´Sup? Blurring the line between microblogging, task-management, and experience-sampling

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Introduction

Near computers, "task-management" usually refers to the computer's management of processing resources and program-switching. However, in this paper, "task" and "task-management" will refer exclusively to personal task-management.

The Windows taskbar manages running programs, but it does not help very much in personal task-management behavior. By default, Windows 7 collapses all windows from a single program into one icon and hides the title text for each program window (following the Mac model). This is even less helpful for task-management than having separate buttons with titles for each open window, because there is no way to represent the current task context or determine which currently-open programs are task-relevant. Furthermore, with the ubiquity of tabbed browsing and cloud computing, the browser tab bar has become at least as important as the system taskbar in switching between "windows". Thus, the Windows taskbar is not (and never was) very helpful in managing tasks.

Need for study

Procrastination is a widespread problem among student populations (for citations, see "Theory and literature" below). Ad-driven websites like Facebook,

Google, and Reddit have an economic incentive to promote habitual procrastination behavior amongst their users. Most notably, Facebook is clearly designed to distract users and engage them in hours of procrastination. Procrastination interferes with academic achievement. Additionally, encouraging and supporting procrastination behavior is equivalent to attacking personal autonomy. But with sites like these being ubiquitous to the point of normativity, what is a computer-user to do?

There are many interface supports for procrastination, but few or none designed to prevent it. Existing anti-procrastination applications heavy-handedly interrupt the workflow and usually do not attempt to teach autonomous self-management skills.

For example, Obtract detects when you are being "unproductive" and imposes a maze over your web browser window that you must solve before being allowed to work again. The mazes become more complicated the longer it detects you procrastinating. Additionally, the program uses social accountability to increase productivity by allowing your team members to see your "productivity score" and allowing you to announce milestones to your team via SMS. While this system might reduce procrastination in the long term, in the short term it is manipulative and painful to use, because it relies on the mechanisms of guilt and social control. Who would want to consistently use such a punishing program? Probably only the most desperate procrastinators—or those being forced to use it by a "team member."

Unstuck is another example. It is a beautifully-designed iPad app that performs an anti-procrastination intervention for you. In a series of guided steps, it

helps label your emotions and thoughts, provides positive self-image alternatives, and helps with goal creation. It seems effective at helping one get "unstuck," and even at teaching long-term anti-procrastination habits, and it is very pleasant to use. However, it is still a heavy-handed intervention, and it is also a commercial app with no related published research.

Besides these two more psychologically-focused examples, all other anti-procrastination apps I have found work via (ultimately punishing) reminders or by artificially restricting access to certain websites. This punishing aspect of most anti-procrastination apps may be what prevents their widespread adoption, and it also does not teach long-term autonomy. Furthermore, most or all desktop-based anti-procrastination apps are designed to work only within a limited computing context: most often, website or internet access is restricted, which does nothing to prevent more creative uses of the computer for procrastination.

Additionally, I have not found any scientific research done on any anti-procrastination interface interventions. This is a gap in the research, because computer-based procrastination is so ubiquitous. Research on preventing computer-based procrastination with computer-based solutions could provide empirically-tested anti-procrastination interface design principles that could be implemented in free software interventions or integrated into existing interface designs. Effective and freely-available anti-procrastination interventions would provide a very large amount of benefit for many people at little cost. In an article titled, "Fostering motivation and creativity for computer users," the author writes:

Computers should afford users mini-breaks too. Unfortunately, these backdrops when in place on a computer are often more distracting

than a short puff on a cigarette a writer may have taken at a typewriter in an old movie. Windows popping up with animations in them, games that need to be completed if one starts them are not being respectful of a person's time and goals. Even the "wallpaper" on graphical interfaces can distract users from finding the icons they are looking for on the screen. Designers can make more computer activities that can be non-distracting background activities.

So many books have been written on procrastination that it is surprising that the computer buyer is not showered with anti-procrastination software. By watching the pattern of use, a computer could interpret aspects of a user's intentions (Burleson and Selker, 2000) … directly focused on procrastination, over editing, or changing tasks. (Selker, 2005)

It is not the intent of this study to design an intelligent monitor, but this quote is illustrative of the gap in anti-procrastination interface interventions and the design approach I have taken in this paper.

Purpose of study

This study sets out to design and test a computer interface intervention intended to support autonomy by promoting mindfulness and reducing procrastination. More specifically, the intervention will be designed to increase awareness of computer-use habits, increase awareness of time spent at various computer activities, and decrease periods of mindless web-browsing. It is also expected that decreased procrastination will result in increased productivity and

student achievement, but here procrastination is primarily considered a problem because it is by definition an interference with autonomy.

In response to the needs described in the previous section, the interface intervention proposed will have the following characteristics:

Promotes both short- and long-term autonomy, on and off the computer. This characteristic is the goal of the intervention.

