal logic. In most communication tasks an information coordinator collects and distributes information. This

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1 Their fourth category, discrepancies, was left out for simplicity.
socially constructed information is stored in meeting minutes. Respondents chose between extremes of keeping everything and throwing everything away.

Administrative or bureaucratic overload, forms of institutionalized distrust against professionals and communication overload resulting from misunderstanding and mismanagement are just a few terms that refer to the information burdens in well-defined and communication tasks. Well-defined tasks require routine and generally involve little information overload. If information overload is experienced, it relates to the sheer amount of information, unexpected waiting times, and limited available time. As such, tasks may be burdening when they consume time and are complex. This becomes worrisome when respondents experience task overload, when their work stays unfinished and when they are being driven from pillar to post. To cope with this multitude, respondents rely on structure and action without reflection.

Ill-defined ‘first time’ or ‘once only’ tasks require interpretation and are much more susceptible to information overload. Additional to the already-mentioned time shortage ill-defined tasks may also involve incomplete or unclear information. To cope with these inconsistencies, respondents improvise and try to re-establish some order. In communication tasks the overload risk lies rather in preparation than in attending the session itself. Communication sessions are held to gear activities to one another, form a shared picture, or the session itself. Communication sessions are held to re-establish some order. In communication tasks the overload risk lies rather in preparation than in attending the session itself. Communication sessions are held to gear activities to one another, form a shared picture, or the session itself. Communication sessions are held to make well-informed choices. Time shortage, inconsistencies, and lack of overview can all have impact. Here coping starts by making inconsistencies and misconceptions explicit.

Information overload in ill-defined and communication tasks can arouse strong emotions, including anger, irritation, fear of failure, missing grip and fatigue and even headaches. Other persons can be a source of frustration changing plans, introducing inconsistencies and missing sufficient discipline. Job stress, even felt at home, can be the result.

With well-defined tasks intrusions are common. When time is pressing subjects try to set their limits and ask people to wait. Task switches (natural breaks) can endanger the context and working speed. Most respondents therefore prefer to finalize a subtask before switching. In most reported cases, respondents give in to intrusions and distractions. Half of the respondents take measures by switching off communication channels or retreating at home or somewhere quiet. Those who give in to such involuntary interruptions often do so only to stop the demands. The risk is a delay in schedule.

Many respondents also welcome a voluntary task switch during a well-defined task. For example, when they need to wait or when a task cannot be readily continued. In half the cases reported tasks were short lived and respondents preferred to round off these tasks at once.

With ill-defined tasks interruptions come at a higher price. Yet interruptions are equally common. When concentration is lost, task resumption most often requires time. So during ill-defined tasks respondents take actions to prevent from becoming interrupted (close door, don’t answer phone). Yet half of the respondents still give in to distractions and intrusions during ill-defined tasks. These may be more urgent tasks or the people involved may simply be demanding. Again, the risk is a delay in schedule. Yet, some task switches also bring inspiration. Voluntary task switches happen for comparable reasons as during well-defined tasks: when respondents have to wait or when they are stuck somewhere further task continuation does not make sense and other activities are welcomed. Half of the respondents report that it is a matter of discipline for them not to switch voluntarily and keep concentration.

For communication tasks interruptions are considered killing for the atmosphere. Yet it happens now and then endangering the quality of the debate. The more structured the meeting, the less susceptible it is to interruptions of any kind. Setting borders is relatively common during communication tasks; the same goes for switching off communication and environmental noise. Real task switching during a communication task does not make much sense; however, a natural break for a short pause does. In general a voluntary task switch during a communication task does not harm too much.

**Tackling information overload**

To avoid information overload to occur in well-defined tasks, information must be organized, borders need to be set and unnecessary (communication or information) channels need to be temporarily blocked. In ill-defined tasks the challenge is to devote sufficient time and concentration in the first place. Next to define the context, time reservation and task focus matter most. For communication tasks the simple rule of thumb seems to be to create and maintain an overview of agenda items and simply limit the number of meetings. When comparing our findings for well-defined, ill-defined and communication tasks, various solutions for information overload seem to be of interest to take into account in the design of practical information overload solutions.

