From Anger to Relief: Five Ideal Types of Users Experiencing an Affective Intervention in HCI

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Abstract—**Negative emotions, like distress, frustration or anger have been shown to impair the human-computer interaction (HCI). Previous research indicates that computers can reduce some of these negative emotional states in users by applying affective interventions. Until now, studies mainly measured the effectiveness of such interventions, but it is still poorly understood why these are effective and how users experience them. In the present study, in reaction to a critical dialogue situation of HCI, an affective intervention was given to deliberately frustrated users. Based on user interviews and by applying methods of qualitative research, users' meaning making processes regarding the affective intervention were explored and categories of experience were worked out. On the basis of these, five ideal types relating to how users experienced and conceptualized the affective intervention were constructed. The typology clarifies that users' appreciation of the intervention varied greatly between enthusiastic approval and definite rejection. This indicates that a 'one type fits all' solution is not appropriate for affective interventions.**

Keywords—intervention; user experience; qualitative research; ideal types; affective computing.

I. INTRODUCTION

Over the past decades, the focus in designing computer systems has shifted towards a more user centered perspective. Besides the consideration of users' demands, abilities and preferences, emotional states that arise during an interaction with a computer system have gained the interest of the human-computer interaction (HCI) community as well. Thus, the domain of 'Affective Computing', which is concerned with emotional communication between users and computer systems as well as with systems' ability to recognize and handle affective information, evolved [1]. Analyzing the impact of emotions seems reasonable, since these affect the way people make decisions, process information or interact with each other. Especially negative emotions, such as distress, frustration, anger, anxiety and sadness have been found to be associated with many unpleasant effects, like decreased ability to pay attention and think creatively or increased likelihood to take risks [2].

The consideration of emotions as an integral part of the human-computer interaction has led to the development of affective interfaces that respond to users' emotions. Besides text- and speech-based graphical user interfaces, especially embodied agents with affective capabilities have been uti-

lized to enhance interactions. In a structured overview of the research into emotional simulation in agents, Beale and Creed [3] found out that simulated emotion can both enhance and hinder interactions. However, when looking at agents' ability to help deliberately frustrated users by applying affective interventions, results seem promising. Providing emotional support toward users led to the relief of negative emotional states like stress [4] or frustration [5], enhanced the problem solving capabilities [6] and improved the willingness to further participate in a given task [7]. A positive effect of interventions was found throughout, no matter how the interventions were implemented (e.g., solely by text [5][7], speech-based [6] or as embodied agents [4][5]).

Although these studies demonstrate that synthetic emotions expressed by computer systems can help frustrated users, it is still poorly understood why this is the case [3]. Their effectiveness was measured either by obtaining user perceptions through questionnaires (ratings of frustration, valence and arousal and ratings of the interaction in general), observing user behavior or analyzing user performance data. Besides these ratings on pre-formulated questionnaire items, the question of how users experienced the interactions and especially the affective interventions remains unanswered.

The aim of the present study is to explore how users experience an affective intervention, which was given to them in reaction to a critical dialogue situation of HCI and hence to better understand what makes such an approach valuable. More specifically, this study can be best considered as a piece of basic research at the intersection between HCI, Psychology and Social Science. It is not the intention to either evaluate the applied system, or to test the effectiveness of the applied intervention. Instead, the aim is to basically understand subjective meaning making processes regarding affective, emotion-oriented interventions applied by technical systems and thus, to answer questions like: What do users generally think about interventions?, What kind of wishes and worries do they have?, Under which circumstances are interventions valuable?, In which ways are users affected by interventions?

Analyzing in depth user experience of affective interventions above mere answers to predefined categories is a research desideratum. Hence, at first a structuring of the empirical phenomenon is needed. For that reason, an open qualitative research methodology, which aims at building a user typology, is applied in the present study. This way it is meant

to work out underlying structures of meaning and interpretation processes.

In the next part of this paper, related work concerning user typologies in HCI will be presented. In the third section, the empirical investigations will be described and in the fourth part, the constructed typology will be detailed. Findings will be discussed and in the end of this paper conclusions for future work will be drawn.

