

Why do we blame information for our overload?

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It's Not My Fault; It's Information Overload!

"This is why I am not getting anything done. I am suffering from information overload!" This has been the salvation of writer blocked tech journalists for 15 years. When you don't know what to write, you can always go down the hall to your editor and say "hey, I want to do a story about information overload". And the editor, looking up from their overflowing email inbox, says "that's brilliant!". And you always get to do that story, and so for 15 years we've been reading the *same* story about information overload. (Shirky, 2008).

This chapter discusses the concept of information overload. Information overload is often cited by researchers, as well as by journalists and consultants, as one of the main causes of work-related pressures. My goal in this chapter is to explore what we refer to when we talk of "information overload," and to suggest that although the workplace pressures attributed to information overload are very real, the concept itself is vague and poorly defined. I then try to isolate the actual causes of the workplace pressures that currently fall under this all-inclusive term, and to unveil two underlying fallacies that hamper our ability to identify and address these causes. These lead me to propose a new agenda for researching and for dealing with these causes of workplace pressure.

Information Overload – One Concept, Many Definitions

As already alluded to in the quote by Clay Shirky used at the beginning of this chapter, information overload is a term often used and misused by both laypeople and professionals. What, then, is information overload? An excellent review of the academic literature on the concept of information overload was published by Eppler and Mengis (2004). It reviews dozens of articles that deal with information overload and organizes the findings. I will use the framework offered by Eppler and Mengis to present the concept of information overload: situations in which information overload occurs, definitions of information overload, its causes and symptoms, as well as countermeasures that were suggested to deal with it.

Information Overload Situations

In what situations do people experience information overload? Eppler and Mengis (2004) divide these into three useful groups: (1) Information retrieval, organization and analysis processes; (2) Decision processes; and, (3) Communication processes. Let's explore examples from each of these groups. The most obvious example of overload associated with retrieving information, organizing it and analyzing it is that of using search engines for finding information on the Internet (Berghel, 1997). Other publications relate to additional information seeking activities (Case, 2012) such as analyzing accounting information for signs of financial distress (Chewning & Harrell, 1990), staying up to date on medical articles and guidelines (Hall & Walton, 2004), or marketing activities such as competitor analysis and advertising media decisions (Meyer, 1998). Decision processes that lead to overload range from decisions taken by highly trained professionals such as air traffic controllers (Sperandio, 1978), to the challenge of choosing between the large

numbers of alternative products consumers encounter as they shop for everyday items such as breakfast cereals or gourmet jams (Iyengar & Lepper, 2000; Jacoby, 1984). Finally, information overload occurs during all communication processes including emailing (Whittaker & Sidner, 1996) and online discussions (Jones, Ravid, & Rafaeli, 2004), as well as during other forms of face to face and mediated communication events (Hudson, Christensen, Kellogg, & Erickson, 2002; Sparrow, 2002) such as face to face meetings, video conferences, or phone-based teleconferences.

Definitions of Information Overload

Eppler and Mengis (2004) identify seven general definitions of information overload which appear in the literature. All of the definitions focus on a specific excess of information, which exceeds a given capacity, and which leads to a negative consequence. The definitions differ in the capacities and the consequences to which they pay attention. Several of them focus on the limitations of human information processing capacity. They suggest that information overload occurs when this capacity is exceeded, leading to negative consequences such as (1) not utilizing all of the available information for the decision; (2) not utilizing all of the required information in the decision making process; and (3) stress and confusion. Others focus on time as the limiting factor, and suggest that overload occurs when there isn't enough time to process the information. Others still, focus on the subjective negative experience of decision makers who suffer stress, overstimulation and anxiety, which they attribute to being overloaded with information.

As is evident from these attempts to make sense of the many different definitions of information overload, the concept is not well defined. Consequently, it

is not surprising that information overload is difficult to measure and to study. The concept has several objective components such as the amount of information and the time consumed processing the information. It also has some subjective components such as decision quality, sense of stress, or satisfaction. Moreover, some of the components are not independent, and might be influenced by the amount of information. For example, it is not clear how information processing ability is influenced by the amount of information available (e.g., Streufert, Suedfeld, & Driver, 1965).

One of the more useful illustrations of the information overload concept is the inverted U-curve (e.g., Hwang & Lin, 1999). Figure 1 illustrates how information overload occurs when a specific desired outcome requires the input of information, and when the quality of the outcomes improves, at least initially, as the amount of information increases (region a). Like most processes that have inputs and outputs, information processing too exhibits the phenomenon of decreasing returns (or decreasing marginal returns), namely that as inputs are added, the quality of the output does not increase linearly and shows saturation (region b). Finally, more input actually has the harmful effect of negatively impacting the output, and the direction of the graph starts to drop (region c).

