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Enterprise-Wide Techniques to Remediate or Avoid Email Overload

CAPSTONE REPORT

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Abstract

Modern knowledge workers (especially managers) are faced with an ever-increasing volume of information in the form of email, yet email management advice often fails to reduce the feeling of overload. This annotated bibliography presents selected literature published from 1988 to 2013 on email overload to identify techniques for combating the problem. Enterprise-wide techniques identified include training on email client features to filter and sort, use of assistants, and setting organizational policies about reading and responding.

Keywords: email overload, email stress, knowledge worker effectiveness, task management

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Introduction

As the volume of information increases, the ability to identify critical information is impaired and work-related stress increases for knowledge workers (Barley, Myerson, & Grodal, 2011; Bellotti, Ducheneaut, Howard, Smith, & Grinter, 2005; Shirky, 2008). This phenomenon is referred to as *information overload* and is defined by Drury and Farhoomand (2002) as the organizational capacity for producing information that far exceeds the human capacity for processing it. Barley et al. (2011) note that communications technologies contribute to feelings of overload and stress and find that despite evidence that multiple forms of information technology contribute to work-related stress, workers tend to attribute the stress primarily to email. Jackson, Dawson, and Wilson (2003) find that the way that most enterprise-wide email users handle incoming email “causes far more interruption compared to what is commonly expected” (p.83) and recommend a number of guidelines concerning employee email management that can make better use of an organization’s email communications and increase employee productivity.

Dabbish and Kraut (2006) similarly define *email overload* as “email users’ perceptions that their own use of email has gotten out of control because they receive and send more email than they can handle, find, or process effectively” (p. 431); they also link this phenomenon to work-related stress and find that higher volumes of email are associated with “increased feelings of email overload, but this relationship [is] moderated by certain email management strategies” (p. 431). Soucek and Moser (2010) find that a specific email training intervention decreases strain and work impairment for individuals, while other authors (Szóstek, 2011; Whittaker, Bellotti, & Gwizda, 2006) note that individuals feel overloaded because current email clients do not adequately address email users’ workflow and task management needs.

Purpose

Email overload is described as a particular problem for managers (Bellotti et al., 2005; Kavanagh, 2003; Mano & Mesch, 2010). As noted by Drury and Farhoomand (2002), knowledge workers who are expected to utilize email to improve their productivity and decision-making ability, such as managers, need to identify techniques to manage email effectively in order to avoid stress and find critical information. Common suggested techniques include (a) setting aside specific times for reading email during the day (Gupta, Sharda, & Greve, 2011); (b) higher proficiency with email client organizational features (Soucek & Moser, 2010; Szóstek, 2011); and (c) individually tailored strategies for dealing with the stress of overload (Russell, Purvis, & Banks, 2007). However, these email management techniques alone may not address the entire issue. Whittaker and Sidner (1996) note that email is not designed for task management or personal information archiving and Bellotti et al. (2005) suggest that email as a tool for task and project management can be improved significantly. Simperl et al. (2010) and Szóstek (2011) further clarify this point and state that email may not be the best tool to use for these purposes.

The purpose of this study is to examine selected literature in order to provide a set of proven email management techniques for application throughout the enterprise that remediate and/or avoid *email overload* as described by Dabbish and Kraut (2006), with the goal to improve work effectiveness (Jackson et al. 2003; Karr-Wisniewski & Lu, 2010; Soucek & Moser, 2010). Techniques are framed for the general line manager, project manager, unit or division director, and company executive whose work and use of email most resembles the description of the audience below, and more likely to be suffering from *email overload* (Bellotti et al., 2005; Dabbish & Kraut, 2006).

Significance

Simperl et al. (2010) note that information management is critical to an organization's success and point to knowledge workers' sub-optimal use of existing information management tools as a limiting factor of overall organizational success. Espejo and Watt (1988) argue that managers must manage information effectively to achieve expected levels of performance and that they greatly increase their effectiveness by understanding how they process information and by increasing their personal information management capacity.

Whittaker, Bellotti, and Gwizdka (2006) note that email is the primary communication tool used to distribute and manage work information and that it is unlikely to change in significant ways in the near future to reduce *information overload*. Jackson et al. (2003) argue that effectively understanding and managing *email overload* increases organizational productivity. This point is supported by a more recent Plantronics survey of international knowledge workers ("How We Work", 2010) that finds email is the primary business communication and collaboration tool with 89% of respondents reporting that email is critical to their overall success and productivity, but that "email is likely to cause communications confusion and anxiety" (p.2) with 57% of respondents reporting experiencing at least some form of *email overload* and loss of productivity.

Audience

All knowledge workers who use email as their primary computer tool to support project management and informal workflow would benefit from understanding *email overload* and how to avoid it (Bellotti et al., 2005). Dabbish and Kraut (2006) note "the complex, dynamic and interdependent nature of the work that many professionals and managers perform requires communication to be successful" (p.432) and find that email is perceived as more important to

their work if (a) they have a high level of management responsibility, (b) their work depends upon the activities of others, (c) they work on many different projects, and (d) their work involves many different types of activities.

Delimitations

This study focuses primarily on managers experiencing what Dabbish and Kraut (2006) describe as *email overload* due to an excessive volume of email. A related idea presented over a decade ago by Whittaker and Sidner (1996) is the use of email to do work task it is not designed for; however, much of the design issues they identified are now addressed by features incorporated into common email clients (Whittaker et al., 2006). Nonetheless, it is instructive to note that email use trends identified in 1996 by Whittaker and Sidner continue to hold true, even as email client features evolve over time (Fisher, Brush, Gleave, & Smith, 2006).

Literature for this study is not limited to any specific time frame; however, it should be noted that most of the identified literature is dated between 1996 and 2013. This time period is when email serves as the primary communication and collaboration tool enterprise wide (“How We Work”, 2010). With a growing use of alternative tools for business communications in the enterprise such as instant messaging, social media, and texting (“How We Work”, 2010), email may in fact diminish in prominence over time. With that in mind, this study should be considered applicable only within the time frame it is published for specific email features; however, the information management techniques needed to be an effective manager should be applicable to whatever communication tool is utilized.

Finally, a number of well-respected authors such as Etchells (2008), Larrivee (2009), Moore (1999), and Sweetnam (2006), offer opinions regarding best practices for email management. While instructive, these opinions are not presented with supporting findings in

qualitative or quantitative studies and are not included because they either have not yet been demonstrated to be effective or they provide no basis to conclude they should be effective.

Research Questions

Main question. As the volume of email continues to rise, what email management techniques can managers employ enterprise wide to effectively remediate and/or avoid *email overload* as described by Dabbish and Kraut (2006)?

Sub-questions. What is *email overload* and why does it occur? Given the consistent nature of accepted best practices (Etchells, 2008; Sweetnam, 2006), what enterprise-wide techniques for email management show the most potential to improve work effectiveness? What enterprise-wide email management techniques show the most potential to reduce work-related stress? Finally, with email being used for more than just communications (Bellotti et al., 2005; Whittaker & Sidner, 1996; Whittaker et al., 2006), what is the role of email as an enterprise-wide general project management and informal workflow tool?

Reading and Organization Plan Previews

Reading plan preview. Busch et al. (2012) describe methods of conceptual analysis as the coding of selected references into content categories and analysis of the frequency or existence of concepts in the selected text(s). This study utilizes the eight steps described by Busch et al. (2012) to code selected references by key concepts related to *email overload* contained in the research question and sub-questions. The eight steps Bush et al. (2012) describe for conducting conceptual analysis are:

1. Determine the level of analysis based on using a single word or a set of words or phrases to describe a concept.
2. Determine what concepts to code for.

3. Determine whether to code for the existence of a concept or the frequency of the appearance of a concept.
4. Determine how to distinguish among concepts.
5. Develop rules for coding texts.
6. Determine what to do with irrelevant information.
7. Code the texts.
8. Analyze the results of coding.

Organizational plan preview. The presentation of references in the Annotated Bibliography section of this document is organized according to a thematic review of references as described by the Writing Center at the University of North Carolina, Chapel Hill (Literature Reviews, n.d.). In this study, selected references are organized by the following themes: (a) what is email overload and why does it occur; (b) what enterprise-wide email management techniques show the most potential to improve work effectiveness; (c) what enterprise-wide email management techniques show the most potential to reduce work-related stress; and (d) what is the role of email as an enterprise-wide general project management and informal workflow tool.

Definitions

Creswell (2009) notes that defining terms adds precision to scientific studies and removes multiple meanings associated with words in everyday language. The following key terms are derived from the selected literature and are defined to ensure that their meaning is clear as they are applied within the general topic of *email overload*.

Email Management

According to Dabbish and Kraut (2006), general email usage patterns and functions of email for work fall into three categories of email management behaviors: “handling the flow of incoming email messages, inbox management and archiving messages for later use” (p.434).

Email Overload

Dabbish and Kraut (2006) define *email overload* as “email users’ perceptions that their own use of email has gotten out of control because they receive and send more email than they can handle, find, or process effectively” (p. 431).

Enterprise Wide

Zhao, Kumar, and Stohr (2000) describe workflow management systems as systems that support the “routing of documents and tasks in electronic form, thereby enabling the automation of business processes across teams, functional departments, customers, and suppliers” (p.46).

This use of information broadly among various units within a business to interact with each other and with external entities represents enterprise wide information management.

Informal Workflow Tool

Simperl et al. (2010) note that “[b]usinesses can greatly increase productivity in their processes by formalizing fixed and frequently executed processes into computer-processable workflows” (p.40). Zhao et al. (2000) propose that formal workflow management mechanisms

that enable the automation of business processes be built into email clients to ensure that such business processes are conducted in a structured manner. However, Bellotti et al. (2005) note that knowledge workers rarely “follow rigid procedures or use workflow tools” (p.93) and typically use email as an informal workflow tool to route documents and coordinate tasks.

Information Management

Espejo and Watt (1988) define information management as the skillful use of information sources or resources to convert information into effective action. In the scope of this study, those information sources and resources are broadly defined and the focus is on the ability to convert information into effective action.

Information Overload

Drury and Farhoomand (2002) offer a number of definitions of *information overload*: (a) the organizational capacity for producing information far exceeds the human capacity for processing it; (b) when knowledge workers are given more information than they can absorb (in such situations, *information overload* is viewed in light of receiving more of it than is needed or wanted to function effectively and further the goals of the individual or the organization); and (c) alternatively, *information overload* can occur when the information processing demand on an individual's time for performing interactions and internal calculations exceeds the supply or capacity of time available for such processing. In the context of this study it is sufficient to consider *information overload* as the general case of receiving too much information to effectively use.

Knowledge Worker

According to Wikipedia (“Knowledge worker”, 2013), there is not a consensus on precisely who knowledge workers are and what work they do; however, one interpretation

includes both the creation and distribution of information as economic capital. Dabbish and Kraut (2006) describe a worker whose work is complex, dynamic, highly interdependent, and requires communication and coordination to be successful. In the context of this study, a knowledge worker is one of any number of professionals engaged in the creation and/or distribution of information utilizing communications and information technology.

Managers

Dabbish and Kraut (2006) describe a certain type of worker who is engaged in communication intensive work more directly linked to the use of email. Specifically they describe managers as “people who have more relationally complex jobs, with more supervisors, subordinates, and projects to manage” (p.432) and note that they generally exchange more email and view email as more important to their jobs.

Personal Information Management

Whittaker et al. (2006) describe the three key functions of personal information management as (a) task management – reminding ourselves of current tasks, tracking task status, and maintaining information relevant to a given task; (b) personal archiving – storing information about completed tasks for future reference; and (c) contact management – storing and organizing names associated with key contacts.

Work Effectiveness

According to Bellotti et al. (2005), knowledge workers must accomplish a number of goals with their use of email including “keeping up to date, responding to requests, tracking requests to others, making deadlines, managing information as it comes in, distributing information, and being prepared for events” (p.101). Accomplishing this set of goals represents a knowledge worker’s work effectiveness as it relates to email use.

Work Related Stress

Barley et al. (2011) note that stress researchers evaluate stress in terms of “perceptions of being overwhelmed by life’s events and demands” (p. 892) and specifically point to established measures based on participants’ feelings of being (a) emotionally drained at the end of the work day, (b) tired when waking in the morning to face another day at work, (c) burned out or stressed from work, and (d) frustrated by their jobs.

Research Parameters

This study follows a qualitative method of inquiry and uses an emergent design (Creswell, 2009) to identify potentially effective email management techniques as cited in published scholarly sources (Bell & Frantz, 2012). The following parameters describe the manner in which this study is framed and conducted including the search strategy, evaluation criteria, documentation approach, reading plan, and organization plan.

Search Strategy

Specific references on this topic are identified utilizing search tools provided by the UO library, focusing on approaches to remediation of the phenomenon of *email overload* as experienced by managers. Keyword searching of *email overload*, *email management*, and *personal information management* are used to identify appropriate literature to the topic and additional references cited in those sources are included in this study. Creswell (2009) notes that refereed journal articles provide a valuable source for literature review in that they are readily located and they report research on a given topic. This study utilizes refereed journal articles to focus on approaches to remediation that are likely to be effective based findings in scholarly studies that involve qualitative and quantitative research methods.