II. USER TYPOLOGIES

In HCI, user typologies are applied in a variety of ways, mostly to enhance design and innovation processes [8][9] or to categorize users according to their media usage behavior [10]. In the design process, user representations, such as stereotypes or personas [11], are used as a means of user modeling and rely primarily on designers' conceptualizations of users [9]. In assessing how people use media technologies, typologies are almost exclusively based on questionnaire surveys and quantitative analysis procedures, like cluster, factor or frequency analyses [10]. Thus, it seems that user types in HCI are mostly grounded on user behavior and have not been associated with user experience, since "little is known about different user types from a qualitative perspective" [10, p.949]. Even in the domain of 'User Experience' (UX), where qualitative research methods are already applied in half of the studies [12], user typologies grounded in experience seem to have been overlooked so far.

In the present study, the aim is to develop a typology of how users experience an affective intervention. Typologies are generally useful for structuring empirical phenomena by dividing people into distinct groups with high intern homogeneity and high extern heterogeneity. They can help to understand contexts of meaning and are thus particularly valuable in exploring user behavior and experience. More specifically, in this study, ideal types in the tradition of sociologist Max Weber will be constructed based on interview data. These ideal types can be thought of as idea-constructs that do not refer to perfect things, moral ideals or statistical averages, but rather stress certain elements common to most cases of a given phenomena on the basis of empirical data. An ideal type is an analytical construct that is "formed by the one-sided accentuation of one or more points of view" [13, p.90]. From a methodological point of view, ideal types can be positioned between empiricism and theory [14]: on the one side, they contribute to a fundamental understanding of users' inner processes, but on the other side, the types are abstracted in such a way, that they enable the inference of generalizations, which in turn makes findings valuable for other research areas as well.

III. EMPIRICAL INVESTIGATIONS

The present study builds on a widely standardized empirical experiment in which a critical dialogue situation of HCI was established. In reaction to this critical situation, an affective intervention was given to participants. Subsequent to taking part in the experiment, participants were interviewed, i.a., with regard to their experiences of the intervention.

A. Wizard of Oz Experiment

In order to simulate a computer system capable of accurate speech recognition and individualized reactions to user behavior, the empirical experiment was designed as a Wizard of Oz study [15]. The system was represented solely by a computer screen with a graphical user interface (without any interface agent) and a male machine-like sounding computer voice. The only way for the participants to interact with the system was via speech. In cooperation with the system, participants had to pack a suitcase for a holiday trip by selecting items from a catalogue depicted on a screen in front of them. At a certain point during the packing procedure, participants were informed about the actual weather conditions at the destination of their trip ('weather barrier'), which were different from what was suggested in the beginning. Therefore, participants were required to repack their suitcase under increasing time constraints, what was meant to cause feelings of stress and frustration. In reaction to this critical situation, an affective intervention was given to the participants (for a detailed description of the whole experimental design see [16]).

B. Affective Intervention

The affective intervention was designed to help participants in reflecting on their critical situation and to offer support for recovery. It consists of three consecutive components (cf. Table 1) and was given to the participants as a speech based audio output right after the weather barrier. The three intervention components were formulated by the research team consisting of psychotherapists in training and an experienced psychoanalyst and basically refer to the common factors of psychotherapy (activation of positive resources, actualization of what is to be changed, active help for coping with the problem, motivational clarification), which were formulated by Grawe [17].

TABLE I.   INTERVENTION COMPONENTS AND CORRESPONDING SPEECH OUTPUTS

Intervention component	Speech output
1. Empathic understanding	"Because of an interruption in the data line the information about your destination could not be obtained earlier. Thus, your situation surprisingly changed. The items you chose suggest you had expected different weather conditions. If you had known the actual weather conditions of your destination, would you have chosen different items? I'm interested in your opinion."
2. Clarification of affect	"Did this situation also trigger any negative feelings? If so, can you describe them?"
3. Encouragement	"I hope your motivation to further contribute to this task was not affected by this too much."

