

# Insight Into Strong Emotional Experiences Through Memory

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## INTRODUCTION

Much of the research in emotion in HCI has been in developing quantitative methods for detecting and analyzing emotions. This has taken away from the subjective nature of emotions and their lasting effect on the user. In addition, this has left little for HCI practitioners to user in their own design and testing. To begin with, we should at least provide simple methods for practitioners to determine what the most substantial emotional experiences are. In this paper I suggest that if we tap into the user's memory of their experience we can gain insight into what emotional experiences made the most emotional impact.

## MEMORY AND EMOTION

Numerous studies have shown that emotionally rich events in one's life are remembered more often and with more clarity and detail (e.g. Christianson & Loftus, 1990; Rubin & Kozin, 1984; White, 1989; Revelle & Loftus, 1990; Schacter, 1996). Vivid memories have been shown to have attributes of consequentiality and surprise; these attributes seem to induce a greater emotional change than those of non-vivid memories (Rubin & Kozin, 1984). Other studies have supported these findings and assert that the type of emotion is not as important as the level of arousal when the memory is formed (Reisberg, Heuer, McLean, & O'Shaughnessy, 1988). Although, it has been noted that in some studies, unpleasant experiences have been better remembered than pleasant.

More importantly, emotionally tagged memories seem to be forgotten more slowly than those formed at a time of less intense affect. This slowing of forgetting is thought to be a product of three factors: physiological arousal itself, the distinctiveness of emotional events, and the extra attention and rehearsal that one devotes to emotional events (Heuer & Reisberg, 1990).

The mechanism that leads to encoding begins with physiological arousal that affects glucose metabolism, which aids in memory encoding (Manning, Hall & Gold, 1990). Physiological arousal also causes the person to pay more attention to the arousing event. This relates to the survival advantage of emotions in certain situations that Darwin proposed. Stemmler, Heldmann, Pauls, and Sherer (2001) showed this concept in their study, which found that

the context of an emotion-eliciting event has a strong relationship with the level of physiological arousal in the subjects.

It also seems likely that these emotionally arousing events are distinctive to the subject because they are more likely to have serious consequences on one's life; this in itself may promote memory (McDaniel & Einstein, 1986). Finally, one reflects on emotional events more often than others primarily because they are more "personal" and more closely connected to one's thoughts and feelings (Burke, Heuer & Reisberg, 1992).

Personal experiences are defined as follows (Pillemer, 1998):

- The memory represents a specific event at a particular time and place.
- The memory contains a detailed account of the rememberer's own personal circumstances.
- The verbal narrative account of the event is accompanied by sensory images.
- Memory details and sensory images correspond to a particular moment or moments of phenomenal experience.
- The rememberer believes that the memory is a truthful representation of what transpired.

However, the accuracy and reliability of recalled emotional memories has not been without controversy. Many cases have been brought up regarding the fallacy of recalled memories, specifically what are termed "flashbulb memories". Flashbulb memories are memories that are "subjectively compelling recollections of an occasion when we heard an important piece of news" (Neisser, 1982, p.43).

## MEMORY OF FRUSTRATION STUDY

Previously I conducted a study where I used memory as an indication of where frustration occurs while using technology (Mentis & Gay, 2003). The participants were prompted to recall using various technologies: operating systems, browsers, websites, text editors, email clients, PDAs, digital video recorders (TiVo), and any other technology. For each category they were asked to describe a

frustrating incident they had experienced. Analysis of the data showed that the majority of remembered frustrating incidents were attributed to auto-formatting, computer errors or bugs, a slow or dropped Internet connection, and pop-ups. These incidents all seem to have one thing in common: they are external to the user's cognitive processing and they interrupt the user's task. These external frustrating incidents take control away from the user. When users decide on what goal they want to achieve, they plan the steps that are needed to complete that goal. However, when there is an unanticipated interruption, the user has to compensate for that interruption, breaking the cognitive flow.

What was especially interesting was that no matter how mild of a usability problem the incident was, it evoked a high level of frustration from the user if it was an interruption. In contrast, incidents, which are normally considered serious usability problems but did not interrupt the user's cognitive flow, were not rated as significantly frustrating. Thus, by using the user's memory of their experiences with technology we learn that to consider all types of usability incidents as the same in the way they affect the user's emotional reaction is to fail to see the intricacies of the human emotional system.

Findings such as these lead to design implications for creating a better overall user experience by not interrupting a user's cognitive flow. This also would apply to environments outside of desktop environments. Bell and Kay (2002) have noted the history of technology in the home, particularly kitchens, have focused on streamlining functionality without acknowledging that people's fondest memories of kitchens have to do with smells, conversations, and food rather than how fast they were able to cook a meal. Thus, their conceptualization of enhancing the user experience is where technology enhances already enjoyable experiences, not replacing or interrupting them.