Established indexing descriptors. *Email overload* is studied by computer scientists, information scientists, and those in the social sciences to provide the theoretical basis within human computer interactions for improving computer-mediated communication and computer supported cooperative work (ACM SIGCHI, n.d.; “Computer-supported”, 2013). Authors such as Bellotti et al. (2005), Kokkalis et al. (2013), and Krämer (2010) apply the knowledge of how humans interact with computers to software and information system design. For example, Bellotti et al. (2005) use a mixed method approach to identify key challenges of task

management in email and apply insights gained in fieldwork to develop a prototype email client based on organization by task and project management.

Common keywords identified by these authors and others related to this topic include:

- Email
- E-mail
- Email Overload
- Email Management
- Information Overload
- Personal Information Management
- Stress
- Strain
- Communication

Evaluation Criteria

References from scholarly sources (Bell & Frantz, 2012) that represent authoritative, credible, and relevant research into *email overload* are selected, reviewed and analyzed.

References, both primary and secondary, found in the library search are included if they are from peer-reviewed journals and (a) are cited by more than one article indicating that they have been established as foundational to the topic; (b) directly address the phenomenon of *email overload* as experienced by managers; (c) offer specific enterprise-wide email management techniques for managers based on research findings; or (d) significantly contribute to the topic on a general basis such as contributing to the definition or understanding of *email overload*.

Documentation Approach

Creswell (2009) notes that using a “computer is an efficient means for storing and locating qualitative data” (p.188). This study relies heavily on electronic resources available through the UO Libraries and the research tool Zotero (www.zotero.org) is used as a plugin to the Firefox web browser to collect, store, and organize selected references. According to Dillard (2012), using Zotero allows “information needed for creating a bibliography [to be] automatically captured ... including source, title, abstract, URL, and date” (p.2). Within Zotero, all cited references are organized into a collection labeled Email Overload, with a sub-collection labeled Biblio for references analyzed in the Annotated Bibliography section of this study. A full text copy in portable document format (PDF) is stored with each reference when available, and the published abstract, coding information, keyword search that led to the article, source database information, and general annotations that indicate relevance to the topic are stored as notes with each reference. Pertinent information is highlighted in the stored PDF files using the annotate function in Apple Preview and the online storage feature of Zotero is used to synchronize the recorded data on multiple machines to ensure against data loss.

Reading Plan

This study follows conceptual analysis procedures (Busch et al., 2012) to systematically code selected literature for the existence of key concepts related to the research question. Selected literature is analyzed following the eight steps described by Busch et al. (2012):

Level of analysis. Sets of words and phrases are utilized to identify key concepts in each of the references included in the Annotated Bibliography section of this study. For example, *email overload* and *led to stress* are used to identify the phenomenon rather than simply *overload* and *stress*.

Quantity of concepts. References are coded for sets of words or phrases that describe the following pre-defined five concepts: (a) the definition of *email overload*, (b) *email overload* causes, (c) email management techniques for improving work effectiveness, (d) email management techniques for reducing stress, and (e) email use for project management and informal workflow tool. Sub-concepts within these generalized categories are identified throughout the coding process as they emerge, and key words and phrases appropriate to each sub-concept are added interactively.

Coding for existence or frequency. References are coded for the existence of key concepts so that each concept can be analyzed within the specific context of each reference, and in relation to the overall scope of the selected literature. The frequency with which a given concept appears within a given reference is not relevant to the study.

Distinguishing concepts. Words and phrases used to describe similar sub-concepts are coded as the same general concept for the purpose of analysis. For example *led to stress* and *causes stress* are coded as the same concept *email overload causes*.

Rules for coding. More than one concept may appear within a given reference and references are coded to reflect the existence of each concept present. Sub-concepts are grouped by key concept.

Irrelevant information. Words and phrases that are not relevant to the key concepts are ignored in the coding process, as they do not contribute to organization of references for deeper analysis.

Coding process. References are coded utilizing a combination of the search feature in Apple Preview for PDF documents and full text reading. The focus of this study is conclusions

drawn based on data analysis and the findings section of each reference is given extra scrutiny to ensure appropriate coding.

Coding results and analysis. An electronic note is created in Zotero for each reference containing codes for concepts and sub-concepts. These notes are searched utilizing the search function within Zotero and grouped by concept and sub-concept and organized according to the Organization Plan section of this study.

Organization Plan

As noted in the Organizational Plan Preview section of this study, the presentation of references in the Annotated Bibliography section of this document is organized according to a thematic review of references described by the Writing Center at the University of North Carolina, Chapel Hill (Literature Reviews, n.d.) and addresses four themes relevant to the research question and sub-questions.

Theme 1 – What is email overload and why does it occur. References organized into this theme are selected to address the phenomenon of *email overload* and its causes based on the assertion by Espejo and Watt (1988) that managers can increase their effectiveness by understanding how they process information. By addressing an understanding of the phenomenon itself, this study provides insight into basic information processing by managers that can be used by individuals and organizations to mitigate causes.

Theme 2 – What enterprise-wide email management techniques show the most potential to increase work effectiveness. References organized under this theme are selected to identify specific techniques for managing *email overload* that focus on mitigating the negative outcomes on productivity that the phenomenon is shown to have (Bellotti et al., 2005; Mano &

Mesch, 2010). This study focuses on techniques that are likely to be effective so that individuals and organizations can adopt successful approaches to increase overall productivity.

Theme 3 – What enterprise-wide email management techniques show the most potential to reduce work-related stress. References organized under this theme are selected to identify specific techniques for managing *email overload* that focus on mitigating the negative aspects of stress and strain that the phenomenon is shown to have (Barley et al., 2011; Dabbish & Kraut, 2006). This study focuses on techniques that are likely to be effective so that individuals and organizations can adopt successful approaches to lower work-related stress and increase overall job satisfaction for workers.

Theme 4 – What is the role of email as an enterprise-wide general project management and informal workflow tool. References organized under this theme are selected to represent limitations to productivity based on the current usage of email for what Whittaker et al. (2006) describe as the main information conduit for work and what Bellotti et al. (2005) call general project management and informal workflow. This study provides insight into the appropriate and inappropriate use of email for information management. This insight can be used by individuals and organizations to choose the right technological tool for a given task, thereby preventing overload caused by the inappropriate use of email.

Annotated Bibliography

Search of keywords using the UO Libraries “Quick Search” of the Academic Search Premier, JSTOR, Project Muse, and Web of Science databases along with specific searching of the ACM Digital Library, Sage eReference, and UO WordCat produces the following key references organized into the themes noted in the Research Parameters section of this study. References are annotated to explain their content and assess their usefulness in this study (Annotated Bibliographies, n.d.). Each annotation includes (a) the complete bibliographic citation, (b) the published abstract provided by the author, (c) an assessment of the credibility of the reference based on the selection criteria noted in the evaluation section of this study, and (d) a summary describing the relevance to this study and/or specific techniques for email management. The references are organized below in four thematic categories, defined by the research sub-questions.

What is email overload and why does it occur?

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

Abstract. The increasing volume of e-mail and other technologically enabled communications are widely regarded as a growing source of stress in people’s lives. Yet research also suggests that new media afford people additional flexibility and control by enabling them to communicate from anywhere at any time. Using a combination of quantitative and qualitative data, this paper builds theory that unravels this apparent contradiction. As the literature would predict, we found that the more time people spent handling e-mail, the greater was their sense of being overloaded, and the more e-mail they processed, the greater their perceived ability to cope. Contrary to assumptions of

prior studies, we found no evidence that time spent working mediates e-mail-related overload. Instead, e-mail's material properties entwined with social norms and interpretations in a way that led informants to single out e-mail as a cultural symbol of the overload they experience in their lives. Moreover, by serving as a symbol, e-mail distracted people from recognizing other sources of overload in their work lives. Our study deepens our understanding of the impact of communication technologies on people's lives and helps untangle those technologies' seemingly contradictory influences.

Credibility. Dr. Stephen R. Barley is a Professor of Management Science and Engineering and the co-director of the Center for Work, Technology and Organization at Stanford's School of Engineering; Dr. Debra E. Meyerson is an Associate Professor of Education and Organizational Behavior at Stanford University; and Dr. Stine Grodal is an Assistant Professor of Strategy and Innovation at Boston University. This article appears in *Organizational Science*, a journal that publishes peer-reviewed articles representing fundamental research about organizations from different scientific disciplines that contribute to understanding of how organizations function and how to improve their performance.

Summary. This article focuses on the asynchronous nature of email as compared to other forms of business communication, and the shifting of social norms with respect to responsiveness to communication in the work place. Based on both qualitative data gathered from interviews with 79 participants and quantitative data gathered from logs kept by participants regarding their work communications, the authors describe *email overload* as (a) a phenomenon linked to higher overall demands on worker's time, (b)

unrealistic expectations that workers will respond immediately to email, and (c) worker's perceptions that email represents unfinished tasks and unmet obligations.

Bawden, D., & Robinson, L. (2009). The dark side of information: Overload, anxiety and other paradoxes and pathologies. *Journal of Information Science*, 35(2), 180–191.

doi:10.1177/0165551508095781

Abstract. This review article identifies and discusses some of main issues and potential problems — paradoxes and pathologies — around the communication of recorded information, and points to some possible solutions. The article considers the changing contexts of information communication, with some caveats about the identification of 'pathologies of information', and analyses the changes over time in the way in which issues of the quantity and quality of information available have been regarded. Two main classes of problems and issues are discussed. The first comprises issues relating to the quantity and diversity of information available: information overload, information anxiety, etc. The second comprises issues relating to the changing information environment with the advent of Web 2.0: loss of identity and authority, emphasis on micro-chunking and shallow novelty, and the impermanence of information. A final section proposes some means of solution to problems and potential improvements.

Credibility. Dr. David Bawden is a Professor of Information Science at City University London, with research interests in foundations of information science, theories and philosophies of information, information management, information-related behavior, knowledge organization, scientific information, information history, and qualitative conceptual analysis. Dr. Lyn Robinson is the Assistant Dean within the School of Informatics at the City University of London with research interests in medical

information, information behavior, and creativity within the discipline of library and information science. This article appears in the *Journal of Information Science*, a peer-reviewed international journal covering topics related to researching and working in information science and knowledge management.

Summary. This article presents a perspective of *information overload* based on the idea that a transition from printed to digital information represents the continuation of the evolution of information management from papyrus scrolls of Egypt and clay tablets of Sumeria to the modern expectation of immediate and easy access to information. The authors describe *information overload* in historical terms as being related to the anxiety of not being able to read all of the books available, shifting in modern terms to a phenomenon where the volume of relevant information available is a hindrance to accomplishing work. According to the authors, individuals adopt pathological coping behaviors for *information overload* including information anxiety (stress caused by being unable to find or understand information), infobesity (personal overload dealt with by avoiding information), and satisficing (taking only enough information to meet a need, even if it means not fully understanding). The authors note that Web 2.0 applications add to the modern landscape of issues, including loss of identity and credibility, impermanence of information, and shallow novelty (decontextualized information) that tend to amplify these behaviors. The authors assert that these issues, and *information overload* in general, may not fundamentally be information problems and that solutions need to be tailored to individual needs by addressing more traditional skill development including (a) time management, (b) desk management, (c) critical thinking, (d)

information presentation, (e) better information management, and (f) the development of a rational personal information management style.

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). New York, NY, USA: ACM.

doi:10.1145/1180875.1180941

Abstract. Almost every office worker can relate to feelings of email overload and stress, but in reality the concept of email strain is not well understood. In this paper, we describe a large-scale nationwide organizational survey examining the relationship between email use and feelings of email overload and task coordination. We found that higher email volume was associated with increased feelings of email overload, but this relationship was moderated by certain email management strategies. The contribution to the field of CSCW is a better understanding of the concept of email related stress, and initial scale development for the assessment of email-related overload and perceptions of the work-importance of email.

Credibility. This article has been cited 21 times in published scholarly material according to the Digital Library of the ACM, and appears to be foundational to the topic of *email overload*. Dr. Laura Dabbish is an Assistant Professor of Information Technology and Organizations at Carnegie Mellon University with a research focus on the problems and challenges of collaborating and organizing work through technology. Dr. Robert Kraut is a Professor of Human-Computer Interaction at Carnegie Mellon University with a research focus on online communities, everyday use of the Internet, collaboration and small work groups, technology and conversation, and computers in

organizations. This article appears in the *Proceedings of the 2006 20th anniversary conference on computer supported cooperative work*, a peer-reviewed publication issued in conjunction with the conference and containing papers that detail existing practices, inform the design or deployment of systems, or introduce novel systems, interaction techniques, or algorithms.

