Fostering Motivation and Creativity for Computer Users

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Abstract

Creativity might be viewed as any process which results in a novel and useful product. People use computers for creative tasks; they flesh out ideas for text, graphics, engineering solutions, etc. Computer programming is an especially creative activity, but few tools for programming aid creativity.

Most computers are used in solitude; however, people depend on social supports for creativity. A computer could provide some of the social support and cues normally offered by humans to keep a worker motivated and help him consider useful alternatives. Computers could support and filter potentially creativity-enhancing communication with other humans. This paper develops the notion that creativity and motivation enhancement can easily be incorporated into the design of high-quality human-computer interaction.

1 Introduction

Dictionaries define "creativity" with words like originality, expressiveness and imagination (Carles, 2003). Creativity brings new ideas and improvements to people's lives. While some still hold that teaching creativity is dubious, Nickerson's work reports on teaching and measuring creativity imp rovement over an extended period of time (Sternberg, 1999). Possibly no one is more cited for his writing on creativity than Mihaly Csikszentmihalyi, the promoter of the idea of flow in creativity (Sternberg, 1999). Teaching creativity has become an industry (Heleven, 2003). Edward DeBono, best known for "lateral thinking", has published dozens of books on the topic. Most common are brainstorming prosthetics, such as outlining tools, lists of steps to go through or pictures and words to help expand ones thinking on a topic.

Computer interfaces are typically judged on many factors such as power, elegance, simplicity, ease of use and learning. Good functional user interface is taking the tool out of the task. If the user interface can avoid being the focus of attention, the user can focus on their goal; i.e., writing the paper, making the phone call, etc.. Spreadsheets, for example, allow people to compare results in what-if scenarios (Brown & Gould, 1987). The ability to start and stop secondary tasks is important to creative pursuits as well. While the ergonomics community considers fatigue important, it has not yet played a role for the human-computer interface. Much could be done to help maintain concentration and productivity, such as breaks. This could be based on recognition of the user's competencies and weaknesses, productive work pattern, signs of fatigue, and sometimes just staying out of the way.

The remainder of this paper gives examples of features that designers can add to human-computer interface that improve users' motivation, engagement and ability to be creative.

2 Setting the stage for creative work

Many factors can help set a creative context. People create rituals, special settings, go to workshops to get them in the mood to be creative. Unfortunately, people will not always be willing to stop working and start up a creativity-enhancing tool. We must search for motivational and creativity-enhancing activities that can be integrated into applications and that don't deter workflow (Burleson & Selker, 2002).

Still, some approaches to getting people to be creative just don't work. I once went to a 5-hour brainstorming session with some of the most creative people I know. It all started with drinks with the hosts the night before. We didn't brainstorm there; we would tomorrow. In the morning we went to an extended breakfast, we were asked to wait for the 20 minutes to set up the mics, 30 minutes for a group photo shot. The facilitator then tried to structure the conversation, which did not open people up. A microphone-off lunch was another time to stop thinking. In all, no one played his or her best cards. Just as the disruptions in this brainstorming meeting stalled intellectual momentum, so do complex procedures for finding, starting or changing computer applications .

An idea has to be captured to be considered. Most people have had the experience of forgetting what they wanted to say when someone else chose that moment to talk. Software should not interrupt when a person is trying to express an idea either.

I have used the Control-C command for cutting in so many text editors that it is automatic. If a person uses a command all the time, it will be executed faster and with less attention. One email system that I use requires many more selections for tasks than other email programs; a task model such as GOMS show these extra steps as distracting (Card, Moran & Newell, 1983). Recalling and entering an uncommon command is more distracting than just recognizing and selecting it (Klatzky, 1980).

Classifying and organizing things can be helpful, but where should they be put to be retrieved? Early hypertext experiments found people's focus on classifying their work distracted them from doing the work (Foss, 1989). Computers are good record keepers and potentially good indexers. Mechanisms for storing new ideas and finding them again should be predictable or easily discovered to avoid retrieval problems. Revisions are easily shown on paper with annotations. Similarly, marks on whiteboards get so important that people become reluctant to erase anything. Ever since the text editor was invented, people have been asking for infinite undo; clipboards still don't have structured undo. I even lost part of this paper due to a limited text-editor undo. Versioning text editors such as PEdit (Kruskal, 1984) have not been widely available until Microsoft Word 6. PEdit created different versions of documents for different purposes, allowing a person to make alternative versions without committing to eliminating others. While Word6 allows different people to use different colors, it does not support keeping and comparing alternative ideas.

Brainstorming is often aided by references such as dictionaries, thesaurus and prosthetics with broadening words, pictures, etc. Now people have the Internet and ask it questions at will. These tools can also cause distraction from the task at hand.