C. Interviews

The interviews aimed at investigating how participants experienced the interaction with the system and how they were affected by the intervention. For the interviews, a semi-structured interview guide was used [18]. In the interview section relating to the intervention, the Interpersonal Process Recall (IPR) [19] was utilized. This method was applied as a specialized interview situation, in which participants watched a video of the intervention segment of their experiment. They were asked to remember and describe their experiences and feelings associated to that situation. Important to note is that they were prompted to explicitly distinguish between their reflections in hindsight and their experiences *in* the concrete situation seen in the video segment. IPR was meant to help participants to reminisce about those feelings and experiences related to the intervention, that would be forgotten typically. After an initial narration generating open question ("Please tell me what was going on inside of you in that situation"), several further questions relating to various aspects of the experience of the intervention (e.g., "How was it for you that the computer system was asking for your feelings?" or "Is there something you would have wished for in that situation?") were asked.

D. Sample

In total, there were 35 participants (17 female, 18 male) who took part in the empirical experiment, received the affective intervention and were interviewed subsequently. They were between 18 and 75 years old (two age groups: 18-28 and 60+) and had different educational backgrounds. The interview sections of these participants, which were dealing with their experiences of the intervention, form the data basis of the present study. By investigating such a heterogeneous sample, it was meant to grasp a wide range of experiences. This corresponds to the rationale of qualitative research, which can be seen in the maximization of variance and in the generation of hypotheses rather than in testing those.

E. Analysis Procedure

Initially, the audio recorded interview protocols were transcribed (which resulted in 232 transcript pages) and afterwards the transcripts were imported into the analysis software 'MaxQDA'. After this preparation of the data material, the actual data analysis began. This was conducted in two main steps: (1.) development of a category system and (2.) construction of ideal types. To ensure validity of the results, the analysis process was accompanied by regular discussions in a group of qualitative researchers (consensual validation). Moreover, to ensure reliability, the single steps of abstraction and interpretation where documented in such a way, that it remained verifiable what participants said and where the interpretation of the researchers began [20].

1) Development of a Category System

The first main step of analysis corresponds to '*summarizing qualitative content analysis*' [21][22]. At first, the text was broken down into meaning units (MUs), which are segments of text that contain one main idea and are understandable by themselves [23]. These MUs were then assigned to the one most suitable of five predefined themes: *(1.) experience of the context, (2.) experience of the system, (3.) experience of the relation to the system, (4.) self-related experience* and *(5.) experience of the intervention*. Next, the assigned MUs were paraphrased and 'streamlined' (anything that distracts from the main statement was deleted) [22], then compared to each other and grouped according to similarities, creating a set of subcategories. Finally, based on their commonalities, these subcategories were further grouped into main categories, which represent a higher abstraction level. Altogether these steps produced a hierarchy of 5 themes, 13 main categories and 58 subcategories (based on 481 MUs) – the category system.

2) Construction of Ideal Types

In the second main step of analysis (which corresponds to an approach for building typologies described by Kelle and Kluge [14]), theme 5: 'experience of intervention' was focused. In order to construct ideal types, the three main categories of this theme ('*characterization of intervention*', '*subjective relevance of intervention*' and '*impact of intervention*') were set as dimensions and the five subcategories each of these main categories was made from, were positioned on their respective dimension. Across dimensions, the subcategories were then interpretatively related to each other (cf. Figure 1). This way, five ideal types were constructed and finally each participant was assigned to exactly one type.

IV. RESULTS

Based on participants' characterization of the intervention and their appraisals of its relevance and impact for them personally, five ideal types were constructed. With the help of these ideal types, it can be demonstrated, in which diverging ways the intervention was experienced and which emotional reactions it evoked (the naming of the types refers to participants' main emotional reaction towards the intervention). In order to further elaborate the characterization of the ideal types (cf. Figure 1) and to clarify for whom of the participants the intervention was helpful, in the following each ideal type will be described in greater detail.

