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EXPERIENCE LANDSCAPES: A SUBJECTIVE APPROACH TO EXPLORE USER-PRODUCT INTERACTION

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1. Introduction

People use their perception to generate preference schemes and build up a selection criterion [Bedolla, 2002]. In addition, decision-making process and product usage are based in multimodal perception obtained from relations between the different perceptual systems (visual, auditory, haptic and taste-smell feedback). Despite that, different importance is given to user perception information while designing product interaction, leading to [Bedolla, 2002]:

- The use of visual and/or auditory attributes as the foremost design guidelines.
- The oversight of perception attributes related to haptic and taste-smell systems.
- The inappropriate use of perception attributes due to unawareness of perceived properties and related experiences.
- A conventional, superficial way of doing user experience research. Without bases or real knowledge about the hedonic preferences, experience desires and perception interests for different typologies of users.

This unveils a need for developing new approaches to gather user's experience requirements for consumer research in early stages of product development, according to design enriched product interactions [Wesvensen, 2001] and therefore, engaging products.
The aim of this text is to analyze and develop product experience gathering methods in user's own words, to help designers obtain a correct understanding of user's requirements. In this paper we propose the use of subjective psychological exploration techniques for characterizing user experience in a deeper and detailed way, thus unveiling the core multimodal perception aspects to describe user experience landscapes. An example from a propaganda pens pilot test is described among the method presentation for an easy understanding of the procedure. Moreover, we present some of the results from the "Products Engineering and Technical Systems I" course were the Repertory Grid (RG) method was used to generate experience landscapes so as to determine product experience requirements and benchmark the new design concepts with related existing products.

2. Theoretical background

Our approach to consumer research methods is based in clinic psychology techniques for a deeper understanding of user experience. Precisely, it is focused in post-modern approaches to clinic psychology [Botella, 1995] that base their exploration in the Socratic procedure (guiding participants to unveil unknown thoughts by themselves). This procedure allows explorations from the participant idiosyncratic point of view. Therefore, it prevents interviewers from biasing studies by influencing participants (making them to describe their experience along a specific dimension). This point of view considers diversity, recovers the meaning as study object and integrates the individuality and the

communality of the participants. To fulfil those aspects, the subjective psychological exploration arises as one of the most important methods. This kind of exploration has been chosen due to its reliability.
Applying subjective psychological explorations as an information-gathering tool in early stages of product development can increase results quality and the percentage of design-relevant information. Precisely, this kind of subjective exploration allows for the acquisition of more reliable and precise information than with objective explorations (closed interviews and questionnaires), even though the amount of participants is smaller.

2.1 Kelly's Personal Constructs Psychology

The Personal Construct Psychology (PCP) developed by George Kelly [Kelly, 1955] was one of the first psychology approaches to develop subjective exploration methods. It focuses on "*how the human process flows, how it strives in new directions as well as in old, and how it may dare for the first time to reach into the depths of newly perceived dimensions*" [Kelly, 1955]. A concise explanation on the basic ideas of PCP can be presented by the following points: Perceptions influence expectations, and expectations influence perceptions; the medium through which this happens is known as the construct system; construct systems (pairs of opposite attributes) are unique to the individual and develop throughout its life.
Based on the PCP theory, different psychological evaluation methodologies have been developed. According to Neimeyer [Neimeyer & Neimeyer, 1993], the different constructivist evaluation techniques can be classified in those with in a construct system structure approach (Repertory Grid technique, Laddering up and down techniques and the Tschudi's ABC technique) and those with a construction process approach (Auto-characterization Analysis technique and Problem Knot technique).

2.2 Kelly's Repertory Grid (RG)

Among all the psychological evaluation techniques based on the PCP, Kelly's Repertory Grid [Kelly, 1955] is the most widely used due to the following aspects [Botella & Feixas, 1998]:

- It is closely related to the PCP theory
- It combines quantitative and qualitative analysis.
- Its mathematic basis allows calculating multiple measurement ratings from the input data.
- Its increased accessibility to statistics software allows improving result generation.