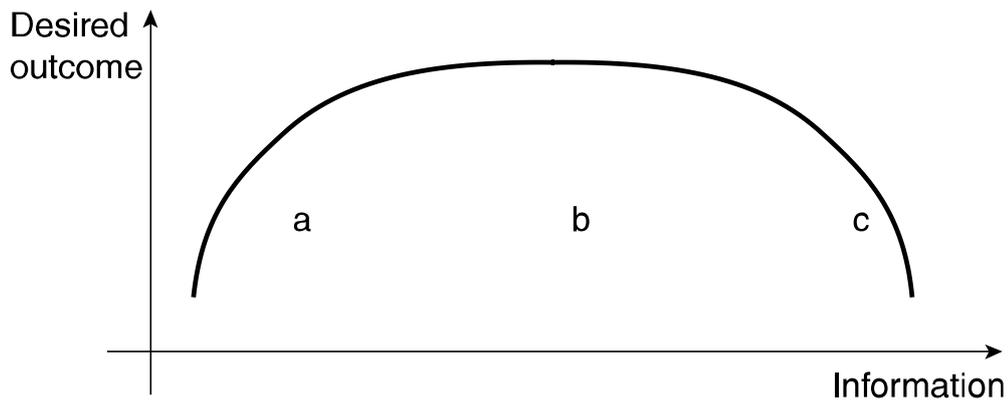


Figure 1. The inverted U-curve of information overload, detailing region a – decreasing returns, region b – saturation, and region c – inversion.

This phenomenon of "too much of a good thing" is not unique to information. An obvious example would be food consumption and health. Living creatures require an adequate amount of food in order to sustain their health, and lack of food leads to malnutrition and hunger. Nevertheless, too much food leads to obesity and health hazards. Similarly, when it comes to weather, a lack of sufficient precipitation leads to drought damages, while too much precipitation leads to flooding damages.

A good demonstration of the ambiguity of the information overload concept is the large number of concepts used synonymously with it or which are closely associated with it. These include: information fatigue syndrome (McCune, 1998); cognitive overload (Kirsh, 2000); technostress (Ayyagari, Grover, & Purvis, 2011); data smog (Shenk, 1997); technology crowding (Karr-Wisniewski & Lu, 2010); sensory overload (Lipowski, 1975); information anxiety (Wurman, 2000); info(rmation) glut (Denning, 2006); continuous partial attention ("Continuous Partial Attention," n.d.); attention deficit trait (Hallowell, 2005) ; infomania (Zeldes, Sward, & Louchheim, 2007); infobesity (Bell, 2004; Morris, 2003); and, communication overload (Franz, 1999). A quick search using Google's Ngram viewer ("Google Ngram

Viewer," n.d.) reveals that the usage of many of these terms has been on the rise since the 1960's, and that the top two most popular ones are information overload and sensory overload. A close reading of the academic and popular literature reveals significant inconsistencies in the use of these terms and of "information overload." In some cases the terms are used interchangeably, and in other cases specific distinctions between the terms are made by particular authors, only to be disregarded by later authors.

This brief review of the concept of information overload demonstrates that the term information overload is poorly defined and inconsistently used. In this chapter I suggest that despite this vagueness, the ubiquity of the term and of related terms in the scientific literature, in books, and in the popular press, implies that it signifies something real, and that this thing is a stress experienced by citizens of the information society. This stress is linked to "information" since it is closely associated with the ever increasing amounts of information delivered via a constantly rising number of information and communication technologies (ICTs). Nevertheless, as I discuss in the following section, the current conceptualizations of information overload need to be carefully evaluated if we wish to make further progress towards overcoming the ubiquitous stress attributed to "information overload."

What's Wrong with the Information Overload Concept?

The weakness of current perceptions of information overload stems from the fact that many of them are *technologically deterministic*, and that they are based on a false *utopian/dystopian dichotomy*. Let's explore these two concepts: technological determinism and the utopian/dystopian dichotomy. Technological determinism is a concept developed by proponents of social construction of technology (SCOT)

(Bijker, Hughes, & Pinch, 1987). Determinists describe technology as an entity that develops autonomously, and that determines, to a large extent, societal development (Bijker, 2010). SCOT researchers have shown that the evolution of technology is not deterministic, and that the many decisions involved in its development are influenced by society and by societal values. They have also shown it is naïve to assume that technology influences society, without acknowledging that society influences technology. They go on to show that one of the main consequences of a deterministic view of technology is that it often leads to the false dichotomy of classifying specific technologies as "good" or "bad" – the utopian/dystopian dichotomy (Kalman, Raban, & Rafaeli, 2013). SCOT researchers make convincing claims that show the futility of arguing whether a specific technology (e.g. guns, nuclear power, or social networking services) are "good" or "bad." They also show that the societal benefits (or harms) of technologies are not intrinsic to the technologies, but rather are a consequence of the way the technology is developed by society, and the way it is adopted and used by society.

An Example of Dystopian Technological Determinism

In what way is the common conceptualization of information overload deterministic? And how does it exhibit the characteristics of the utopian/dystopian dichotomy? A good demonstration of this conceptualization is a study of technostress published in the prestigious MIS Quarterly (Ayyagari et al., 2011). Technostress is one of the terms used synonymously or in close association to information overload, and it describes "a modern disease caused by one's inability to cope or deal with ICT's in a healthy manner" (Ayyagari et al., 2011, pg. 832). In their study, the authors focus on workplace technostress, and identify a list of five

workplace stressors that might be linked to ICTs. They are: work overload, role ambiguity, job insecurity, work-home conflict, and invasion of privacy. Then, they measure how each of these are related to other constructs and to technostress.

The study is carefully designed and controlled, and its findings are important and interesting. What I focus on is how the five workplace stressors are operationalized in the study. For example, the work overload construct comprises three items which the study participants are asked to provide their agreement to: (1) "ICTs create many more requests, problems, or complaints in my job than I would otherwise experience." (2) "I feel busy or rushed due to ICTs." (3) "I feel pressured due to ICTs." The work-home conflict comprises items such as (1) "Using ICTs blurs boundaries between my job and my home life." And, the role ambiguity construct comprises items such as (1) "I am unsure what to prioritize: dealing with ICT problems or my work activities." And, (2) "I can NOT allocate time properly for my work activities because my time spent on ICTs-activities varies."

