

humaine

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Task leader	KTH
Author(s)	Kia Höök
EC Project Officer	Philippe Gelin

Address of lead author: Kristina Höök
 Department of Computer and Systems Sciences
 Stockholm University/Royal Institute of Technology (KTH)
 Forum 100
 164 40 Kista
 Sweden

kia@dsv.su.se

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1 The place of this report within HUMAINE

The final workpackage reports in HUMAINE have been designed as brief statements that complement other sources. On one hand, substantive content – particularly technical content – has been reported in deliverables throughout the project. On the other hand, several potentially overlapping sources are part of the final reporting process. In particular, the activity report for the final period sets out the goals achieved during the final period; and the final report for the project as a whole includes a relatively non-technical account of what the workpackage has achieved.

This core of this report is shared with the section on WP9 in the final report for the project as a whole. That consists of a short, non-technical summary of what the workpackage has achieved. However, there are details that do not belong in a report intended for the general reader (such as information about the participating institutions, meetings organised, etc). They are covered here.

Workpackage members invested a substantial amount of effort in the deliverables, and they form a continuing resource available to the community on the HUMAINE portal. They are listed for completeness. In some senses it would make sense to do the same for publications, but they are too difficult to allocate to individual workpackages. A full list is given in the final report for the project as a whole.

2 Workpackage remit, membership and structure

WP9 has had its focus on *user-centred design methods and evaluation of affective interactive systems*. It should be noted that user-Centred Design (UCD) is not only a set of methods, but primarily an approach to systems development that puts users and questions regarding their needs, wants and usage situations in focus. User-centred design is thereby a design philosophy that can have many incarnations, all sharing the same underlying principles a) to make user issues central in the design process, b) to involve users in the design process, c) to carry out early testing and evaluation, and d) to do design iteratively. User-centred methods therefore cover all stages of design process - from gathering data to inspire the design, to the final evaluation.

This document is organised around the five major activities in WP9, of:

- **Review of existing methods** for user-centred design and evaluation, which could be of particular relevance for affective technology.
- **Development of new methods** especially targeted at understanding and evaluating emotional aspects of using technology.
- **Application of new, as well as previously existing, methods** within a range of different research projects within the domain of affective computing.
- **Internal dissemination within the HUMAINE network**, in the form of a workshop, a brainstorming exercise and discussing the methods explored.
- **External dissemination** of methodological findings through participation in international conferences and workshops, as well as through publication in research journals.

3 Main achievements

3.1 Review of existing methods

In our review of existing user-centred methods, we provided examples of methods for each of the steps in an iterative design process. The methods selected all bear relevance to the specific problem of “getting to know” the users and their experiences, sometimes in the literature referred to as *empathic* design methods.

3.1.1 Think aloud

Thinking aloud is a method traditionally used in usability testing as a way of finding out the ‘why’ behind a particular problem. While using an interface, a user verbalises his/her cognitive activity by saying what he or she is doing. For affective evaluations, we hypothesized that this kind of setting elicits more information than just a cognitive reflection of a user’s interface activities. Users are given the role of an expert who speaks out while using an application that can provoke an emotional experience.

3.1.2 RGT

The basic idea behind the Repertory Grid Technique (RGT) is to elicit a set of personal constructs (or dimensions) for each participant which then evaluates the objects being studied. Constructs are elicited by comparing elements to each other in various ways and extracting their similarities and dissimilarities. Constructs are usually bi-polar, taking on values between two extremes.

3.1.3 Experience clips

Experience clips is a method proposed by Isomursu and colleagues (Isomursu, Kuutti et al. 2004), to be used when evaluating mobile services. The mobile service is given to a user and a friend of the user, the spectator, who is equipped with a camera and other documentation facilities and asked to send back feedback on how the user is experiencing the system. In Isomursu and colleagues’ study, presented in the paper mentioned above, users took turns in being the user and the spectator. Users got to use mobile phone applications and they were asked to focus on feelings, emotions and subjective experiences, aspects that are very hard to capture with traditional methods.

3.1.4 Psychometric evaluation methods

Leeds conducted an extensive literature review on three distinct areas of application of psychometrics. First, empirical work concerned with the development of new psychometric measures that are specifically focused on users’ affective responses to computing systems. Some of these studies have used data reduction techniques to identify component elements of these responses and as a basis for model development. Second, a review of a range of context-generic psychometric assessments of affect that are well-founded in the psychological literature, and that have been or could be applied in the context of emotion-related computing systems. Finally, a range of psychometric measures of ‘global’ usability. These are well

recognised measures that are widely used in studies of usability, but that may not have been used in the context of emotion-related computing.