The RG technique can be defined as an organized interview by its management and theoretical foundations. Its aim is to "*build up mental maps of the clients' world in their own words"* [Botella & Feixas, 1998]. The RG results are presented in a data matrix composed of tree different basic components [Botella & Feixas, 1998]: Elements (placed in columns) 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 [Osgood, 1953]), 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.
From a product design perspective, the RG purpose is not to analyze the subject 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 artifacts, manifest in the personal constructs a group of individuals comes up with, is the design–relevant information that should bring design space to life"* [Hassenzahl & Wessler, 2000].

3. Experience landscapes: returning to a subjective RG approach

The RG, as a psychological evaluation technique, has been broadly used as a subjective method focused on individual analysis. Its adaptation as a consumer research information-gathering tool has changed this approach to an objective point of view [Hassenzahl & Wessler, 2000] to allow for using a

bigger sample of participants in order to apply statistical analysis and to generate global results as in questionnaires.
The objective approach is based in a quantitative point of view rather than a qualitative. Its basis is to establish a comparison between the results from different participants extracting general conclusions. This point of view can be considered a contradiction, as the RG is based on the individuality and subjectivity of the participants. Therefore, detailed design-relevant information (subjective and specific comments about personal user experiences while interacting with the product) is lost in the RG global analysis.
The text presented in the next pages shows the research done so as to adapt the RG technique, applied in the field of psychological analysis by Kelly [Kelly, 1955] and modified by Feixas [Botella & Feixas, 1998]), to be used as a design guiding tool without loosing its subjective approach. We propose some modifications to the RG design and development stage to be able to consider specific comments about personal user experiences as design-guiding information (experience landscapes). See figure 1.

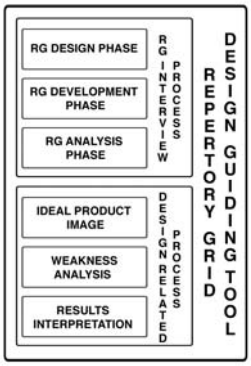

Figure 1. Repertory Grid design-guiding tool proposal

3.1 Repertory Grid interview process

The RG design phase main objective is to set up the Repertory Grid. The decisions to be taken are based in the three basic components of the RG elements (column headers in figure 2), constructs description (matrix files) and element evaluation (matrix cells in figure 2). To guide element selection for the Repertory Grid (real products, mock-ups, 3D models, services or experiences to evaluate by the participants), we propose different element typologies according to its characteristics and purpose (introducing psychology based fictitious elements):

- Relevant elements describe the research area to investigate. In our RG design approach, they will be a representative sample of heterogeneous products in the field of study.
- Fictitious elements are created for gathering direct information about participants' thoughts on the ideal product (ideal fictitious element) or the product they are able to buy for themselves (real fictitious element). Furthermore, fictitious elements determine the importance (role) of each construct related to their desires and dreams (ideal fictitious element) and their consumer behaviour (real fictitious element). As an example, in a propaganda pens pilot test two fictitious elements were used (ideal pen and real pen). See figure 1.
- Contrast elements differ from relevant elements because they have opposite characteristics, far from the ideal product ones. The value of these elements is to help participants to create basic constructs.
- Participants can generate personal elements. Evaluators use them just in case participants find interesting adding another element to the group of relevant elements during pilot tests. They can be used to validate representative samples of products if none is generated or to add more elements to the sample if a personal element is generated.

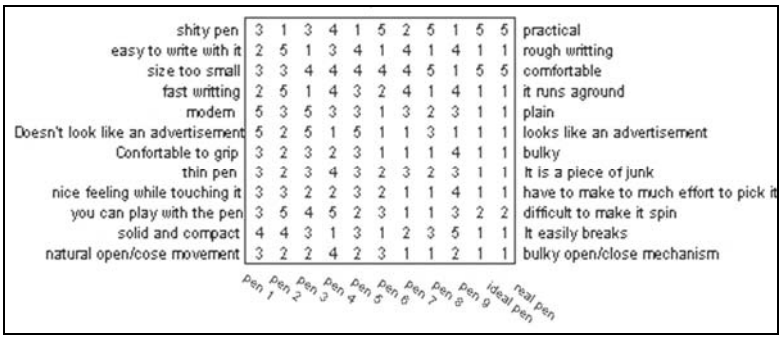

Figure 2. Repertory Grid results from a propaganda pens pilot test with 9 relevant elements and 2 fictitious ones represented with REP IV program using a 1-5 ordinal scale