Summary. This article is based on a randomly selected survey sample of participants across the United States and presents findings that address factors that contribute to *email overload* as well as an assessment of the correlation of certain email management tactics to strain associated with the phenomenon. The survey addresses job characteristics, email work importance, email volume, email management tactics (handling incoming email flow, inbox management, and email archiving), email overload, and task coordination. The findings present a number of key concepts to *email overload* including (a) email is perceived to be more important to white collar workers who have greater management responsibilities, work that depends on activities of others, work on many projects, work on many different types of activities; (b) a correlation exists between participating in more face-to-face meetings and a higher email volume; (c) checking email frequently as it arrives reduces *email overload*; (d) having a large number of email folders is associated with higher levels of *email overload*; and (e) importance of email to job function and volume of email are associated with higher levels of *email overload* but task interdependence is not, however, increased *email overload* is associated with reduced coordination effectiveness.

Drury, D. H., & Farhoomand, A. F. (2002). Managerial information overload. *Commun. ACM*, 45(10), 127–131. doi:10.1145/570907.570909

Abstract. Overwhelmed by the organizational imperative to collect every kind of information available, and finding technical solutions generally miss the point, knowledge workers need to improve their personal capacity for inquiry.

Credibility. This article is cited 25 times by other related articles according to the Digital Library of the ACM, and appears to represent some foundational concepts. Dr. Ali Farhoomand is an Associate Professor of Business and Director of the Centre for Asian Business cases and the University of Hong Kong with a research focus in information systems evaluation, global electronic commerce, and management of technology and innovation. Dr. Don Drury is a Professor of Accounting and MIS at McGill University, Montreal, Quebec, Canada, with a research focus in managerial accounting, management information systems, management forecasting and comparative studies of accounting practices and theories. This article appears in the *Communications of the ACM*, a peer-reviewed journal focusing on the computing and information technology fields covering emerging areas of computer science, new trends in information technology, and practical applications of information technology.

Summary. This article presents the results of an empirical study involving 124 managers of various business sectors in Australia, Hong Kong, Singapore, the U.K. and the U.S. regarding *information overload*. Respondents most frequently cited the term to mean (a) an excessive volume of information, (b) difficulty or impossibility of managing information, (c) irrelevance or unimportance of most information, (d) lack of time to understand information, or (e) multiple sources of information. The findings show that (a) over 50% of managers report that they experience information overload regularly; (b) the primary source is perceived to be email and the Internet; (c) the primary reported effect is

a loss of time; and (d) respondents rely primarily on personal (filtering, eliminating sources, delegation, and prioritization) rather than technical or organizational solutions to dealing with overload. The authors conclude that these findings support the need for (a) better technological tools for information workers to sort and filter information, (b) better IT architectures that can identify and route critical information more effectively, and (c) changing work expectations for knowledge workers from finding answers to presenting meaningful information.

Espejo, R., & Watt, J. (1988). Information management, organization and managerial effectiveness. *The Journal of the Operational Research Society*, 39(1), 7–14.
doi:10.2307/2581993

Abstract. In this paper we argue that information management is not only about managing the information resources of an organization as an economic activity; it is also about the use that individuals make of their information inputs and outputs. The discussion centers on individual managers, particularly on how successful they are in converting information into effective action. The management of complexity is seen as the cornerstone of managerial activities; managers are always faced with the problem of matching their limited information-processing capacity to the much larger information space implied by their responsibilities and commitments. It is argued that managers can employ at least three possible strategies to achieve an adequate matching: they can make adjustments to the organization structure; they can design their organizational conversations; and they can aim at a good manager-to-task fit.

Credibility. This article is cited by 31 other related articles according to the Digital Library of the ACM, and represents some foundational concepts related to information

management in general that contribute to the understanding of *email overload*. Dr. Raul Espejo is a visiting professor at the University of Santiago, Santiago, Chile, and the director of the World Organization for Systems and Cybernetics with a research focus on organizational diagnosis and design along with issues of democracy, transparency and risk in policy-making. Mr. John Watt was a Senior Lecturer at the University of Aston, Birmingham, England. This article appears in the *Journal of the Operational Research Society*, a peer-reviewed journal covering the theory, practice, history, and methodology of Operational Research.

Summary. This article presents a discussion of three strategies for improving organizational information management in terms of increasing individual manager's ability to process inputs and to effectively distribute outputs. These three strategies are (a) make adjustments to the organizational structure that limit the type and amount of information any given manager needs to perform their task, (b) design organizational conversations to clarify commitments made, and (c) adjust manager-to-task fit so that individuals can grow personally in relation to their task within the organization and amplify their output. The authors present a conceptual framework that maintains equal importance for managers to both assimilate and disseminate information in order for an organization to effectively use information and avoid *information overload*.

Fisher, D., Brush, A. J., Gleave, E., & Smith, M. A. (2006). Revisiting Whittaker & Sidner's "email overload" ten years later. In *Proceedings of the 2006 20th anniversary conference on Computer supported cooperative work* (pp. 309–312). New York, NY, USA: ACM.
doi:10.1145/1180875.1180922

Abstract. Ten years ago, Whittaker and Sidner published research on email overload, coining a term that would drive a research area that continues today. We examine a sample of 600 mailboxes collected at a high-tech company to compare how users organize their email now to 1996. While inboxes are roughly the same size as in 1996, our population's email archives have grown tenfold. We see little evidence of distinct strategies for handling email; most of our users fall into a middle ground. There remains a need for future innovations to help people manage growing archives of email and large inboxes.

Credibility. Dr. Danyel Fisher holds a PhD from the University of California, Irvine, and is a researcher at Microsoft Research with a focus on information and data visualization. Dr. A. J. Brush holds a PhD from the University of Washington and is a senior researcher at Microsoft Research with a focus on ubiquitous computing and computer supported cooperative work. This article appears in the *Proceedings of the 2006 20th anniversary conference on computer supported cooperative work*, a peer-reviewed publication issued in conjunction with the conference and containing papers that detail existing practices, inform the design or deployment of systems, or introduce novel systems, interaction techniques, or algorithms.

Summary. This article presents a study of email inboxes for users within Microsoft Corporation that conforms to the general methodology and research aims of a study conducted 10 years earlier, and compares findings between the two to see if email management behavior has changed. The findings suggest that (a) email archive volume has grown; (b) message flow is not obviously greater; (c) inbox size stayed the same; (d) there are more folders in use; and (e) email management tactic profiles identified in the

earlier study (non-filers, spring cleaners, and filers) still function as ideal types. The authors conclude that basic email use has remained consistent despite advances in email client functionality.

Jerejian, A. C. M., Reid, C., & Rees, C. S. (2013). The contribution of email volume, email management strategies and propensity to worry in predicting email stress among academics. *Computers in Human Behavior*, 29(3), 991–996.

doi:10.1016/j.chb.2012.12.037

Abstract. The present study explored the contribution of email volume, email management and worry in predicting email stress among a sample of Australian academics. The sample comprised 114 academic staff from Curtin University in Perth, Australia. An online survey was conducted to gather data on the target variables. A moderated hierarchical regression indicated that the combined model accounted for a significant 11.90% of the variance in email stress ($p = .008, f^2 = .135$). Worry individually accounted for a significant proportion of the variance ($p = .010, f^2 = .06$, 95% CI [.028, .202]). Email volume also significantly predicted email stress ($p = .00$, $f^2 = .057$, 95% CI [.011, .079]). Email management did not moderate the email volume and stress relationship. The findings suggest that email stress is impacting upon academic teaching staff and that research on mitigating this stress needs to be undertaken.

Credibility. Ailsa Jerejian and Clare Reid are both associated with the Curtin Health Innovation Research Institute, Curtin University, Perth, Australia. Dr. Clair Rees is an Associate Professor of Health Sciences at Curtin University, Perth, Australia with a research focus in nature and treatment of anxiety disorders, telemental health and videoconferencing, personality, therapist-factors, and evidence-based therapy. This

article appears in *Computers in Human Behavior*, a peer-reviewed journal focusing on the use of computers from a psychological perspective and includes original theoretical works, research reports, literature reviews, software reviews, and book reviews.

Summary. This article presents the study of a survey of the Faculty of Health Sciences at Curtin University regarding the relationship between email stress, email volume, and email management. Participants were asked to complete established questionnaires designed to assess propensity to worry, the degree of email overload experienced, volume of email received, and volume of email processed and the results were analyzed for relationships among these variables. Based on the data, the authors conclude that (a) respondents who are more likely to worry are more likely to experience overload, (b) respondents who receive more email are more likely to experience overload, but that (c) respondents who process more email are not necessarily more likely to experience overload.

Mano, R. S., & Mesch, G. S. (2010). E-mail characteristics, work performance and distress. *Computers in Human Behavior*, 26(1), 61–69. doi:10.1016/j.chb.2009.08.005

Abstract. The purpose of the study is to examine how e-mail affects work performance. E-mail communication studies have aroused both praise and query regarding the suitability, appropriateness and effectiveness of electronic messages in information management. Less is known about the effects of e-mail on work performance. We consider (1) which e-mail features affect work performance; (2) whether these features are differentially associated with positive (work effectiveness) or negative (stress and distress) side-effects; and (3) whether individual- and organizational-level characteristics are associated with positive and/or negative work performance. Using a secondary level

analysis based on the Pew and American Life sample we show that extent, content, and increased volume of e-mail are (a) more frequently reported by managers than by non-managers (b) age, gender, marital status and education can become a critical issue (c) the amount of e-mail received and sent is positively related to work performance. These findings suggest that assessing the costs and benefits of electronic communication should cover individual features as well as e-mail-related features to assess their impact on work performance.

Credibility. Dr. Rita Mano-Negrin is a Senior Lecturer at University of Haifa, Israel, with a research focus on labor force participation and outcomes in public and nonprofit organizations, organizational processes in public and nonprofit organizations, women in the labor market, and social policy. Dr. Gustavo Mesch is a Professor of Sociology and Anthropology, University of Haifa, Israel, with a research interest in urban sociology, crime and deviance, Internet and society, and research methods. This article appears in *Computers in Human Behavior*, a peer-reviewed journal focusing on the use of computers from a psychological perspective and includes original theoretical works, research reports, literature reviews, software reviews, and book reviews.

Summary. This article presents a secondary quantitative analysis of data collected by the Pew Internet and American Life Project, email in the workplace, and focuses on the relationship between email and work performance. Analysis of the Pew data investigates the relationship between (a) the number of people you exchange email with regularly; (b) the frequency of checking email before and after work; (c) the proportion of work-related email sent daily compared to non-work-related; (d) the overall volume of work-related email recently sent and received and employees' work performance including (a) work

effectiveness; (b) work-related stress; and (c) work-related distress. Based on the analysis, the authors conclude that both the number of people with whom email is exchanged and the amount of personal email sent and received have no effect on work performance; however, frequency of checking email and the number of work-related email sent and received increase work effectiveness but also increase work-related stress and distress. The authors also find that managers are likely to send and receive more email than non-managers and are more likely to react to an overload of email communication.

Renaud, K., Ramsay, J., Hair, M. (2006). "You've got e-mail!" ... Shall I deal with it now? Electronic mail from the recipient's perspective. *International Journal of Human-Computer Interaction*, 21(3), 313–332. doi:10.1207/s15327590ijhc2103_3

Abstract. This article considers the nature of e-mail from the recipient's perspective—what the seemingly free and easy communication really costs the recipient. Information gathered by electronic monitoring software is shown to be at odds with the results of an online survey of e-mail users' perceptions of their e-mail experience—users drastically underestimate the disruptive effects of e-mail. The conclusion is that the constant monitoring of e-mail actually reduces productivity and that there is a need for increased power, control, and awareness on the part of the e-mail recipient to ensure that e-mail remains a tool rather than a tyrant. It is necessary to alert the user of the true cost of e-mail alerts.

Credibility. Dr. Karen Renaud is a Senior Lecturer in Computer Science at the University of Glasgow, UK, with research interests in usability of security systems, graphical authentication mechanisms, security and email acceptable use policies, the use

of technologies in organizations, electronic voting, and privacy. Dr. Judith Ramsay is a Lecturer at the University of the West of Scotland, UK, with research interests in human-computer interaction, human communication, educational technology, and media literacy. Dr. Mario Hair is associated with the University of the West of Scotland, UK. This article appears in the *International Journal of Human-Computer Interaction*, a peer-reviewed journal covering research in computing, artificial intelligence, psychology, linguistics, communication, design, engineering, and social organization, which is relevant to the design, analysis, evaluation and application of innovative interactive systems.

Summary. This article presents the results of two related studies conducted by the authors. The first is a quantitative analysis of the monitored email behavior of six research subjects where the authors find that users switched often between email and other applications. This finding led the authors to presume that this would inhibit work performance; however, the methodology of the first study precludes a direct assessment of work performance so the authors conducted a second study utilizing a survey instrument to collect responses from 177 participants regarding their email use and perceptions of its disruptive effects on their work. The data from the second study shows that participants believe that (a) email makes their lives easier, (b) they prefer to send email rather than receive email, (c) they feel pressure to respond to email right away while they do not expect mail they send to be acted upon immediately, and (d) email alerts do not represent an interruption to their work. The authors conclude that (a) a discrepancy exists between the disruptive effects noted in the first study and the lack of recognition of that disruption in the second study, (b) the mismatch between sender and receiver expectations is what makes email a tyrant, and (c) the equilibrium between

sender and recipient must be addressed by increasing the power, control and awareness of the email recipient.

