Introduction

- **Emotion**
  - Much of what we do as humans is driven by our emotions
  - Emotion is a fundamental component of being human

- **HCI Researches about emotion**
  - Humans are more efficient and creative problem solvers when they are happy
  - Emotion is closely tied to user acceptance and satisfaction
  - Emotion serves as a primary motivation for consumptive behavior
  - Certain brain regions associated with emotion are highly active when people make buying decisions

- **Objective**
  - Reviewing existing emotion measurement tools
  - Discussing the development of a method that combines both verbal and nonverbal scales to assess emotional responses
  - **Significant value emotion measurement provides to better understand the complete user experience**
What is Emotion?

- There are many definitions of “emotion” in the relevant literature

- Two aspects of what actually constitutes human emotion
  - Emotion is a psychological reaction to events relevant to the needs, goals, or concerns of an individual
  - Emotion is comprised of physiological, affective, behavioral, and cognitive components

Measuring Emotion

- Emotion is an inherently complex construct
  - Having trouble describing how they feel and distinguishing between different emotions
  - Difficult to pinpoint the exact cause of a particular emotion (can change instantaneously)

- Measurement tools
  - Verbal measurement tools
  - Nonverbal measurement tools
  - Physiological measurement tools
Verbal Measurement Tools

- **Verbal emotion measures**
  - Developed and utilized primarily in marketing and advertising research
  - Taking the form of self-reports where respondents use a scale to record their emotions

- **Criticism**
  - Only capturing respondents’ conscious emotional states
  - In order to effectively assess emotional response, comprehensive verbal measures tend to be lengthy
  - Respondents may have difficulty remembering how they felt only minutes earlier
  - Best applicable in studies in which the subject passively participates
  - Language-dependent

- **Merit**
  - Easy to develop and use

- **Two most prominent verbal scales**
  - Likert scales: Rate on item from strongly disagree to strongly agree
  - Semantic Differential scales: Place bipolar adjective pairs at each end of the scale

- **Examples of verbal emotion**
  - Standardized Emotional Profile
  - Feeling Toward Ad scales
  - Leavitt Reaction Profile
  - PAD Semantic Differential Scale

Nonverbal Measurement Tools

- **Nonverbal measures**
  - Visual representations of emotion that participants select to characterize how they feel

- **Merits**
  - Validated cross-culturally as consistently interpreted
  - Aim to capture unconscious emotional responses and incorporate a certain amount of ‘fuzziness’

- **Examples of nonverbal measures**
  - PrEmo
  - Self Assessment Manikin
  - Facial Action Coding System
  - Emocards
Measure Development

- Combining an extensively used verbal scale with a more experimental nonverbal emotion measure
  - No one emotion measure alone would suffice as a reliable assessment of emotion
  - Nonverbal measures were all very experimental and of unknown validity

**PAD Semantic Differential Scale (PAD scale; Mehrabian & Russell, 1974)**
- Verbal component
- 3 important aspects of emotion
  - Pleasure
    - A positive affective state which is separate from feelings such as preference and reinforcement
  - Arousal
    - An emotional state from sleepy to very excited
  - Dominance
    - The extent to which a person feels unrestricted or free from outside control

<table>
<thead>
<tr>
<th>PAD Dimension</th>
<th>Maintained Pairs</th>
<th>Discarded Pairs</th>
<th>Additional Pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleasure</td>
<td>Annoyed - Pleased</td>
<td>Unsatisfied - Satisfied</td>
<td>Drowsy - Alert</td>
</tr>
<tr>
<td>Arousal</td>
<td>Relaxed - Stimulated</td>
<td>Sluggish - Frenzied</td>
<td>None</td>
</tr>
<tr>
<td>Dominance</td>
<td>Controlled - Constraining</td>
<td>Influenced - Important</td>
<td>None</td>
</tr>
</tbody>
</table>

Emocard (Desmet, 2000)
- Consisting of sixteen cartoon-like faces
- Each face represents a combination of two of the dimensions included in the PAD scale
  - Pleasure
  - Arousal
Experiment

- Application domain
  - 2 versions of a Customer Relationship Management application interface

- Measures
  - Traditional usability measures
    - Time on task
    - Number of errors
  - Emotional measures
    - Emocard
    - PAD scales

- Participants
  - 22 (13 male & 9 female)
  - Not having any prior direct experience with the interface

- Task
  - 7 comparable tasks
  - Tasks were randomized into 3 randomized task lists
  - Participants were randomly assigned to one of the 3 task list versions

