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ANALYZING THE ROLE OF CONSTRUCTIVIST PSYCHOLOGY METHODS INTO USER SUBJECTIVE EXPERIENCE GATHERING TECHNIQUES FOR PRODUCT DESIGN

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ABSTRACT

User experience (UX) field includes a broad number of different aspects about interacting with products or services. User experience is far away from the performance-based objective paradigm from traditional usability, focusing in a wider point of view where users needs, desires and fantasies have a role in users decision-making process. Today's methods and tools to evaluate user experience are not useful anymore if the practitioners want to apply them to evaluate other issues (like emotions and affect, social interaction) than strictly related aspects about product usage. Quantitative analysis and hypothesis and validation approaches can't deal in a structured way with this amount of information and the results obtained are ephemeral and complex to measure. That's why different questions emerge about the validity of existing UX evaluation methods.

These aspects about user experience involving feelings about accomplished needs, desires and fantasies are what we call subjective experience information. To obtain this kind of information, user experience needs to be analyzed from a different perspective, studying the psychological relationship between the user and products or services. This article describes what is constructivist psychology, and what is its relevance for user experience research in early stages of product development. Firstly, a general overview of the proposed point of view introduces constructivist psychology to user experience practitioners. Then, different constructivist psychology techniques are presented and several attempts to apply them in product design are analyzed. Finally, exploratory studies illustrate with examples how these techniques should be used as subjective user experience information gathering tools.

Keywords: subjective information, user experience, constructivist psychology.

1 INTRODUCTION

For the last several years, the design process has been seen as a close dialogue between various competences. Research into users, contexts and cultures has increasingly taken part in product development cycles. Yet this structured by the objectivist assumption that users are not creative and do not know what they want [1].

A new approach is emerging in which potential users are invited to participate with designers in the actual development process. People are now beginning to take part in the design process, as adapters of the designed product or even as co-creators [2]. So, design research may be improved by including new sociological, anthropological and psychological methods to envision possible futures and behaviours [3] based in the new approach, a subjective paradigm. This article describes constructivist psychology as an example of this change of paradigm and why is it relevant for user experience research in early stages of product development. A general overview of this proposed point of view is introduced through constructivist psychology techniques to user experience practitioners. In this case, the study focus is the psychological relationship between users and products or services, analyzing the subjective experience from users viewpoint.

2 DEFINING CONSTRUCTIVIST PSYCHOLOGY

From the Constructivist point of view, the world of human subjective experience (human affective experience [4]) is a fragile human construction, supported by an innate individual and shared search for an acceptable level of order and predictability in life, as well as the need to find some foundation for personal actions.

Constructivist psychotherapy is based in a diverse and subtle interchange and negotiation of personal meanings (constructions) between the client and the therapist. The process involves precisely articulating, elaborating, and revising the constructions that the client uses to organize her or his experience and actions [4]. Several features of the psychotherapy process have to be emphasized, including the delicacy with which the therapist must explore the experiential world of the client, the dialogical and discursive basis of their interaction, and the contributions of the client and the therapist to their mutual investigation.

These three aspects reflect a more fundamental human approach in the search for relatedness, connection, and mutuality of meaning, between the client and the therapist, using the common ground provided by our own language and our embodiment to form an inter-subjective bridge between their phenomenal worlds [4]. At a more general level, this process involves working with clients to develop a detailed representation of often inaccurate constructions in which they are emotionally related and define what they consider a viable course of action.

Constructivism emphasizes the role of the individuals in defining meaning, and in that way framing experience, constituted by the linguistic conventions and cultural narratives in which they are embedded. However, constructivist techniques can be useful with both individuals and collectives. It is possible to apply this perspective even in such subjective processes, like memory, that have collective dimensions. In these processes, thought is in an important sense distributed through larger social and linguistic networks, with individuals organizing the meaning-making process [4].

3 CONSTRUCTIVISM, A CHANGE OF PARADIGM IN PSYCHOLOGY

Constructivist psychology can be considered a change of paradigm as its foundations differ from previous approaches. Constructivism is based on the constructive and semantic processes of human memory, language and cognition, breaking from the more associacionist, determinist, and more precisely, the objectivist perspective [5].

