



Lin-Lin Chen, Tom Djajadiningrat, Loe Feijs, Steven Kyffin, Dagmar Steffen, Bob Young

Design and semantics of form and movement

DeSForM 2010

Lucerne University of
Applied Sciences and Arts

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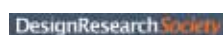
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Design and semantics of form and movement

DeSForM 2010

Program DeSForM 2010

Wednesday, November 3rd

11.00 – 12.45 Registration

12.00 – 12.45 Welcome Lunch

Opening

13.00 – 13.30 Gabriela Christen, Rector Lucerne School of Art and Design
Steven Kyffin, DeSForM Co-Founder, Professor Northumbria University,
Newcastle upon Tyne
Roman Aebersold, Head of Research, Lucerne School of Art and Design

Paper Presentation I: Design semantics in the academic context

13.30 – 14.00 Smell the design: Utilizing the sense of smell in creating holistic experience/
Vivian Ung
14.00 – 14.30 Wayfinding using colour: A semiotic research hypothesis/ Salvatore Zingale
14.30 – 15.00 Metaphor: Investigating spatial experience/ Donna Wheatley

Excursion

15.15 Departure
Vitra Campus & Net'n'Nest Office, Vitra, Weil am Rhein
Keynote Speech
Sevil Peach, SPGA, London /UK
Vitra – a journey. The breathing office
Apéro

Program DeSForM 2010

Thursday, November 4th

8.30 Registration

9.00 – 10.00 *Keynote Speech*
Johan Redström, Interactive Institute, Sweden
Meaning of form

10.00 – 10.30 Coffee Break

Paper Presentation II: Design semantics in the context of innovation

10.30 – 11.00 The phenomenology of getting used to the new: Some thoughts on memory, perception, numbing and the Zen-view/ Michael Hohl

11.00 – 11.30 Design semantics of connections in a smart home environment/
Bram van der Vlist, Gerrit Niezen, Jun Hu, Loe M.G. Feijs

11.30 – 12.00 Designing for heart rate and breathing movements, Loe M.G. Feijs,
Geert Langereis, Geert van Boxtel

12.00 – 12.30 PeR: Designing for perceptive qualities (demo) / Eva Deckers,
S.A.G. Wensveen, C.J. Overbeeke

12.30 – 14.00 Lunch Break

Paper Presentation III: Design semantics in the academic context

14.00 – 14.30 Singular or multiple meanings: A critique of the index/ Anzeichen approach to design semiotics/semantics/ Jørn Guldberg

14.30 – 15.00 Seeing things differently: Prototyping for interaction and participation /
Stella Boess, Gert Pasman, Ingrid Mulder

15.00 – 15.30 Constructing a message by product design: The concept of product language in theory and practice/ Hector Solis-Muñiz, Stephen Rust

15.30 – 16.00 Semantic dimensions: A web-based game to evaluate the meaning of form (demo) / Katja Thoring, Roland M.Müller

16.00 – 16.30 Coffee Break

Paper Presentation IV: Design semantics in company context

16.30 – 17.00 Vehicle design and brand perception: An investigation into visually decomposing product forms/ Charlie Ranscombe, Ben Hicks, Glen Mullineux, Baljinder Singh

17.00 – 17.30 Design semantics and company context: Practical packaging and branding development case for food industry / Toni Ryyänen, Annaleena Hakatie

20.00 Conference Dinner

Program DeSForM 2010

Friday, November 5th

8.30 Registration

9.00 – 10.00 *Keynote Speech*

Stuart Walker, Imagination Lancaster, Lancaster University, UK

Wordless questions: Environment, meaning and propositional objects

Paper Presentation V: Design semantics in the context of sustainability

10.00 – 10.30 Product durability for the experience society/ Stijn Ossevoort

10.30 – 11.00 Coffee Break

Paper Presentation VI : Design semantics in local and global context

11.00 – 11.30 Souvenirs - local messages. An exploration from the design perspective/

Franziska Nyffenegger, Dagmar Steffen

11.30 – 12.00 Urban museums: Bringing traditions to the contemporary urban surroundings of Barranquilla / Tania Delgado, José Mugno

12.00 – 12.30 Global locality: A study on redesigning examples of Turkish traditional tea/ coffee tray and tea glass/ Ozge Merzali Celikoglu

12.30 – 12.45 Announcement of next years' conference DeSForM 2011

12.45 – 14.00 Lunch Break

Excursion

14.00 – Departure

Designers' Saturday "Preview for Professionals" and official opening ceremony in the "Alte Mühle", Langenthal