3.1.5 Cultural probes

In a Cultural probe method participants are typically given a range of materials, such as a diary, a disposable camera and postcards, together with a set of provocative tasks and questions that makes participants reflect over some aspect of their life. The obtained data from such a study are then used exclusively as design inspiration and should therefore not be seen as a method for gathering data to prove some particular point in a scientific sense.



Figure 1 Cultural Probe-material sent to subjects in the Affective Diary project (see below)

3.1.6 Technology probes

Technology probes were proposed by Hutchinson and colleagues in 2003. Their idea was to place partly unfinished technology in people's homes and then study how participants made sense of it, also here the method is for inspirational usage and not a method for gathering data to prove some particular point in a scientific sense since users are allowed to interact with the technology placed in their home totally after their own liking.

3.1.7 Wizard of Oz

This is a kind of evaluation method to be used when a design is not yet, or only partly implemented as a working system. By manually making the system respond to user action in certain ways, it is thereby possible to test out and experiment with various designs in a quick and affordable manner before the system is actually working. With new and complex systems, such as the ones explored in HUMAINE, this was thought as an especially useful method.

3.1.8 Critical Design Practice

Recently there has been a renewed interest in design methods where the designer herself takes on a more active role in assessing the qualities of what is being built. As designers of interactive systems get more experience of designing for affective engagement, design approaches grounded in prior experience and empathic skills of the design team may in fact be very successful in reaching acceptable systems. It is however important to be aware of the method's strengths and weaknesses, e.g., the commonly reported difficulty to imagine user actions and interpretations that go beyond the intended use scenarios.

3.1.9 Bodystorming

Body storming is a light-weight variant of ethnography that is becoming increasingly popular in design projects. The principle is to visit the environment where the system is meant to be used, and to use that experience as an input to design decisions. By putting oneself in the

actual use setting, and by interacting with and observing users in the intended contexts, several aspects that are not available otherwise becomes salient and possible to try out, both by physical action or by asking the people in place.

3.2 Development of new methods

3.2.1 Methods grounded in media theory

Based on literature on Film, Comics and media studies, and analysis of theories of aesthetic experiences, KTH came up with a range of dimensions such as agency, immersion, transformation, of relevance to use as parameters in the design and evaluation of dramatic experience. These were used in the project for guiding designs as well as for evaluative purposes in the area of interactive drama.

3.2.2 The Sensual Evaluation Instrument

The Sensual Evaluation Instrument (SEI) is an experimental tool for non-verbal self report of affective state. The basic idea of SEI is that subjects will use a set of designed physical shapes while interacting with the object of evaluation to convey their experience, instead of reporting in verbally. The instrument consists of a set of organically shaped physical objects that are meant to evoke different emotions in users albeit without having a predefined meaning. The goal is to let users become free to make and thereby articulate their own coupling between objects and emotions.



Figure 2 The objects in the Sensual Evaluation Instrument

3.2.3 Laban analysis of body language

Laban analysis is a method used in dance theory to describe the physical dimensions of different movements. Laban's theory oftentimes referred to as LMA (Laban's Movement Analysis) is composed of five major components: body, space, effort, shape and relationship. In the work at KTH, the two components effort and shape was used to help understand the underlying dimensions of affective body behaviours.

3.2.4 In situ informants

The aim with an In situ exploration is to move beyond the laboratory environment where often simplistic scenarios are used to get users emotionally involved. The In situ method is used to enter and explore the subjective and distributed experiences of use, as well as how emotional experiences with technology unfold in everyday practice. The method is a

combination of three well established user-centred design methods, Experience clips and the Cultural and Technical probes methods.

Using the in situ method we provided subjects with packages including a technical probe, in the form of a research prototype (eMoto and Affective Diary), together with some cultural probes to document on their experiences with the particular prototype. The packages also include material to give to a close friend who will give a more outside perspective on the user's activities. As the aim of the in situ method is to look for how emotional experiences unfolds in everyday practice, the spectator needs to be someone who has a deeper understanding of the personal expressions and the body language for the specific user. Emotional body language can be highly individual and hard to interpret unless you know someone well, even though you are a professional.



Figure 3 Probes given to user, left, and probes given to spectators, right.

3.3 Application of new, as well as previously existing, methods

3.3.1 Think aloud

This method was explored in a study conducted at the Geneva Emotion Research Group in July of 2006. 20 participants between the ages of 20 and 40 took part in our study. The application tested was Yahoo! Avatars. The site provides users with tools to customise their personalised avatar and also with tools that broadcast their persona to their social networks. The customisation of Yahoo! Avatars was chosen for this study as it is web based and thus lends itself to being studied in the lab. Upon arriving users were trained on how to do the think aloud.