Contemporary cognitive psychology is still dominated by racionalist and objectivist perspectives, which have traditionally avoided the phenomenological realm and the complex nature of the lived human experience. From their point of view, reality is understood as an objective external order that exists independently from people's observations [6]. Subsequently, they focus their preoccupation with objectivity, experimental control, and the development of a secure knowledge base to guide applications to practice and obtain a veridical matching of the knowledge claims and real world as revealed through the senses (correspondence theory of truth) [5].

Three central theses underlie the objectivism concept of the human experience [7]:

- An objective, separate real world lies beyond the organism and exists independently of being perceived.
- True or valid knowledge about the world is ultimately rendered through sensory experience.
- Knowledge can be totally separated from the individual.

The ensuing psychotherapy relationship between the client and the therapist coming from this approach can be considered hierarchical. The client has a passive role and the therapist uses an indirect procedure, looking at the client's experience from the outside.

From such a non-objectivist perspective like constructivism, an essential task becomes understanding how people's characteristics as observers are involved in the process of experiencing. How people participate in co-creating the dynamic personal realities to which they individually respond [8]. This shift to a participatory basis leads to a radical change in traditional formulations of human experience, human knowledge, and professional assistance [6].

Constructivism psychology includes a diverse family of theories and methods, but all of them are based in three interrelated principles of human experience [9]:

- Humans are proactive participants in their own experience-that is, in all perception, memory, and knowledge.
- The vast majority of the ordering processes organize human lives to operate at tacit levels of awareness.

- Human experience and personal psychological development reflect the ongoing operation of individualized, self-organizing processes that tend to favour the maintenance of experiential patterns. Although uniquely individual, these organizing processes always reflect and influence of social systems.

From these principles, four basic metaphors for therapy, explicit or implicit in constructivism writing, emerge showing therapy as personal science, as a selfhood development, as a narrative reconstruction and as a conversational elaboration [5]:

- Therapy as a personal science signifies the consideration of clients as experts in their own experiential world, adopting what Kelly [10] has referred as a credulous approach. The therapist takes the client's perspective seriously and respects it [11].
- Therapy as self-development is understood as a willingness to use the client's personal knowledge system and to see the problem and the world through his or her eyes. The constructivist therapist's attitude, therefore, is more inquisitive than disputational, more approving than disapproving, and more exploratory than demonstrative [11].

Considering therapy as a conversational elaboration means establishing an equal footing relationship between the therapist and the client. Thus the therapeutic conversation can be seen as an emotionally resonant form of symbolic exchange or performance, rather than as a thin line of verbal assertion. In therapy as a narrative reconstruction, meaning arises from the communicative action rather than residing within individual selves or knowers. Therapy itself becomes an exercise in co-creative languaging among all of members [12].

4 CONSTRUCTIVISM, A TURNING POINT FOR GATHERING SUBJECTIVE EXPERIENCE INFORMATION IN PRODUCT DESIGN

Today's standards in user research do not actively involve the intended user in the conceptual design process. Ethnography (observing user behaviour) and closed interviews are the most used techniques by user experience practitioners and are structured on the assumption that users are passively reactive (not creative and do not know what they want) [1]. The way users are understood is primarily through objective information: pictures and the analysis of pictures (video ethnography, photo diaries or field notes which includes maps as well as sketches) or by quantitative data.

In spite of this, a new approach to user research is emerging in the field of interaction design. It is shifting from user centred to co-design and from empathy to co-experience. A participatory approach to user centred design with the aim to gather more detailed information about contexts and user experience focused in user needs, desires and fantasies. These attempt to understand practice from the inside, from the perspective of the individual practitioner. In this view, human action (including practice) cannot be understood as simple behaviour. It must be seen as shaped by the values, intentions, and judgements of the intended users [13].

This approach to user experience can be understood as a subjective view of practice. Research on practice from this perspective generally adopts qualitative methods, is likely to make limited use of statistics, and is likely to adopt a practical view of the relationship between the researcher and the user [13]. There is a very strong tradition in the human and social sciences based on just this view and the Constructivist psychology is a clear example of that. For this reason, applying Constructivist techniques for user research can help obtain direct information about the user's experience by balancing the relationship between the researcher and intended users while considering the later an expert in the experience being analyzed.