The RG development phase is a key aspect of this research because it is the main process of gathering users perception information (construct generation). In this phase, where participants keep their leading role as construct generators (carried out with the Kelly method [Kelly, 1955]), we propose that the interviewer's role should go beyond guiding. They should focus participants to the core of their experiences by using personal interviews from Socratic point of view and by applying laddering techniques [Hinkle, 1965].

3.2 Integration within the design process

For designing purposes, it is desirable to develop a subjective information-gathering tool for product experience that works out as product interaction guide styles, like trend maps. From a design-engineering approach, the RG method has been used to quantify requirements and plan milestones to achieve during a design process from a user centric design point of view, like first step of QFD. The challenge of our approach is to manage subjective and specific comments on personal user experiences from a subjective point of view without loosing its design-engineering focus. Therefore, we purpose an outcome from the RG analysis that can be represented in different ways and adapted to different design stages:

- Experience landscapes (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 [Jaeger, S.R. et al., 2005]. In this approach, as we deal with design relevant subjective information, this visual representation describes participants product perception from their experience, referenced with fictitious elements (ideal or real product image). See figure 3 visual representation of propaganda pens RG analyzed with Principal Component Analysis [Slater, 1976] [Slater, 1977] using the spatial model developed by Gower [Gower, 1966] and represented with Biplot [Glower and Hand, 1995].
- Ideal product image (fictitious elements RG results) allows determining construct roles related to users desires and dreams. A comparison between ideal and real fictitious elements is a way to enhance design related information through the determination of user preferences (ideal ones) and perception requirements (real ones).
- Weakness analysis (difference between relevant and ideal elements RG results) shows relevant element shortcomings that can be translated as product perception characteristics to be improved (see table 1).
- Product benchmarking (weakness analysis comparison between the different elements, see table 1 last row) is useful for classifying the different elements and allows for the comparison of results from different participants.
- Priority analysis (weakness analysis comparison between the different constructs, see table 1 last column) is useful for determining key product perception characteristics in order to create breakthrough products.

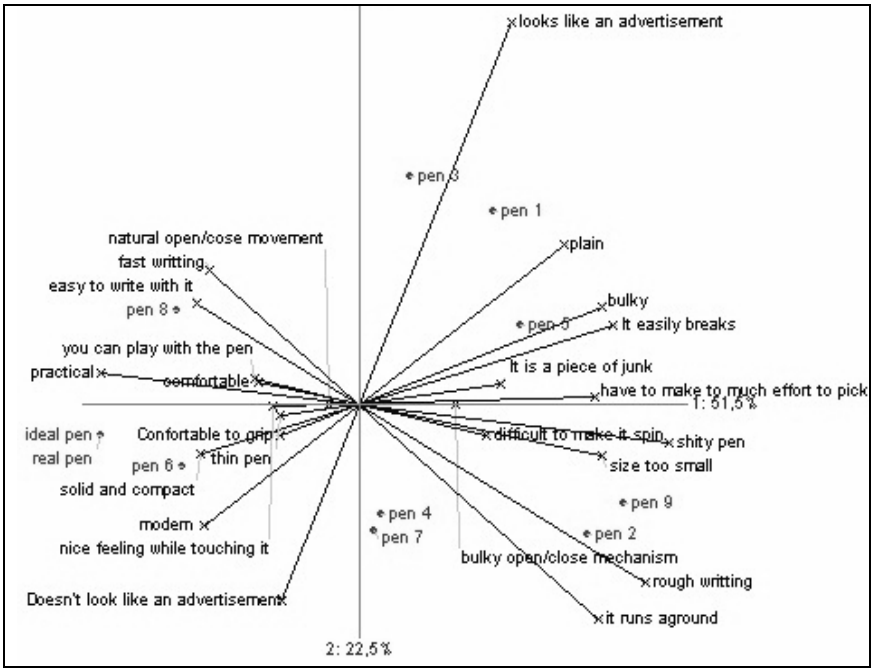

Figure 3. Propaganda pens RG pilot test experience landscape visualization with REP IV PrinGrid spatial analysis

