A Scale for Measuring Email Overload

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ABSTRACT
We present an eight-point scale of email overload to assess users' feelings of email overload. Based on previous research [4], we designed a survey to examine email overload. 292 subjects filled out the survey as part of a software deployment. Eight of our questions worked together well as a scale, which can be used to evaluate the effectiveness of future email systems, as well as to explore current behavior. We show that the scale links well to user behavior.

1. INTRODUCTION
We get, we all agree, entirely too much email. Even after the spam is separated from the valuable messages, the catalogs and distribution lists are separated from personal mail, users seem to complain about email overload. Indeed, a broad history of research projects [2,7,8 and others] have attempted to investigate both the factors that drive email overload, and ways that it can be mitigated.

Unfortunately, there are no comparable ways of measuring overload. Some work has taken the question head-on [3], asking respondents to agree or disagree with "I am overwhelmed by [my email]." However, single questions can lead to under-reporting, as users need to make a binary decision. Traditionally, broader scales that approach questions from more directions and that address real behaviors are considered more reliable. A set of overload-oriented survey questions that are easily distributable can help researchers understand the extent of overload, as well as evaluate technologies that may alleviate it.

In this paper, we present a scale for measuring perceived email overload within workplace environments. In the following sections, we discuss the research background of the notion of "email overload," and review some attempts to measure it. Next, we present the scale and discuss the context in which the scale was developed. Last, we discuss some correlates of email overload that emerged in our research.

2. RELATED LITERATURE
The first use of the term "email overload" came from Whittaker and Sidner [8], and referred to the many different functions that email served: as calendar, to-do list, data archive, and contact list. The term "overload" has been broadly reinterpreted since as the feeling of being overwhelmed by email [7]. While some sources disagree [3], others argue that incoming email carries so many new tasks that users cannot keep up to date [2]. The popularity of email disciplines and methodologies [1,6] suggest that there is a general concern about overload.

Bellotti et al. [2], examining email as a center for tasks, found that users' perceptions of overload corresponds to the number of unresolved tasks in the users' inbox (and not the volume of messages incoming). Neustaedter et al. [4] surveyed 2000 participants in a large corporate environment, receiving 233 responses. Their instrument, based on 5-point Likert scale, was intended to both learn about email triage techniques, and included a series of questions meant to approach email overload.

3. SURVEY CONSTRUCTION
We adapted the survey of [4] to collect detailed information about email habits. The survey included questions asking users how long they thought they spent triaging email, how much of their email they read, and their experience of stress associated with handling email. Results from [4] highlighted the relevance of certain email-behaviors such as reading mail sequentially or by priority. Our survey focused more specifically on the experience of being overwhelmed by incoming email.

In total, we asked users to respond to ten questions relating to email: six from [4], as well as four new questions; all ten items were rated on a Likert scale ranging from Strongly Disagree (-2) to Strongly Agree (+2).

4. SURVEY DEPLOYMENT
We packaged our survey with a modified version of the SNARF tool [5]. Promoted as an "email triage" tool, SNARF allows users a fast overview of their email based on social information. An instrumented version of SNARF was deployed broadly as a voluntary download, allowing us to compare survey responses to actual email behavior. The instrumented version provided logs that allowed us to know how much email users were sending and

Email Overload Scale, sorted by factor loadings with means
1. I feel I spend too much time keeping up with my mail (0.75)
2. Email cuts into the time I wanted to spend on other tasks (0.92) *
3. I have trouble keeping up with email on days I am away from my desk (0.68)
4. I get too much email (1.05) *
5. I spend too much time getting rid of unimportant messages (0.83) *
6. I am satisfied with the strategy I use to keep up with my mail (reverse coded, 0.08)
7. When I return from vacation / time off, I feel overwhelmed when triaging my mail (1.22)
8. Sometimes my emails may get lost or missed (0.47)
* denotes questions on this survey not in [4].

Table 1. Email Overflow scale.

receiving, as well as how many correspondents they interacted with. We deployed SNARF within our company, a large software development organization.