4.1 Applying the repertory grid technique to analize the young mothers' subjective experience with baby chairs

Human judgments are due to a comparative process. Human perception, for example the aesthetic or emotional, depends on the relationship between different experiences and situations that have happened over time. Comparisons are used to create mental map of perceived differences, in which the decision making process relies.

The Repertory Grid (RG) is based in the constructive alternativism. It uses the comparison in its development, creating a set of constructs or bipolar dimensions related among each other where adjectives and characteristics correlate with the appraisal. The RG technique can be defined as a cooperative inquiry and described as an organized interview by its management and theoretical

foundations, It enables the person to tell us something of the way in which he sees and orders the world, building up mental maps of the clients' world in their own words [14].
The repertory grid as a subjective experience information gathering technique brings the possibility to obtain tacit or intuitive understanding as highly conscious, verbalized constructions [15], contributing to a better understanding of the decision making process in consumer's future response. That's because the construing process is not exclusively, or even primary, a conscious experience and takes place at various levels of cognitive awareness.
Repertory Grid consists of three essential features: a set of elements, a set of constructs, and a series of ratings of those elements along those constructs [16]. The RG is presented in a data matrix composed of tree different basic components [14]: Elements (placed in columns in fig. 1) are defined as a representative sample of people, events, activities, places or objects from the area you want to explore. They are related to a specific personal experience domain. The rows of the matrix are filed with personal constructs (bipolar dimensions like semantic differentials [17]), which represent personal views or judgments (qualities people use to describe the elements in their personal, individual world). Each cell of the matrix represents the quantitative evaluation of the elements by the constructs (see fig. 1).

	baby chair1	baby chair2	baby chair3	baby chair4	baby chair5	baby chair6	baby chair7	baby chair8	baby chair9	ideal baby chair	
nice, straight lines, vertical (modern)	5	1	3	2	3	3	1	5	5	2	overdressed, too many elements
safety, reinforced joints	2	2	4	3	5	5	1	1	1	3	weak, seems unstable
comfortable, takes up little space	5	2	3	4	5	5	3	5	4	1	bulky, occupies a lot of space
ergonomic seat, body adaptable	1	5	1	5	1	1	5	1	1	1	uncomfortable seat, non adaptable, rigid
proportional seat back	4	1	5	2	4	4	2	4	5	3	for really little babys seat back too big
discreet, few colors	4	1	5	1	1	1	1	5	4	1	kitsch, too many colours
practical, can be used when baby gets older	4	1	1	1	4	4	1	4	5	2	short time of use, only for little babys
reclinable seat, the baby can sleep	2	5	5	5	2	1	5	3	5	1	rigid seat, only for eating or playing
foldable structure, occupies little space	1	5	5	5	1	2	5	3	2	2	rigid structure, occupies more space
wood, nicer and more hygienic	5	1	5	1	5	5	1	5	5	1	other materials
comfortable legs, lateral or without frontal joints	5	1	1	1	5	5	1	5	5	3	too open legs, it seems you are going to trip over
tray with an elevated border	1	4	1	4	1	1	5	1	1	1	smooth tray, unsafe

Figure 1. Repertory grid results from the analysis of subjective experience with a baby chair by young mothers done with Repgrid IV

The Repertory Grid move from the clinical application to product design is based on two main aspects:

- The concept of a guided interview, which searches the subjectivity of the information forcing the appearance of relevant items from the user. It focuses participants to the core of their experiences by using personal interviews with a Socratic basis.
- The concept of psychological relationship between the subject and the elements is preserved, although in this case the elements to analyze are products or services and not people closely related to the participant like in the clinical application. Precisely because of this, it considers personifications of products as closely related elements to the participants' experience and then studies the existing personal relationships among them. See figure 2 as an example of the set of elements used in a RG analysis of baby chairs.

The purpose of the Repertory Grid, as a subjective experience information gathering technique, is not to analyze the subject (like in psychology) but the elements. Design relevant information (perception-related consumer preference behaviour) can be obtained by analyzing the personal constructs generated with different participants and sorted by the importance of the results obtained from the evaluation of products by the different constructs. The differences between elements, manifested in the personal constructs, are the design–relevant information that should bring design space to life [18].
A Repertory Grid contains both qualitative and quantitative data. The identity of the elements and the nature of the constructs may provide qualitative information while the relationships between the constructs and elements may be interpreted as qualitative data [19]. However, the information in a grid clearly depends on the elements and constructs that have been elicited.
Experience landscapes [20] (constructs and elements spatial analysis visualization of RG results) are a visual way of representing results from each participant RG interview. This procedure has been used in many other RG applications [21]. In this approach, which represents design relevant subjective

information, the visual representation describes participants' product perception from their subjective experience, referenced with fictitious elements (ideal or real product image). See figure 2 visual representation of baby chair RG analyzed with Principal Component Analysis [22] using the spatial model developed by Gower [23] and represented with Biplot [24].