A. 'The Angered'

In total, 7 participants (4 female) of all ages and levels of education were assigned to the ideal type named 'The Angered'.

At first, 'The Angered' enjoys interacting with the system, but the information about the changing weather conditions at the destination of the holiday trip disappoints him and he holds the system responsible for this ("*it knew for sure that it had disappointed me with this*", KM). He feels not to be seen and not to be taken seriously by the system, because this doesn't live up to its promises and even puts pressure on him by asking personal questions ("*why does it want to know my feelings now, of course everybody is angry when starting from false assumptions and then it laxly states neener-neener your in the wrong winter*", AM). As a result, 'The Angered' is insecure and suspicious and hence, instead of perceiving the intervention as helpful, it has a rather negative effect on him.
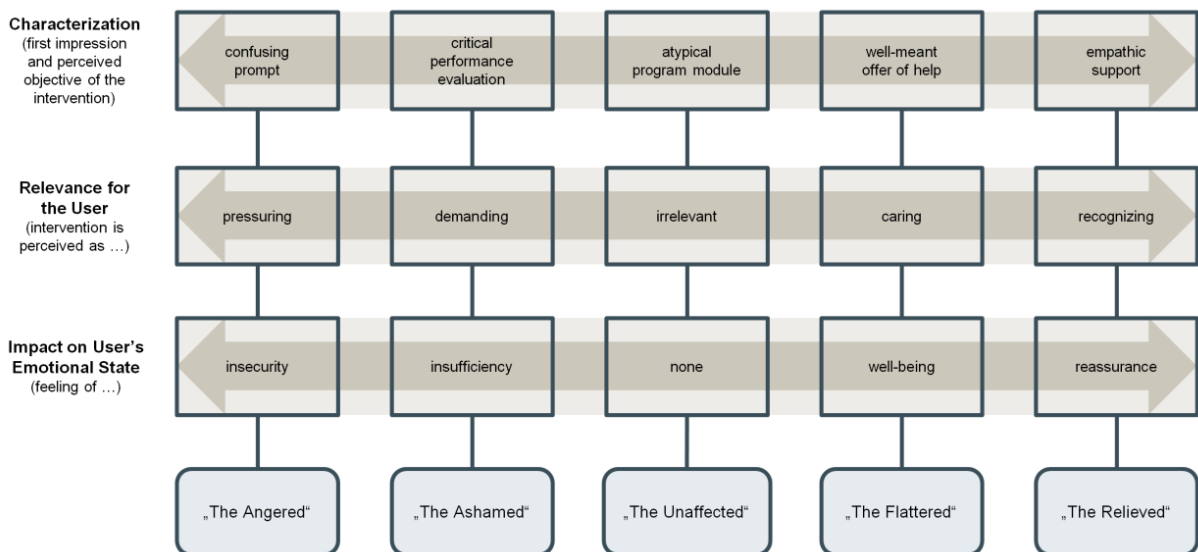
Figure 1.   Dimensions of the three main categories of theme 5: 'experience of intervention'. Vertical lines indicate how the subcategories of each dimension were related to each other for the purpose of constructing the five ideal types.

B. 'The Ashamed'

Overall, 8 participants (3 female), who all belong to the older age group and have rather higher levels of education, were assigned to the ideal type termed 'The Ashamed'.

For 'The Ashamed' it is most important to handle the experimental task in the 'right' way. He feels that the system is superior to him, that it tests him and that it critically evaluates his performance (*"according to my computer at home I'm the active one and the technology is inferior, but here the technology is superior and so I have to do what it demands of me"*, WF). In his opinion, he has failed in packing the suitcase the 'right' way and therefore feelings of insufficiency arise, which are moreover strengthened by the demanding nature of the system. Still, he considers admitting his failure towards the system as his obligation, because *"when you've made a mistake, you have to take the responsibility for it"* (BP).

C. 'The Unaffected'

Altogether, 8 predominantly young participants (2 female), with solely higher levels of education, were assigned to the ideal type named 'The Unaffected'.