If one looks at all these items, it is clear that these stressors that lead to technostress are operationalized by "blaming" technology and suggesting that ICTs create requests, make us feel busy, rushed, or pressured, and that they blur boundaries, and take away time from work activities. But, a SCOT researcher would point out that it is not the ICTs that create the requests, but rather people who use the ICTs to send messages or to assign tasks. It is not the use of ICTs that blurs the boundaries between work and home, but rather the managers, colleagues or clients who expect work to be carried out at home (or family and friends who expect employees to divert attention to them during the workday). And, it is unclear priorities set by managers and organizations that lead to role ambiguity in regards to

the balance between ICT related activities and other work activities. Blaming ICTs for work pressure, work-home conflicts, or role ambiguity does not make sense, and is a good example of technological determinism and the false utopian/dystopian dichotomy.

Overload: Perception vs. Reality

Nevertheless, the sense that ICTs are to blame for these stresses is pervasive, and the Ayyagari et al. (2011) study reflects this widely-held belief. This belief is elegantly demonstrated in a study by Barley, Meyerson, and Grodal (2011). In this study, the researchers studied the communicative activities of employees in a high-tech firm. Their goal was teasing apart the impact of two categories of influencers of workplace stress and sense of overload. The first category, often studied in the past, is the material properties of the communication technologies the employees used. The second category, which received much less attention in prior literature, is social forces. This research perspective, which accepts that both social forces and material properties of technologies influence experiences such as the stress of information overload, is the sociomaterial approach (Orlikowski, 2007). It asserts that these two categories of influencers, social and material, are entwined and interdependent, and that studying one without regard to the other, leads to a partial understanding and to debatable conclusions.

Barley et al. (2011) tried to understand how email and other ICTs contribute to workplace stress and overload, by examining the technologies used by the employees, and how these are entangled with social norms, interpretations, and with the daily workflow. They tried to understand why the same technologies that are perceived as adding flexibility and bolstering the employees' sense of being able to cope with their workload are also perceived as the cause of stress and overload. Their findings were instructive. They reported that about two thirds of the employees' average workdays (6.4 hours out of 9.4 hours), were spent

communicating. These 6.4 hours were spent about equally on meetings and face-to-face encounters (34%), email (31%) and phone calls or teleconferences (30%). The remaining 5% were spent using various other technologies such as instant messaging, video-conferencing, and voicemail. Note, that of these three major modes of communication, email is the only asynchronous mode of communication, a mode of communication that does not require an immediate response and that offers some flexibility in regards to timing.

The researchers examined the participants' communication logs, and the surveys and interviews that evaluated the attitudes, stresses, perceptions, and interpretations of the employees who participated in the study. The examination revealed an important gap between participant perceptions, and reality. The participants believed that the more they used email, the longer they worked, and that this increase in work time led to an increased sense of overload. Nevertheless, the findings of the study show that the assumption that the increase in time devoted to email is the major source of the overload was overly simplistic. In fact, email use was related to stress regardless of how much time participants worked. Moreover, the participants were not aware that teleconferences and phone calls were also associated with longer working hours, and that time spent in meetings also increased workload. In other words, it seems like people focus on email as the cause of increased work hours and of increased sense of overload, and ignore other time sinks and causes of overload. The authors conclude that "rather than attending to how much time teleconferences and meetings consumed ... interviewees focused on their inboxes as the salient source of overload and the target of their complaints"

(Barley et al., 2011, pg. 901). Thus, email is perceived not only as the single source workplace stress, but also its symbol.

In light of these findings, is it surprising that ICTs¹ are blamed for workplace stress, in a technologically deterministic and dystopian manner? In fact, it seems as if the same material properties of ICTs such as email that provide users with more control and flexibility, are the properties that make email stand out from the crowd of other communication activities as the one that leads to overload and stress. It is easier to focus on email work during off-work hours than on the face-to-face meetings and teleconferences that consumed a large part of the workday, leaving the employee with little time for other tasks. This is somewhat analogous to complaining about the high cost of gasoline, and ignoring the impact of insurance, car payments, maintenance and repairs, on the high cost of car ownership.

The findings that there is a gap between the perceived causes of overload and stress, and the real causes, are not unique to the Barley et al. (2011) study. For example, Kock, Parente, and Verville (2008) identified gaps in the perception of information overload that stem from nationality (US versus New Zealand). Gaps in the perception of information overload that stem from differences in the perception of email as a "business critical" tool have been described by Sumecki, Chipulu, and Ojiako (2011). And, gaps that stem from different email management tactics have been described by Dabbish and Kraut (2006). Furthermore, it was shown that activities that increase overload, such as multitasking, might not improve

¹ The Barley et al. (2011) study is based on data collected in 2001-2, before the wide use of ICT's such as smartphones and applications associated with them.

performance, but still satisfy other needs, for example by providing emotional gratifications (Wang & Tchernev, 2012).

In the first part of this chapter we reviewed the academic literature on information overload, and saw that the concept is poorly defined and its usage is inconsistent. In the second part of the chapter we reviewed several studies of people's perceptions of workplace overload, and of the attributions they make in regards to the causes of these pressures, and saw that people's understanding of these pressures and of their causes is also vague, highly subjective, and often lacking and not in line with the empirical evidence. Nevertheless, it is also clear that the pressures and sense of overload described in the studies are real, and that they have a negative impact on the wellbeing of knowledge workers. The question is how to move away from the deterministic dystopian attitude to ICTs and workplace stress, and develop a research agenda that will further our understanding of these pressures. The next section proposes an answer to this question.