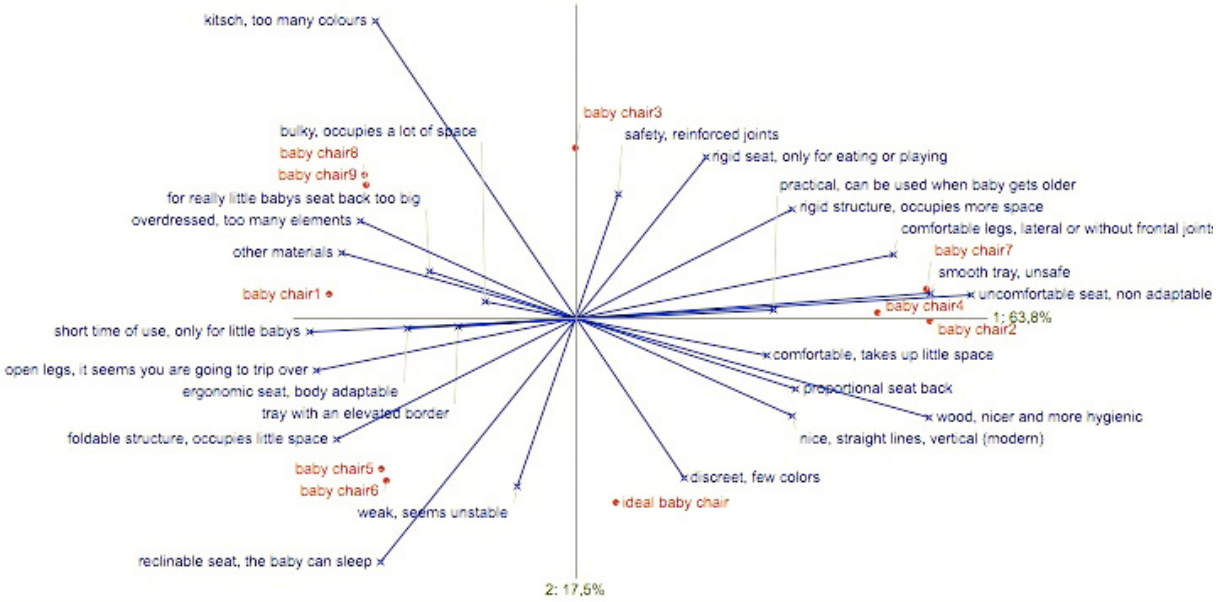

Figure 2. Visual representation of a baby chair RG analysis referenced with an ideal element done with Repgrid IV to explore users' consumer response.

4.2 Applying laddering techniques to obtain the emotional qualities that customers associate with the experience of using advertising pens

A laddering interview is a guided interview, where the psychologist is trying to get to the root of the problem through questioning, revealing insights into their lives that are not apparent. Laddering techniques, as do subjective experience information gathering techniques, serve the same function with the exception that researchers are not looking for the root of a problem. Rather, they are trying to find the key reasons for the customer's response to a particular product. The object of a laddering interview is to uncover how product attributes, usage consequences, and personal values are linked in a person's mind [26]. Doing so will help create a meaningful mental map of the consumer's experience.

Laddering can be seen as a structured interview. It is structured in the sense that needs to ensure the participant does not stray away from the current information hierarchy. To the initial answers given by consumers result in statements that begin to reveal more about the abstract and emotional qualities the customer associates with the experience [26]. These are not merely statements about the product, but thoughtful, personal reflections that are one step closer to finding personal values or explain the way a value is linked to an attribute of a product.