**Well-defined** tasks may be information intensive. The challenge here is to have sufficient information access. Organizational intranets are often the place to turn to. If intranets lag behind, personnel will spend unnecessary time to collect systematic information. However a high quality intranet will also demand devotion of the same personnel to keep records up to date and share new information.

**Ill-defined** tasks are most susceptible to information overload in its purest form. Not knowing what belongs to a task and what does not, the information collection, information processing and communication around an ill-defined task can get out of hand. The challenge is to reserve sufficient time to reflect and plan the process, and not to be trapped in any open ended information gathering adventure.

The information intensity of communication tasks depends on the meeting chair. A good chair knows the trade off between content and process, and between
information absorption and information processing; and leaves room for discussion. Ideally no or little new information should be brought to the table when professionals meet. They should have done their reading and thinking beforehand. The practice nowadays is that meeting preparation can be just-in-time, which is often just-too-late. This all results in unprepared attendants who need to improvise and slow down the decision speed; and most likely affect the meeting quality. Too often meeting length and frequency rise when preparations are meagre. Just-in-time will not save costs.

REFLECTIONS ON APPLIED METHODS
With the interviews we not only aimed to improve our insight in information overload, but also to find suggestions for designing support to cope with it. In order words, to let the ‘sufferers of information overload’ learn from the best-practices of the thick-skinned champions to improve overall performance of knowledge work.

Let us compare our time-consuming open questions approach to a hypothetical multiple-choice alternative. Had we asked people to indicate in a multiple choice paradigm whether their well-defined task would be a routine task, an organization task or an administrative task, subjects might have gotten confused, whereas they could easily articulate the goal of their task in their own words. As nobody knew upfront which categories would cover the field, an alternative multiple-choice question could have looked something like: ‘The goal of your task is to…’ {‘perform a check’, ‘order something’, ‘follow a procedure’}. So the idea of routine would have been missed entirely, unless a much wider range of choices would have been offered laying extra burden on the subjects and us researchers.

What lessons have we learnt by using several design methods for understanding? Our task-oriented interviews result in different information overload characteristics than our earlier probing methods. In the photo study, we captured the fact that information overload has a social component. People experience information overload due to distractions and social pressure. This was less obvious in the interviews. Subjects reported that forced task switches are irritating, but they did not particularly describe these switches as unpreventable. Many of the well-defined (and little challenging) tasks were experienced as irritating or even frustrating; sometimes because it distracts them from their inspirational work.

Regarding the ill-defined and communication tasks respondents blame their own lack of discipline. Information ambiguity is definitely a clear factor in both studies. Many remarks about lengthy discussions and reworked plans are made in the context of ill-defined and communication tasks. Respondents mentioned their inability to select the right information and stop in time. This may as well indicate the poor quality of information sources or underdeveloped abilities for information retrieval as the inherent task complexity. However, task complexity mostly comes up when we ask subjects how susceptible their ill-defined and communication tasks are to distracters. There is a clear tendency to shut off any physical or social noise as soon as things require real concentration, and ill-defined and communication tasks really do so. Distracters appeared to be welcome as well as unwelcome. Most respondents report that they know when a distracter is welcome or not, but it is more difficult to end environmental noise in an office garden than in settings where doors can be closed or quiet hiding places are available. Some respondents really need to be ‘service minded’ during working hours and cannot shut off distracters. In their circumstances the real concentrated reading and thinking shift toward evening work and homework.

