Did you send it? Enhancing the use of e-mail in scientific research and in the academy

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Abstract

Misuse of the main information technology used in the academy, electronic mail, can be ended through expanded knowledge and renewed education. Becoming acquainted with advanced time management and communication pragmatics students will shortly remedy today's e-mail misuse leading to professors overwhelmed by anxiety-driven e-mails; and scholars wasting valued time on e-mail minutia. Universities reformed by managers literate in today's management theory will focus again on teaching and research, prioritizing scholarly deep work and thus abandoning the use of "urgent" e-mails with the request of spreadsheets and reports. Professors across the world need to educate undergraduate students on the healthy and productive utilization of the e-mail.

Keywords: e-mail, scientific productivity, internet, digital era

1. Introduction

Plentiful research, summarized in several books, has been devoted to the impact of the internet on scientific research. After all, the internet of networked computers had been designed for research purposes. As early as of 2003, Nentwich argued that the internet does not change only the distribution of knowledge but, most importantly, also the very process of knowledge production.[1]

Since over a decade publishing and retrieving scientific articles is an entirely "digitalized" process, namely an online activity involving the internet access to digital (electronic) files generally made available in portable document and hypertext markup language (PDF and HTML) formats.

Today's students find it hard to believe that until the late 1990s, publishing a scientific article started by mailing an envelope embedding three or even five copies of a written manuscript addressed to the journal's editor. Current scientific articles are "hypertexts" realizing Bush's 1945 insight on forthcoming text in which references to other text would be present as "hyperlinks" that the reader can immediately access.[2]

Even more importantly, the internet truly enables the shift to open science[3] in which scientific articles are published first as freely accessible preprints inviting scholarly feedback,[4] and subsequently as peer-reviewed articles, typically under a license such as the one (Creative Commons) "inviting everyone to adopt and reuse its content".[3]

Lesser attention has been devoted to study the impact of electronic mail (e-mail) on scientific research, even though its use by a pioneering community of scholars goes back to the mid 1970s long before the World Wide Web invented in 1993. For instance, in 2008 Hanson-Baldouf and Weiss were finding that "studies related to e-mail use in the specific context of faculty-student communication and enhanced learning are limited and warrant further investigation".[5]

Five years later a study on the use of e-mail in student–faculty interaction in countries as diverse as Germany, Saudi Arabia, and Japan was again finding a "lack of pragmatic competence… in all three groups of students, independent of the proficiency level and seniority.[6] Universities keep sending their professors "urgent" e-mails with the request of ever new reports; and researchers wasting time with e-mail minutia. All said misuse of the e-mail can be ended through expanded knowledge and renewed education.

2. The unique features of e-mail communication

E-mail is a communication technology that combines flexibility and almost instantanous transmission of information to one or multiple recipients across a computer network which today is basically global.[7] In 1978, a 14-year-old boy, V. A. Shiva Ayyadurai, invented the e-mail as will be subsequently used by people across the world, namely as the electronic mail software embedding all the functions of every e-mail program: Inbox, the Memo (To, From, Date, Subject, Cc, Bcc), Outbox, Address Book, Trash, Folders, Attachments, and more.[8] His aim was to replace with e-mail the pneumatic post system used until then to deliver letters among office workers of a small medical college in Newark.

In an interesting recent account on how "experts" continued to wrongly predict the end of e-mail since its inception, Shiva Ayyadurai has explained that the aforementioned experts "keep confusing e-mail with other media: chat, on-line bulletin boards, texting, instant messaging, blogs, etc. But, when one truly looks at the origin of e-mail: the interoffice mail system, which was the engine of communications for businesses, it becomes clear, that as long businesses, big and small, are around, e-mail will be here for a long, long time".[9]

2.1 Instantly, across the globe

Contrary to conventional mail, with electronic mail exchanged by networked computers no "atoms" (to use Negroponte's difference between bits comprising digital information and atoms making up physical tangible objects)[10] are transferred, but only "bits" sort out by the simple mail transfer protocol (SMTP) created by Postel "to transfer mail reliably and efficiently".[11]

Enabling almost instantaneous communication across borders, collaboration between scholars and researchers becomes smooth and easy. Using the aforementioned "attachment" function, for example, a scholar can send the draft of a scientific article (alongside pictures and videos) to a co-worker based in another continent. Feedback that once took weeks to be received via the national postal service, can now be obtained in hours or days.

2.2 Collaboration enabler

In a 2007 study devoted to the internet as a tool to promote collaboration and productivity in the scientific community in South Africa, scholars were finding that the use of electronic mail was "the primary technology of collaboration for communication between individuals and teams of scientists and scholars", even though they found "little evidence" that the use of the new information and

communication technologies had any large impact on foreign productivity.[12]

On the contrary, an almost contemporary study based on collecting data on more than 1,400 scientists from five academic disciplines (astronomy, chemistry, computer science, economics, and psychology) and seven European countries (Denmark, Germany, Ireland, Italy, the Netherlands, Switzerland and Greta Britain) clearly pointed to a positive correlation between internet use and research productivity.[13]

In 2009, a seminal study correlated a large random sample of 3,771 research-active life scientists from 430 U.S. institutions with a dataset combining information on the diffusion of two early innovations in information technology (BITNET, a U.S. network of universities comparable to the internet); and the DNS, the hierarchical and decentralized naming system by which internet domain names are located and translated into internet protocol addresses) from 1969 to 1993.[14] Results were revealing.