DeSForM 2010

Welcome to DeSForM 2010 in Lucerne, Switzerland! After four successful workshops in Europe and an inspiring excursion to Taiwan in 2009, DeSForM returns to Europe. The Faculty of Design of Lucerne School of Art and Design feels honoured to host the sixth International Workshop on Design and Semantics of Form and Movement. Lucerne, a city in the German-speaking, north-central part of Switzerland, located on the shore of the Lucerne Lake, is presently a rather popular tourism destination. The sound townscape of the mediaeval Old Town including the Chapel Bridge and the Mill Bridge, the legendary Grand Hotels spreading an elegant atmosphere from the end of 19th century, modern locations such as the Culture and Congress Centre, built according to the plans of the architect Jean Nouvel, and last not least a panoramic alpine view over central Switzerland attract many visitors from all over the world.

The Lucerne School of Art and Design is successor of the first School of Arts and Crafts in Switzerland that was founded in 1876. Today, the institution is part of the Lucerne University of Applied Sciences and Arts and scattered throughout the city. Due to this fact and in order to give you a taste of the cities' cultural heritage, the DeSForM workshop will take place at various locations: We welcome you in the Schools' exhibition space Erfrischungsraum in the historic centre, whereas the opening and first paper presentations will take place in the Empire interior of the nearby Maskenliebhabersaal. The main workshop will be held in a modern university's location nearby the lake.

As University of Applied Sciences and Arts the Lucerne School of Art and Design received its mandate for research from the Swiss government twelve years ago. With regard to content, the research activities are focused on two subject areas that evolved from the school's long-standing and well-founded areas: design & management and visual narrative & explanation. Meanwhile, applied and third-party funded research became an essential activity and second foothold of the Faculty of Design, in addition to design education. In Switzerland we hold a leading role in design research and are prepared to initiate and share interdisciplinary and cross-national research projects.

In line with former workshops, the intention of this DeSForM workshop is to continue and deepen the lively discussion on design and semantics. The role of design in society is becoming more and more important. Forms, either concrete or abstract always carry meanings and it is the responsibility of design to make good use of these meanings and to keep track of how meanings change over time and among various culture groups. Beside papers from an academic background that explore theoretical foundations of semantics from a design perspective, we aim to highlight specific fields and topics such as design semantics in the context of so-called glocalization, innovation, sustainability, and branding.

Papers addressing these fields clearly show relevance to design practice and application and should link academia, professional designers and industry together.

We are very pleased to have three renowned keynote speakers to share knowledge, experience, ideas and viewpoints with us:

Sevil Peach, SPGA Architecture + Design, London/ UK, will speak about how design can meet the challenges of workplace environments for knowledge workers.

Johan Redström, Director of the Design Research Unit at the Interactive Institute, adjunct Professor at the School of Textiles, University of Borås, and Docent in Interaction Design at Gothenburg University/ Sweden will present examples from his work that represent bigger issues relating to meaning.

Stuart Walker, Co-Director of ImaginationLancaster, Adjunct Professor Engineering at the University of Calgary, Canada, and Visiting Professor of Sustainable Design at Kingston University/ UK, will introduce a critical approach to environmental issues in the form of practice-based design research.

We hope that you will be inspired by the keynote addresses, presentations, and discussions in this conference as well as by two visits outside Lucerne. The program includes a guided tour on the Vitra Campus and the Net'n'Nest Office by Sevil Peach in Weil am Rhein (Germany) and a preview for professionals at the Designers' Saturday Langenthal (Switzerland).

The event can only take place in this form thanks to the auspices of IFIP, the Design Research Society, and Designers' Saturday Langenthal; thanks to sponsorship of Philips Design, Vitra, Swiss National Science Foundation and Lucerne School of Art and Design; with support from the National Taiwan University of Science and Technology, Technical University Eindhoven and Northumbria University; and with commitment of the local organisers and students assistance. Special thanks go to Gabriella Gianoli, Bern, who paved the way for the cultural side program.

We hereby offer the 6th DeSForM proceedings. We would like to thank all the authors, how submitted their work to DeSForM, and the reviewers for providing constructive and critical comments. We are sure that the annual workshops contribute to knowledge creation and consolidation in a relevant field of design research and theory.

