Looking Up Information in Email: Feedback on Visit Durations Discourages Distractions

Judith W. Borghouts
UCL Interaction Centre
University College London
London, WC1E 6BT
judith.borghouts.14@ucl.ac.uk

Duncan P. Brumby
UCL Interaction Centre
University College London
London, WC1E 6BT
d.brumby@ucl.ac.uk

Anna L. Cox
UCL Interaction Centre
University College London
London, WC1E 6BT
anna.cox@ucl.ac.uk

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Abstract
Data entry often involves looking up information from email. Task switching to email can be disruptive, and people can get distracted and forget to return to their primary task. In this paper, we investigate whether giving people feedback on how long they are away from their task has an effect on the duration and number of their switches. An online experiment was conducted in which participants had to enter numeric codes into an online spreadsheet. They had to look up these codes in an email sent to their personal email address upon starting the experiment. People who were shown how long they were away for made shorter switches, were faster to complete the task and made fewer data entry errors. This suggests feedback on switching duration may make people more aware of their switching behaviour, and assist users in maintaining focus on their main task.

Author Keywords
Data entry; self-interruptions; email; task switching; online experiment, notifications.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): User interfaces.

Introduction

Many computer tasks require the user to access and collect information from different sources. For example, an office worker might be working on an expense claim in a spreadsheet, but will have to retrieve relevant account codes from a message sent via email. When making these switches, there is often the risk of getting distracted, in particular when switching to email [7]. People may initially switch to email to look something up for their main task, but then get diverted by other emails. How can people be encouraged to minimise these distractions?

Reducing distractions

There have been several approaches to improve people's focus. In order to mitigate self-interruptions, Kim, Cho and Lee [8] developed an intervention that allowed people to temporarily block specific sources that they considered distracting, such as email, IM applications and social media. However often these sources need to be accessed in order to complete the task they were working on. Other commercial applications such as RescueTime [14] do not block sources but instead provide users an overview of their computer activities, to reflect how much time they spend in total on certain sources. Interview studies revealed it is often not clear to users what they should do with this data [3], and there is little evidence of their effectiveness in improving focus [12].

Gould, Cox and Brumby [6] looked at switching behaviour during online crowdsourcing work, and found that an intervention during work that encouraged people to stay focused after they had self-interrupted reduced the number of switches to unrelated tasks.

Recognising that switches often occur as part of a task, we consider whether the duration of switches can be reduced by giving people real-time feedback on how long they switch away during a data entry task. This is important to consider, because the longer people interrupt, the more disruptive it is [10], and the harder it is to resume a task [1].

In this paper, we investigate whether an intervention showing people the average duration of their window switches has an effect on duration and number of switches during a data entry task. An online experiment was conducted, in which participants had to enter numeric codes into a form. These codes had to be retrieved from a message sent to the participant's personal email account. Half of the participants received feedback on the average duration of switches away from the data entry task through a browser notification. Results showed that these participants made shorter switches when looking up information from their email than the control group who did not receive feedback. In addition, participants who received feedback completed the data entry task quicker and made fewer errors.

Method

Participants

Thirty-two participants (19 female) took part in the online experiment. Ages ranged from 22 to 63 (M = 29.7 years, SD = 8.6 years). Participants were recruited via university email lists, social media and online platforms to advertise academic studies, and participation was voluntary. Participants were alternately allocated to the control or notification condition.