Different Loads for Different Folks

I propose that the pressures that fall under the category of "information overload" and which are experienced by workers in general, and by information workers in particular, arise from three separate but overlapping loads that characterize the typical workplace of the knowledge society. These three loads are work load, communication load, and information load (Fig. 2). Each of these loads is different, but they overlap to varying extents, and are thus interdependent. Because of these interdependencies, treating or studying only one of them is not fruitful. An unreasonable amount of any of these three loads will lead to overload, and this

overload can lead to stress, but it is important not to confuse the three terms: a load is different from overload, and both of these are different from stress.

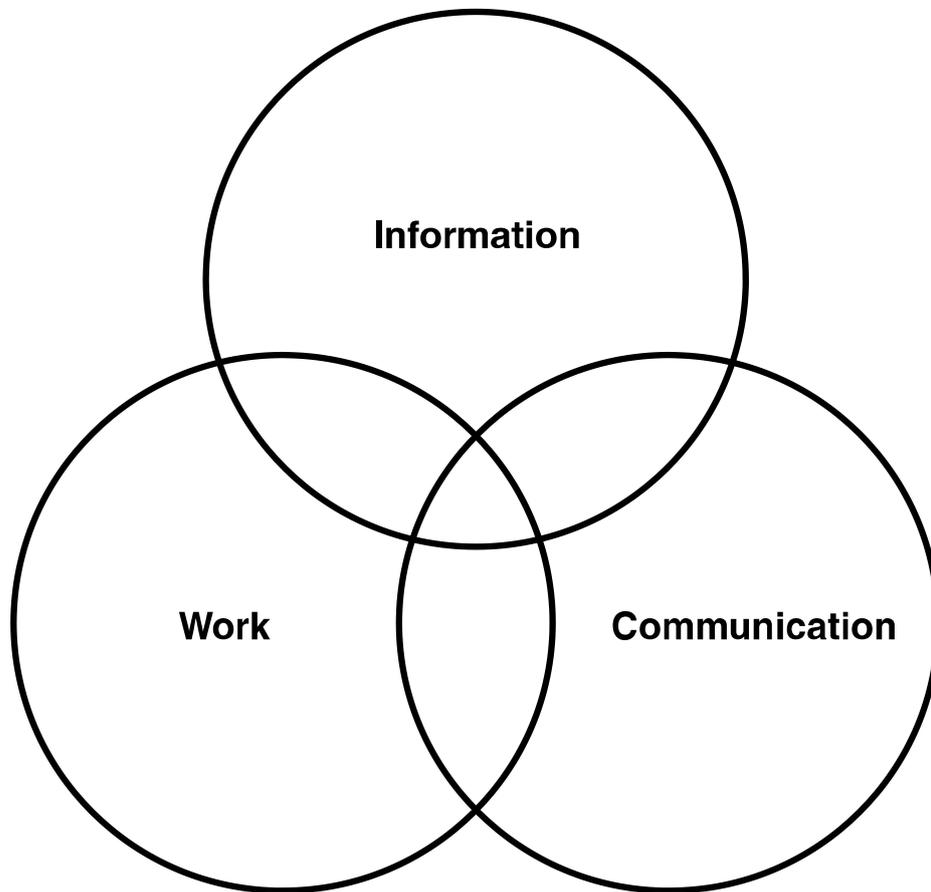


Figure 2. The three loads that characterize the workplace.

In order to demonstrate the need to distinguish between the three loads, as well as between load, overload and stress, let's take the way a knowledge worker, for example a manager, uses email in the workplace. This manager uses email extensively to carry out her job responsibilities. She uses it to communicate with her managers, subordinates, clients and other organizational stakeholders. A lot of the information she needs arrives via email, though she also uses many other information sources. Now, let's examine what could increase each of the three loads

on this manager. The work load could increase as a result of the manager being assigned new duties that have in the past been assigned to a colleague who is no longer employed by the company. The communication load could increase as a result of the company adding a new company-wide communication tool such as instant messaging to all company computers, and requiring employees to monitor it during the workday. Or, as a result of an increase in the number of company-wide messages that originate from the human resources department, messages updating employees about new procedures, events, and benefits. The information load could increase as a result of the company purchasing a license for the manager to access a database that includes large amounts of valuable information about competitors.

Each of these increases in load would either be an increase that the manager could absorb, or an increase that leads to overload, i.e. to a situation where the resources that the manager has are no longer enough in order to deal with the increased load. In the case of the new duties, the result of the increased work load would be considered work overload if, for example, her ability to perform her old duties would be diminished, as well as her ability to perform the additional duties. In the case of the increased communication load, we would consider her to experience communication overload if as a consequence of the new medium or the additional messages, she will no longer be able to stay on top of all her incoming messages and to provide timely responses. In the case of the new license for the valuable database, we would consider the consequence to be information overload if, for example, the manager would find herself spending a lot of her research time in the new database, but ending up with less actionable information to assist her decisions than she had in the past.

In addition to these three examples of possible overloads, each of them could either cause stress for the manager, or not. For example, in the case of communication overload, the manager might overcome the overload by taking a training session that will improve her ability to deal with large amounts of workplace email (e.g., Soucek & Moser, 2010), and consequently avoid the stress. Or, she could decide to filter all the incoming messages from human resources, and read them at home over the weekend. If this does not result in a home-work conflict, this might be a solution that prevents the manager from experiencing the stress associated with communication overload.