Lucerne, November 3rd, 2010

Lin-Lin Chen, National Taiwan University of Science and Technology, Taiwan

Tom Djajadiningrat, Philips Design, Eindhoven, the Netherlands

Loe Feijs, Technical University Eindhoven, the Netherlands

Steven Kyffin, Northumbria University, Newcastle upon Tyne, Great Britain

Dagmar Steffen, Lucerne School of Art and Design, Switzerland

Bob Young, Northumbria University, Newcastle upon Tyne, Great Britain



Sevil Peach

Vitra – a journey: The breathing office

If current business aspirations require knowledge workers who are adaptable, can communicate, share and interact, this often results in open plan workplace environments. As designers, we need to respond and balance these criteria at both a corporate level, as well as at a physical and an emotional level.

We must endeavour to move away from a Tayloristic legacy where workers were treated as units of production, but rather to create a human focused working environment that provides definable, intimate group spaces that allow the individual to work within an understandable scale and landscape, respecting the individual's need to be able to retreat, to be private, and to allow for user personalisation. We need to create a place that offers choices – a place that recognises that we function in different ways throughout the day and allows users the freedom to choose the space and tools that best suit their personality, mood and the type of work to be undertaken. The workplace needs to act as a supportive environment that is inviting, familiar and that inspires and motivates the inhabitants, nurturing feelings of ownership, comfort and confidence.

The fact that peoples' behaviour varies with their environment is a given. Therefore shaping the environment through design can potentially change how people think and behave. Aesthetics are obviously important when designing any space, but in designing workplaces we have to go beyond purely aesthetic concerns and stylistic interventions and ensure that the central focus is people, human activity and social matrices.

It is important that it has a meaningful and understandable landscape that allows the users to move freely and confidently within it, as well as having a strong architectural armature that is non threatening and which enables the end users' activity to flow unconsciously in harmony with the environment. Design solutions for this may not be immediately obvious but quickly present themselves after detailed observation of how people perform these activities without thinking as part of their working subconscious.

We need to look at the familiar and everyday activities within the workplace and try to bring a new meaning to them in a manner that appears effortless to the users, so that the environment is embedded in people's workplace behaviour and practical subconscious.

Good workplace design should not force users to adhere to new rules but should act as a catalyst, facilitating them to discover new relations and ways of thinking and supporting them to work in a fluid manner. We need to sensitively challenge the perceived workplace tools, behaviour, routines, bureaucracies and hierarchies and, when necessary, redefine, identify and add what is missing, to enhance peoples' lives and creativity.

Designing Vitra's offices has been a long journey going back over 12 years. The initial brief was to create a "breathing" office which was flexible enough to respond to future changing ways and work patterns. The transformation was completed in the year 2000, but has subsequently gone through a series of minor transformations that have been used to test Vitra's new ranges of furniture, however, recently we

have made a more significant intervention responding to Vitra's new organisational and user needs.

Of equal importance to the successful realisation of the physical change has been the cultural transformation on both personal and organisational level, which has seen people and work practises move from enclosed to a transparent, open culture.



Sevil Peach formed her studio Sevil Peach Architecture & Design together with Architect Gary Turnbull in London in 1994. As a team, Sevil Peach take a multi-disciplinary approach to their wide-ranging projects - from creating private homes and studios for individual clients, to developing a 10 storey fashion design centre for Mexx in Amsterdam. She has a longstanding and on-going relationship with Vitra having designed their showrooms, exhibitions and offices throughout Europe and USA and has recently completed Microsoft's Headquarters in Amsterdam. Peachs' office is currently working on a new concept for a Laboratory Workplace for Novartis and is collaborating with Herzog de Meuron Architects on the new Tate Modern Museum Extension Building in London. She has participated in a number of International workshops and conferences for, amongst others, the Dessau Bauhaus, Roskilde University, Denmark; Oslo City Conference; Designmai, Berlin; Mind the Map Conference, Istanbul, the SIA Symposium, Basel and led various summer workshops for Vitra Design Museum at Boisbuchet France.

Johan Redström

Meaning of form

Abstract

For some time design research has investigated how the means and meanings that designers envision and embody through their designs influence and frame both use and user. Taking a step back and reflecting upon lessons learned from this research, we might ask ourselves the following: if the concepts and meanings we express through a design influence how people understand what it is and what it can become through use, what about the influence of the basic design concepts we use to understand and develop the design spaces these products stem from? It seems rather likely that just as the intended meaning of a design influence how it is perceived, so does the meaning of our basic concepts influence the way we think and work in design. In other words, to be innovative at the level of things, we might have to also take a step back and reflect upon more basic concepts in design and how these frame and structure design practice.

In this talk, I would like to present some experiences and reflections from our work with trying to shift the meaning of quite basic concepts to open up for alternative views. More than ten years ago, we began to investigate how technology can be understood as 'material' in design. By trying to shift the meaning of technology away from being considered as something given to design – as something to be 'applied' by designers in search for the next big thing – to instead be considered a material alongside other materials, we tried to find a new conceptual ground for dealing with issues of expressiveness and aesthetics in technology development. For the past few years, we have been exploring a somewhat similar approach to the concept of 'form'.