'The Unaffected' considers himself as experienced with technology and therefore knows what he usually can expect from a system. To him, having an impersonal and distant working relation with the system is as important as keeping the control over the interaction (*"I've always nodded my head, because it was so obvious what it wanted at all the times, so I just nodded my approval or said no"*, FW). Generally, he doesn't want to share his feelings with a machine. Having an inappropriate suitcase for the holiday trip leaves him cold (*"I didn't have the feeling that something was going on inside of me, it was ok, bad luck"*, SK), thus he feels no need for the intervention and considers it as dispensable (*"that's not useful for me"*, HG).

D. 'The Flattered'

Overall, 4 predominantly young participants (2 female), with mostly lower levels of education, were assigned to the ideal type termed 'The Flattered'.

'The Flattered' experiences the system as sincerely interested and for that reason he feels positive about it. At the same time he also recognizes the weaknesses of the system, but in favor of a productive collaboration he rather concentrates on its strengths (*"you can't be angry with it, it's a computer, it doesn't do anything malicious by intention, so I still felt comfortable with it"*, YD). Packing the suitcase is more of a game for 'The Flattered' and the information about the changing weather conditions rather amuses than it stresses him. He does not really need the help offered by the intervention, but he appreciates systems' empathy (*"I really liked that it was asking after me, because it was like having a cold and reserved person in front of you that suddenly offers commiserations [...] that's a positive surprise"* UK).

E. ' The Relieved'

In total, 8 participants (6 female), who are predominantly young and have mostly lower levels of education, were assigned to the ideal type named 'The Relieved'.

'The Relieved' is insecure in working on the experimental task and the weather barrier additionally stresses him (*"you are thrown in at the deep end, so nobody just keeps going as if nothing has happened, of course you have lost it a little bit and you don't know what it's all about"* CK). In his helpless state, he experiences the intervention as an empathic support that recognizes his misery (*"it asked exactly the right questions in the right moments of stress"*, SS). 'The Relieved' generally feels reassured and supported by the system, which he perceives as guiding and sympathetic and as somehow human-like (*"you suspect something or someone behind it that is resonating with you"*, SD).

V. DISCUSSION

The aim of the present study was to understand how participants of a Wizard of Oz experiment conceptualized and experienced an affective intervention that was given to them in reaction to a critical dialogue situation. In an account of basic research, a typology was developed, which clearly demonstrates the variance of possible ways in which an intervention can be experienced. Especially for the further development of assistive technology, which aims at reacting adequately to needs and states of its users (e.g., like in the case of companion-systems [24][25]), it is important to get an idea of the far reaching impact technical support can have on users' system- as well as self-experiences.

The results presented here, indicate that users' sense making processes regarding the intervention (in terms of characterizing it and assessing its relevance and impact) are not solely positive and constructive. Besides experiencing the intervention as an offer of help ('The Relieved') or as entertaining ('The Flattered'), also characterizations as a pressuring demand ('The Angered') or a critical evaluation of performance ('The Ashamed') were found. Resulting feelings from these negative appraisals, like insecurity or insufficiency, can have a negative effect on dialogue success and the general rating of the interaction and thus present an obstacle to the actual goal of user support.

Furthermore, this study demonstrates that in case of emotional communication with a computer system, individualized support is needed. The ideal types can serve as basis for the development of type-specific interventions:

- For 'The Angered' it will be important to clearly explain how a system is functioning and which options to interact the user has.
- For 'The Ashamed' it is crucial to make clear that the system is not evaluating the user and that the user does not have to fear negative consequences.
- For "The Unaffected' it should simply be possible to turn off the intervention.
- In the cases of 'The Flattered' and 'The Relieved', the approach presented in this study seemed already pretty appropriate. In terms of a possibly more stressing event, maybe even more help (e.g., by providing concrete recommendations) could be offered.

These are only first ideas, which definitely need further elaboration and empirical validation.