Table 1. Weakness analysis results from a RG propaganda pens pilot test

	p.7	p.4	p. 6	p. Id	p. R	p. 8	p. 3	p. 1	p. 5	p. 2	p. 9	total
looks like an advertisement - Doesn't look like an advert.	0	0	0	0	0	-2	-4	-4	-4	-1	0	-15
plain - modern	-2	-2	0	0	0	-1	-4	-4	-2	-2	-2	-19
It is a piece of junk - thin pen	-2	-3	-1	0	0	-1	-2	-2	-2	-1	-2	-16
bulky - Confortable to grip	0	-1	0	0	0	0	-2	-2	-2	-1	-3	-11
too much effort to pick it up - nice feeling while touching it	0	-1	-1	0	0	0	-1	-2	-2	-2	-3	-12
size too small - comfortable	-1	-1	-1	0	0	0	-1	-2	-1	-2	-4	-13
It easily breaks - solid and compact	-1	-4	0	0	0	-2	-2	-3	-2	-3	-4	-21
shity pen - practical	-3	-1	0	0	0	0	-2	-2	-4	-4	-4	-20
trough writting - easy to write with it	-3	-2	0	0	0	0	0	-1	-3	-4	-3	-16
it runs aground - fast writting	-3	-3	-1	0	0	0	0	-1	-2	-4	-3	-17
bulky open/close mechanism - natural o/c movement	0	-3	-2	0	0	0	-1	-2	-1	-1	-1	-11
difficult to make it spin -you can play with the pen	1	-3	-1	0	0	1	-2	-1	0	-3	-1	-9
	-14	-24	-7	0	0	-5	-21	-26	-25	-28	-30	

4. Practical application

"Products Engineering and Technical Systems I" is a fourth year Design Engineering specialization course at the Industrial Engineering School of Barcelona that belongs to the Technical University of Catalonia. It introduces engineering students to issues associated with product innovation and design methods. The RG method was used in this course to determine product experience requirements and to benchmark their concepts with related existing products. The main aspect of the course was to create new and innovative products. Therefore, the course was a challenging test for experience landscapes as they were applied in new product development where nothing like it could already be found in the market.

The developed products in the 2004/2005 course were: Baby Swing-chair (a multipurpose modular child chair), Levy Slot (slot with magnetic levitation suspension and propeller propulsion systems), Fitness Swimming Pool (swimming pool with a water current counter flow system), Super shower (shower with an integrated full body drier), Home Press (home device to press plastic bottles with minimum effort), One Step Tire Chains (easy to use snow chains), and Handbag Lunchbox (carrying case with a separated lunch box).

As an example, we present part of the Baby swing-chair development process (the obtained user experience information and the final 3D model). First of all, to gather information about user experience, two experience landscapes from different participants with the RG analysis were generated. Participants used for the interviews were people that were going to buy a baby chair for they child. Precisely, couples that just have had a first baby or were going to have the first one. The first participant was a 31 year old woman with a 6 month baby and the second a 35 year old pregnant woman (see the results in figure 4).