3.3.2 SEI and RGT – used to evaluate interactive narratives

SEI and RTG methods were both evaluated and compared at KTH, with existing of-the-shelf computer games as well as with research prototypes in the domains of affective interaction. We found SEI particularly useful in the sense that participants could talk about the objects and explain what emotions they portrayed in different situations. The SEI objects are in that sense open for a range of interpretation, and in the end allows for articulation of more complex emotions.

In WP9 we modified the RGT method to work as an evaluation method for interactive narratives, order to capture aspects of players' experience such as agency, immersion, transformation, emotional- and dramatic experience. As far as we know RGT has not previously been used for evaluating the dynamic progression of an (emotional or other) experience.

The real strength of SEI, and the reason that the method was created, lies in capturing the emotional experiences of the users. This came through in the studies performed at KTH. The modified version of RGT on the other hand, was better at capturing dramatic experience, agency and immersion. None of the methods captured how well the drama helped players to transform into the characters they played.

3.3.3 Wizard of Oz Studies with ECAs

A domain and agent-independent tool was developed, to test the social attitude of users towards ECAs. This tool together with a method of speech and language analysis, was employed to test whether and how the user characteristics influence the 'affective' aspects of their interaction with ECAs. An interesting opportunity offered by this experience was to compare 'subjective' evaluation of own affective state (by means of questionnaire) with 'objective' observation of affective behaviour. This comparison helped to prove, in particular, that the two methods measure, in fact, two different aspects of social presence introduced by Bailenson, that is perception of the technology and social response to it.

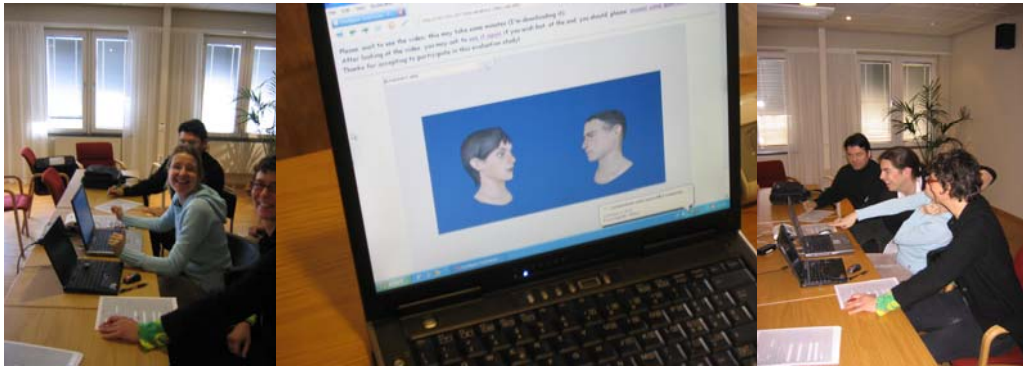


Figure 4 Testing the WoZ environment at the HUMAINE WP9 workshop in Stockholm

3.3.4 Speech system at Cantoche

This study is evaluating T-System’s emotion aware voice portal. It was designed to address one of the major problems in evaluating affective systems, which is to produce or find usage situations where real user emotions emerge spontaneously without artificial modifications that turn the exercise into a laboratory study. In this study, the variables studied were subjective estimations of

- the emotional effect caused by the strategy (by questionnaires and logfiles)
- the strategies’ effect on the users behaviour (by logfiles)
- the believability of the conciliation strategies (by questionnaires)

3.3.5 In situ – “Wild” – evaluation methods

Another user study conducted within HUMAINE was done on the eMoto system – a mobile messaging system where users express themselves through physical gestures that renders colourful, animated shapes in the background of text messages. The design intent behind eMoto was that it should be engaging physically, intellectually and socially, and allow users to express themselves emotionally in all those dimensions, involving them in an affective loop experience. The study method, which we name in situ informants helped us enter and explore the subjective and distributed experiences of use, as well as how emotional communication unfolds in everyday practice when channelled through a system like eMoto. Study results point to the importance of supporting the sometimes fragile communication rhythm that friendships require – expressing memories of the past, sharing the present and planning for the future. We saw that emotions are not singular state that exist within one person alone, but permeates the total situation, changing and drifting as a process between the two friends communicating. We also gained insights into the under-estimated but still important physical, sensual aspects of emotional communication.