Identifying Root Causes

The goal of the manager example was to demonstrate the differences between the three main sources of workplace loads: work, communication, and information, as well as the difference between "load", "overload" and "stress". The different sources of load could lead to overload and stress, and if we wish to deal with these negative consequences, we need to be clear about the source of these negative consequences. In other words, we are looking for the *root cause* of the overload and stress the employee is experiencing. For example, if an employee experiences stress since he or she is dealing with ever increasing numbers of emails during unusual hours (early in the morning, late at night, over weekends and holiday, and during vacations), it is essential to identify the root cause of this situation.

The root cause might be work overload that leads to less time to "do email" in the office, or simply added work responsibilities that lead to more email correspondence. Alternatively, the root cause might be information overload, for example if the employee joined a very active mailing list that is an important source

of information. Finally, the root cause might be communication overload, since there is a significant increase in the exchange of email messages within the company.

Unless we understand the root cause of the stress the employee experiences, it is unlikely that our solutions will help overcome the stress. For example, if this employee who reports stress due to unmanageable amounts of email is working for a manager who feels that when a subordinate is not working evenings and weekends, that subordinate is not productive enough, then the root cause of the employee's overload and stress is work overload. In this case it is unlikely that providing such an employee with tips and technologies on dealing with emails more effectively would help. The only consequence of more effective handling of emails by this employee would be that the manager would continue adding tasks and assignments until the workload again forces the employee to work evenings and weekends.

Information Overload, Then and Now

Having made the distinction between the possible root causes, as well as between load, overload and stress, it is important to note that these distinctions are very difficult to make, especially in the case of knowledge workers. For knowledge workers, *information* and *communication* comprise a significant part of the *work* they do, and it is difficult to separate their effects. A rise in the workload leads in many cases to increased communication and an increase in the amount of information required to carry out the new tasks. Nevertheless, despite the difficulty, disentangling the roles and impacts of these loads in the contemporary workplace remains an important challenge to researchers and practitioners.

Information overload is not a new phenomenon. The biblical Ecclesiastes already complained that "of making books there is no end, and much study is a weariness to the flesh" (Ecclesiastes, 12:12, 1917 JPS edition), and we hear concerns about the difficulties of dealing with the ever increasing amounts of information throughout recorded history. Nevertheless, the amount of information we deal with on a daily basis at home and at work is constantly on the rise (Neuman, Park, & Panek, 2012; "Special report - Managing information," 2010), and we are constantly finding new ways to use this information (Weinberger, 2012). Russell Neuman, cited above, tells the story of a panel of experts that was convened in the early days of trains, to study the possible psychological effects trains might have on passengers. They concluded that as trains increase their speed, we will reach a psychological speed limit above which the passengers will no longer be able to look out the windows. The reason would be that the amount of information that will flood them from the fast changing scenery outside will overload their brains and cause psychological damage. The experts recommended that when those speeds are achieved, the transparent windows will be covered or replaced.

History teaches us that all of the dire predictions about our inability to deal with an ever increasing amount of information were disconfirmed. On the contrary: society succeeds in leveraging knowledge to advance science, to improve living standards, fight illness and increase lifespans. This effect is most apparent in the postindustrial rise of the knowledge economy, or information society (Machlup, 1962; Porat, 1977), where an increasing percentage of the workforce comprises knowledge workers who produce knowledge goods (Kalman et al., 2013).

Although the discussion of information overload is not new, it is now a widespread phenomenon that permeates much wider audiences. What has changed in the last few decades? What are the forces that encourage work, information and communication overload in our society? The rise of the information society and knowledge economy created an environment where information is both the chief economic input and output. Unlike the industrial age, which gradually developed optimization methods that steadily improve the ability to turn physical inputs and labor into tangible outputs, the relationship between inputs and outputs in the knowledge economy is more difficult to measure and to optimize.

Despite interesting first steps towards the understanding of value-creation by knowledge workers (Spohrer, Maglio, Bailey, & Gruhl, 2007; Spohrer, Vargo, Caswell, & Maglio, 2008), we are still far from understanding at what point the three workplace loads we discuss here, information, work, and communication, become overloads, and negatively impact outputs. It is an economy where innovation and creativity are important, but also the ability to plan and to execute according to plan; an economy based on information which can, once digitized, be duplicated indefinitely and almost at no cost; it is an economy that is not based on scarcity, but rather on the abundance of information which is its main input and output; and, it is a highly competitive economy where change is the only constant. While we might be making progress in our ability to optimize the productivity of help-desk personnel and sales representatives, we are far from this level of understanding in regards to employees for whom the relationship between inputs and outputs are more complex, employees in roles such as managers, marketers, researchers, instructors, or designers.

One of the common solutions to the difficulty of assessing the required inputs for these employees, and the value they create, is to use crude heuristics and rules-of-thumb such as "the more the better," "keep them busy," or "idleness is the mother of evil." In other words, overload the employees with tasks, and with information. The rationale is that if we can't measure the employees' productivity, at least we can ensure they are busy all day, emailing, flooded, and complaining about overload and stress. Needless to say, this is not an effective approach, and often it is counterproductive. The fallacy of the assumption that keeping employees busy all the time is a key to productivity has been refuted even in regards to traditional industries (e.g., Ronen, 1992), and this certainly applies to knowledge work, where employee creativity, innovation and motivation are cherished.