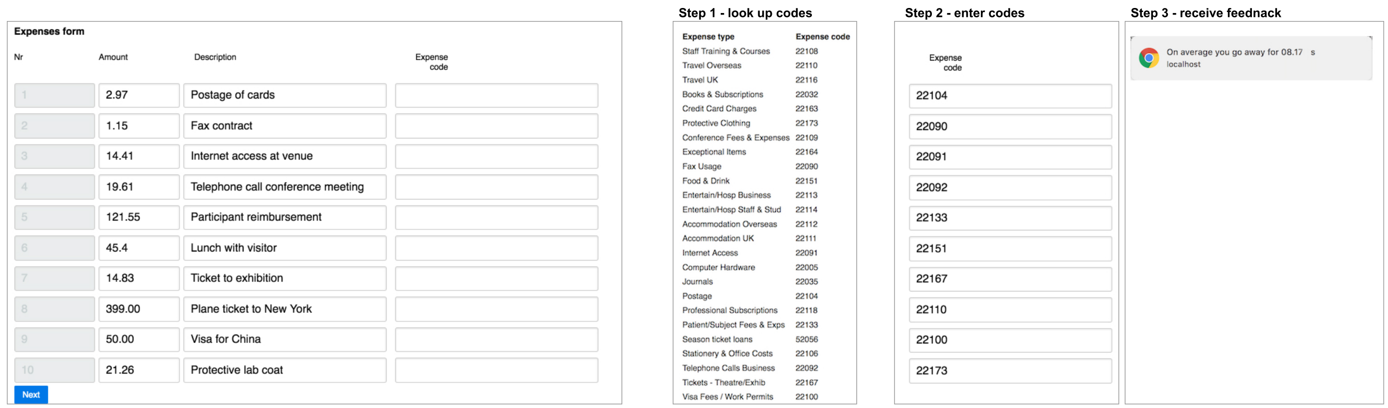

Figure 1. The data entry task as shown in the browser. At the start of each trial, participants were presented with ten expenses as shown on the left. Participants had to look up codes from their email (Step 1) and enter this into a sheet (Step 2). After every trial, the notification condition received time information (Step 3).

Design

The study used a between-participants design with one independent variable – a notification. In the *control* condition, participants did not receive a notification, but switches away from the data entry window were recorded. In the *notification* condition, participants were shown a notification every time they completed a trial of ten data entries. This notification showed the average duration of all window switches away from the data entry window. The purpose of this notification was to see if the number and duration of switches could be reduced by giving participants feedback on the time spent on switches. The dependent variables were the number and duration of switches away from the data entry interface, trial completion time, and data entry errors. Switching behaviour was recorded using JavaScript's blur and focus events. These were triggered whenever a participant switched away from the data entry window, whether to their email inbox or to a different window or application.

Materials

The experiment was conducted in a web browser. Participants were asked to complete a routine data entry task modelled on an expense processing task [2]. Participants were presented with an online sheet containing a set of ten 'expenses' (see Figure 1). They had to complete each row by entering the correct expense code for the expense. They retrieved this code by looking it up in a table of 25 expense categories which each had a corresponding 5-digit expense code. Participants had to determine which category an expense belonged to, look up the code of this category and enter it in the row of the expense. We used expense categories and codes that are currently used by a public university to process expenses.

In the example given in Figure 1, the expense in the first row belongs to the category 'Postage' and the participant would have to copy the code 22104 from the expense table into the empty cell of the top row. A code did not occur more than once in a trial. The codes within a trial could be entered in any order. Once the codes of the ten expenses had been entered, participants clicked the Next button to go to the next trial and the sheet was filled with ten new expenses. In the *notification* condition, a browser notification appeared at the end of each trial at the right-hand corner of the screen that told participants the average duration of window switches away from the primary data entry task. The notification stayed visible for several seconds (a default set by the browser), or until dismissed by participants (by clicking on it). Participants were not alerted to any mistakes and once they had pressed the Next button, they could not return to the previous trial to correct any errors. Participants had to complete one practice trial, and five experimental trials. The purpose of the practice trial was to familiarise participants with the task; data from this practice trial was excluded from the analysis.

Procedure

The study was advertised online with a brief description and a website link to sign up. Participants signed up for the experiment by entering their email address, and were sent an email with the table of expense categories and expense codes. The email also included instructions with a new link where the study was available. Participants were asked to complete the task on a desktop or laptop computer and open the experiment in Google Chrome, Firefox, or Safari. Participants were not informed beforehand which condition they had been allocated to, and were told the purpose of the study was to understand how people perform data entry tasks. Participants in the *notification* condition were informed that they would receive notifications during the experiment.

Participants first read an online consent form on the website, and were not able to continue to the experiment until they had given consent. Participants in the *notification* condition received an additional dialog box to enable notifications in their browser, and had to click 'OK' to continue. Participants were instructed to have both their email and data entry window open on the same device, and to keep both windows maximised at all time, to ensure they had to switch back and forth between the two windows. Participants who made no recorded switches were excluded from the dataset.

After completing all experimental trials, participants were shown a page of debriefing information, explaining the purpose of the study. An email address was included as a point of contact if participants had any further questions.