This section highlighted some standard software user interface features that help people try ideas and some of the problems that can occur. The rest of the paper will focus on how the design of human-computer interaction can be useful.

3 Cognitive science considerations

What are the precursors to motivational and creative success in a task? Perceptual-sensory, precognitive, cognitive, ergonomic, behavioural and social dimensions all impact human performance (Klatzky, 1980). Designers need to make software to take these human constraints into account.

Perceptual issues play a big role in what we notice. Time used for concentrating on perception borrows from cognitive tasks. Sensory limitations are in every interface decision from display contrast ratio to font design and even the shape of typing keys. The IBM TrackPoint (Rutledge & Selker, 1990) is at least 20% faster at selection than other joysticks because it uses a cognitive model of how fast eyes track. Even the wallpaper on graphical interfaces can distract users from finding the icons they are looking for on the screen.

Ergonomic issues affect what we can reach. The TrackPoint is placed in the middle of the keyboard as a direct consequence of literature that shows that a person spends more than a second switching from a keyboard to the mouse and back again (Rutledge & Selker, 1990). This placement saves almost a second spent reaching for a mouse or track pad, which significantly speeds activities like text editing.

Precognitive issues are recognized without even taking one's conscious attention. A blinking cursor attracts the eye. Dropped shadows can be recognized much faster than picture-frame style bezels, etc. (Enns & Rensink, 1990). Designers can use precognitive perception to help creative people attend to problems and opportunities.

Just as with physiological psychology issues, the limits of cognitive ability must be respected to allow people to learn and remember. For example, user interfaces that inadvertently prime a user with a point of view might stop other ideas from being considered (Klatzky, 1980). User interfaces that require too much short-term attention are difficult to use. The limit to how many things can be remembered at once is often covered by the legendary 7 +- 2 (Klatzky, 1980).

Word6 is a mentor for bad spellers and syntax lightweights (Heidorn, Jensen & Richardson, 1993). One study showed how formatting technology could distract people from their writing objectives (Rosson, 1983). A group with a command-line controlled text editor produced better writing than the group with a What I See Is What I Get text editor. Users must understand where the creative interest is to choose tools that allow them to focus on their goal.

Behavioural issues affect creative potential too. Most people's offices are adorned with mementos to make them feel comfortable. These belongings can help them take mini breaks and have outlets for releasing tension. A nice place to sit with a view, a beverage, a pad of paper for jotting notes or drawing can all provide needed diversion that doesn't stop the work flow. Unfortunately, solitaire, instant messaging, animated pop-ups and games that need to be finished once started are all more distracting than a sip of a beverage.

Attempting to balance our need for focus with our desire for breaks can turn into procrastination. By watching the pattern of use and mouse movements, a computer can interpret aspects of a user's intentions (Lockerd & Selker, 2002). This might be used to monitor distractions and encourage people to stop procrastinating. In any case we should make computer activities that can be non-distracting background mini-breaks.

Social issues also affect people's ability to be creative. Telling a person that they are doing well part way through a project improves their resolve to finish it (Nass & Reeves, 1996). Instant messaging and email, help a people expand their thinking and search for a solution (they can also distract and make it harder to focus). Drift Catcher (Lockerd & Selker, 2002) classifies email based on social relation and succeeds at getting people to focus on the relationships they want to improve.

Fostering motivation and creative tasks must take into account social expectations. The ability for a person to feel judged by a computer is well documented (Nass & Reeves, 1996); people are less willing to communicate something to a computer that they perceive as a judgement about it. The computer's persona could be used to help people feel creative (Burleson & Selker, 2002).

4 Discussion

Support tools could foster creativity by helping people find things, show alternatives, annotate and compare ideas and evaluate their work (Miller, 2002). Such tools should also be careful to allow a user to keep structure, communicate appropriately and notice how much time or other resources they are committing to an idea. Sometimes the most important creative inspiration will be to look for collaborators. A creativity-enhancing toolkit needs to help in the evaluation of when to encourage a person to enter a social partnership.

This paper is a call for the integration of motivation and creativity enhancing considerations in software. Developers need toolkits to help them incorporate and validate creativity and motivation enhancements into software.

The paper has presented some approaches for improving computer user motivation and focusing on the creative process. We have taken a walk through human capabilities that user interface designers must consider in their design. The emphasis has been on what systems do to distract users from productive creative work, and what could be done to enhance these processes. These approaches hold clues to the elements that should be included.

We must reduce the memory load for people to be creative. I am nostalgic for a web programming approach that didn't require keeping an alphabet soup of tools and protocols in mind to be productive.

This paper is meant to be part of the beginning of an era in which computers become partners in peoples' work. We hope to help computer application developers focus on the cognitive and emotional precursors to creativity, the highest human cognitive process of all.

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