Unloading the Future

So far in this chapter we saw that information overload and related terms are poorly defined but widely used, and that this wide usage reflects a ubiquitous sense of stress related to knowledge work and to usage of information and communication technologies. We learned that this stress is a result of at least three main categories of loads – work, information and communication, and that although these three are highly interdependent, it is important to identify which of them is the root cause of the stress the employee experiences. How could these insights guide future research on workplace pressures, and how could they assist practitioners such as managers and employees better cope with these pressures?

The first step is to distinguish among the root causes of the stress attributed to information, communication or technology overload, and identify the causal chain that leads to these stresses. Even if people feel, for example, that their stress is a

consequence of too much email, researchers need to explore deeper and see whether they can identify causes that lead to the excessive email: is it work overload, information overload, or communication overload. Based on anecdotal evidence, it is more likely that most of these cases are a result of work overload: too many tasks, and insufficient resources. Identifying root causes is not an easy challenge (Andersen & Fagerhaug, 2006), especially in regards to the complex ecosystems in which knowledge workers find themselves (e.g., Ahuja, Chudoba, Kacmar, McKnight, & George, 2007). Nevertheless, until these are identified, probably through a combination of qualitative and quantitative methods, the fruitfulness of efforts to lower stress levels will be limited.

Once the root causes are distinguished from effects that are further down the causality chain, the next step is to better understand the incentives that promote the different types of loads and overloads. Different types of loads and overloads will be associated with different incentives, some more obvious, such as the belief of managers that overloading an employee is the way to increased productivity (Brown & Benson, 2005), and some less obvious. A good example of a covert incentive is the phenomenon of self-interruptions by knowledge workers who stop in the midst of working on one task, to engage in another task such as checking for new email, and browsing news websites or social networking sites. What do they gain by breaking their concentration and diverting it to another, unrelated, task? One possible incentive to self-interrupt in order to check for new messages might be the mechanism of variable interval reinforcement, which was shown to reward brains through the release of dopamine (Freeman, 2009). More research is required to

understand the motives to self interrupt (Adler & Benbunan-Fich, 2012; Jin & Dabbish, 2009).

Finally, once we have a better understanding of the root causes of the stresses, and of the explicit and implicit incentives that perpetuate the loads and the overloads that lead to these stresses, it should be possible to devise more effective solutions to the stresses, and to evaluate their efficacy. The solutions could be organizational, as well as technological. Moreover, the most interesting solutions would probably combine organizational changes and technology. A good example of the complex relationship between organizational attitudes and practices that use technology to reduce stress is provided in a study by Leslie, Manchester, Park and Mehng (2012). The study showed that flexible work practices such as telecommuting can have either a positive or negative impact on the career of employees who utilize them. They demonstrated that the impact varies based on the attributions made by the managers of the employees who utilize flexible work practices. When managers attribute the utilization of flexible work practices to a desire to increase productivity, the utilization led to positive career outcomes. However, when the same utilization was attributed to a desire for personal life accommodation, it led to negative career outcomes. This study demonstrates that finding the technological solution to a specific load is not necessarily a solution to the organizational challenge, and that organizational context needs to be taken into account when applying these solutions.

Conclusion

The stress attributed to information overload in the knowledge society is pervasive and ubiquitous. Nevertheless, a close examination of the literature shows

that information overload is poorly defined and that its conceptualization and usage exhibit technological determinism and a false utopian/dystopian dichotomy.

Knowledge workers who suffer from workplace pressures, as well as researchers who study them, tend to blame information and ICTs for the stress, and are likely to disregard other causes such as work overload. Researchers and practitioners still find it difficult to identify whether the root cause of the stress is information overload, work overload, or communication overload. Failing to distinguish between these root causes prevents us from finding solutions that will effectively alleviate the stress. This is exacerbated by the many processes, forces and incentives of the information society that promote a constant increase in the amount of information we have access to, in the amount of communication we are engaged in, and in the amount of tasks and assignments we attempt to accomplish.

Workplace pressures and stress are not an inevitable consequence of the knowledge society. We need to carefully analyze the causal chain that leads to these stresses, and the incentives that encourage practices that eventually lead to overload and stress. This analysis needs to avoid technological determinism, and to acknowledge the subjectivity and context dependency of these workplace pressures and loads, and of the stress they cause. Consequently, we will be able to devise solutions that harness information technologies not only to optimize traditional measures such as throughput and short-term productivity, but also measures such as employee satisfaction and sense of accomplishment. There is no reason why the same technologies that facilitate the constant rise in the productivity of knowledge workers cannot be employed to also decrease the workplace stresses discussed in

this book, and lead to outcomes such as better work-life balance, increased workplace diversity, and a decrease in workplace stress and burnout.

References

- Adler, R., & Benbunan-Fich, R. (2012). The effects of positive and negative self-interruptions in discretionary multitasking. In *CHI '12 Extended Abstracts on Human Factors in Computing Systems* (pp. 1763–1768). Austin, Texas, USA: ACM.
- Ahuja, M. K., Chudoba, K. M., Kacmar, C. J., McKnight, D. H., & George, J. F. (2007). IT road warriors: Balancing work--family conflict, job autonomy, and work overload to mitigate turnover intentions. *MIS Quarterly*, *31*(1), 1–17.
- Andersen, B., & Fagerhaug, T. (2006). *Root Cause Analysis: Simplified Tools And Techniques*. ASQ Quality Press.
- Ayyagari, R., Grover, V., & Purvis, R. (2011). Technostress: technological antecedents and implications. *MIS Quarterly*, *35*(4), 831–858.