The task-oriented interviews rather focus on what happens within a task than on events between tasks. To illustrate, the photographs, postcard study, and the critical incident interviews show multitasking as well. The very fact that respondents photograph their e-mail inbox again and again, whereas they hardly mention e-mail in the interviews tells something about the peculiar status of e-mail. It demands attention in the working place and yet one cannot associate it with specific activities. The dangers of exaggerated e-mail dependency are obvious. Workers lose their focus, are easily distracted and easily distract others with unarticulated and half ready questions and information. The working style that e-mail obviously evokes is a real-time, react-now style. Too many just-in-time activities endanger deeper concentration and eventually burden the ill-defined and communication tasks. They will take longer than necessary and their quality may be less than required. The heart of what information overload really is may very well lie between tasks rather than within. Task support should therefore be ‘focus support’ in the first place. The more communication media surround us, the larger the challenge to use them wisely and sparingly to let our greatest resource, our own brain not be overstressed and misused.

In conclusion
To conclude, the open-ended storytelling style allowed us to hear ‘through’ the voices and concerns of our respondents. Their characteristic remarks allowed us to make some classification of coping strategies with respect to information overload. Our respondents were too experienced to really work without structure, so we expected that many of the so-mentioned ill-defined tasks would turn out to be just defined differently, for instance with more consultation and iteration. Approaching information overload in such a comprehensive way not only improved our insight in the concept of information overload; it also helped us to provide support that improves individual knowledge workers in their work. What’s more, the method used made the knowledge workers that participated in the current study more aware of how they dealt with information overload, and how they could improve their working activities. Put differently, it makes them reflect. In keeping with Frayling (1993) who distinguished between research into design, research for design and research through design, using design methods for understanding can be seen as an extension of research through design.
DESIGNING PRACTICAL IMPLICATIONS IN CONTEXT

Given the results and observations from our studies we constructed a set of guidelines tailored to address information overload. First, a long list of possible guidelines was created during a brainstorm session. We then categorized the guidelines into sender, receiver, tooling and organization guidelines. In this way we recognize that the guidelines influence different factors and require different implementation strategies.

Sender and receiver guidelines are directly targeting a person’s way-of-working, attitude and responsibilities (e.g., good practices). Sender guidelines aim to increase awareness such that senders communicate and distribute information more effectively and efficiently. Receiver guidelines aim to provide sufferers of information overload with coping strategies and role-based best practices. Tooling and organization guidelines provide the right conditions from an organizational point of view, to let employees or groups of employees be as effective and efficient as possible. Tooling guidelines contain hints to improve the tools used to organize and manage information on a personal as well as organizational level. Last, organization guidelines are aimed at introducing training and awareness programs throughout the organization, as well as the introduction of organization-wide principles. This means that higher management must be committed to invest in the problem to really generate effects within the organization.

The above guidelines need different implementation strategies because they address different aspects of information overload. Furthermore, to facilitate the absorption and acceptance of guidelines different ways for introduction must be considered. A good approach depends not only on the nature of the guidelines and the audience, but it also depends on the organizational culture. The guidelines to be introduces should be targeted to this. For example, in some organisational cultures will humorous texts or out-of-the-box gadgets better reach their goal, whereas other organisation cultures demand more formal ways to communicate guidelines to deal with information overload. In the workshop we therefore made an inventory of possible designs and approaches. From this inventory we created per guideline a short list of acceptable alternatives in keeping with the culture of the studied organization. Currently, we are implementing and evaluating these guidelines (see Janssen & de Poot, 2006).