Thomas, G. F., King, C. L., Baroni, B., Cook, L., Keitelman, M., Miller, S., & Wardle, A. (2006). Reconceptualizing e-mail overload. *Journal of Business and Technical Communication*, 20(3), 252–287. doi:10.1177/1050651906287253

Abstract. This study explores social processes associated with e-mail overload, drawing on Sproull and Kiesler's first and second-order effects of communication technologies and Boden's theory of lamination. In a three-part study, the authors examined e-mail interactions from a government organization by logging e-mails, submitting an e-mail string to close textual analysis, and analyzing focus group data about e-mail overload. The results reveal three characteristics that contribute to e-mail overload— unstable requests, pressures to respond, and the delegation of tasks and shifting interactants— suggesting that e-mail talk, as social interaction, may both create and affect overload.

Credibility. Dr. Gail Thomas is an Associate Professor of Management Communication at the U.S. Naval Postgraduate School, Graduate School of Business and Public Policy, with a research focus on communication challenges faced by public and private sector managers. Dr. Cynthia King is an Assistant Professor of Management Communication at the U.S. Naval Postgraduate School, Graduate School of Business and Public Policy, with a research focus on rhetorical criticism and discourse analysis of spoken and written texts and particularly the relationship between language and meaning in organizational contexts. This article appears in the *Journal of Business and Technical Communication*, a peer-reviewed journal focused on research and scholarly discussion of business communication, technical communication, and scientific communication.

Summary. This article presents a study of email from five middle level program managers collected in three parts, (a) a log of all email for five days with user identified messages that represented overload, (b) representative email strings selected by each user and a single representative email string selected by the authors, and (c) transcripts of audiotaped focus group discussions of the five managers regarding email overload in general and the representative email string in particular. In the analysis of the email logs, the authors find that the majority of email messages are short and easily understood (contrary to their assumptions) and that it is not the email itself that causes overload but the work it implies. In the analysis of the representative email, the authors find common occurrences emerging from the data including (a) requestors revising requests in subsequent responses, (b) implied and explicit pressures to respond with immediacy, and (c) the delegation of tasks and shifting set of users involved in email thread. In the analysis of the transcripts, the authors find five key reasons perceived by participants for *email overload*: (a) email is easy to distribute, (b) users are never out of contact, (c) users are able to multitask, (d) tasks are highly complex and involve coordination, and (e) responses are expected to be immediate.

Whittaker, S., & Sidner, C. (1996). Email overload: Exploring personal information management of email. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 276–283). New York, NY, USA: ACM. doi:10.1145/238386.238530

Abstract. Email is one of the most successful computer applications yet devised. Our empirical data show however, that although email was originally designed as a communications application, it is now used for additional functions that it was not designed for, such as task management and personal archiving. We call this email

overload. We demonstrate that email overload creates problems for personal information management: users often have cluttered inboxes containing hundreds of messages, including outstanding tasks, partially read documents and conversational threads. Furthermore, user attempts to rationalise their inboxes by filing are often unsuccessful, with the consequence that important messages get overlooked, or "lost" in archives. We explain how email overloading arises and propose technical solutions to the problem.

Credibility. This article has been cited 237 times by related scholarly works according to the Digital Library of the ACM, and is foundational to the topic of *email overload*. Dr. Steve Whittaker is a Professor of Human Computer Interaction at the University of California at Santa Cruz and has research interests in digital tools to regulate emotions and support personal reflection, personal information management, supporting online community, and distraction and focus. Dr. Candace Sidner is a Research Professor in Computer Science at the Worcester Polytechnic Institute with research interests in natural language processing, artificial intelligence, intelligent user interfaces, and human-robot interaction. This article appears in the *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, a peer-reviewed publication issued in conjunction with the conference and containing papers that represent original research in the field of human-computer interaction.

Summary. This article presents a study of email use and management by 20 participants by quantitatively analyzing the content of their email box and then conducting a qualitative semi-structured interview with each participant to understand how individual users organize and manage their email. The authors use the quantitative data to characterize users into three different inbox management profiles: (a) frequent filers who

move email into appropriate folders and have small inboxes; (b) no-filers who leave all email in the inbox and search for needed messages by key word searching; and (c) spring cleaners who periodically organize their inbox into folders (every one to three months.) The authors find that (a) managers experience higher volumes of incoming email than non-managers and are often no-filers, (b) email is used for task management as well as asynchronous communication with users leaving mail in their inbox to remind them of incomplete tasks, and (c) users find it hard to file messages both due to the difficulty involved and the fact that there may be few benefits to doing so. The authors propose technical solutions to the problem by suggesting email client functionality that can (a) group messages by thread or topic, (b) identify messages that require action, and (c) remind users of deadlines.

What enterprise-wide email management techniques show the most potential to improve work effectiveness?

Gupta, A., Sharda, R., & Greve, R. A. (2011). You've got email! Does it really matter to process emails now or later? *Information Systems Frontiers*, 13(5), 637–653.

doi:10.1007/s10796-010-9242-4

Abstract. Email consumes as much as a quarter of knowledge workers' time in organizations today. Almost a necessity for communication, email does interrupt a worker's other main tasks and ultimately leads to information overload. Though issues such as spam, email filtering and archiving have received much attention from industry and academia, the critical problem of the timing of email processing has not been studied much. It is common for many knowledge workers to check and respond to their email almost continuously. Though some emails may require very quick responses, checking

emails almost continuously may lead to interruptions in regular knowledge work. Managing email processing can make a significant difference in an organization's productivity. Previous research on this topic suggests that perhaps the best way to minimize the effect of interruptions is to process email frequently for example, every 45 minutes. In this study, we focus on studying email response timing approaches to optimize the communication times and yet reduce the interruptive effects. We investigate previous recommendations by performing a two-phase study involving rigorous simulation experiments. Models were developed for identifying efficient and effective email processing policies by comparing various ways to reduce interruptions for different types of knowledge workers. In contrast to earlier research findings, results indicate that significant productivity improvements could be achieved through the use of some email processing policies while helping attain a balance between email response time and task completion time. Findings also suggest that the best policy may be to respond to email two to four times a day instead of every 45 minutes or continuously, as is common with many knowledge workers. We conclude by presenting many research opportunities for analytical and organizational IS researchers.

Credibility. Dr. Ashish Gupta is an Associate Professor of Operations Management at Minnesota State University Moorhead with research interests in understanding cognition, decision-making, and workflow with the goal of improving healthcare delivery and improving Health IT systems. Dr. Ramesh Sharda is the Director of the Institute for Research in Information Systems with research interests in information overload and interruptions, decision support systems, and collaborative systems. Dr. Robert Greve is an Associate Professor of Software Engineering at Oklahoma City University with

research interests in knowledge work, information overload, interruptions, multi-tasking, and email processing strategies. This article appears in *Information Systems Frontiers*, a peer-reviewed journal that presents new research and developments at the interface of information systems and information technology from analytical, behavioral, and technological perspectives.

Summary. This article presents a two-phase study that utilizes a computation modeling approach to simulate knowledge worker email processing habits to investigate the relationship between frequency of email processing and task completion time. The first phase of the study assesses the relationship between checking email at specific intervals during a day versus continual checking and (a) knowledge worker time utilization, (b) email response time, and (c) task completion time by simulating five different priorities of email with differing completion time requirements and uninterrupted time to complete primary tasks. The second phase of the study assesses the relationship between checking email at specific intervals during a day versus continual checking and (a) project managers' time use efficiency and (b) amount of time needed to complete a daily threshold of work by simulating the same five different priorities of email and the ability to process the priority messages in a timely way. The authors conclude that the data shows (a) a significant correlation between workers being busier during the day if they check their email more often than four times a day; (b) a correlation between workers taking longer to complete primary tasks if they check their email more often than four times a day; (c) dividing work between non-priority email and priority email will result in greater efficiency of project management time; (d) checking email twice daily will not result in significantly fewer hours worked daily for project managers; and (e) checking

email twice daily during peak email arrival times will not result in shorter resolution times. Based on these findings, the authors assert that the optimal policy is to check email between two and four times a day.

Jackson, T. W., Dawson, R., & Wilson, D. (2003). Understanding email interaction increases organizational productivity. *Commun. ACM*, 46(8), 80–84. doi:10.1145/859670.859673

Abstract. To minimize the effect of email interruption on employee productivity, limit the frequency of new-email alerts (silence them, too), make it easier to assess each message's importance, and remove the reply-to-all facility.

Credibility. Dr. Thomas Jackson is a lecturer in Computer Science at Loughborough University, Loughborough, U.K. with research interests in electronic communication, information retrieval in the work place, and applied and theory based information management. Mr. Ray Dawson is a Professor of Knowledge Management at Loughborough University, Loughborough, U.K. with research interests in software project management, knowledge management, systems performance, requirements analysis, and software configuration management. Mr. Darren Wilson is the Information Systems Director at The Danwood Group, Lincoln, U.K. This article appears in *Communications of the ACM*, a peer-reviewed journal focusing on the computing and information technology fields covering emerging areas of computer science, new trends in information technology, and practical applications of information technology.

Summary. This article presents a study of email use by sixteen subjects based on video capture of their computer desktops during normal work days. The study seeks to understand whether recovery time is associated with email interruptions by measuring the reaction time to respond to new incoming mail and the time required to resume work that

was in progress at the point of interruption. The findings indicate that for these subjects (a) 70% of email is reacted to within six seconds of arrival; (b) recovery time is on average 64 seconds (which is considerably shorter than published recovery times for telephone calls); and (c) there are natural peak times for email interactivity at 8:30 a.m., 11:30 a.m., 14:30 p.m., and 16:30 p.m. The authors conclude that the accumulative effect of interruptions due to the volume of email is significant and based on the findings recommend the following guidelines to increase employee productivity: (a) reduce the prominence of interruptions by turning off the new-email-alert dialogue box and email sound alerts; (b) restrict the use of email-to-all messages and reply-to-all messages; (c) set up the email inbox to display only sender, subject and first three lines of the message so recipients can quickly determine if it needs immediate attention; (d) set up the email application to check for email no more frequently than every 45 minutes; and (e) train all staff in how to set email priority, perform email housekeeping with message rules, create users groups and address books, and structure email messages.

Kanungo, S., & Jain, V. (2008). Modeling email use: A case of email system transition. *System Dynamics Review (Wiley)*, 24(3), 299–319. doi:10.1002/sdr.406

Abstract. A large urban university expected its transition to a new and improved email system to result in higher productivity than before. However, email productivity did not show significant improvement after the transition. To understand this lack of improvement in productivity, we modeled the relations among variables that affect email use and productivity using system dynamics. The results show that in non-volitional use situations stress related to email use and email productivity are significantly influenced by the levels of tolerable email backlog and steady incoming emails. Users react to

changes in email backlog by calibrating their level of use. This adjustment, in turn, depends on each user's level of email self-efficacy and the rate at which users learn to adapt to changes. The contribution of this paper lies in showing that email productivity can improve if users develop a stable pattern of email use. This can minimize variations in email use and in so doing is likely to leverage email use.

Credibility. Dr. Shivraj Kanungo is an Associate Professor of Decision Sciences at George Washington University with research interests in evaluating information technology effectiveness in organizations, information and communication technologies for development, decision support systems and software engineering, and information systems evaluation. Dr. Vikas Jain is an Assistant Professor of Information and Technology Management at The University of Tampa with research interests in the business value of information systems, systems analysis and design, and database design. This article appears in *System Dynamics Review*, a peer-reviewed journal that publishes original research that addresses advances in systems thinking and system dynamics and their applications to societal, technical, managerial, and environmental problems.

Summary. This article presents a case study of modeling email use utilizing a two phase process to first define a system dynamics model of email use based on participant empirically collected data and iterative validation and then using the model to compute different scenarios to analyze the nature of new email application adoption and use. The model takes inputs for (a) email volume and (b) tolerable email backlog. Performance metrics over time are produced for (a) productivity, (b) email use, (c) stress, and (d) attitude toward new email system. The results show that under low or normal email volume and tolerable email back log, performance metrics improve for email users after a

period of stabilization of email use; however, performance metrics decline over time for email users under normal or high email volume and low tolerable email backlog. The authors assert that these findings indicate that (a) email can be used more effectively by being more tolerant of email backlogs; (b) users who do not establish a regular email use pattern take longer to reach stable behavior and longer to (re)gain productivity; and (c) high productivity levels are associated with a low level of incoming emails and low productivity levels are associated with high work pressure. The authors conclude that organizations must let people customize their zone of comfort when it comes to email use and that efforts to limit unwanted email traffic can significantly improve email productivity.