- Barley, S. R., Meyerson, D. E., & Grodal, S. (2011). E-mail as a Source and Symbol of Stress. *Organization Science*, 22(4), 887–906. doi:10.1287/orsc.1100.0573
- Bell, S. J. (2004). The infodiet: how libraries can offer an appetizing alternative to Google. *The Chronicle of Higher Education*, 50(24), B15.
- Berghel, H. (1997). Cyberspace 2000: Dealing with information overload. *Communications of the ACM*, 40(2), 19–24.
- Bijker, W. E. (2010). How is technology made?—That is the question! *Cambridge Journal of Economics*, 34(1), 63–76. doi:http://dx.doi.org/10.1093/cje/bep068
- Bijker, W. E., Hughes, T. P., & Pinch, T. J. (1987). *The Social construction of technological systems new directions in the sociology and history of technology*. Cambridge, Mass.: MIT Press.
- Brown, M., & Benson, J. (2005). Managing to Overload? Work Overload and Performance Appraisal Processes. *Group & Organization Management*, 30(1), 99–124. doi:10.1177/1059601104269117
- Case, D. O. (2012). *Looking for information: A survey of research on information seeking, needs, and behavior*. Emerald Group Publishing.
- Chewning Jr, E. G., & Harrell, A. M. (1990). The effect of information load on decision makers' cue utilization levels and decision quality in a financial distress decision task. *Accounting, Organizations and Society*, 15(6), 527–542. doi:10.1016/0361-3682(90)90033-Q
- Continuous Partial Attention. (n.d.). *Linda Stone*. Retrieved January 18, 2013, from <http://lindastone.net/qa/continuous-partial-attention/>
- Dabbish, L. A., & Kraut, R. E. (2006). Email overload at work: an analysis of factors associated with email strain. In *Proceedings of the 2006 20th anniversary conference on Computer supported cooperative work* (pp. 431–440). Banff, Alberta, Canada: ACM. doi:10.1.1.83.9750

- Denning, P. J. (2006). Infoglut. *Communications of the ACM*, 49(7), 15–19.
doi:<http://dx.doi.org/10.1145%2F1139922.1139936>
- Eppler, M. J., & Mengis, J. (2004). The concept of information overload: A review of literature from organization science, accounting, marketing, MIS, and related disciplines. *The information society*, 20(5), 325–344.
doi:10.1080/01972240490507974
- Franz, H. (1999). The impact of computer mediated communication on information overload in distributed teams. In *Proceedings of the 32nd Annual Hawaii International Conference on Systems Sciences, 1999. HICSS-32* (Vol. Track1, p. 15 pp.). Presented at the Proceedings of the 32nd Annual Hawaii International Conference on Systems Sciences, 1999. HICSS-32. doi:10.1109/HICSS.1999.772712
- Freeman, J. (2009). *The Tyranny of E-mail: The Four-Thousand-Year Journey to Your Inbox*. Simon and Schuster.
- Google Ngram Viewer. (n.d.). Retrieved January 18, 2013, from <http://books.google.com/ngrams>
- Hall, A., & Walton, G. (2004). Information overload within the health care system: a literature review. *Health Information & Libraries Journal*, 21(2), 102–108.
doi:10.1111/j.1471-1842.2004.00506.x
- Hallowell, E. M. (2005). Overloaded Circuits: Why Smart People Underperform. *Harvard Business Review*, (January).
- Hudson, J. M., Christensen, J., Kellogg, W. A., & Erickson, T. (2002). I'd be overwhelmed, but it's just one more thing to do: Availability and interruption in research management. In *Proceedings of the SIGCHI conference on Human factors in computing systems: Changing our world, changing ourselves* (pp. 97–104). ACM.
doi:10.1145/503376.503394

- Hwang, M. I., & Lin, J. W. (1999). Information dimension, information overload and decision quality. *Journal of Information Science*, 25(3), 213–218.
doi:10.1177/016555159902500305
- Iyengar, S. S., & Lepper, M. R. (2000). When choice is demotivating: Can one desire too much of a good thing? *Journal of personality and social psychology*, 79(6), 995.
doi:10.1037/0022-3514.79.6.995
- Jacoby, J. (1984). Perspectives on information overload. *The Journal of Consumer Research*, 10(4), 432–435. doi:10.1086/208981
- Jin, J., & Dabbish, L. A. (2009). Self-interruption on the computer: a typology of discretionary task interleaving. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1799–1808). Boston, MA, USA: ACM.
- Jones, Q., Ravid, G., & Rafaeli, S. (2004). Information overload and the message dynamics of online interaction spaces: A theoretical model and empirical exploration. *Information Systems Research*, 15(2), 194–211.
- Kalman, Y. M., Raban, D. R., & Rafaeli, S. (2013). Netified: Social Cognition in Crowds and Clouds. In *The social net: Understanding our online behavior, 2nd edition*. Oxford University Press.
- Karr-Wisniewski, P., & Lu, Y. (2010). When more is too much: Operationalizing technology overload and exploring its impact on knowledge worker productivity. *Computers in Human Behavior*, 26(5), 1061–1072. doi:10.1016/j.chb.2010.03.008
- Kirsh, D. (2000). A few thoughts on cognitive overload. *Intellectica*, 30(1), 19–51.
- Kock, N., Parente, R., & Verville, J. (2008). Can Hofstede's Model Explain National Differences in Perceived Information Overload? A Look at Data From the US and New Zealand. *IEEE Transactions on Professional Communication*, 51(1), 33–49.
doi:10.1109/TPC.2007.2000047