Results

In total, 36 participants signed up for the study, but four participants did not complete the task and their data was excluded from analysis. Because the number of switches, duration of switches, and error rates were not normally distributed, non-parametric Mann-Whitney tests were used to analyse effects of a notification on these dependent variables. A Shapiro–Wilk test suggested that the trial completion times were normally distributed, $W = 0.94$, $p = 0.05$, so an independent t-test was used to analyse the effect on trial times.

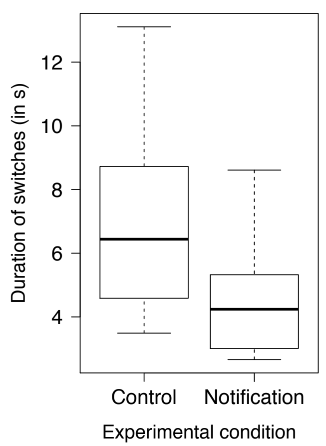

Figure 2. Boxplot of duration of switches away from the data entry interface in each condition.

Figure 2 shows the variability of duration of switches for the two conditions. Results show that switches were significantly shorter among participants who had a notification (*M*=4.51s, *SD*=1.80s) than among those without a notification (*M*=7.11s, *SD*=3.14s), *U*(17, 15) = 186, *p* = .01, *r*=.45. Participants switched once for every code entered (i.e., ten times per trial). There was no significant difference in number of switches, *U*(17, 15) = 80, *p* = 0.1.

Error rates were calculated by dividing the number of data entry errors by the number of error opportunities. The error rate was significantly lower for participants with a notification (*M*=2%, *SD*=2%) compared to participants who had no notification (*M*=6%, *SD*=6%), *U*(17, 15) = 190, *p* < .01, *r*=.49.

Participants took between 10 and 20 minutes to complete the whole experiment. Participants with a notification were faster in completing trials (*M*=94.98s, *SD*=17.69s) compared to participants without a notification (*M*=122.90s, *SD*=35.43s), *t*(30) = 2.96, *p* < .01, *d*=.99.

Discussion

Computer window switches are common and often disrupt work. This study set out to see whether an intervention that showed people how long they spent switching away from a task could reduce the number and length of switches. The results show that participants who were given this information made shorter switches, were faster at completing the task, and made fewer errors. These findings suggest that shorter switches can lead to better task performance, and are in line with previous studies connecting the duration of an interruption to its disruptiveness [1,10].

Feedback on switching duration did not reduce the number of switches as in prior work [6]. In our study, participants had to switch as part of the task and had to briefly hold information in the head. Giving a notification after every switch would have risked overexposing participants to notifications, limiting their usefulness [4,12]. Therefore, feedback was only given after *every trial,* as opposed to *every switch* as in Gould et al's [6] study. Moreover, the notification only showed information regarding the duration of switches. Farmer et al. [5] showed that people work to maximise their task performance based on the explicit feedback that they are given. Based on this, we expect that people might be encouraged to also reduce the number of switches when given explicit information on this aspect.

The current study used focus and blur events to analyse window switching behaviour. This meant that task switches outside the device, with the task window still in focus, were not captured. Possibly participants learnt to not interrupt themselves when they were away from this window, but after they had returned to the window. In our ongoing analysis, we will further look at inter-keystroke intervals and differentiate between moments when participants had briefly paused for thought, and moments when they had likely switched to another activity [6].

Most experimental studies on self-interruptions use artificial distractions, such as chat messages, to prompt and study self-interruptions [e.g. 13]. The current study makes a methodological contribution by using participants' own personal email inbox, based on the assumption that email provides a source of distraction [7,9]. Possible sources of distractions were other, unread and new incoming emails. In other situations, people may also have to first locate the correct email, and browse several emails to find the information they are looking for [13]. We expect there to be an even higher potential for distraction if people have to find the correct email.

The results of this study offer guidance to the design of productivity interventions to improve focus and mitigate digital distractions. A simple and effective intervention to help people focus better when doing computer-based work is to provide feedback on how much time they spend switching to other windows. An important concern with the current study is that participants worked on an experimental data entry task. Future research should investigate whether the benefits of giving feedback on window switching behaviour extend to more naturalistic tasks.

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