The most notable effects of the new information technology (IT) was found on collaboration, as shown by the increase in the number of co-authors observed since the 1980s. However, whereas late-career stage scientists did not benefit from the adoption of IT by their institutions, early-to-mid-career stage scientists *greatly* benefited from the new technology in terms of research quantity, quality and collaboration networks. Furthermore, IT acted as an equalizing force increasing even more the productivity of scientists at mid- and lower-tier institutions, enabling faculty at said institutions to access to colleagues and resources at top tier universities and research centres.

Since 1993 progress in the uptake of rapidly advancing IT has been dramatic, changing the practice of research in academia,[1,4] and also that of teaching and learning.[15] Access to the internet and to the e-mail became ubiquitous. A number of problems and negative consequences quickly emerged.

3. From enhanced to worsened productivity

The negative effects of e-mail misuse on well-being and productivity have been well documented since the early 2000s. In 2001, a study at a service company in Great Britain surprisingly reported that "e-mail messages do have some disruptive effect by interrupting the user - more than is generally assumed".[16] Some 70% of e-mails received, the scholars found, were viewed within 6 seconds, "quicker than letting the phone ring three times".

Only a very small minority of employees, the scholars found, would postpone reading e-mail. The majority of employees enabled such interruptions every 5 minutes. Furthermore, the study reported a misuse of e-mail that would become ubiquitous worldwide, namely that many of the e-mail messages received were not really relevant to

employees because they mostly resulted from an e-mail sent to all employees using the "send-to-all" function of the e-mail software when instead the message received "was often only useful to one or two".[16]

Seven years later another team in Great Britain described e-mail as an inbuilt work stressor contributing to work overload, with potential negative effects on social relationships and productivity.[17] Underlining how it was "time to include e-mail communication skills as a key part of the interpersonal skills training for all managers", the authors noted:

«At Thomas Edison's Ontario home, the birthplace of the telephone, there is a small plaque depicting instructions to the users of the then new medium: how to speak, at what voice level and intonation, at what distance from the receiver, key phrases, etc. At the time these made a necessary manual; nowadays, one reads the notes with a wry smile: surely everyone knows what one can and can't do with a telephone? As we are at the onset of a world e-mail dominated epoch, we likewise could do with some user instructions, deployment conventions, and best practice. That may be no mean task.»[17]

The fact that checking e-mail less frequently reduces stress was shown by a 2015 experimental study aimed at investigating how the frequency of checking e-mail affects well-being.[18] During one week in which 124 adults were asked to check their e-mail to three times a day, they experienced low daily stress and eperienced higher well-being on a diverse range of well-being outcomes. During another week in which participants could check their e-mail an unlimited number of times per day, they experienced significantly enhanced psychological stress.[18]

Specifically, the team found that by limiting the number of times people checked their e-mail lessened tension during a particular important activity and lowered overall day-to-day stress. In turn, lower daily stress was associated with higher well-being, as assessed by a range of outcomes including hedonic (*i.e.*, affect, comfort, painlessness and ease) and eudaimonic outcomes (*i.e.*, meaning to a broader context, self-realization, quality and authenticity). Furthermore, lower stress was associated with other positive outcomes including higher mindfulness, self-perceived productivity, and sleep quality. We briefly remind that hedonia and eudaimonia are complementary psychological functions with both hedonic and eudaimonic variables having an important impact on well-being.[19]

As shown by a seminal recent management study reporting the outcomes of a survey of 639 employees from U.S. private firms as well as from universities, the mere employer expectation of work e-mail monitoring during nonwork hours is detrimental to the health and well-being of not only employees, but their family members as well.[20]

4. Recommendations

Both scholars and students need long periods of time during which creatively advance research ideas, solve problems, study, write and review research articles and research projects. In the words of Drucker:

«To be effective, every knowledge worker… needs to be able to dispose of time in fairly large chunks. To have dribs and drabs of time at his disposal will not be sufficient even if the total is an impressive number of hours.»[21]

Most scholarly activities need quiet time, without the interruption of phone calls, e-mails and meetings, namely the digital distraction worsened by onerous administrative burdens for which, for example, a 2014 study of a faculty time-use study carried out at a U.S. university found that the average professor spent 61 hours a week working.[22] Yet, while 17 percent of the workweek days were dedicated to meetings and 13 percent to e-mails, only 3 percent of the workweek day was spent on research and 2 percent on manuscript writing.