Context-independent. This characteristic is directly related to the goal of providing an intervention for all—and not just some—kinds of computer-based procrastination.

Minimally-interruptive. This characteristic is a design decision, and further support for its expected efficacy will be provided in the literature review, below.

Non-punishing. The ethical and design decision will attempt to provide the user with no negative stimuli, including reminders of procrastination. Further support is provided in the literature review.

Non-judging. This final characteristic is an ethical and design decision to not judge the user's behavior as desirable or undesirable, good or bad, but to instead merely provide opportunities for reflection on past behavior. This engages the user's own judgment instead of imposing the values of the experimenter upon the user; additionally, it is a lighter approach that will demonstrate the power of reflective interfaces. Further support is provided in the literature review.

Organization of proposal

In this exploratory, semi-qualitative design-based research study, an application called 'SUP will be designed, implemented, and adjusted with user feedback. Finally, the data collected by the software will be used to perform a semi-qualitative analysis of the app's short-term effectiveness. Although the program will be designed to promote long-term behavioral change, testing the long-term effects of the interface intervention will be left for a later study.

'SUP stands for ' Subtle User Probe. What appears to be an apostrophe in 'SUP is actually a mathematical prime symbol. Usually, these are placed at the end of a variable name to indicate a derivative, set complement, negation, transformation result, or matrix transposition (Wikipedia, 2013). However, here it is used at the beginning of the word to indicate a shift in variable meaning before the variable has been named; i.e., the shift is primary, or i ≠ i. Thus, it is being used as a symbol of mindfulness[1].

Theory and literature

Procrastination

Research has shown that procrastination is a widespread problem:

"Estimates indicate that 80-95% of college students engage in procrastination... Approximately 75% consider themselves procrastinators, and almost 50% procrastinate consistently and problematically...with students reporting that it typically occupies

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[1] See also Rand Spiro's related acronym work on Advanced Web Exploration and the Wide-Open Web.

over one third of their daily activities…These percentages appear to be on the rise" (Steel, 2007).

Procrastination is often characterized as "bad, harmful, and foolish" and "over 95% of procrastinators wish to reduce it" (Steel, 2007). Studies have linked procrastination with poorer performance and long-term well-being (Steel, 2007). Given the prevalence and harm of procrastination and the amount of time many people spend on their computers (procrastinating), the dearth of computer-based anti-procrastination research is surprising.

Mindfulness & procrastination

Mindfulness, defined briefly by Ellen Langer as "the process of drawing novel distinctions" (Langer & Moldoveanu, 2000), is a psychological construct developed from Buddhist ideas of mindfulness. Langer also links mindfulness with perspective-taking, tolerance of ambiguity, and creativity, and has shown that increasing mindfulness can protect health.

Research has begun to suggest that increasing mindfulness may provide some relief to procrastination. Sirois and Tosti (2012) showed that low mindfulness was associated with procrastination, and that mindfulness mediated the negative effects of procrastination on stress and health. They also found that "procrastination was also linked to less frequent practice of mindfulness promoting activities such as yoga and meditation." This is the first study linking mindfulness and procrastination, and these findings are only correlative, but they raise the interesting (and logically compelling) hypothesis that increasing mindfulness may decrease procrastination.

In her studies on mindfulness, Langer has repeatedly found that subtle or minor interventions can have a significant effect on mindfulness (Langer &

Moldoveanu, 2000). This suggests that a relatively small intervention may increase mindfulness, and if it does, it may decrease procrastination.

Minimally interruptive

Steel (2007) cites research which notes "that one predictor of procrastination is the number of choice points that a task requires. The more junctures that require choice, the more likely it is that one will procrastinate."

For this reason, interruptions will be kept to a minimum number to avoid creating "choice points" when the user is working. To further reduce this possibility, ambient notifications will be used, so that the user may ignore or fail to notice notifications when they are engaged in a workflow. (On the other hand, the choice points 'SUP creates may help people to bootstrap themselves out of procrastination activities.)

Non-punishing & non-judgmental

Sirois and Tosti also cited previous research "indicating that procrastinators evaluate themselves in a negative manner," and go on to say:

> "Difficult tasks can activate judgemental and reactive thoughts which
> promote frustration, self-criticism, and impulsive decisions to abandon
> the task. In contrast, mindfulness facilitates non-reactive
> acknowledgment and acceptance of these difficult thoughts, and
> allows them to dissipate" (Sirois & Tosti, 2012).

This suggests that an anti-procrastination software interface should not judge the user, and in fact, should refrain from making the idea of procrastination (i.e., failure to work) salient to the user at all. Triggering thoughts about

procrastination that is occurring may merely serve to trigger self-critical thoughts that strengthen the procrastination pattern.

