By Thomas W. Jackson, Ray Dawson, and Darren Wilson

UNDERSTANDING EMAIL INTERACTION INCREASES ORGANIZATIONAL PRODUCTIVITY

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.

Electronic communication is clearly an integral part of the communication infrastructure in every kind of organization, but its costs and benefits remain undefined. Our research aims to analyze the cost-effectiveness of email, suggest ways in which it can be improved, and determine whether some amount of recovery time is associated with email interruptions. We've been conducting it since 1999, mainly at the Danwood Group, a retailer of office equipment, mostly photocopiers, with more than 500 employees at 19 sites in the U.K.

ILLUSTRATION BY JASON SCHNEIDER

Looking to understand email interactivity, we've sought to determine whether interrupt recovery time is associated with email and whether a "hard" cost is associated with that interruption. For example, the recovery time after a phone call interruption is at least 15 minutes, thus increasing the amount of time each day at work and at home spent on interrupts [2]. But our telephone research was carried out using software developers as its subjects. The highly creative nature of software development means developers are likely to require extra time to recover from interrupts compared to other job categories, hence the 15-minute phone call recovery time. There is no reported empirical research on how long it takes to recover from an email interrupt.

We reviewed a number of employee-monitoring applications to determine the most appropriate way to record email interactivity, including Windows Virtual Network Computing (WinVNC), Lotus SmartCAM, I-SPY, and Windows Ranger [4–7]. Many of them involve restrictions, including a lack of reliability, no access to the monitoring source code, inappropriate system tray icons, slowness, and the need for excessive media to record an employee at work for a full day. We thus selected WinVNC, along with a video recorder to record employee activities throughout a typical workday.

WinVNC is a remote display system that allows viewing of a remote computer desktop environment, not only on the machine on which it is running but also from anywhere on the Internet and from a variety of machine architectures [1]. We installed WinVNC on both the client and server sides to allow us to monitor the employees' machines remotely. One of us (Jackson) modified the original WinVNC program to remove the icon in Figure 1 from the system tray. Without the icon the test subjects could not know when they were being monitored. We attached a video recorder to the server side to record all employee activity on the screen to videotape. We monitored a total of 16 employees over 28 working days, yielding more than 180 hours of video recordings. As we monitored individual employees, we also monitored the frequency of their individual email collections from the server.

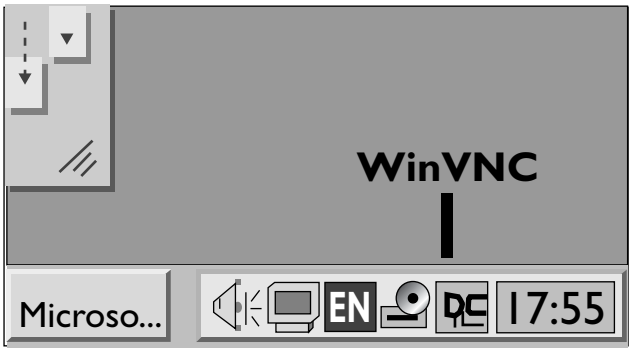

Figure 1. The WinVNC icon that was later removed from the system tray.

Data Analysis

We recorded all 16 employees' email interactivity, along with the activity leading up to and following each email interruption. We define an email interrupt as any email distraction that makes employees stop their planned activity. We calculated the recovery time by recording the amount of time it took employees to return to their work at the same rate of performance at which they left it. This required an element of judgement by the person reviewing the recorded material. However, in nearly every case we noted there was a clear point at which users ceased to move their cursors around the screen and jump between screens trying to resume their train of thought and the performance of useful work. Although this may be regarded as a rather inexact measure, the clear change as users returned to productive work means that, in practice, interpretation of the activities by different researchers would not have produced any significant difference in the results.

Of the 16 employees monitored, 12 used Microsoft Outlook 2000 and the other four Microsoft Outlook 97. All would see a new email-arrived icon appear in the system tray when new email arrived, and 57% would also see a new email-arrived pop-up dialogue box appear. It took each of them an average of 1 minute 44 seconds to react to a new email notification by activating the email application—70% within six seconds of their arrival and 85% within two minutes of arrival. We found the time it took them to recover from email interrupts and return to their work at the same work rate at which they left it was on average 64 seconds.

It appears that email involves a clear communication pattern; Figure 2 outlines the interaction time on the Danwood Group email system throughout a typical workday. Email interactivity is classed as a user reading or composing a message, including reply, reply to all, and forwarding. It involves two main peaks—one at 8:30 A.M., as employees arriving at work check for new email, and one at 16:30 P.M., as employees check their email before going home. In total, there are four natural communication periods during the day; the other lesser peaks in Figure 2 are at 11:30 A.M. and at 14:30 P.M., possibly resulting from employees checking their email just before and just after lunch.