There are no formal instructions for the laddering process but it basically involves the laddering up and laddering down procedures. The laddering up procedure is a technique that asks 'why' questions and elicits constructs of increasing superordinacy, which are very frequently also core constructs (values). Precisely, by asking which pole of the construct you prefer and then why you prefer it. Later the opposite pole is asked to complete the construct. The laddering up process continues until descriptions become extremely self evident to the client and increasingly difficult to express. R. Neimeyer [27] modified this procedure and called it dialectical laddering. It is useful when both poles may have negative implications and a person cannot say which pole of a personal construct is the preferred one. It differs from the laddering up procedure because it asks why a person would prefer to be described by one pole of a personal construct rather than the other.

The laddering down technique or also called pyramiding [28] is used to obtain more detailed and explicit information. It can be described as a way of moving downwards to more concrete or subordinate constructs [29] to know more precisely what a particular superordinate construct actually

means. The laddering down procedure asks how and what questions (how would I know if … was interesting? What would something that is … be like?) to elicit an increasingly subordinate construing. The resulting answer helps to give the therapist and the client the first of what are often several poles of new constructs to elaborate more detailed and defined (subordinate) constructs. After receiving an answer, one asks for the opposite pole. This gives the other end of a dichotomous construct, which is relevant with regard to the explored construct. The laddering down process continues until descriptions become extremely concrete.

Laddering procedures as subjective experience information gathering techniques departs from the same basis than in the clinic case to discover hierarchical relations of different aspects of the experience analyzed with existing products. It focus participants to the core of their experiences by:

- Extracting emotional values from the perceived product characteristics (laddering up). See figure 3.
- Unfolding detailed functional characteristics and physical attributes from a general emotional observation (laddering down). See figure 3.

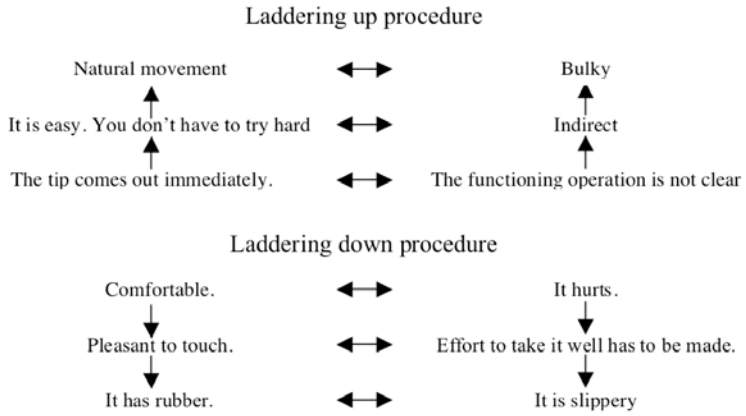

Figure 3. Constructs obtained from laddering up and down techniques applied to the analysis of advertising pens in order to deeply explore users' perception key points.

The subjective experience information that can be extracted directly from the participant mainly relates physical, functional and emotional characteristics. In spite of this, the participants usually elicit these characteristics separately and the design relevancy of the information obtained differs from each type. Physical information is easily translated into product characteristics, but is related to certain products (it is based directly on product comparisons) so it is not possible to determine its importance and relation to a broader product spectrum. Functional information can be used to generate new product features related to user experience but don't give enough information about how to design its functionalities. Emotional information is too ambiguous and general that can only be used for inspiration.

The laddering up and down techniques allow that most of the information generated from the interviews can be considered mixed information, relating physical, functional and emotional characteristics. Therefore, it solves emotional constructs ambiguity with information about usage experience and it adds physical characteristics to the functional construct's lack of detail.

4.3. Applying projective procedures as embodied experience communicators in a key ring design process

Projective techniques such as subjective experience information gathering techniques are used to enhance sensitivity to tacit understandings. They work as a mode of guidance that underlies intuitive knowing [30]. The results are sensory reconstructions of high-generality imagery described as being somewhere between perceptions and symbolic thought. They represent a more aesthetically rich and personally felt mode of mental awareness [15].

Projective techniques are based in the idea that new chains of implications become possible as broad levels of abstraction open a much wider network of subordinate categories and ideas. From the expertise in one domain, this level of abstraction allows one to grasp connections between otherwise irrelevant concepts.