- Leslie, L., Manchester, C., Park, T.-Y., & Mehng, S. A. (2012). Flexible Work Practices: A Source of Career Premiums or Penalties? *Academy of Management Journal*. doi:10.5465/amj.2010.0651
- Lipowski, Z. J. (1975). Sensory and information inputs overload: Behavioral effects. *Comprehensive Psychiatry*. doi:10.1016/0010-440X(75)90047-4
- Machlup, F. (1962). *The Production and Distribution of Knowledge in the United States*. Princeton University Press.
- McCune, J. C. (1998). Data, data everywhere. *Management Review*, 87(10), 10–12.
- Meyer, J. A. (1998). Information overload in marketing management. *Marketing Intelligence & Planning*, 16(3), 200–209. doi:10.1108/02634509810217318
- Morris, J. H. (2003). Tales of Technology: Consider a cure for pernicious infobesity. *Pittsburgh Post-Gazette*. Retrieved January 18, 2013, from <http://www.post-gazette.com/stories/business/news/tales-of-technology-consider-a-cure-for-pernicious-infobesity-517925/>
- Neuman, W. R., Park, Y. J., & Panek, E. (2012). Info Capacity | Tracking the Flow of Information into the Home: An Empirical Assessment of the Digital Revolution in the U.S. from 1960–2005. *International Journal of Communication*, 6. doi:<http://ijoc.org/ojs/index.php/ijoc/article/view/1369>
- Orlikowski, W. J. (2007). Sociomaterial Practices: Exploring Technology at Work. *Organization Studies*, 28(9), 1435–1448. doi:10.1177/0170840607081138
- Porat, M. U. (1977). *The information economy: definition and measurement*. U.S. Dept. of Commerce, Office of Telecommunications.
- Ronen, B. (1992). The complete kit concept. *International Journal of Production Research*, 30(10), 2457–2466. doi:10.1080/00207549208948166
- Shenk, D. (1997). *Data Smog: Surviving the Information Glut* (1st ed.). HarperOne.

- Shirky, C. (2008). Clay Shirky. It's Not Information Overload. It's Filter Failure. Retrieved December 16, 2012, from <http://blip.tv/web2expo/web-2-0-expo-ny-clay-shirky-shirky-com-it-s-not-information-overload-it-s-filter-failure-1283699>
- Soucek, R., & Moser, K. (2010). Coping with information overload in email communication: Evaluation of a training intervention. *Computers in Human Behavior*, 26(6), 1458–1466. doi:10.1016/j.chb.2010.04.024
- Sparrow, P. (2002). Strategy and cognition: Understanding the role of management knowledge structures, organizational memory and information overload. *Creativity and Innovation Management*, 8(2), 140–148. doi:10.1111/1467-8691.00128
- Special report - Managing information. (2010). *The Economist*. Retrieved January 23, 2013, from <http://www.economist.com/printedition/2010-02-27>
- Sperandio, J. C. (1978). The regulation of working methods as a function of work-load among air traffic controllers. *Ergonomics*, 21(3), 195–202. doi:10.1080/00140137808931713
- Spohrer, J., Maglio, P. P., Bailey, J., & Gruhl, D. (2007). Steps Toward a Science of Service Systems. *Computer*, 40(1), 71 –77. doi:10.1109/MC.2007.33
- Spohrer, J., Vargo, S. L., Caswell, N., & Maglio, P. P. (2008). The Service System Is the Basic Abstraction of Service Science. In *Hawaii International Conference on System Sciences, Proceedings of the 41st Annual* (p. 104). Presented at the Hawaii International Conference on System Sciences, Proceedings of the 41st Annual. doi:10.1109/HICSS.2008.451
- Streufert, S., Suedfeld, P., & Driver, M. J. (1965). Conceptual structure, information search, and information utilization. *Journal of Personality and Social Psychology*, 2(5), 736–740. doi:10.1037/h0022679
- Sumecki, D., Chipulu, M., & Ojiako, U. (2011). Email overload: Exploring the moderating role of the perception of email as a “business critical” tool. *International Journal of Information Management*, 31(5), 407–414. doi:10.1016/j.ijinfomgt.2010.12.008

- Wang, Z., & Tchernev, J. M. (2012). The “Myth” of Media Multitasking: Reciprocal Dynamics of Media Multitasking, Personal Needs, and Gratifications. *Journal of Communication, 62*(3), 493–513. doi:10.1111/j.1460-2466.2012.01641.x
- Weinberger, D. (2012). *Too Big to Know: Rethinking Knowledge Now That the Facts Aren't the Facts, Experts Are Everywhere, and the Smartest Person in the Room Is the Room*. Basic Books.
- Whittaker, S., & Sidner, C. (1996). Email overload: exploring personal information management of email. In *Conference on Human Factors in Computing Systems - Proceedings* (pp. 276–283). doi:10.1145/238386.238530
- Wurman, R. S. (2000). *Information Anxiety 2*. Que.
- Zeldes, N., Sward, D., & Louchheim, S. (2007). Infomania: why we can't afford to ignore it any longer. *First Monday, 12*(8). Retrieved from http://www.firstmonday.org/issues/issue12_8/zeldes/#author