Further research involving communication patterns is required to establish how to increase employee effectiveness by identifying the best times to communicate during the day, thus minimizing interrupts. However, all kinds of organizations should experiment, encouraging their employees' communication to take place during the four natural peaks identified in our research, thus helping reduce employee interrupts and the possibility of message fatigue.

Interrupt Effect

Our research also found that the interrupt effect from email is more than might be expected. The employees we studied allowed themselves to be

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interrupted almost as frequently (every five minutes) as they are with telephone calls. The common reaction to the arrival of an email message is not to delay the response to a time that is more convenient to the user but to react within six seconds, almost as quickly as they would respond to a telephone call. The interrupt effect is thus comparable to that of a telephone call. However, the recovery time from an email interruption (64 seconds) is significantly less than some published recovery times for telephone calls. While email interrupts reduce recovery time, users receive more and more emails, and the cumulative effect is still likely to be significant. We conclude that while email is still less disruptive than the telephone, the way most users handle incoming email causes far more interruption compared to what is commonly expected.

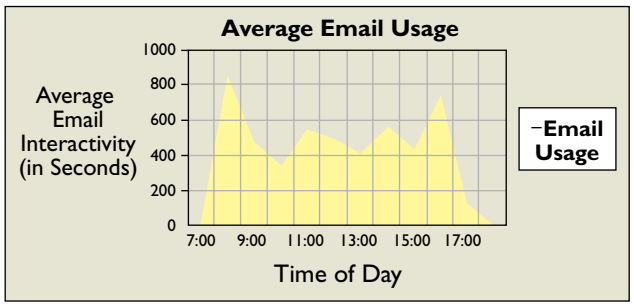

Figure 2. Email usage throughout the day.

Based on how the 16 studied Danwood Group employees interacted with email and dealt with the related interruptions, one of us (Jackson) produced the following guidelines for how to use email in the workplace in the interests of increasing employee productivity:

- Reduce the prominence of interruptions by turning off the new-email-alert dialogue box and email sound alerts;
- Restrict the use of email-to-all messages and reply-to-all messages; using more targeted email user groups may be helpful;
- Set up the email inbox to display only sender, subject, and the first three lines of the message, so recipients can quickly determine whether it requires their immediate attention;
- Set up the email application to check for email no more frequently than every 45 minutes; and
- Train all staff in how to set email priority, perform email housekeeping with message rules, create user groups and address books, and structure email messages.

Focusing on a "typical" employee and making some hypothetical assumptions, it is possible for any email user to determine the amount of time that can be saved by implementing these guidelines. If employees set up their email applications to check for email every five minutes, then it is possible (if they're heavy email users) that 96 interruptions can occur during a normal eight-hour workday. However, if the email application is set up to check for email every 45 minutes, then possible interruptions are reduced to to no more than 11 per day. For example, if it takes on average 90 seconds to read and recover from an email and employees are interrupted every five minutes, the employee would have only 3.5 minutes before the next interrupt. However, if employees are interrupted every 45 minutes and nine messages accumulate, it would thus take an average of six minutes to read all nine messages and recover from the interruption; this scenario would then leave 39 minutes before the next interruption, allowing employees more time to get on with their "real" work.

Another way to minimize disruptions is to reduce the prominence of new-email alerts. By turning off new-email pop-up dialogue boxes and sound alerts and by leaving just a silent new-email icon in the system tray, users would be less aware that email has arrived. This would be useful if, say, they are doing

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something requiring concentration and a prominent interruption would clearly disrupt their thought process. By having only the new email icon in the system tray, employees' attention would be attracted only when the concentration level is less demanding and the interruption would occur at a more convenient time.

Most employees would benefit from restricting the use of the reply-to-all email function; if, for example, it is used on an email message containing 120 recipients the organization would in effect be paying for three hours of employee time (interruptions and viewing the message).

We found that some employees develop their own ways of dealing with new email. For example, a number of Danwood Group employees set up their email applications to display the first three lines a message in each email subject field, along with the sender and date, in their inboxes. They thought this would save time, as they could quickly scan new messages to determine whether or not they are important enough to open and read immediately. If they are, they would open them; otherwise they left them for a more convenient time.

Conclusion

Our research demonstrates the value of measuring communication processes. We've thus been able to quantify the effect of email on employee time and productivity, yielding some surprising results, as well as a number of recommended guidelines concerning email application management and employee training. These recommendations will, for example, enable the Danwood Group and many other organizations, no matter their size or industry, to make better use of their email communication and increase employee productivity. The implication for managers in other organizations is that if their own employees handle email this way they would also benefit in terms of employee productivity despite regular email interruptions. C

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