Different projective techniques have been developed to evoke contexts and increase creativity in the product design. Some of these techniques make use of semantic linguistic resources like metaphors (ViP approach [31]), hyperboles (Design for Extreme Characters [32]), personification (Product Personal Profiling [33]) and allegories (Interaction Relabelling [32]).
In this case, sensory metaphors are proposed for describing subjective experiences. It is based in the idea that there are so many concepts, really important ones, which are abstract or are not precisely defined in participants' daily experience (emotions, ideas, time...) and this makes necessary the use of other easy understandable concepts (objects, contexts, orientations...) [33]. Sensory metaphors, defined as sensorial interaction metaphors, allow the designer and the user to create a mental picture of how impressions can be evoked while designing the product interaction. Sensory metaphors facilitate the understanding of the complex emotional system through an intuitive idea (an existing example in the everyday life with some high emotional contents). They are useful to know information in terms of what and how participants like to experience products by moving this preferred actions or situations to a parallel product, context or experience.
Sensory metaphors can be used throughout the conceptual phase of design when determining the product interaction characteristics. Furthermore, they can be used to communicate among members of the design team and with the potential users. The latter also enables the experimental validation of the perception of the emotions the product evokes. See figure 4 as an example of a key ring design where users information challenges different concepts and their feedback helps to choose between different design ideas.

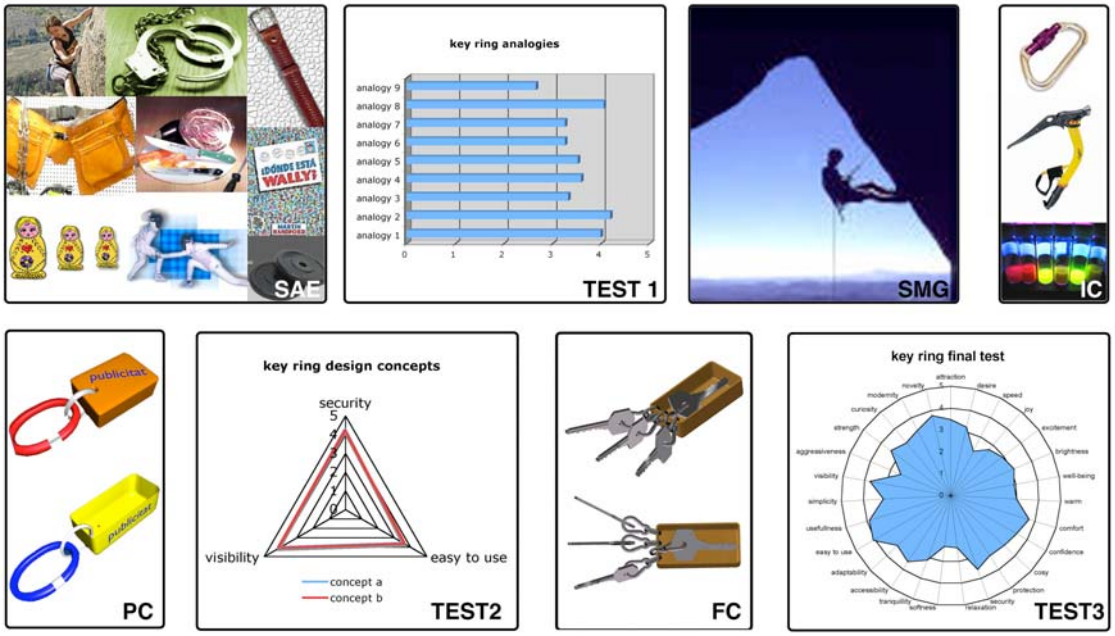

Figure 4. Representation of the key ring design and test process focused on discovering new ways of interaction. The first test was used to choose the most suitable analogies (handcuff the keys, climbing, where's Wally). The second test was used to choose between different product concepts with different details and the third one to evaluate the final product [35]

