Assessing the Emotional Part of User Experience

Potential of Affective Computing Methods

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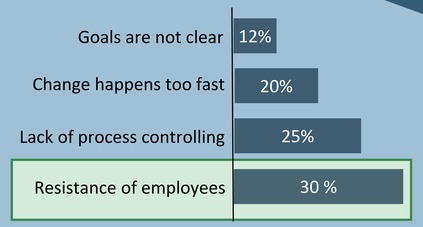
Motivation

Why do digital transformation projects fail?



(Schott & Wick 2005)

Focus on User Experience (UX) to increase user acceptance and satisfaction.

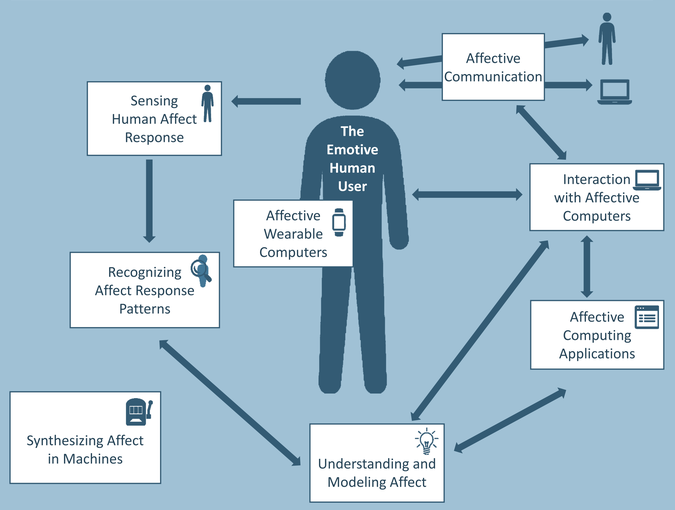
UX "includes all the users' emotions, beliefs, preferences, […] that occur before, during and after use" (ISO 9241-210)

Research Problems and Gaps:

- UX measures come typically in form of questionnaires and interviews
- UX measures are often usability-related
- The emotional part is not accounted for

Focus: Human emotions and their assessment

Affective Computing (AC) is computing that "relates to, arises from or influences emotions" (Picard 1995)



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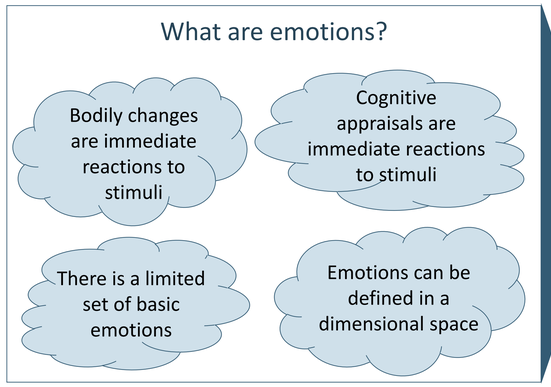
Emotion Models

Literature Review of emotion models frequently used in AC research



Critical Assessment

- Often not defined what emotion is and what it is not
- Some approaches lack scientific grounding
- *„Evidence"* is either for limited set of emotions or tested with animals
- Not agreed upon which emotions are basic and why
- No consensus whether dimensional space has 2 or 3 dimensions

Emotion Measures

Literature Review of measures frequently used in AC research

Electromyography (EMG)

Measures muscle movement invisible to the human eye

- ✓ Distinguish levels of arousal
- ✓ Distinguish levels of valence
- ✓ Applicable for discrete emotions
- ✗ Facial expression to some extent controllable

Electrodermal Activity (EDA)

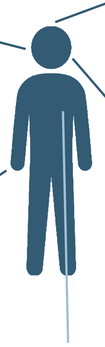
Measures skin conductivity (sweat)

- ✓ Distinguish levels of arousal
- ✓ Identify mental workload
- ✗ Problematic for valence differentiation
- ✗ Problematic for identifying discrete emotions

Heart Rate (HR) & Respiration

Measure frequency of your heart beat or chest cavity expansion

- ✓ Distinguish levels of arousal
- ✗ Problematic for valence differentiation
- ✗ Problematic for identifying discrete emotions
- ✗ Respiration influences heart rate



Electroencephalography (EEG)

Measures electric energy from the brain

- ✓ Information about relation of emotion and cognition
- ✓ Distinguish levels of arousal
- ✓ Identify mental workload
- ✗ Problematic for valence differentiation
- ✗ Problematic for identifying discrete emotions

Self-Assessment Methods

Measure through questionnaires, interviews, think aloud…

- ✓ Help to interpret physiological measures
- ✓ Applicable for discrete emotions
- ✓ SAM abstracts from language
- ✗ Prone to biases
- ✗ When with words, probably language-related problems

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Discussion

Opportunities of Affective Computing

- It offers new methods for data gathering
- Deeper insights in customer reactions
- Deeper insights in affective states of humans
- Accurate measures for arousal and mental workload
- Possibility to measure stress of employees
- Additional measures to better assess UX

Challenges of Affective Computing

- Real-time data gathering is difficult
- Need to conceptualize emotional states before measuring them
- High chances of error of sensors
- Highly intimate data – employees might refuse to use it

Implications

1. Further research required with focus on conceptualizing emotions for UX measurement
2. Need to identify more measures for valence levels, e.g. more focus on neuroscience
3. Need to address security and privacy matters before applying these measures in business environments
4. Need to make "emotion measurement" easier for UX practitioners, e.g. develop a method or framework
5. Find a way to automatically adapt user interfaces to individual needs

Research Method

Research Objective

In how far can we use and apply methods from Affective Computing to UX measurement?

Authors	Chanel et al. (2011)	Christy & Kuncheva (2013)	Fritz et al. (2014)	Hamdi et al. (2012)	Healey (2015)	Hudlicka (2008)	Kim and André (2008)	Kotsia et al. (2013)	Liu et al. (2010)	Mahle & Minge (2008)	Soleymani et al. (2012)	Tan et al. (2014)	Taylor et al. (2015)	
Emotion Model	Valence/ Arousal	-	-	Basic Emotions	Mixed Approaches	Basic Emotions	Valence/ Arousal	-	Valence/ Arousal	Mixed Approaches	Valence/ Arousal	-	-	
Focus	Video Games	Video Games	Task Difficulty	Response to Pictures	Physiology of Emotions	Video Games	Music	Video Games	Response to Audio and Pictures	Components of Emotions	Response to videos	Video Games	User Frustration	
Measures ↓														Sum
Electroencephalography (EEG)	X	X	X	X	X	X		X	X		X			9
Electrodermal Activity (EDA)	X	X	X		X	X	X	X		X			X	9
Skin Temperature	X	X				X		X					X	5
Breathing Rate/ Respiration	X	X			X		X	X					X	6
Electrocardiography (EKG)				X	X		X	X					X	5
Electromyography (EMG)		X			X	X	X	X		X		X		7
Heart Rate (HR)	X				X	X	X			X		X	X	7
Self-assessment scales	X			X					X	X	X	X		6
Facial Expressions		X				X		X		X	X	X		6