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

Abstract. Individuals within organizations are beginning to make an important realization: more information technology (IT) usage in the workplace can, at times, lead to productivity losses. We conceptualize this frequently observed, but largely ignored phenomenon as *technology overload*, when additional technology tools begin to crowd out one's productivity instead of enhancing it. We found support for three main factors contributing technology-based productivity losses through *information overload*, *communication overload*, and *system feature overload*. Interestingly, these factors are a function of the individuals who use the technology, not the technology itself. In this paper, we present the results from three studies that (1) develop and pre-test a scale measurement for technology overload and its distinct dimensions, (2) validate the

instrument, and (3) explore the relationship between technology overload and knowledge worker productivity. Our findings demonstrate the relationship between information technology usage and knowledge worker productivity, and they suggest how tradeoffs can be managed to ameliorate technology overload.

Credibility. Dr. Pamela Karr-Wisniewski is a Post-Doctoral Researcher in the College of Information Sciences at Penn State University with a research interest in meta-cognition of technology use to optimize positive individual, interpersonal, and organizational outcomes. Dr. Ying Lu is an Assistant Professor of Business Information Systems & Operations Management at the University of North Carolina at Charlotte with a research interest in management of information systems, business value of IT and organizational impacts, organizational agility and IT, IT innovation and competitive advantage, and IS strategy and alignment. This article appears in *Computers in Human Behavior*, a peer-reviewed journal focusing on the use of computers from a psychological perspective and includes original theoretical works, research reports, literature reviews, software reviews, and book reviews.

Summary. This article presents an analysis of a survey conducted of 104 knowledge workers regarding (a) their perceived dependence on technology; (b) their perceived productivity; and (c) their perceived level of information, communication, and system feature overload. The authors apply statistical analysis methods to the survey results to determine if significant relations exist between these variables. The findings indicate that there is a positive relation between technology dependence and productivity; however, there is a very strong negative relation between technology dependence, overload, and productivity. These findings lead the authors to conclude that organizations can get a

larger return on their technology investments if they allow users to (a) limit methods of communication; (b) limit feature sets of software tools; and (c) limit the volume of information processed through executive summaries, dashboards, etc.

Kokkalis, N., Köhn, T., Pfeiffer, C., Chorneyi, D., Bernstein, M. S., & Klemmer, S. R. (2013).

EmailValet: Managing email overload through private, accountable crowdsourcing. In *Proceedings of the 2013 conference on Computer supported cooperative work* (pp. 1291–1300). New York, NY, USA: ACM. doi:10.1145/2441776.2441922

Abstract. This paper introduces privacy and accountability techniques for crowd-powered systems. We focus on email task management: tasks are an implicit part of every inbox, but the overwhelming volume of incoming email can bury important requests. We present *EmailValet*, an email client that recruits remote assistants from an expert crowdsourcing marketplace. By annotating each email with its implicit tasks, EmailValet's assistants create a task list that is automatically populated from emails in the user's inbox. The system is an example of a *valet* approach to crowdsourcing, which aims for parsimony and transparency in access control for the crowd. To maintain privacy, users specify rules that define a sliding-window subset of their inbox that they are willing to share with assistants. To support accountability, EmailValet displays the actions that the assistant has taken on each email. In a weeklong field study, participants completed twice as many of their email-based tasks when they had access to crowdsourced assistants, and they became increasingly comfortable sharing their inbox with assistants over time.

Credibility. Mr. Nicolas Kokkalis is a PhD Student of Computer Engineering at Stanford University with expertise in designing social applications that grow virally, using word of

mouth marketing techniques in online forums. Dr. Michael Bernstein is an Assistant Professor of Computer Science at Stanford University, with research interests in human-computer interaction and design of crowdsourcing and social computing systems. Dr. Scott Klemmer is an Associate Professor of Computer Science at Stanford University, with research interests in the social and psychological ingredients of design excellence, mobile interfaces for sharing expertise and achieving goals, and peer learning and assessment. Mr. Thomas Kohn, Mr. Carl Pfeiffer, and Mr. Dima Chorneyi are associated with the Stanford University HCI Group. This article appears in the *Proceedings of the 2013 conference on Computer supported cooperative work*, a peer-reviewed publication issued in conjunction with the conference that presents research in the design and use of technologies that affect groups, organizations, communities, and networks.

Summary. This article gives an overview of a crowd sourced tool called EmailValet that enables users to manually extract information and organize tasks from email and/or delegate the task of task creation to online human assistants and presents a study of the effectiveness of the tool in terms of (a) accuracy of task creation, (b) usefulness, and (c) privacy concerns and trust. The study includes 28 participants as email customers and three online human processors, with participant customers completing a final semi-structured survey after one week of using the service and 16 participants participating in all aspects of client use with measurable task completion rates. Structured data from measurable task completion rates are evaluated for the conditions where the participant (a) utilized assistance (*Assistance*); (b) could not see assistant created tasks but could create their own (*Self*); and (c) could not see or create tasks (*Control*). The findings include (a) an increase in acceptance rates of tasks created by online assistants from

62.1% on the first day of the study to 84.8% on the last day; (b) 68.6% of accepted assistant created tasks to all tasks created by participant and assistants as a measure of tasks missed by assistants; (c) a much higher task completion rate for the *Assistance* condition compared to *Self* or *Control*, at 58.4% 29.3% and 26.3% respectively; and (d) only two participants opted to manually control which individual emails assistants could see and act on (most participants gave broad access to messages based on key words or priority) and those who specifically blocked access to content did so based on patterns such as passwords or sender identity. The unstructured survey data corroborated these findings with qualitative statements in support of (a) increased confidence in accuracy of assistant created tasks over time, (b) the lack of context awareness by assistants cited as the reason for missed tasks, (c) the positive impact on task management, and (d) increased trust over time. These findings lead the authors to conclude that there are significant and measureable increases in task completion rates when an assistant is utilized to help extract and present tasks from email.

Mock, K. (2001). An experimental framework for email categorization and management. In *Proceedings of the 24th annual international ACM SIGIR conference on Research and development in information retrieval* (pp. 392–393). New York, NY, USA: ACM.

doi:10.1145/383952.384033

Abstract. Many problems are difficult to adequately explore until a prototype exists in order to elicit user feedback. One such problem is a system that automatically categorizes and manages email. Due to a myriad of user interface issues, a prototype is necessary to determine what techniques and technologies are effective in the email domain. This paper describes the implementation of an add-in for Microsoft Outlook 2000™ that intends to

address two problems with email: 1) help manage the inbox by automatically classifying email based on user folders, and 2) to aid in search and retrieval by providing a list of email relevant to the selected item. This add-in represents a first step in an experimental system for the study of other issues related to information management. The system has been set up to allow experimentation with other classification algorithms and the source code is available online in an effort to promote further experimentation.

Credibility. Dr. Kenrick Mock is an Associate Professor of Computer Science at the University of Alaska, Anchorage, with a research focus in eye tracking, agent-based simulations and complex systems, authentication schemes resistant to shoulder surfing, and visualizing attrition in computer science. This article appears in *Proceedings of the 24th annual international ACM SIGIR conference on Research and development in information retrieval*, a peer-reviewed publication issued in conjunction with the conference and containing papers that represent new research and the demonstration of new systems and techniques in the broad field of Information Retrieval.

Summary. This article presents a prototype system meant to test different ideas for categorization and management of email. The prototype is meant to offer functionality that addresses how people use email as described by Whittaker and Sidner (1996) by improving functionality of existing email clients in a way that compliments existing behavior. The author describes two main functions to be demonstrated (a) the automatic grouping of email within categories, and (b) a search tool to find relevant email. The prototype uses key word identifiers provided by the user to (a) organize email into the group feature already present in Microsoft Outlook and (b) automatically organize these messages in folders. The prototype also provides an interface for users to select a

message and find similar messages contained in the inbox. No conclusions are drawn by the author regarding the efficacy of this approach and further research is suggested.

Wajcman, J., & Rose, E. (2011). Constant connectivity: Rethinking interruptions at work.

Organization Studies, 32(7), 941–961. doi:10.1177/0170840611410829

Abstract. While the subject of interruptions has received considerable attention among organizational researchers, the pervasive presence of information and communication technologies has not been adequately conceptualized. Here we consider the way knowledge workers interact with these technologies. We present fine-grained data that reveal the crucial role of mediated communication in the fragmentation of the working day. These mediated interactions, which are both frequent and short, have been commonly viewed as interruptions — as if the issue is the frequency of these single, isolated events. In contrast, we argue that knowledge workers inhabit an environment where communication technologies are ubiquitous, presenting simultaneous, multiple and ever-present calls on their attention. Such a framing employs a sociomaterial approach which reveals how contemporary knowledge work is itself a complex entanglement of social practices and the materiality of technical artifacts. Our findings show that employees engage in new work strategies as they negotiate the constant connectivity of communication media.

Credibility. Dr. Judy Wajcman is the Head of the Sociology Department of the London School of Economics and Political Science, U.K., with a research interest in the sociology of work and employment, science and technology studies, sociology of information and communication technologies, gender theory, and organizational analysis. Ms. Emily Rose is associated with the Institute for Social Science Research at University

of Queensland, Australia. This article appears in *Organization Studies*, a peer-reviewed journal that presents theoretical and empirical research that seeks to promote the understanding of organizations, organizing and the organized in and between societies.

Summary. This article presents data collected from a qualitative assessment of 18 participants regarding their work flow, use of technology, and overall work practice with the goal of understanding the role of interruptions in knowledge work. Data are collected from a survey questionnaire, shadowing of participants during the workday, logging of episodes of work activity, and a post-shadowing interview. The findings indicate that (a) knowledge workers spend 74% of their workday engaged in communication; (b) 90% of work episodes last for 10 minutes or less; and (c) knowledge workers do not consider email and other technology mediated communications as interruptions, rather they consider these as integral to their work. The authors assert that these findings indicate that knowledge workers are utilizing technology-mediated communications to exert a great deal of control over their work activities and the source of overload is an artifact of corporate culture that demands perpetual availability rather than stemming from the technology itself. The authors go on to suggest that rather than rely on machine learning techniques to filter and organize communications, organizations should develop explicit policies at the macro level to ensure the use of media technologies better serve organizational goals.

Whittaker, S., Bellotti, V., & Gwizdka, J. (2006). Email in personal information management.

Communications of the ACM, 49(1), 68–73. doi:10.1145/1107458.1107494

Abstract. For many of us, work is interpersonal rather than solitary, and email is the main conduit through which that work and its related information are distributed. We

tend to live in our email, as reflected in the amount of time we spend using it and our evaluation of its importance in everyday work. Email's role as conduit naturally leads to it being used for three key functions in personal information management (PIM): task management, personal archiving, and contact management.

Credibility. This article has been cited 27 times according to the Digital Library of the ACM, and appears to contain some foundational concepts to the phenomenon of *email overload*. Dr. Steve Whittaker is a Professor of Human Computer Interaction at the University of California at Santa Cruz and has research interests in digital tools to regulate emotions and support personal reflection, personal information management, supporting online community, and distraction and focus. Dr. Victoria Bellotti is a Principle Scientist at the Palo Alto Research Center, a Xerox company in Palo Alto California, with primary research interests in technology-centered business ventures, human requirements for future technology, and the design of human-centered systems focusing on the user experience. Dr. Jacek Gwizdka is associated with Rutgers University, New Brunswick, NJ. This article appears in the *Communications of the ACM*, a peer-reviewed journal focusing on the computing and information technology fields covering emerging areas of computer science, new trends in information technology, and practical applications of information technology.

Summary. This article presents a discussion of the role of email in supporting personal information management functions of (a) task management, (b) personal archiving, and (c) contact management. The authors describe email as a unifying application that is the primary means of distributing and managing work for knowledge workers and review specific suggestions for how email clients should be modified to support these key

functions. These suggestions include (a) organizing collections of email related to a single task based on threads; (b) automatic methods built-in to email to detect and highlight critical tasks; (c) automatic methods built-in to email to automatically extract contact information from email senders; and (d) making data within email more easily extracted by project and task management software so that workers can still utilize the convenience of email but with the higher level functions and better organizational structures of dedicated tools. The authors assert that email will continue to be central to knowledge work but that in order to reduce the overload problems, information must be siphoned from email either by adopting other tools with access to email information or by automatically organizing information contained within the communications.

Xiang, Y. (2009). Managing email overload with an automatic nonparametric clustering system. *Journal of Supercomputing*, 48(3), 227–242.

Abstract. Email overload is a recent problem that there is increasingly difficulty that people have to process the large number of emails received daily. Currently, this problem becomes more and more serious and it has already affected the normal usage of email as a knowledge management tool. It has been recognized that categorizing emails into meaningful groups can greatly save cognitive load to process emails, and thus this is an effective way to manage the email overload problem. However, most current approaches still require significant human input for categorizing emails. In this paper, we develop an automatic email clustering system, underpinned by a new nonparametric text clustering algorithm. This system does not require any predefined input parameters and can automatically generate meaningful email clusters. The evaluation shows our new algorithm outperforms existing text clustering algorithms with higher efficiency and

quality in terms of computational time and clustering quality measured by different gauges. The experimental results also well match the labeled human clustering results.