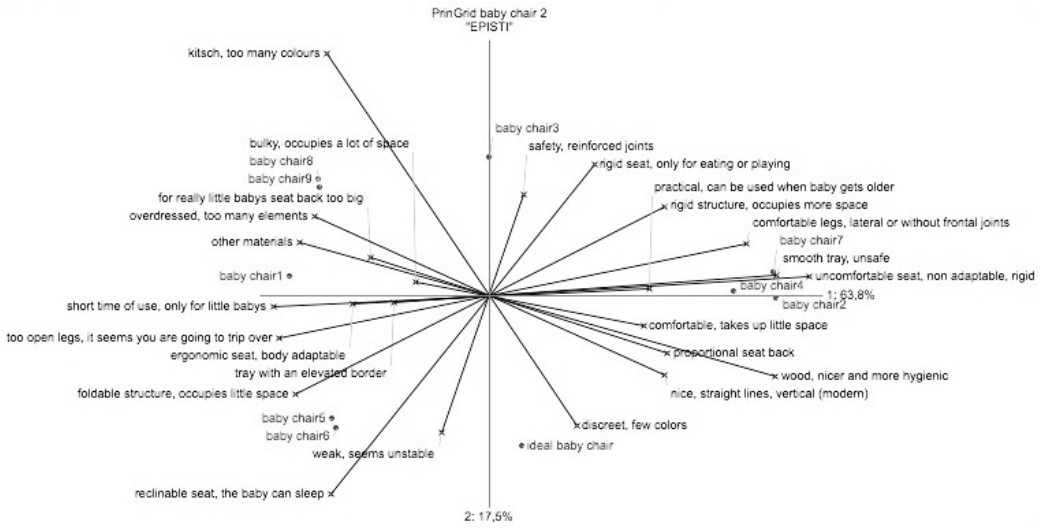

Figure 4. Baby chair 2nd experience landscape visualization with REP IV PrinGrid spatial analysis

Both user experience analyses (experience landscapes and weakness analysis) were used to extract information for the swing-chair detailed design. Experience landscapes determine visually the most important constructs from the first participant: reclinable seat (so the child can sleep), practical (height adjustable structure), comfortable seat (padded) and wood as a nicer and cleaner material. In the same way for the second participant: discreet (few colours), comfortable legs (lateral or without frontal joints), reclinable seat (the baby can sleep and not just eat), wood as nicer and more hygienic, modern (with straight lines, vertical), proportional seat back.

More design-relevant information from participant consumer preferences was extracted from the construct characterization process with the laddering technique and from the opposite pole generation like: perception of wood as a hygienic and clean material, that safety is related to chair joints space for the baby and tray borders, that angle and joints distribution in chair legs as a key point to have a handy chair, and so on. After that, weakness analysis was used to establish an order of importance between constructs for the first (reclinable back, wooden chair) and the second participant (foldable structure, reclinable back, wooden chair).

Results from the two participants were quite similar. Both detected the need for reclinable back and wooden baby chairs as the most important aspects. This information guided the students, as user experience requirements, to develop their concept of a new baby-chair that can also be used as a swing and a walking frame. See figure 5.

Figure 5. Baby chair final 3D design concept

5. Conclusions

This last part of the article is about students' RG learning process, results analysis (construct characterizations) and the usefulness of the approach. Firstly, some interesting things about the subjective RG development process where that the students got direct contact with user experience as RG can be considered a user centric design tool. They obtained detailed and reliable information (mostly unknown by the user). Main drawbacks can be summarized in the following learning problems: difficulty in forming non biasing open questions, characteristics grouping problems for construct generation and difficulties in applying the laddering method to obtain design-relevant information. Despite all this considerations, doing a pilot interview to get basic knowledge about the procedure can easily solve all of these problems.

Within the RG results, generated constructs can be classified as: physical, functional and emotional. Physical constructs are related to immediate perception, describing one or more product characteristics, like: straight lines, wood material, reinforced joints, and tray with an elevated border. Functional constructs are related to product usage, for example: only for eating or playing, able to slide, short time of use and adjustable structure. Emotional constructs are related to user subjective thoughts, cultural background and experience, for example: comfortable, nice, hygienic, weak, overdressed, seems that you are going to trip over, and discreet. This classification can be used to analyse each kind of constructs and its design relevancy. Physical constructs are easily translated into product characteristics but are related to certain products (they are based directly on product comparisons). Therefore, it is not possible to determine its importance and relation to user experience. Functional constructs 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 constructs are too ambiguous and general that can only be used for inspiration.

Despite this observations it is important to highlight that, applying the laddering technique, most of the generated constructs can be considered mixed constructs. Constructs of this kind relate physical, functional and emotional characteristics. Moreover, information that comes up from this kind of constructs can be considered design-relevant because it solves emotional constructs ambiguity with information about usage experience and it adds physical characteristics to the functional constructs' lack of detail. That brings a level of usefulness to this subjective approach that cannot be achieved by objective user-experience exploration methods.

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