The affective intervention applied in this research was intentionally kept relatively short, didn't utilize an embodied agent and was given to the participants regardless of their current emotional state. This way it was possible to gather a differentiated view on experiences, since participants were not tempted to interpret the intervention in a certain way and moreover, the meaning making processes of all kinds of participants (including those who were not in a negative emotional state and thus erroneously received the intervention, like 'The Unaffected') were included in the analysis.

In the course of building the typology, the age, sex and educational backgrounds of the participants were neglected. This way it was possible to develop the typology largely independent from pre-expectations of the researchers. How-

ever, trends in terms of these sample characteristics can be found within the ideal types, but creating user types solely on the basis of sample characteristics is not desirable. In that case, the shades between the types would get lost, the types would not be rich in substance or it would not even be possible to identify them at all. For instance, 'The Angered' is very heterogeneous in relation to the sample characteristics and would probably have been overlooked.

The sample of this study was very heterogeneous, which proved to be valuable for revealing the variance of experiences. In terms of qualitative research studies, the sample size of 35 participants is adequate [26], since it permitted a deep, case-oriented analysis that resulted in a new and richly textured understanding of experience [27]. Generally, in qualitative research it is not the intention to make predictions about the distribution of features in the population, but to reconstruct subjective meaning making processes in order to identify new aspects. Hence, not the frequency of features, but their variety is of interest [28].

The implications of the present study can primarily be seen in generating an understanding for the importance of individual meaning making processes in HCI. With the ideal types, an empirically based typology was constructed, which offers implications for argumentative generalization and theory generation. The typology reveals the 'how' and 'why' of experience as well as it illustrates the broad range of possible experiences. The types presented here, can serve as a basis for building personas, which normally rather rely on non-empiric conceptualizations of designers [11]. In working out underlying structures of meaning and exemplifying interpretation processes regarding the experience of technical support, there is also a content-related relevance for other areas of HCI, like User Experience, User Modeling or Personalization research, because these are either interested in similar content (User Experience) or can utilize the typology as a basis for adaptation (User Modeling and Personalization).

VI. CONCLUSION AND FUTURE WORK

The present study aimed at analyzing how participants experienced an affective intervention, which was given to them in reaction to a critical dialogue situation of HCI. In applying a qualitative research strategy, the experiences participants described in interviews have been structured and a user typology consisting of five ideal types has been constructed. These ideal types clarify that participants' appreciation of the intervention varied greatly between enthusiastic approval and definite rejection. This indicates that a 'one type fits all' solution is not appropriate for affective interventions. In this paper, first suggestions for the development of type specific interventions have been made, but further elaboration and empirical validation is needed.

Understanding individual experiences above relating to ratings on predefined categories or measurements of effectiveness, was the main objective of the present study. The developed ideal types clarify the importance of subjective meaning making processes: even a relatively simple intervention was capable of evoking strong feelings, like anger or shame, but also the initially intended relief. This reveals the

enormous potential the approach of applying affective interventions has, especially for individualized assistive technology (e.g., companion-systems). However, emotional support provided by technical systems has to be relevant for users and it should enable them to personally relate to it. Otherwise, it can have a negative effect on users' interaction experience, their overall liking of the system or in the worst case it can even lead to a decrease in cooperativeness or to communication break ups.

In the future, more empirical data is needed to further validate the described typology. It is unclear, to what extend the design of the experimental task and participants' involvement with it, as well as the design of the intervention or the demographical structure of the sample have influenced the construction of the typology. It will be interesting to explore other contexts of use or even more frustration evoking scenarios and moreover, it will be interesting to investigate another sample with a different demographical structure. However, the typology developed here can serve as a starting point for future studies with bigger sample sizes.

After further validation of the typology, it is conceivable to develop a questionnaire, with which it will be possible to quickly assign users to the appropriate user type even before an interaction begins. However, the scales such a questionnaire could be based on have to be identified first. Investigating user characteristics like attributional style, personality traits, self-efficacy or computer-experience could be a starting point for this. When it is possible to identify the user types at the beginning of an interaction, the effectiveness of type specific intervention strategies can be tested empirically.

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