How to provide scholars more uninterrupted time for thinking and teaching in what he has aptly called "deep work",[23] has been lately proposed by Newport. In brief, universities willing to prioritize again research and teaching will first carefully re-examine which adiministrative and service activities are truly worthwhile, getting rid of all those "mainly serving to sustain bureaucratic self-regeneration";[24] and then provide faculty with support from a dedicated pool of assistants helping several professors to accomplish adiministrative and service tasks.[24]

Actionable advice to restore an healthy and productive use of electronic e-mail in the academy requires learning how *i*) clearing the mind at work, *ii*) effectively processing e-mails, and *iii*) writing effective e-mails only.

4.1 Clearing the mind

How clearing out unnecessary mental clutter caused by trying to keep track of all work commitments has been conceived and taught by Allen, starting in the late 1980s.

Learning from his youth years in which he was taught how to achieve the "ready state of the martial artist - a mind like water"[25] Allen developed a simple yet highly effective system for managing a person workload which, clearing the mind by writing down all planned (and unfinished) tasks and projects, and then breaking them into "actionable" written work items.

This simple gesture of writing down planned tasks (recording them externally) moves them out of the mind and allows the mind to focus attention on taking action on tasks, instead of recalling them. This achieves "a condition of working, doing, and being in which the mind is clear".[25]

In brief, with his "focus on organizing tasks into 'actionable' external memories, and on opportunistic, situation-dependent execution"[26] Allen discovered during the practice of management consultancy and education what cognitive science will reveal several years later, namely that "the brain heavily relies on the environment to function as an external memory and a trigger for actions".[26]

Dealing with e-mails, the use of Allen's simple method suggests how to effectively processing our e-mails, in an ordered fashion, one by one, in a state "characterized by a sense of control, focus and well-being - in sharp contrast to the confusion, anxiety and procrastination that accompany the all-too-common situation of information overload".[26]

4.2 Processing e-mails

To avoid interruptions effective processing of e-mails separates the acts of reading and answering electronic missives. Merging Allen's ideas with the key principle of the approach of Forster to time management,[27] namely "to create a 'buffer' between the information and demands that are coming at you, and your response"[28] McGuinness has lately identified several benefits of a thoughtful approach to e-mail processing in which yesterday's e-mails are processed today, in a single batch:[28]

- One deals with the manageable task to process a finite number of e-mails, rather than an ever-expanding inbox.

- Avoiding interruption from today's e-mails.

- Better (more thoughtful and helpful) answer e-mails produced in a better state of mind in which one is less likely to take on unnecessary commitments by agreeing to something in order to get rid of the e-mail.

4.3 Writing effective e-mails

Usability was the principle that guided Shiva Ayyadurai when developing the first e-mail software in 1978:

«I had better make e-mail really easy-to-use. This meant all those features had to delivered through an easy-to-use user interface. At that time there was no mouse, just a keyboard. An easy-to-use interface meant simple menus, no need to type in commands or codes, ease of navigation, ability to quickly scan their incoming mail, etc.» [9]

By the same token, aware that effective communication is measured by what the message recipient understands and by her/his reaction to the message (feedback),[29] in the academy and in scientific research only useful and professional e-mails should be written and sent.

- **Short and clear subject**. The subject is important. Shorten and foucs subject lines. A subject headline like "Molecular group absorption frequencies for betanin FTIR analysis" will be rephrased as "Betanin FTIR analysis: absorption frequencies".

- **One topic, short, clear and proofread**. An useful email is comprised of a short message directly focusing on the message content comprised of a single topic. No introductory text. Only important points of the message near the top, written in a clear and highly readable fashion. Only proofread text should be sent.

- **Short, separated paragraphs**. If the message requires two or three paragraphs, these should be short and separated by blank lines, avoiding capital and large size font.

- **Files shared online**. Today's reliable file sharing services[30] avoid attachments and the associated security risks enabling the recipient to download documents with no registration when connected to the internet via a free service and thus avoid paying for a mobile download.

- **Personal e-mails only**. Refrain from using e-mail-to-all messages, and especially reply-to-all messages.

5. Perspective

We have explained elsewhere how the education of scientists *and* managers needs to be renewed by integrating science and management education within culture as unifying context so as to shape tomorrow's organizational leaders *and* scientists called to solve the global sustainability crisis that requires engagement at the highest level.[31]

Misuse of the main information technology used in the academy - electronic mail - can be ended through similarly through expanded knowledge and renewed education.

Becoming acquainted with advanced time management[25,27,28] and communication pragmatics,[29] tomorrow's students will remedy today's e-mail misuse that leads professors to be overwhelmed by anxiety-driven e-mails;[5,6] and scholars to waste their valued time on e-mail minutia.

Universities reformed by managers literate in today's (and not yesterday's "scientific") management theory will focus again onto advanced teaching and research,[23.24] prioritizing scholarly deep work, and thus abandoning the use of "urgent" e-mail-to-all-professors messages with the request of ever new spreadsheets and reports.

This study hopefully contributes to said needed progress by identifying selected recommendations to educate undergraduate students on the healthy and productive utilization of electronic mail based on over two decades of scholarly research in the field.

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