Johan Redstrom is Director of the Design Research Unit at the Interactive Institute, adjunct Professor at the School of Textiles, University of Borås, and Docent (Associate Professor) in Interaction Design at Gothenburg University. His background is in philosophy, music and interaction design, and he has previously been Associate Research Professor at the Royal Academy of Fine Arts, School of Architecture, in Copenhagen, Denmark, and program manager of the Masters Program in Interaction Design at the IT University in Göteborg. Working with areas such as sustainable design, computational materials and design theory, his research aims at combining philosophical and artistic approaches to design research. Main research programs include *Slow Technology* on designing for reflection rather than efficiency in use, *IT+Textiles* on combining traditional craft with emerging technologies, and *Static!* and *Switch!* on increasing energy awareness in everyday life.

Asking ourselves questions about how current conceptions of form must be revisited as a response to the call for a more sustainable development, we have explored issues such as where to draw the line between what we understand as a matter of form and what is a matter of use.

Stuart Walker

Wordless questions: environment, meaning and propositional objects

Abstract

Contemporary notions of 'progress' are characterised by free-market capitalism, technological innovation and economic growth. It is therefore unsurprising that, in response to today's environmental and social challenges, many advocate the development of new technologies and 'greener' products. However, apart from their 'eco' hue, such exhortations support a system that is virtually indistinguishable from conventional production/consumption practices; and it is these very practices that are so inextricably linked to environmental damage and social injustice.

When we are urged to address a critical concern by, essentially, doing more of the very thing that caused it, we can be sure that this represents a crisis of the imagination. A more fundamental change in direction is needed; one that embodies substantive values and deeper notions of meaning. In plotting such a course, perhaps our aim should not be to change the world but rather to learn how best to live in it. If we can do this, the world will change.

This talk explores these themes through creative, practice-based design research – a type of research that draws on tacit knowledge, subjectivity and a-rational modes of thinking alongside reasoned argument and more systematic approaches. The outcomes of this work include various propositional objects, which are not so much products as questions in form. They ask us to consider potential directions for creating a material culture that not only offers utilitarian benefit but is also congruent with more profound understandings of human meaning.



Stuart Walker is a Professor and Head of Design and Co-Director of the ImaginationLancaster creative research lab at Lancaster University, UK and Visiting Professor of Sustainable Design at Kingston University, UK. Formerly, he was Associate Dean at the Faculty of Environmental Design, University of Calgary, Canada where he retains an affiliation. His research papers have been published and presented internationally and his conceptual designs have been exhibited at the Design Museum, London, across Canada, in Rome and, most recently, at the Storey Gallery, Lancaster, UK. He serves on the editorial boards of several international journals. His book, *Sustainable by Design: Explorations in Theory and Practice* is published by Earthscan, London, and *Enabling Solutions*, co-authored with Ezio Manzini and Barry Wylant is published by the University of Calgary Press.

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 Technical University of Istanbul, Turkey

Smell the design: Utilizing the dense of smell in creating holistic experience

Abstract

This is a project regarding something we all do about 30,000 times a day - the act of smelling. Our sense of smell is often neglected when it comes to design; even when mentioned in the design matter, the 'smell' of an object or space is often viewed as a negative quality. The olfactory system is very closely related to our memory and subconsciously affects our everyday experience. This project delves into the often-neglected dimension of this reality and proposes utilizing olfaction as a way of enhancing memories connecting events and spaces.

Keywords:

Smell, Memory, Emotion, Identity.

1 Introduction

Smell is the most primitive sense and often considered the most important sense throughout the animal kingdom. Mothers can recognize their babies by smell, and newborns, who develop smell before other senses, rely on it to recognize their mothers. It is also the most mysterious sense among all, with people often unaware of what our noses tell us. Although our noses do not perform as precisely as in other animals, we still utilize our sense of smell to gather information about our surroundings and to register memorable events. Subsequently, the scent of a place can be intentionally organized for the purpose of enhancing an existing establishment.