Further, this suggests that invasive interactions that punish the user by shutting down internet access, flashing "motivating" messages, or requiring the user to navigate mazes may actually be promoting procrastination by increasing frustration directly, and by reminding the user that they are a "procrastinator," fueling negative self-talk. This is why the anti-procrastination intervention in this paper has been designed to be as non-punishing and unburdensome as possible.

Questions and/or hypotheses

The study will be conducted as an ongoing collaboration between participants and researchers to test and refine 'SUP and the theory behind it. The initial study will set out to answer the following questions:

1. Do users enjoy using 'SUP and perceive benefit from it?
2. Does using 'SUP increase awareness of computer-use habits?
3. Does using 'SUP increase awareness of time spent at various computer activities?
4. Does using 'SUP decrease periods of recreational web-browsing?

It is believed that answering these four questions will serve as a good proxy for determining whether the higher-level goals described above (in "Purpose of study") can be met with this type of intervention. Additionally, answering these questions will also provide information on the value of experience-sampling and reflection in the promotion of mindfulness.

Method

Sampling procedures

Study participants will be recruited via a website, advertised via social media sites, academic mailing lists, and word-of-fingertip. This mimics the eventual target audience and distribution plan for the interface intervention software. This method of sampling may provide a large number of participants, increasing the statistical validity of quantitative results. Demographic information will be collected from participants for use in analysis.

Research design

After signing up for the study by checking eligibility boxes, filling out a demographics survey, and submitting their email address, participants will be guided in downloading and installing the software intervention. No mention of procrastination will be made after the initial recruitment, to prevent triggering feelings of anxiety and affecting results.

Participants (also referred to as users within the design context) will use 'SUP for as long as they would like, or until the study is concluded (several months). Data will be collected and analyzed throughout this time, and researchers will communicate with some participants to elicit feedback on 'SUP and its perceived effects.

Design-based research involves an iterative process of testing, theorizing, and modification of designs. As part of the study, modifications to 'SUP may be designed and distributed to some or all participants as software updates. This will allow for highly-flexible testing of micro-hypotheses and rich collaboration with

participants as they provide feedback on their own experiences and feelings in reaction to 'SUP.

Further details of the research design are elucidated as design decisions in the following section.

Interface intervention design

Textbox in Windows taskbar

With high-resolution, widescreen monitors and, in Windows 7, the collapsing of multiple windows into a single taskbar icon and the removal of taskbar button text (by default), space has been freed up in what was once a very crowded region of the screen. Because of this, along with the goal of making the interface intervention context-independent, I have designed the intervention around a textbox interface that is added to the Windows taskbar.

Experience-sampling with ambient notification

Experience-sampling has been used to collect data on people's thoughts and feelings throughout their day. For example, Csikszentmihalyi used experience-sampling text messages to collect data for a study on flow. In this intervention, experience-sampling will be used to collect data for the user's own later reflection, as well as for analysis for the study.

At intervals, the text box in the Windows taskbar begins glowing to notify the user of an experience-sampling event. For the first several events, a text prompt also appears in the box that says, "What were you doing when you noticed this?" After the first 15 sampling events to which a response is received, this text stops appearing to reduce the invasiveness of the sampling event. It is hoped that

this will provide adequate training in the use and meaning of the experience-sampling box.

The notifications will be adjusted during user testing to be "ambient." This means that they will not immediately catch the user's attention, but will instead be noticed as "already there" when the user's eyes next stray to the bottom part of the screen. This is to prevent an invasive and distracting interruption of the user's activities, which would likely be perceived as punishing after a few repetitions. An interruption may also serve to knock the user out of a flow state, heightening procrastination. During a flow state, ambient notifications may go unnoticed or be easily ignored ("primum non nocere").

The glowing continues for 90 seconds. If the user does not enter a response within this time period, the glowing stops and the event will be recorded as a non-response. If the user does enter text, it is logged in the history (see next section). The user also has the option of focusing the cursor in the text box and pressing Enter without entering text; this records a "default response" in the history. Users will be instructed that they may use this option when they are "doing nothing," cannot decide what to type, or do not feel like responding. It is hoped that allowing blank responses will reduce the occurrence of non-responses and increase the accuracy of typed responses. Associating blank responses with "default mode" activity may also reduce the occurrence of blank responses during non-"default mode" activity.

'SUP detects when the user is away from the computer and will not attempt to sample during those times. These inactive intervals are recorded in the history. Additionally, when an experience-sampling event occurs, 'SUP detects when the

user is using an application in full-screen mode and cannot see the experience-sampling notification; these times will be logged as a response with the name of the application and a note that it was in full-screen mode.