Figure 5 Video snippet from In-situ evaluation of the eMoto system

3.3.6 I-Shadows

In the I-Shadows project, a range of user-centred methods have been used together with children to create an interactive, affective, system for a puppet show. I-Shadows is a new Chinese Shadow kind of play, where interactivity emerges and emotional characters (shadows) create stories following an Interactive Drama paradigm. In I-Shadows users are no longer only spectators, but also participate actively in the story development using their own puppets. The system participates also actively, by monitoring the scene using a video camera, and participating by projecting the image of autonomous emotional characters (our shadows). Users and system collaborate in the improvisation of a new story.



Figure 6 I-Shadows

3.3.7 Affective Diary

The *Affective Diary* system was developed in a related project, but the evaluation was done partly in HUMAINE. In *Affective Diary*, users' physical data are picked up from sensors worn on their upper arm. These are transformed into how much users have been moving and their arousal level. These two dimensions are portrayed as simple characters plotted against a time line. Along the time line, mobile data such as text messages, photos, and similar from users' mobile phones are entered. Together, these form materials that represent scraps and bits from users' everyday life. On top of these, users can scribble their reflected thoughts. In the study, it was found that users not only understood and made use of these materials, they could also find new insights about themselves, patterns of behavior that they were not aware of and, sometime, they could even use the system to train themselves to new (better) behaviours.



Figure 7 Affective Diary - biosensorbracelet and computer application

3.4 Internal dissemination within the HUMAINE network

In January 2006, KTH arranged a two and a half day workshop with the aim of bringing together researchers and industry practitioners in the area of affective interface design and evaluation. The workshop was a follow-up to the successful workshop on "Evaluating Affective Interfaces - Innovative Approaches" held at the international conference CHI 2005 – also organised by HUMAINE researchers¹.

The focus of the workshop was on practical application and use of novel design/evaluation methods, and also to let participants gain hands-on experience of using various (new and old) evaluation methods. The workshop was organized by the HUMAINE, and all members of HUMAINE were welcome to attend the workshop with or without a submitted contribution. Researchers and practitioners that were not members of HUMAINE were also invited, but were required to submit a contribution to the workshop².

WP9 also had an interchange with WP8 resulting in a concrete scenario with methodological considerations for user-centred design of affective technology, grounded in the baseline technologies on affective text messaging and persuasive technologies developed at KTH and Trento. In figure XX, a pictures of testing the Bodystorming method for brainstorming are portrayed.



Figure 8 Trying out the Bodystorming method

Finally, WP9 organised a brainstorming session in January 2006 where participants from Paris 8, INSESC, Haifa, Cantoche, KTH as well as invitees from Cornell University, tried out a range of brainstorming methods to help design an interactive character application for a “confession”-scenario.

¹ More information here: http://www.sics.se/~kia/evaluating_affective_interfaces/

² For more information on this workshop, proceedings, participants, etc. turn to: <http://www.sics.se/interaction/wp9ws/>

WP9 also contributed to an on-going discussion within HUMAINE on the role of affect in interaction, introducing a slightly different theoretical perspective based on phenomenology and with a more design-oriented perspective.

3.5 External dissemination

Apart from the specific research publications (listed below), Katherine Isbister and Kristina Höök organised a special issue of the International Journal of Human-Computer Studies, on behalf of HUMAINE. The theme of the special issue was “Evaluating affective interactions“, and attracted top international scholars in the field. Out of 29 submissions, 10 were selected for publication³.

Intended as an external dissemination is also the handbook, with a series of suggestions and recommendations of appropriate methods to consider in the design of affective systems on a more general level.

Finally, Jarmo Laaksohati wrote his PhD-thesis within HUMAINE. The thesis is named “Plot, Spectacle, and Experience: Contributions to the Design and Evaluation of Interactive Storytelling”, and can be downloaded from:

<http://www.sics.se/~kia/avhandling.pdf>

http://www.sics.se/~kia/cover_Jarmo.pdf

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http://www.sciencedirect.com/science?_ob=PublicationURL&_tokey=%23TOC%236829%232007%23999349995%23644099%23FLA%23&_cdi=6829&_pubType=J&_auth=y&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=7c8b8cd9778c44ec18d8330e2d42fdf5

4 WP9 Deliverables (all of these are available on the portal)

Del. no	Deliverable name
D9a	Usability of emotion oriented systems recommendations green paper
D9b	Preliminary Plans for Exemplars - Usability
D9c	potential exemplars: usability
D9d	Proposal for exemplar and work towards it: Usability
D9e	Workshop proceedings
D9f	Psychometric assessment model/approach
D9g	A taxonomy of affective systems usability testing
D9h	Mid-term report on usability exemplar progress
D9i	User-Centred Design for an Affective Promotion Campaign