SNARF users were asked to complete an optional survey related to their experiences with email, and were reminded again by email several days later. 292 people completed the pre-survey for a response rate of 51%. After six weeks, we distributed a post-survey to all SNARF users. Participants that filled out the post-survey were entered into a lottery for gift certificates. 161 persons filled out the post-survey (response rate of 28%). 122 had also filled out the pre-survey, for a total of 331 unique users.

Most respondents were in technical fields: program managers, developers, and consultants; the population was overwhelmingly male (92%). While these users were self-selected to be more interested in email technologies (and thus possibly more overloaded), their experience has validity for other contexts.

5. SCALE CONSTRUCTION

We examined the 292 responses to understand email overload within our organization. While each of the ten items had a broad distribution, none of them seemed to be a single descriptor of email overload.

We applied a Principle Components factor analysis with a varimax rotation on the 292 responses from our survey. Items 1-8 worked well as a factor, while items 9 and 10 worked together as a second (weaker) factor. The first 8 items are shown in order of importance for the scale[1].

The scale consists simply of the mean of the standardized scores for the eight variables included. When we averaged the values along the scale, items 1-8, we found they were distributed broadly along a bell-shaped curve, centered at 0.8 ("agree").

The items correlated with each other (Spearman's Rho) ranging from .333 to .681 ($p<0.01$ for all), indicating that the items are all generally associated with each other, but are not collinear: that is, none of them is fully redundant with the others. The penultimate test was to examine the Cronbach's alpha, a measure of inter-item reliability. The score of .86 is certainly acceptable. A confirmatory test was done using Maximum Likelihood factor analysis. This particular model has a highly significant goodness-of-fit ($p < 0.001$, 20 d.f.).

6. USING THE SCALE

Our scale can be used not only to judge degree of overload within a population, but can be used to examine correlates of overload in email and organizational behavior.

We applied the scale to email behavior to see whether the scale was reflecting real email use. We found a number of significant correlations between the email overload scale and email-related measures. (None of these, unfortunately, was use of SNARF.)

Using ordinary least squares regression, we built a model of email overload. The R^2 is 0.29, suggesting that almost 30% of the variance in this scale can be explained by these 9 variables. The preferred model (shown in Table 2) indicates that overload is connected to both to behavioral factors (how the user responds to those messages, variables 1-6) and to structural factors (what sort of email comes to the user, 7-9). Users are more likely to suffer from overload if they are distracted by notifications (1) or if they try to pick-and-choose important messages (3) using a multi-pass strategy; users are less likely if they feel that they can keep on top of their email (2, 6). We find that overload is actually *negatively* related to incoming messages that are addressed to the user (9). This is fortunate, because it suggests that overload may be aided by a 'restructuring' of the email checking process, rather than simply 'getting less mail'. Non-significant variables include the number of messages sent by users, how many lists they are subscribed to, and how frequently the user checks their email.

OLS Regression on email overload (N=267)

	B	(beta)
(Constant)	-0.51*	
Survey Data		
1. Notifications distract me	0.81***	*(0.32)*
2. When messages arrive I deal with them right away	-0.50**	*(0.14)*
3. When triaging I deal with important people first	0.48***	*(0.19)*
4. Other than SNARF I tried alternatives for email	0.11***	*(0.21)*
5. Time spent triaging (in minutes)	0.00*	*(0.11)*
6. Notifies me for all/some/no new messages	-0.11*	*(-0.11)*
Log Results		
7. Number of distinct people who user has sent messages to	0.00*	*(-0.15)*
8. Number of distinct people co-addressed on messages with the user	0.00***	*(0.45)*
9. Number of messages addressed to the user	0.00**	*(-0.23)*
Adj. $R^2 = 0.29$	*p<0.05, **p<0.01, ***p<0.001	

Table 2. Model for email overload. Beta represents one standard deviation's effect on the overall score.

7. CONCLUDING NOTES

We believe that this scale can provide a valuable tool to researchers attempting to study email overload. The eight questions can be easily added to many surveys, and provide a broad perspective on whether users are overwhelmed. In our population, users agreed that they were overloaded; levels of overload were linked to their behavior within email, as well as the email they received.

We look forward to future studies of factors linked to email overload, and to using this scale to measure the success of future overload-reducing tools.

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[1] The two rejected items were "When I am at my desk, I am typically able to keep up with email as it arrives" and "I look forward to receiving new mail from people I know".

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