DISCUSSION AND CONCLUSIONS

From our study it can be concluded that the foremost causes of information overload are too much information and ambiguity of tasks. Many people, especially knowledge workers, report that they have too much information at their disposal. Too much to process at a moment’s notice, too much too quickly decide what’s relevant and what not. Quite often, information is perceived as ambiguous. Just a few reactions from our study to illustrate: Why has this e-mail been sent to me? Am I expected to act on it? Increased ease of communication is an often-mentioned evildoer that creates this sense of information overload. For example, with e-mail is the threshold to send messages is very low, and it is very easy to distribute mail messages widely, using a long list of possibly interested people. The feeling of information overload can also be caused by the knowledge worker's typical tasks. Many tasks are open, not clearly defined. On the one hand this offers the knowledge worker ample freedom to interpret a task, on the other hand it offers no guidance in determining its limits. Does the information at hand suffice? Or should one continue to mine these readily available and seemingly infinite sources of information. Also many knowledge workers perform multiple tasks at a time. The employees easily switch between two tasks while finishing a phone call concerning yet another matter. Such multitasking is in fact quite stressful for employees. Every disturbance creates a backlog. It takes additional time to resume the task at hand. This is not efficient. All in all, information overload is not just a matter of receiving too much information at a time. It also relates to not knowing what information is out there, to its quality, and the work that an employee has to conduct. Possibly cognitive overload is a more appropriate term, signifying that the information absorption rate surpasses the ability to digest it. Many more aspects around information processing are involved here.

Consequences of information overload

In the literature and even in newspapers we can read that information overload leads to a lot of stress. Employees cannot make decisions efficiently, due to information overload. Yet, knowledge workers have found ways to cope with it. This does not mean however that they are happy about the situation. In our research we look for ways to help knowledge workers to handle information more effectively. This can be done by teaching knowledge workers how to organize their work differently, to alter certain dangerous habits, for instance through tips and training. Also, it is possible to take the working habits of employees as a starting point and subsequently improve their information handling by means of technological improvements. Overall, the solution starts by raising awareness about the topic.

So, what is the main lesson learned in our study. As said before, the heart of what information overload really is may very well lie between tasks rather than within. Task support should therefore be ‘focus support’ in the first place. The more communication media surround us, the larger the challenge to use them wisely and sparingly to let our greatest resource, our own brain not be overstressed and misused.

Information overload is relative, not least because our society imposes an ever more challenging media palette (Johnson, 2005) that new generations take for granted, while it scares existing generations. From the game and image literate screenagers (Rushkoff, 1996), to the highly interactive net generation (Tapscott, 1997), to the multitasking generation Y (Scott, 2005) that was born digital and takes texting, gaming, the web, Ipod video as lifestyle elements, new generations feel at ease with information loads that overwhelmed earlier cohorts (Grudin, 2005).
New media literacy sometimes may seem imprecise; however, in fact the thinking is just different. Understanding may be scattered compared to preceding generations (Clarke, 1997), but its effortlessness creates room for activities and interactions that also stimulate the brain. New generations should therefore be left free to cope with complexity in their way. Tasks that are now seen as scattered may be perceived as unified in the future; and currently unified tasks may then become scattered. More importantly, many tasks that now draw our attention may be fully automated in the near future, leaving room for new tasks that we tend to overlook. Forms of social web weaving by blogging, texting and communities may be examples of that. Within one human generation one distinguishes some 5 cohorts such as the passive welfare or ‘lost’ generation, romantic generation X, and the aforementioned skeptical screenagers, playful netagers, and explorative generation Y. In a typical organization, information services therefore need to be made adaptive to compensate for the immature or inflexible brain capacities (Dresang, 2005) to prevent a digital divide from occurring between generations.

Our interview and storytelling results indicated that a minority of our respondents reported an overall problem with information overload. And yet, a lot can be improved if we look carefully at the problems they mention. Approaching it from a ‘generational’ perspective, the urge to collect and process all available information may well fade away over time. New ‘media literate’ generations who have grown up in information overload instead of scarcity, understand that more information will not help people to make better decisions. Yet data showed that many respondents still have not adopted any new thinking. They just feel more secure when they have more information at their disposal. What started out as diligent behaviour when they grew up, has gradually turned against them. Now they need to learn not to overindulge and understand that less information and fewer tasks at a time will allow them to manage their time more efficiently. Paradoxically younger generations indulging in similar information amounts may cope with that easily.

So, what one perceives as information overload, may be perfectly manageable to the other. Measures should always take these personal characteristics into account. As we see it, information overload is primarily a personal responsibility. Secondly employees need to understand how they impose information overload on others. These two being solved, digital tools can be introduced to work more effectively and process information more easily.

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