Credibility. Dr. Yang Xiang is the Director of the Network Security and Computing Laboratory and Professor of Information Technology at Deakin University, Burwood, Australia, with research interests in network and system security, distributed systems, and networking. This article appears in the *Journal of Supercomputing*, a peer-reviewed journal presenting archival survey papers on all aspects of supercomputing including technology architecture and systems, algorithms, languages and programs, performance measures and methods, and applications.

Summary. This article presents a new mathematical clustering algorithm that is meant to manage email overload by automatically clustering email based on the email content rather than by user input parameters. The new nonparametric text clustering algorithm is compared to two standard algorithms in use for similar work, hierarchical agglomerative and K-means matching, and is found to (a) take less computational time to run, (b) produce better results in terms of internal similarity of items clustered based on statistical analysis, and (c) produce better results in terms of external similarity of items in comparisons to human clustering of the same data. The nonparametric text clustering algorithm is shown to match human clustering more than 60% of the time as compared to 54% and 39% for hierarchical agglomerative and K-means respectively. These findings lead the author to conclude that new email systems built on this algorithm to automatically cluster email can reduce email overload by reducing the cognitive load required to process items into folders manually.

What enterprise-wide email management techniques show the most potential to reduce work-related stress?

Ramsay, J., & Renaud, K. (2012). Using insights from email users to inform organisational email management policy. *Behaviour & Information Technology*, 31(6), 587–603.

doi:10.1080/0144929X.2010.517271

Abstract. One would expect email substantially to increase organisational productivity and efficiency. There is little empirical evidence of this since email use is such a complex tool that it would be well nigh impossible to attribute efficiency increases solely to email. There is anecdotal evidence of the positive aspects of email (Phillips, S. R. and Eisenberg, E. M., 1996. Strategic uses of electronic mail in organisations. *The Public*, 3 (4), 67-81; Virji, A., et al., 2006. Use of email in a family practice setting: opportunities and challenges in patient-and physician-initiated communication. *BMC Medicine*, 4 (18), doi: 10.1186/1741-7015-4-18), and of aspects of email usage that cause aggravation and concern (Whittaker, S. and Sidner, C., 1996. Email overload: exploring personal information. *Management of email*. In: *Proceedings of the ACM conference on human factors in computer systems*, Atlanta, Georgia, USA. New York: ACM, 276283; Fischer, D., et al., 2006. Revisiting Whittaker and Sidner's "email overload" ten years later. In: *Proceedings of the 2006 20th anniversary conference on computer supported cooperative work*, 4-8 November 2006 Banff, Alberta, Canada. New York: ACM, 309-312). Such anecdotal evidence is of limited use in assessing efficiency gains but serves to prompt studies into the impact of the pervasiveness of organisational email on individual employees. To study this, we spoke to email users about their experiences through a series of reflective semi-structured interviews to gauge the effects of email on the

individual user. We linked our findings to a number of behavioural principles and assessed whether the identified email-related behaviours should be encouraged, forbidden or modified. We propose one way of addressing unhelpful emailing behaviours to maximise email's potential for enhancing productivity. We argue that such insights from the level of the individual emailer are the key to maximising email's potential to fulfill its original purpose as a productivity enhancer.

Credibility. Dr. Judith Ramsay is a Lecturer at the University of the West of Scotland, UK, with research interests in human-computer interaction, human communication, educational technology, and media literacy. Dr. Karen Renaud is a Senior Lecturer in Computer Science at the University of Glasgow, UK, with research interests in usability of security systems, graphical authentication mechanisms, security and email acceptable use policies, the use of technologies in organizations, electronic voting, and privacy. This article appears in *Behaviour & Information Technology*, a peer-reviewed journal that presents original research studies and proactive articles on the design, development, use and impact of the human aspects of Information Technology broadly defined.

Summary. This article presents a qualitative study of email use based on semi-structured interviews with eighteen participants and a thematic analysis of their responses to questions. The analysis reveals three strategies for processing email, (a) scheduled, constrained limited reading; (b) obsessive checking; and (c) ignore and delete. Four strategies were identified for organizing email (a) color coding, (b) use folders, (c) prioritizing based on sending, and (d) feeling overwhelmed (i.e. doing nothing). The study found that participants viewed email *positively* in that it is a good way of transferring information quickly and efficiently, *negatively* in that there was a perceived

pressure to respond quickly, and as *enabling some bad behavior* that included (a) buck-passing; (b) back-covering; (c) unneeded broadcasting; (d) nagging; (e) potential misunderstandings; (f) loss of inter-personal communication; (g) BCC usages; and (h) work intrusion into personal time. The authors conclude based on these insights that organizations need to foster good emailing group norms and suggest that organizations should develop educational programs for their employees that set out communication principles, acceptable and unacceptable behavior, and support these with advertising slogans based on adapted culturally accepted proverbs (such as email is a good servant but a bad master, etc.)

Russell, E., Purvis, L. M., & Banks, A. (2007). Describing the strategies used for dealing with email interruptions according to different situational parameters. *Computers in Human Behavior*, 23(4), 1820–1837. doi:10.1016/j.chb.2005.11.002

Abstract. Interruptions research is heavily reliant on a paradigm involving ‘enforced interruption’. Email use however constitutes a special form of ‘controlled interruption’. As there is no precedent available in the existing literature to describe what strategies people use to deal with ‘controlled interruption’, an exploratory first study was undertaken using an open-ended interview design. Twenty-eight email users working within UK organisations were asked about how they dealt with email interruptions, when faced with different situational or task parameters. Qualitative content analysis of interview transcripts revealed a wide range of strategies used for dealing with email *in general*, and for specific situations in particular, with idiosyncratic differences in application. These findings are consistent with the predictions of Action Regulation Theory [Hacker, W. (1985). Activity: A fruitful concept in industrial psychology. In M.

Frese, J. Sabini (Eds.), Goal directed behaviour: The concept of action in psychology. London, Lawrence Erlbaum Associates (Chapter 18); The German Journal of Psychology 18(2) (1994) 91–120] – that people select strategies (action programs) for achieving a task according to the specific parameters of the task or goal. However, the findings go further in highlighting the salience of individual differences in underwriting one's choice of strategy (or action program). Further research is required to understand which strategies are linked to effective performance, and how individual differences influence strategic decision making in multi-goal work environments.

Credibility. Dr. Emma Russell is a Chartered Psychologist in the Division of Occupational Psychology at Kingston University, London, U.K., with research interests in strategies for dealing with new technology communications and how these related to well-being and personality. Dr. Adrian Banks is a Lecturer in the Psychology Department of the University of Surrey, U.K., with a research interest in syllogisms, reasoning in groups and teams, reasoning in dynamic time-pressured situations, the reasoning of experts, reasoning in human-machine systems, and informal logic. Dr. Lynne Millward Purvis is associated with the Psychology Department of the University of Surrey, U.K. This article appears in *Computers in Human Behavior*, a peer-reviewed journal focusing on the use of computers from a psychological perspective and includes original theoretical works, research reports, literature reviews, software reviews, and book reviews.

Summary. This article presents the results of a qualitative exploratory study of email management strategies employed by twenty-eight participants under varying situational parameters. Transcripts of structured participant interviews are coded and the content

analyzed for patterns of email management techniques under normal, high, and low deadline pressures. Participants reported adopting different strategies for email management in response to the varying pressure to meet deadlines; however, they also reported a wide variety of approaches in response to higher pressure, with no consistent approach adopted by all participants. This variable response leads the authors to conclude that participants employ idiosyncratic responses to email management when under pressure, but that the response is based on an evaluation of the situational parameters including deadlines, nature of task, and criticality of email to the task. The authors note that previous research has focused on forced interruptions that disrupt tasks and conclude, based on the data collected in this study, that email represents a controlled interruption that does not force attention away from tasks.

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

Abstract. The present paper introduces three facets of information overload in email communication: A large amount of incoming information, inefficient workflow, and deficient communication quality. In order to cope with these facets of information overload, a training intervention was developed and evaluated. Data were collected from 90 employees on several evaluation levels within a longitudinal evaluation design (one pretest double posttest design). The results reveal that the training contributed to an increase in knowledge and media competencies. We also found evidence for a transfer of training contents to the workplace. Finally, strain diminished on several dimensions. In particular, problems with media usage and work impairment decline significantly, an

effect that was stronger for those participants who face a large amount of email at their workplaces.

Credibility. Dr. Roman Soucek is a researcher with the School of Business and Economics at the University of Eranen-Nuremberg, Nurnberg, Germany. Dr. Klaus Moser is the Chair of Psychology at the University of Eranen-Nuremberg, Nurnberg, Germany, with a research interest in personnel selection, performance appraisal, training and development, survey research, and the psychology of advertising. This article appears in *Computers in Human Behavior*, a peer-reviewed journal focusing on the use of computers from a psychological perspective and includes original theoretical works, research reports, literature reviews, software reviews, and book reviews.

Summary. This article presents an evaluation of an email training intervention conducted for six companies involving 90 participants. Participants are surveyed regarding three aspects of email overload before, immediately after, and three to four weeks after the training. The training covered three parts (a) email client functionality aimed at processing a high volume of email; (b) principles of effective work flow; and (c) the appropriate handling of email communications including “good practice” and “bad practice”. The surveys assess participants’ improvements in their information processing abilities and the reduction of email strain. The data indicate that as a result of the training, participants (a) are able to increase their knowledge of email client features, (b) are able to apply their knowledge of email clients to improve email use, (c) are able to lower email strain in terms of their ability to decrease problems with media usage and decrease work impairment, but (d) do not improve their ability to deal with superficial and ambiguous communication. The authors conclude that individual capabilities that prevent

information overload can be improved by this training intervention; in particular information processing capabilities can be increased and several facets of email strain can be decreased.

What is the role of email as an enterprise-wide general project management and informal workflow tool?

Bellotti, V., Ducheneaut, N., Howard, M., Smith, I., & Grinter, R. E. (2005). Quality versus quantity: E-mail-centric task management and its relation with overload. *Human-Computer Interaction*, 20(1/2), 89–138. doi:10.1207/s15327051hci2001&2_4

Abstract. It is widely acknowledged that many professionals suffer from "e-mail overload." This article presents findings from in-depth fieldwork that examined this phenomenon, uncovering six key challenges of task management in e-mail. Analysis of qualitative and quantitative data suggests that it is not simply the quantity but also the collaborative quality of e-mail task and project management that causes this overload. We describe how e-mail becomes especially overwhelming when people use it for tasks that involve participation of others; tasks cannot be completed until a response is obtained and so they are interleaved. Interleaving means that the e-mail user must somehow simultaneously keep track of multiple incomplete tasks, often with the only reminder for each one being an e-mail message somewhere in the inbox or a folder. This and other insights from our fieldwork led us to a new design philosophy for e-mail in which resources for task and project management are embedded directly within an e-mail client as opposed to being added on as separate components of the application. A client, TaskMaster, embodying these ideas, was developed and tested by users in managing their

real e-mail over an extended period. The design of the client and results of its evaluation are also reported.

Credibility. This article has been cited 25 times according to the Digital Library of the ACM, and appears to contain some foundational concepts to the phenomenon of *email overload*. Dr. Victoria Bellotti is a Principle Scientist at the Palo Alto Research Center, a Xerox company in Palo Alto California, with primary research interests in technology-centered business ventures, human requirements for future technology, and the design of human-centered systems focusing on the user experience. Dr. Nicolas Ducheneaut is the Director of Gamer Behavior Research at Ubisoft and an Adjunct Professor at the Baskin School of Engineering, UC Santa Cruz, with research interests in human play, social dynamics of multiplayer online games and virtual worlds, and innovative social software. Mr. Mark Howard is associated with the Palo Alto Research Center, a Xerox company in Palo Alto California as a software engineer. Dr. Ian Smith is the Chief of Technical Staff at Captricity and is associated with Intel Research and the Palo Alto Research Center. Dr. Rebecca E. Grinter is a Professor of Interactive Computing at the Georgia Institute of Technology with research interests in human-computer interaction, ubiquitous computing, and computer supported cooperative work. This article appears in *Human-Computer Interaction*, a peer-reviewed journal focusing on theoretical, empirical, and methodological issues of user science and system design.