### **PRACTITIONER USE OF MEMORY**

Many practitioners would like to consider the emotional impact of their systems but find that time and money are large barriers to conducting various methods of analysis. Memory of emotion can be easily integrated into a product lifecycle by following the following rules.

1. Do not outright ask the test subject about their emotions unless you are specifically interested in a particular emotion. Asking questions that do not lead the test subject to think too much about their emotions seems to get the most honest responses. I have used the following as my start off question: "Tell me about your experience with this system?"
2. Remember that the things they mention are important experiences. There is a reason they are remembering it and relaying the memory to you. Particularly pay attention to emotionally laden words that are used.

3. If they don't seem to be remembering much or are not able to open up, cues for memory are very useful. Asking about a particular task (if a usability test) or a section of the interface could bring about recall. However, do not push and prod since that defeats the purpose.

Another use of memory is that it can be a longitudinal method of emotion analysis. Since memory of emotional incidents can degrade over time those that are more salient will persist longer. This provides a method of rating incidents which are remembered. For instance, two experiences which are remembered a day later might have different levels of emotional arousal and thus only one might be remembered a month later.

Currently I have just begun to use this subjective measure to test systems for maritime security. Memory questions are an easy supplemental method to a usability test's exit interview, which does not add cost or a significant amount of time. Typically, I ask the user what they remember of their overall usage of the system and then specifically what negative and positive experiences they remember. These seemingly innocuous questions hide the fact that I am interested in a visceral emotional response to their interaction with the system. I make note of emotion words they may use in describing their experiences (e.g. frustrated, glad) and record exactly what incident led to their negative or positive experience. A few times I have followed up with another interview a few weeks after to assess which memories have persisted. This highlights which experiences left the most meaningful effects.

Many times we do not have formal usability studies with the users of the system. Recently, I have had the opportunity to interact with users of a beta system. After the first week of deployment I was able to spend some time with the users. I would always start out by asking them, "tell me about your experience with the system." Again, asking them to reflect upon and discuss their overall interaction with the system opens them up to using emotionally laden terms to describe their experience without being cognizant of my interest in those terms.

Another way I have used emotional memory retrieval has been during ethnographic studies before designing a system. I have used memory as a way to determine what experiences are emotionally rich in the user's current environment and where technology can assist or detract from their experiences. By viewing what the user deems worthy of sharing as emotionally meaningful experience I have a method by which to assess the emotional impact as well as the overall user experience of a system we would be building.

### **REFERENCES**

1. Bell, G., & Kaye, J. (2002). Designing technology for domesticated spaces: A kitchen manifesto. *Gastronomica* 2(2), 46-62.

2. Burke, A., Heuer, F., & Reisberg, D. (1992). Remembering emotional events. *Memory & Cognition*, 20, 277-290.
3. Christianson, S.-A., & Loftus, E. (1990). Some characteristics of people's traumatic memories. *Bulletin of the Psychonomic Society*, 28, 195-198.
4. Heuer, F., & Reisberg, D. (1990). Vivid memories of emotional events: The accuracy of remembered minutiae. *Memory & Cognition*, 18, 496-506.
5. Manning, C., Hall, J., & Gold, P. (1990). Glucose effects on memory and other neuropsychological tests in elderly humans. *Psychological Science*, 1, 307-311.
6. Mentis, H. M. & Gay, G. K. (2003). User recalled occurrences of usability errors: Implications on the user experience. *Extended Abstracts of the Conference on Human Factors in Computing Systems, Ft. Lauderdale, Fl.*
7. McDaniel, M., & Einstein, G. (1986). Bizarre imagery as an effective mnemonic aid: The importance of distinctiveness. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 12, 54-65.
8. Neisser, U. (1982). Snapshots or benchmarks? In Neisser, U. (Ed.) *Memory Observed: Remembering in Natural Contexts* (pp. 43-48). San Francisco: W. H. Freeman & Co.
9. Pillemer, D. B. (1998). *Momentous events, vivid memories*. Cambridge, MA: Harvard University Press, 1-3, 50-52.
10. Reisberg, D., Heuer, G., McLean, J., & O'Shaughnessy, M. (1988). The quantity, not the quality, of affect predicts memory vividness. *Bulletin of the Psychonomic Society*, 26, 100-103.
11. Revelle, W., & Loftus, D. A. (1990). Individual differences and arousal: Implications for the study of mood and memory. *Cognition and Emotion*, 4, 209-237.
12. Rubin, D. C., & Kozin, M. (1984). Vivid memories. *Cognition*, 16, 81-95.
13. Schacter, D. L. (1996). *Searching for memory*. New York: Basic Books.
14. Stemmler, G., Heldmann, M., Pauls, C. A., & Scherer, T. (2001). Constraints for emotion specificity in fear and anger: The context counts. *Psychophysiology*, 38, 275-291.
15. White, R. T. (1989). Recall of autobiographical events. *Applied Cognitive Psychology*, 3, 127-136.