- Procedure for each task
  - Completing task
  - Selecting the Emocard which best represented their initial emotional reaction to the task
  - Continuing onto the PAD scale
  - Being asked for their qualitative feedback

2 ways data analysis

- Responses across all respondents, regardless of interface, to assess the validity of the PAD scale

- All data by interface and task to compare responses
**PAD Semantic Differential Scale Analysis**

- **Mehrabian & Russell (1974) study**
  - PAD scale fell evenly into the emotion dimensions of Pleasure, Arousal, Dominance

- **Factor analysis**
  - Factor 1 ➔ Pleasure
  - Factor 2 ➔ Arousal
  - Factor 3 ➔ Dominance
  - Additional pairs of Tense-Relaxed and Unfriendly-Friendly represented Factor 1

<table>
<thead>
<tr>
<th>Bipolar Adjective Pair</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unfriendly-Friendly</td>
<td>.872</td>
<td>.247</td>
<td>.229</td>
</tr>
<tr>
<td>Annoyed-Pleased</td>
<td>.872</td>
<td>.272</td>
<td>.254</td>
</tr>
<tr>
<td>Unsatisfied-Satisfied</td>
<td>.878</td>
<td>.257</td>
<td>.228</td>
</tr>
<tr>
<td>Despairing-Hopeful</td>
<td>.801</td>
<td>.373</td>
<td>.265</td>
</tr>
<tr>
<td>Tense-Relaxed</td>
<td>.835</td>
<td>.255</td>
<td>.131</td>
</tr>
<tr>
<td>Relaxed-Simulated</td>
<td>.326</td>
<td>.814</td>
<td>.248</td>
</tr>
<tr>
<td>Calm-Excited</td>
<td>.332</td>
<td>.782</td>
<td>.329</td>
</tr>
<tr>
<td>Sleepy-Wideawake</td>
<td>.284</td>
<td>.785</td>
<td>.021</td>
</tr>
<tr>
<td>UNaroused-Aroused</td>
<td>.438</td>
<td>.556</td>
<td>.250</td>
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<tr>
<td>Controlling-Controlled</td>
<td>.117</td>
<td>.391</td>
<td>.661</td>
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<tr>
<td>Influenced-Influential</td>
<td>.232</td>
<td>.282</td>
<td>.730</td>
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<tr>
<td>Submissive-Dominant</td>
<td>.905</td>
<td>.095</td>
<td>.751</td>
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<tr>
<td>Guided-Autonomous</td>
<td>.458</td>
<td>-.005</td>
<td>.672</td>
</tr>
</tbody>
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- **A scale reliability analysis**
  - Dropping of the items Unaroused-Aroused & Controlling-Controlled would increase overall scale reliability

- **Scale application may be extended beyond that of advertising and marketing to the domain of software interfaces**

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**Interface Comparison**

- **Analysis of usability measures**
  - No significant differences between interfaces
    - Time on task
    - Number of errors

- **Analysis of PAD scale & Emocard responses**
  - Significant differences in participants’ emotional responses
    - Interface A was more satisfying and friendly
    - Users rated interface A as more pleasing and relaxing for three out of seven tasks
Interface Comparison (Cont’d)

- Additional information was gathered from session usability notes and respondents’ qualitative feedback

- Use of the PAD scale and the Emocard measures encouraged participants to provide feedback in emotional terms
  - Qualitative data was both rich in content and often emotionally charged

  "It took me a while to find the [content]… I chose the slightly perplexed face… after exploring I found the [content] but initially it was a bit frustrating."

  "I struggled to find information about the topic, it wasn't intuitive. I searched in several areas... the [interface] should have been linked and said something like 'ok the info isn't here but try this instead.'"

  "I absolutely hate when I see something red that pops up and doesn't tell me anything... It makes me feel stupid. It drives me up the wall. I put a sad face, because it makes me kind of sad... I had a strong negative reaction to that. It was kind of unexpected, [Interface B] had a nice clean interface then this red blinking error popped up out of nowhere. It made me kind of tense."

Discussion

- Usability
  - Simply the easiest component of user experience to assess
  - Number of errors, time on task, heuristic evaluations, usability test etc.

- Emotional experiences
  - How studying emotion can add value to traditional user experience research
  - A proper study of emotion required a certain amount of “fuzziness”
    - Emocard allow for and encourage the fuzziness necessary for realistic emotional measurement

- Relationship between usability and users’ emotional response
  - Perceptions of usability are often affected by emotion
  - The actual usability of a product will almost certainly have an effect on one’s emotional state