Summary. This article presents a multi-part study that (a) assesses variations in email use across three different knowledge-intensive organizations through *in situ* interviews with 28 participants to establish a baseline; (b) applies this usage pattern to the Palo Alto Research Center (PARC) to establish email use as representative of similar organizations;

(c) utilizes interviews and video observations of email usage of seven participants to establish what task related activities email is typically used for; (d) uses data collected to inform the design of a prototype software tool meant to combat overload; and (e) seeks feedback from study participants regarding the effectiveness of the prototype. The data indicate that initial participants email include the following type of activities in order of predominance: (a) announcements; (b) dialogue, discussion, negotiation; (c) organizing, scheduling; (d) not an activity (spam etc.); (e) coauthoring, document review; and (f) formal information gathering. Forty five percent of these activities involve more than 20 people, 30% of these activities involve only two people. The authors conclude that PARC is fairly representative of knowledge-work professionals and identify six key challenges of task management in the email usage of the seven in-depth study participants including (a) keeping track of lots of concurrent actions; (b) marking things as important or outstanding; (c) managing activity extending over time or keeping track of threads of activity; (d) managing deadlines and reminders; (e) collation of related items including email and documents, and in particular those related to events such as meetings; and (f) getting a task oriented overview, at a glance, rather than scrolling around inspecting folders. The authors identify three classes of tasks conducted in email by the participants including (a) rapid-response tasks easily completed by participants alone; (b) extended-response tasks completed by participants alone but subject to interruptions due to their duration; and (c) interdependent tasks that require participants to coordinate work with others such as delegating sub-tasks and waiting for responses to continue. The data collected indicate that the interdependent tasks are typical of managers and cause overload as participants are required to track the status of the work of others for which

they may have little control and for which tracking is difficult. These findings lead the authors to conclude that it is not simply the quantity of email that leads to overload, but the number of interdependent tasks performed and lack of specifically designed email task management features. Based on these findings the authors present the seven in-depth study participants with a prototype software tool that presents email organized around tasks rather than messages. The authors find that participants are not able to effectively use the prototype due to software bugs and critical missing functionality (such as printing), but participants do report the design principles as compelling.

Faulring, A., Myers, B., Mohnkern, K., Schmerl, B., Steinfeld, A., Zimmerman, J., ... Siewiorek, D. (2010). Agent-assisted task management that reduces email overload. In *Proceedings of the 15th international conference on Intelligent user interfaces* (pp. 61–70). New York, NY, USA: ACM. doi:10.1145/1719970.1719980

Abstract. RADAR is a multi-agent system with a mixed-initiative user interface designed to help office workers cope with email overload. RADAR agents observe experts to learn models of their strategies and then use the models to assist other people who are working on similar tasks. The agents' assistance helps a person to transition from the normal email-centric workflow to a more efficient task-centric workflow. The Email Classifier learns to identify tasks contained within emails and then inspects new emails for similar tasks. A novel task-management user interface displays the found tasks in a to-do list, which has integrated support for performing the tasks. The Multitask Coordination Assistant learns a model of the order in which experts perform tasks and then suggests a schedule to other people who are working on similar tasks. A novel Progress Bar displays the suggested schedule of incomplete tasks as well as the

completed tasks. A large evaluation demonstrated that novice users confronted with an email overload test performed significantly better (a 37% better overall score with a factor of four fewer errors) when assisted by the RADAR agents.

Credibility. Mr. Andrew Faulring is a Research Programmer in the Human-Computer Interaction Institute at Carnegie Mellon University, with a research focus on usable interfaces for intelligent agents. Dr. Brad Myers is a Professor in the Human-Computer Interaction Institute at Carnegie Mellon University, with research interests in programming environments, end-user software engineering, handheld devices, user interface development systems, user interfaces, programming by example, visual programming, interactions techniques, and window management. Mr. Ken Mohnkern, Dr. Bradley Schmerl, Dr. Aaron Steinfeld, Dr. John Zimmerman, Dr. Asim Smailagic, Dr. Jeffery Hansen, and Dr. Daniel P. Siewiorek are associated with the School of Computer Science at Carnegie Mellon University. This article appears in the *Proceedings of the 15th international conference on Intelligent user interfaces*, a peer-reviewed publication issued in conjunction with the conference that presents research and development on intelligent user interfaces.

Summary. This article presents an overview of the functional design goals for an Artificial Intelligence (AI) driven task-centric email client that is part of a larger set of tools developed to help office workers complete tasks more efficiently called RADAR. This article specifically addresses enhancements to the client that incorporate a task strategy component called the Multitask Coordination Assistant (MCA) and presents a study of the overall improvement to task completion accomplished with the new component (*With MCA*) as compared to work performed with no AI assistance (*Without*

Learning) and work performed with the earlier functions but not the new component (*Without MCA*). The study involves 23 participants in the *Without Learning* condition, 28 participants in the *Without MCA* condition, and 28 participants in the *With MCA* condition that are asked to perform a prescribed set of tasks designed to model a real world application of email use for a project planner that includes various priorities for tasks, interdependence for tasks, and deadlines. The results indicate that participants *With MCA* perform better and more consistently complete the priority tasks with fewer errors than the other two categories. Participants *With MCA* are found to (a) have a higher overall evaluation score with 44% less variation (based on task completion); (b) incorrectly complete tasks half as many times; and (c) complete more important tasks than the participants *Without MCA*. These results lead the authors to conclude that the approach of presenting a mixed-initiative user interface showing multiple tasks and programmatically offering strategic advice on task completion with the MCA offers significant advantages to standard email presentation of tasks and/or the presentation of the next task in order.

Krämer, J. P. (2010). PIM-Mail: Consolidating task and email management. In *CHI '10 Extended Abstracts on Human Factors in Computing Systems* (pp. 4411–4416). New York, NY, USA: ACM. doi:10.1145/1753846.1754162

Abstract. Traditional email clients are built with a "one-touch" model in mind that assumes an immediate action is performed once an email is read. However, some emails require a follow-up action or users decide to read them later, so they cannot be discharged immediately. We present a prototype to keep track of these email-associated tasks that works as a plug-in inside a traditional email client. Besides providing flexible task

management features, such as linking more than one message to a task to follow conversations, our system also supports exchanging tasks for collaborative work.

Credibility. Mr. Jan-Peter Kramer is a Research Assistant with the Media Computing group and is associated with RWTH Aachen University, Germany, with research interests in tools for programmers. This article appears in *CHI '10 Extended Abstracts on Human Factors in Computing Systems*, a peer-reviewed publication issued in conjunction with the conference that presents research in the field of human-computer interaction.

Summary. This article presents a discussion of a prototype email plug-in to organize email into tasks as designated by the email user by dragging a message to a To Do tray. Email so designated are tagged with a TODO: header and a preset completion notification mail is sent to the originator when the associated task is completed. The prototype is shared with four colleagues and based on informal feedback the prototype is refined with the addition of the ability to drag multiple messages onto the same task, for messages with similar subject lines to be automatically associated with the task, and tasks are color-coded. The author outlines future quantitative assessments planned to inform future refinements based on public distribution of the plug-in for free to explore how user strategies to deal with email flow change when utilizing this new functionality.

Simperl, E., Thurlow, I., Warren, P., Dengler, F., Davies, J., Grobelnik, M., ... Moreno, C. R. (2010). Overcoming information overload in the enterprise: The active approach. *IEEE Internet Computing*, 14(6), 39–46.

Abstract. Knowledge workers are central to an organization's success, yet their information management tools often hamper their productivity. This has major implications for businesses across the globe because their commercial advantage relies on

the optimal exploitation of their own enterprise information, the huge volumes of online information, and the productivity of the required knowledge work. The Active project addresses this challenge through an integrated knowledge management workspace that reduces information overload by significantly improving the mechanisms for creating, managing, and using information. The project's approach follows three themes: sharing information through tagging, wikis, and ontologies; prioritizing information delivery by understanding users' current-task context; and leveraging informal processes that are learned from user behavior.

Credibility. Dr. Elena Simperl is a Senior Lecturer in the Web and Internet Science Group at the University of Southampton, U.K., with research interests in socially and economically-motivated aspects of creating and using semantically enabled content on the web and in methods facilitating and encouraging large-scale collaboration and participation. Dr. Frank Dengler is a Research Associate with the Institute of Applied Informatics and Formal Description Methods at the Karlsruher Institute for Technology, Germany, with research interests in knowledge management. Dr. Dunja Mladenic is a Professor at the Jozef Stefan International Postgraduate School, Ljubljana, Slovenia, with research interests in semantic technology, text mining, and data mining/machine learning. Mr. Ian Thurlow and Mr. John Davies are associated with British Telecom; Mr. Paul Warren is associated with Eurescom; Mr. Marko Grobelnik is associated with Quintelligence; and Mr. Jose Manuel Gomez-Perez and Mr. Carlos Ruiz Moreno are associated with Intelligent Software Components. This article appears in *IEEE Internet Computing*, a peer-reviewed journal covering all aspects of Internet computing, from programming and standards to security and networking.

Summary. This article presents a discussion of two tools associated with the Active project of the IEEE and describes a case study of the application of these tools underway at British Telecom. The Active project is focused on tools that reduce knowledge workers' information overload and the article describes two components of the project, the Semantic MediaWiki (SMW) and the Active Knowledge Workspace (AKWS). The SMW utilizes folksonomies to tag information managed in corporate wikis for knowledge management and process support. Tags applied with the SMW are utilized by the AKWS in support of active workspaces for information retrieval and process analysis. The AKWS is a combination of a server side communications infrastructure for services such as context/task/action management, information mining, metadata management, and recommendation services and standard office applications on the desktop such as Microsoft Office and Internet Explorer that are activated with tagging, context awareness, and logging capabilities. The focus of AKWS is to provide a workspace that organizes and presents information based on (a) ontologies, (b) observed streams of data items represented in different modalities, and (c) analytic techniques identifying objectives to optimize that enable knowledge workers to readily perform non-formalized tasks such as collecting customer information for a sales proposal. A case study of how these two components are applied at British Telecom is outlined that first assesses user requirements and then deploys AKWS for 12 users to address (a) information sharing, (b) contextualized information delivery, and (c) supporting non-formalized processes. Based on initial observations, the authors note that (a) users favor strongly automatic context-tag generation and context switching; (b) context switching is particularly important for line staff (in this case ICT specialists); and (c) process recording and optimization is more

relevant for managers. The authors conclude that information management technology must be seamlessly integrated into existing tools to be successful.

Siu, N., Iverson, L., & Tang, A. (2006). Going with the flow: Email awareness and task management. In *Proceedings of the 2006 20th anniversary conference on Computer supported cooperative work* (pp. 441–450). New York, NY, USA: ACM.

doi:10.1145/1180875.1180942

Abstract. Email use in the context of everyday work practices, or *email flow*, has not been heavily studied. We present the results of a pair of studies examining how users *interlace* email with their day-to-day, ongoing work processes. We demonstrate that our subjects use email as a tool for managing moment-to-moment attention and task focus. We also provide a model of this workflow that builds upon an existing model by Venolia et al. Finally, we provide specific design recommendations to enhance the usability of email clients in support of these modes of interaction.

Credibility. Dr. Lee Iverson is an Assistant Professor in the Department of Electrical & Computer Engineering, University of British Columbia, with research interests in computer vision, computer graphics, geographical visualization, GIS systems, networked information systems, and systems for human-centered collaboration. Dr. Anthony Tang is associated with the Human Communication Technologies Laboratory at the University of British Columbia, with research interests in human-computer interaction, user interface design, computer supported cooperative work, novel interaction techniques and input devices, collaboration, and information visualization. Mr. Nelson Siu is associated with the Human Communication Technologies Laboratory at the University of British Columbia. This article appears in the *Proceedings of the 2006 20th anniversary*

conference on computer supported cooperative work, a peer-reviewed publication issued in conjunction with the conference and containing papers that detail existing practices, inform the design or deployment of systems, or introduce novel systems, interaction techniques, or algorithms.

Summary. This article presents two studies, one qualitative and one quantitative, that seek to understand users view of email-oriented tasks and the transitions between these tasks. In the first study, four participants are interviewed and job shadowed to get an understanding of their email use and in particular their email flow as it relates to task management. The results of this qualitative analysis indicate that these participants engaged in three different email flow handling actions (a) *Glance*, where participants simply gained a sense of the rate of incoming mail used to decide if an interruption in current work is merited; (b) *Scan*, where participants interrupted work to process email; and (c) *Defer*, where participants explicitly or implicitly flag emails for handling at a later time. The *Defer* action is found to be used to manage overflow and represent management of tasks that require more in-depth attention or are of a lower priority to those handled immediately in the *Scan* action. In the second study, three participants agree to have their email usage automatically monitored through an email logging plug-in that tracks the timing of email management specifically designed to help understand the *Defer* action. Participants' email is monitored for three weeks and data is quantitatively analyzed for (a) number of handling events, (b) messages received, (c) messages sent, and (d) the time spent between opening a message and replying to it. The results indicate that two different types of *Defer* actions are employed by participants (a) intra-session *Defer*, where responses are delayed until the end of an email session and is employed by

the three participants 70%, 80%, and 72% of the time respectively; and (b) inter-session *Defer*, where responses are delayed several hours to several days and is employed by the three participants 30%, 20%, and 28% of the time respectively. These results lead the authors to assert that these participants use email as an ad-hoc tool for directing their attention throughout the day and that once items are identified that need attention they interrupt work and either respond immediately, defer for a few minutes, or defer for an extended time depending on the amount of attention required for the task. Based on these results, the authors suggest that an added functionality to email clients that allows for deferred tasks to be grouped in a separate window for attention later would improve email management and task completion.

Szóstek, A. M. (2011). "Dealing with my emails": Latent user needs in email management.