4.4. Constructivism psychology narrative procedures in subjective experience information gathering techniques

Approaching storytelling as subjective experience information gathering techniques takes into account narrative psychology to attempt to understand and try to solve part of the problem of how people express their thoughts. By relating user's subjective experiences into a well-known context like telling a story, these sub-conscious experiences can migrate to a storytelling experience as we schematize it, communicate it, and add levels of meaning [36]. It avoids the inherent problems of participants not

being able to identify the existing inner relationship between the interpretation and meaning-creating process, social context information and latent needs.
Narrative procedures applied to obtain direct information about subjective experience, visual narratives based in a self-exploration and expression loop are an example of that. The self-exploration and expression loop is based in the information flow between the expression phase and the exploration phase. Basically, it means that information from the exploration phase can be used in the expression phase (expression through exploration) contributing to a better understanding of personal values and increasing the exploration phase level of detail; and information from the expression phase can be used in the exploration phase (exploration through expression) enabling reflection from the expression phase.
The expression phase is based on narrative techniques. Participants have to advertise themselves through a presentation or visual narrative. They have to choose and relate different objects, products or situations from the exploration phase to create a narrative that describes them. Therefore, considering narratives not only static, dynamic visual information can also be analyzed. The symbolic component of rhythm, tempo, and movement can also be used in order to foresee the intrinsic values of the participants.
The results were participants' personal presentations advertising themselves, presenting their inner needs and values. They explored and generated 30 sec. animated visual presentations (e.g., movies, PowerPoint, Flash and Director animations) separately as part of the self-exploration and expression loop (expression through exploration). See figure 5 as an example of the procedure and its application to obtain information about personal values in social communication.

WHAT INSPIRES ME? (ADJECTIVES)	WHERE CAN I FIND IT? (OBJECTS, PRODUCTS, SITUATIONS ...)	DESCRIPTION	SCENARIO
High tech	microchips	technology revolution, size reduction	
	foams	light and semi-transparent, multiple properties	
Simplicity	plain surfaces	you can then play with textures easily	
	sea	tension between air and water, anything else	
Nature	snow white	purity, calm, ...	
	Rough materials	strong feelings, contact with the elements, ...	
Mistery	Hidden spaces	makes work your imagination	
	presents	unknown features	
	Comics	detectives, balck and white visuals, tension atmosphere ...	

Figure 5. Results from an example using the self-exploration and expression loop to discover users' inner needs. The exploration phase relates participants' desired physical features (e.g. size, lightness, textures), functional qualities (e.g. visualization, hidden spaces) and symbolic qualities (e.g. simplicity, nature, mystery) in a 30 seconds presentation [37]

5 CONCLUSIONS

As technologies evolve new sensorial qualities emerge, a major challenge in the coming years is to align people's sensorial experience and technology closer together to create a more intuitive way of interacting using natural gestures and sensory-emotive qualities to fulfill peoples inner needs, desires and fantasies. The approach to experience design presented by these exploratory studies shows a path to explore with the aim to help designers to accomplish this proposal.
Focusing attention on the quantitative data in the Repertory Grid and its representation can be substantially interesting. Grid data can be analyzed at the univariate, bivariate and multivariate levels to answer different kinds of questions about the participants' presented subjective experience. It can be used to develop product experience benchmarking, weakness analysis and experience requirements for priority analysis. Moreover, the qualitative part of the information could also be very valuable because of its reliability. As the participants have elicited constructs by a Socratic procedure, they provide unbiased information to the researcher about the key aspects of the participants' subjective experience with the analyzed product. The Socratic procedure allows unveiling rich subjective information about user experience with the least possible amount of previous information, without realizing any previous research tasks or establishing any hypothesis about the results. The participants replace researchers in aspects of development and analysis in which they are more capable, or in other words, their personal subjective experience.

Laddering procedures require complex skills and are is not simple interviewing techniques. They involve applying different skills: the ability to be a credulous listener, to suspend one's own value system and, thereby, to be able to guide the clients construing. Laddered constructs take more time to put into words than subordinate ones. Despite these limitations, laddered constructs had more implications than the previously elicited constructs, are more important than non-laddered constructs and provide a measure of hierarchical structure

Participants understand the idea of using projective techniques like Sensory Metaphors as embodied experience communicators but occasionally they didn't use their full potential because they applied them in a reduced way. Despite these difficulties, rich interaction contexts were created translating the subjective experience (note that this refers to human response from the perception of the senses) behind the sensory metaphor into interaction concepts.

The exploration and expression process in narrative techniques denotes the existing communication problem between designers and users and among themselves. Semantic differences between values were found within the results. Thus exemplifying the lack of common language base of semantic meaning to words describing products and showed how the narrative techniques used in the description of personal values, beliefs and assumptions facilitated the communication and understanding of this tacit knowledge without misinterpretations.

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