In order to avoid forming data-hiding interference patterns with the user's own cyclical behavior patterns (e.g., 22-minute TV shows), random intervals will be used for the experience-sampling. The time between events will range from 15 minutes to 2.5 hours, with a mean occurrence of about 1 hour. This amount of time was chosen to provide a useful level of resolution for the user's reflection process, without overwhelming them with too many experience-sampling events. Random sampling has the downside of being more stress-inducing than predictable sampling intervals, and if this is found to be a problem for users during testing it will be switched to set intervals of 75 minutes.

Because the notification for an experience-sampling event is ambient, no functionality to disable 'SUP will be provided short of force-quitting the program, and participants will be asked not to do this for the duration of the study. Every design decision has been made with reducing the potential invasiveness and annoyance of the experience-sampling process in mind; it is assumed that if the process feels invasive or annoying to users, they will ignore the 'SUP or seek to disable the program, withdraw from the study, or enter meaningless responses.

Because computers are often used for sensitive and highly-personal activities, participants will be instructed that they may add the word "private" anywhere in their response to prevent the content of that response from being sent to the research team.

Personal microblogging with reflective aids

By clicking on a button next to the 'SUP textbox, users will be taken to the history page. This local webpage provides a birds-eye view of their responses using multiple representations.

The bulk of the page will be taken up by a list of responses they have entered, sorted by recency. The user can scroll down to see older and older responses they entered. This encourages reflection over recent entries.

Another part of the page will be devoted to a frequency graph of words over time. This chart will show colored segments for the most frequent words in the history, with the thickness of the segment depending on the frequency of the word. The words will be written on their segments. The time length of the graph can be adjusted to include more or less history. Thus, a glance at this chart will reveal some of the historical themes in response data (see Fig. 1 for example).

Another graph will provide the same type of visualization, but focused on cyclic instead of linear time. This chart will be helpful for quickly seeing daily or weekly patterns of responses.

These reflective interfaces provide an opportunity for a feedback loop to develop between users' history and their language use: just by looking at the graph and desiring to make it more meaningful, users may develop their own keyword patterns and implicit systems of classification for their activities, broadening and articulating their awareness of their computer-use habits. This mirrors the Buddhist meditation practice of labeling phenomena as they arise, in order to create distance so that they may pass away. This feedback loop between reflection and experience labeling is the primary action of the intervention, and will be a rich source of data for analysis.

Measures

For this exploratory study, valid data is considered to come from participants who speak English as their first language and identify as having problems with procrastination. Data that does not fit this will be discarded. This is a substitute for eligibility requirements, to prevent data contamination by curious-but-ineligible web browsers who may check all the eligibility boxes in order to try the software. If provisions can be made for non-English analysis then this discarded data will also be included.

All data collected by the program will be sent to researchers for visual, qualitative, and quantitative analysis. Comparisons will be made in activity-labeling diction distributions between early and later use of 'SUP. The "awareness" hypotheses will be answered by qualitative-quantitative mixed analysis of user diction histories in combination with discursive user feedback from short qualitative surveys sent to some participants at intervals.

Limitations

Although the long-term design-based research format does provide an opportunity for rich interactions and investigations with researchers and participants, the study does have a number of limitations:

1. "Minimally-interruptive" is still interruptive. Interruption may increase or decrease procrastination, or it may cause subjects to develop negative associations with the 'SUP interface, reducing future effectiveness and affecting results.

2. The study has a demographic bias towards upper- and middle-class American computer users, based on the proposed sampling method.

3. There is no way to evaluate off-computer effects of the intervention, except through survey.

4. There is no plan to evaluate the long-term effects of the study, after the study ends.

Twitter StreamGraph for @andersaamodt

Neoformix

andersaamodt: dynamic abstract representations,systems thinking, tree/network/rhizome, multigravity,emergent complexity, critical evolution, nonadditivity
andersaamodt: self-organized criticality! angle of repose, critical point, strange attractor, supercritical fluid
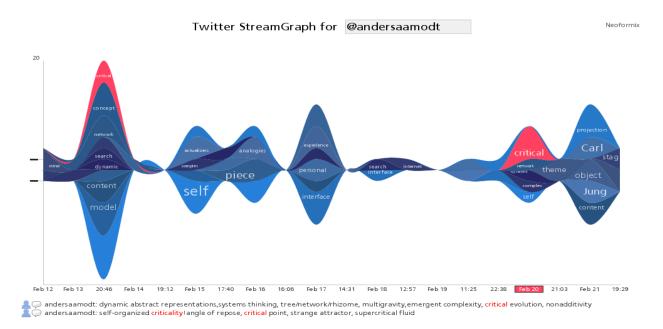
Fig. 1, an example of the visualization the user may see in 'SUP's history. This visualization makes salient the words that users enter 'SUP's textbox and how their activity-description vocabulary changes over time. This visualization can be done in either linear time to show historical patterns or cyclical time to show daily or weekly activity patterns. (From http://www.neoformix.com/Projects/TwitterStreamGraphs/view.php)

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