Computers in Human Behavior, 27(2), 723–729. doi:10.1016/j.chb.2010.09.019

Abstract. Email is a communication channel that provides a number of benefits. It can be stored, retrieved and forwarded. It also allows a recipient to choose when to uptake communication and how to pace it. However, email also incurs one prevalent cost: the feeling of email overload. One of the reasons leading to that feeling lays in the fact that current email clients do not provide an inbox structure that facilitates email prioritization, information structuring and work-flow management. The goal of this study was to understand the latent user needs regarding handling emails. We identified six such needs: three pertaining to email organization (email annotation, reliable structure and no urgency to classify) and three related to email retrieval (informative overview, flexible sorting and efficient search). We further investigated the dominance, importance and dependencies

between these needs. The results were then discussed and implications for future inbox design were proposed.

Credibility. Dr. Agnieszka Matysiak Szóstek is a Research Assistant in the Industrial Design Department of the Eindhoven University of Technology, The Netherlands. This article appears in *Computers in Human Behavior*, a peer-reviewed journal focusing on the use of computers from a psychological perspective and includes original theoretical works, research reports, literature reviews, software reviews, and book reviews.

Summary. This article presents a qualitative study that seeks to understand latent user needs in email use by analyzing user preferences stated during a design exercise. Sixteen participants are asked to present a snap shot of their current email inbox that is printed on paper and each email message is cut out and presented to participants to rearrange according to two different design objectives. The design objectives are (a) an inbox structure that reflects their personal preference for organization and retrieval of email, and (b) an inbox structure that reflects the relative importance of emails. The design sessions are analyzed for participant motivation for design choices and themes regarding user needs that emerge from those motivations. The findings show that latent needs emerge in (a) email organization and (b) email retrieval. For email organization, participants' statements reflect a relative importance score of (a) 83% for the need to annotate email, (b) 15% for the need to have a consistent inbox structure, and (c) 2% for the need regarding not to have to classify email immediately. For email retrieval, participants' statements reflect a relative importance score of (a) 52% for the need to have an informative overview of the inbox, (b) 33% for the need for flexible sorting, and (c) 15% for the need for efficient search possibilities. The author notes that they observed

in the qualitative data that users were generally more concerned with email retrieval than email organization and assert that better email annotation (primary email organizational need) would enable better email retrieval functions implied by the needs identified in the study.

Zhao, J. L., Kumar, A., & Stohr, E. A. (2000). Workflow-centric information distribution through e-mail. *Journal of Management Information Systems*, 17(3), 45–72.
doi:10.2307/40398493

Abstract. Organizations require ways to efficiently distribute information such as news releases, seminar announcements, and memos. While the machinery for information storage, manipulation, and retrieval exists, research dealing directly with its distribution in an organizational context is scarce. In this paper, we address this need by first examining the pros and cons of the conventional "mailing lists" approach and then proposing new workflow mechanisms that improve the efficiency and effectiveness of information distribution through e-mail. The proposed approach is relevant to other information distribution approaches beyond e-mail. The main contributions of this study include: (1) offering a workflow perspective on organizational information distribution; (2) analysis of workflows in two new information distribution methods based on dynamic mailing lists and profile matching, respectively; and (3) proposing a new way of matching supply and demand of information that extends existing information filtering algorithms.

Credibility. Dr. J. Leon Zhao is a Professor of MIS at the University of Arizona, with research interests in modeling and analysis methodologies for business and workflow processes, e-business workflow management, collaborative process management,

workflow modeling and verification, organizational knowledge distribution, e-market security and role-based access control, web services technology and application integration, embedded facilitation in distributed group systems, and distance learning and distributed education systems. Dr. Akhil Kumar is a Professor of Information Systems, Smeal College of Business, at Penn State University, with research interests in health IT, BPM and workflow systems, service composition, process mining, and business analytics. Dr. Edward A. Stohr is a Professor of Information Management Technology, Stevens Institute of Technology, NJ USA, with research interests in decision support, process automation, and workflow management. This article appears in the *Journal of Management Information Systems*, a peer-reviewed journal that presents research that advances the practice and understanding of organizational information systems.

Summary. This article presents a discussion of a proposed approach to work-flow centric information distribution through email that addresses the issues of email overload from the sender rather than receiver perspective of the transaction. The authors describe two work-flow processes applied to mailing lists that they argue improve the accuracy of information distribution and reduce unwanted email from being sent. This article uses a seminar announcement as an example message to demonstrate the approach. The first workflow is demonstrated based on creating a mechanism for users to be prompted for a response regarding their intentions to attend and logging that information to build tags to be used for both mailing list development and user profile creation with consistent taxonomies that can be programmed against. The second workflow is demonstrated by incorporating the tags created in the first workflow and adding them to profiles created for the mailing lists by list owners and of individuals by the users themselves and by

human resource data. The authors describe how to programmatically match mailing list membership and content to interests embedded in the profiles, thereby ensuring that mail is not sent to people who are not interested in the topic at hand. The authors describe mathematical algorithms to build profiles and match interests and conclude that this approach creates a more efficient distribution of information and management for organizational workflow.

Conclusions

Common ideas and techniques are identified during the analysis of the selected references presented in the Annotated Bibliography section of this study that serve to help managers remediate and/or avoid *email overload* throughout the enterprise. Recommendations are identified in both qualitative and quantitative findings presented in peer-reviewed journals. Each of the four organizing themes used to frame the presentation of the references annotated in this study illuminates key factors of *email overload* and how to address it. Themes include (a) defining *email overload* and why it occurs; (b) enterprise-wide email management techniques that show the most potential to increase work effectiveness; (c) enterprise-wide email management techniques that show the most potential to decrease work-related stress; and (d) the role of email as an enterprise-wide general project management and informal workflow tool.

Theme 1 – Defining Email Overload and its Causes

Email overload could be defined very simplistically as receiving too much email, and indeed references presented in this study confirm that there is a correlation between the volume of email received and the feelings of overload (Dabbish & Kraut, 2006; Jerejian et al., 2013; Mano & Mesch, 2010). The perception of lack of control of email is a key factor in overload (Barley et al., 2011; Bawden & Robinson, 2009; Dabbish & Kraut, 2006), and if it were just a matter of too much email the logical response would be to get control of email by either (a) using email less, or (b) managing how time is spent working on email. However, both of these email management techniques have been shown to be problematic. For example, Mano and Mesch (2010) find there is positive relation between higher email use and work effectiveness, while Jerejian et al. (2013) find that more time spent working on email does not alleviate overload. Dabbish and Kraut (2006) find that frequent checking of email helps rather than hinders feelings

of overload, while Gupta et al. (2011) find that statistical models show checking email two to four times a day results in better task completion times. These contradictory findings fail to justify the notion that a simple correlation exists between the volume of email a user receives and how overloaded they feel. In order to find solutions that effectively combat overload, a more nuanced understanding of the phenomenon is needed.

Barley et al. (2011) find that *email overload* is not just about how much email individuals receive and send. Rather, their findings indicate that the stress associated with *email overload* is a reflection of (a) the social context within organizations regarding perceived expectations of responsiveness, and (b) email left in the inbox at the end of the day representing tasks undone and unmet obligations. A key factor is the implied expectation that responses to email messages will be immediate (Barley et al., 2011; Ramsay & Renaud, 2012).

The literature indicates that not all tasks are the same when it comes to overload. For example, the work of managers in general leads to more overload (Dabbish & Kraut, 2006; Drury & Farhoomand, 2002; Mano & Mesch, 2010; Whittaker & Sidner, 1996). While the asynchronous nature of email means that users can set their own priorities for when work gets done, it also means that they must keep track of many tasks at once (Thomas et al., 2006). Bellotti et al. (2005) find that tasks that are dependent on the work of others (such as delegated sub-tasks) in particular are associated with overload.

In summary, the references included in this study define *email overload* as a combination of (a) increased email usage, (b) changing work demands and expectations regarding communication and timeliness, along with (c) the type of work involved. Email use poses both positive and negative opportunities for individual productivity and task management and addressing *email overload* at an enterprise wide level requires an understanding of the most

effective ways to manage email in support of work effectiveness while minimizing the negative overload aspects.

Theme 2 – Methods to Improve Work Effectiveness

The traditional approach to improve work effectiveness for managers is to structure the organization so that managers need a limited set of information to fulfill their tasks (Espejo & Watt, 1988). This approach does not support the modern *knowledge worker* who needs access to a wide variety of information to be able to complete complex and non-routine tasks (Dabbish & Kraut, 2006). While the literature offers few specific proven methods to improve work effectiveness, a number of techniques are offered to limit the volume of unnecessary information. Techniques include (a) using email as a lightweight information sharing tool, such as training on email client features to filter and sort email more effectively (Jackson et al., 2003; Karr-Wisniewski & Lu, 2010; Soucek & Moser, 2010); (b) implementing automated attendants to sort and filter (Faulring et al., 2010; Mock, 2001; Xiang, 2009); and (c) utilizing human assistants to sort and filter email messages for users (Kokkalis et al. 2013). It is of particular note that only the use of assistants (both digital and human) is found to have a clear and demonstrable improvement in work effectiveness. Kokkalis et al. (2013) findings show a 29.1% increase in task completion rates when human assistance is used as compared to a control state of not grouping by tasks at all. Faulring et al. (2010) find that use of their Artificial Intelligence driven Multitask Coordination Assistant increases task completion rates and improves work consistency. The common idea is that email is an essential tool for information flow and task assignment but that it must be augmented to ensure that the matters that require more attention and time are grouped separately and can be addressed as something other than email communications (i.e. as tasks).

Theme 3 – Methods to Lower Stress

References included in this study contradict traditional advice on email management to reduce stress. Suggestions such as checking email only a couple times during the day and organizing email into folders are actually shown to increase stress for managers who are required to keep abreast of tasks and shifting priorities throughout the day (Dabbish & Kraut, 2006). Common coping techniques of (a) immediately responding in an obsessive way, (b) ignoring email, and (c) delaying email processing until later are described but not demonstrated to alleviate the stress associated with overload (Ramsay & Renaud, 2012; Russell et al, 2007). Proactive training on email features has been shown to lower stress in some cases (Soucek & Moser, 2010), but in general the only advice is to address the source of stress, namely the implied expectation of immediate responses to email and immediate task completion (Barley et al., 2011; Ramsay & Renaud, 2012; Thomas et al. 2006). Suggested techniques include (a) training on email composition to clearly articulate deadlines; (b) setting corporate policies with clear expectations about reading and responding to email outside of work hours; (c) frequent checking of email but in a non-task interrupting way; and (d) sharing of best practices for email management (Ramsay & Renaud, 2012; Russell et al., 2007; Soucek & Moser, 2010).

Theme 4 – Email and Task Management/Informal Workflow

Findings presented in the references analyzed in this study also contradict commonly held beliefs such as those described by Jackson et al. (2003) that incoming email represents an interruption to work that lowers work-effectiveness. Renaud et al. (2006) find that, contrary to their expectations, email users did not perceive checking email as a disruption to their work. Wajcman and Rose (2011) find that knowledge workers do not consider email and other technology mediated communications as interruptions, rather they consider these as integral to

their work. Findings presented by Siu et al. (2006) support this assertion and describe three different reactions to incoming email that indicate users identify tasks and set priorities for work in a non-interruptive way by (a) glancing at email as it comes in, (b) interrupting work only when the rate of incoming email indicates an issue requiring immediate attention, and (c) acting on email only when it is convenient.

Much of the literature points to work done by Bellotti et al. (2005) and their descriptions of task oriented workflow in email. These authors describe the need to coordinate work amongst a number of people using email to share information and organize tasks that require the collation of related items including email, documents, and electronic files. A clear picture emerges of email as a fundamental means of sharing information and conducting work, but as Whittaker et al. (2006) note, in its current form email does not necessarily handle task management functions well. Szóstek (2011) finds that based on a design exercise, email users need to be able to easily and flexibly present various views of their inbox based on key words and metadata. Simperl et al. (2010) assert that limitations of email as a task management tool can be addressed by techniques that enhance standard communication tools to present context aware views of information including email threads associated with a given task or body of work. An example would be a sales representative using a dedicated desktop profile for each customer, with the ability to quickly switch between profiles so that the appropriate and pertinent information is readily available.

Recommendations

To alleviate or avoid *email overload* for managers enterprise wide, organizations need to address both key causes, namely (a) the organizational culture that demands or implies immediate response, and (b) the need to separate out tasks from the information flow so that

managers can keep track of the work being done. To address the expectation of immediate response, Ramsay and Renaud (2012) suggest that organizations implement an education campaign to improve awareness and set communication norms. Targeting this education specifically for managers would likely be the most effective, as managers suffer more from the problem and are the people most likely to be perpetuating the cultural expectation. To address the need to separate out tasks from email, organizations should require mandatory email client training for managers with a focus on utilizing existing features to sort and filter email as described by Soucek and Moser (2010). For executive managers and those managers suffering from overload to the point where their work performance is critically impacted, Kokkalis et al. (2013) suggest that organizations should enlist human administrative assistants to read and organize managers' email into tasks. These authors believe that organizations should be able to utilize one assistant for multiple managers thereby increasing both cost effectiveness and work output. In the future it may be possible to utilize artificial intelligent based digital assistants to organize email by task, which may lead to better inherent functionality for email clients in this regard.

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