2 Background

2.1 The reputation of olfaction

We experience the world through our five basic senses - sight, hearing, touch, taste, and smell; some senses are more studied than others. It is commonly agreed that visual perception is the most valued, and our sense of hearing highly treasured. Perhaps due to its ambiguous and immeasurable quality, along with the evanescent nature of odor, the sense of smell has been underrated in western philosophy, leading to reluctant research in this field. Studies in the 1990's have shown that smell was considered the least valuable sense and the first one people would sacrifice if forced to choose from among the senses [1]. Not so many years ago, people were unaware of the fact that about 80% of what we thought was taste was actually smell. Today we combine the two sensations and call it 'flavor'. Research has shown that people who have smell deficiency often have trouble differentiating between a cup of coffee and a glass of red wine when both are served at the same temperature, or distinguishing an apple from a raw potato [2].

2.2 Scents and memory

French philosopher Charles Fourier suggested that scientific exploration had a blind spot regarding the way we experience aroma, which plays an important role in harmonizing the universe [3]. In Helen Keller's essay, "Sense and Sensibility", she describes the sense of smell as a fallen angel; "for some inexplicable reasons

the sense of smell does not hold the high position it deserves among its sisters.” The deaf-blind social activist valued her sense of smell as the most important apparatus:

I never smell daisies without living over again the ecstatic morning that my teacher and I spent wandering in the fields, while I learned new words and the names of things. Smell is a potent wizard that transports us across a thousand miles and all the years we have lived.

To her, the smell of the surroundings helps her find her way, the odor of people leads her directly to the personality of each person [4]. This very same sensation also affected great writers such as Marcel Proust. His world renowned autobiographical novel about memory, *In Search of Lost Time*, describes the smell and taste of a spoonful of tea soaked with a piece of Madeleine cake taking him back to re-experience a long forgotten memory:

No sooner had the warm liquid mixed with the crumbs touched my palate than a shudder ran through my whole body, and I stopped, intent upon the extraordinary thing that was happening to me. [...] Suddenly the memory revealed itself. The taste was of a little piece of Madeleine which on Sunday mornings [...] Aunt Leonie used to give me, dipping it first in her own cup of tea, [...] Immediately the old gray house on the street, where her room was, rose up like a stage set [...] and the entire town, with its people and houses, gardens, church, and surroundings, taking shape and solidity, sprang into being from my cup of tea [5].

Proust was so shockingly moved by the incident; though the sight of the tea and the Madeleine cake did not recall his memory, the seemingly insignificant act of tasting and smelling rippled all the vivid reminiscence. Just as the aroma of the Madeleine cake took Proust back to the pleasurable past, the same effect can also bring back recollection filled with other emotions, such as joy, anger, rage, heartache, or terror. Many New Yorkers experienced the smell of fear in January 2007 when a gas leak filled the air in lower Manhattan, reminding people of the smell just following the World Trade Center attack [6].

The above portrayals might sound very poetic and arcane, but the connection between scent and memory can be very practical as well; interesting research found that students who studied material while exposed to a particular scent performed better on tests when that same scent was present. Apparently, their memory of

what they learned was improved solely by the presence of the scent that accompanied their initial exposure to the material [2].

Research has shown that while smell recognition might not be as accurate as visual recognition, it lasts much longer. An experiment conducted by T. Engen showed when people are asked to identify an image that was shown minutes earlier, there is almost 100% accuracy, whereas with odor recognition there is only 20% accuracy; but with scent, the same degree of accuracy lasts up to one year, while the rate of visual recognition declines rapidly over time [7].

We are constantly being stimulated by scent whether consciously or not, with our brain making associations between the scents we are breathing in and the actions we are conducting. We collect memories with all aspects of our senses. Odor has a unique way of registering itself in our memory, and a number of scientific experiments have proven that odor evokes memory from much further back in time. Studies show that while visual cues recall 50% of memory after 3 months, odorous cues still recall 65% of memory after one year. This is not to say that odorous cues are better than visual or audio cues; they are simply a ‘different’ kind of memory cue. Experiments done by Rachel Herz, a visiting assistant professor of psychology at Brown University, have shown that what’s special about an odorous cue is that the memory is more holistically recalled and usually contains more emotionality [2].

2.3 The olfactory system

How does our sense of smell have such inducing ability? From a biological point of view, smell is the most ancient and primitive sense. It is the first sense to be developed; by three months into pregnancy, the fetus already has a fully functioning sense of smell in the womb. There are about 20 million olfactory receptors covering our nostrils, although only 300 to 400 of them are functioning. In comparison with vision, there are only 4 types of receptors receiving all the colors we see. An ordinary person can discriminate about 12 thousand different odors, while a professional such as a perfumer, whisky blender, or chef may do a much more remarkable job, differentiating almost 100 thousand odors [2]. The fact is that despite the great amount of knowledge we’ve attained about human biology, scientists are still unsure of precisely how our noses take in odors; different theories are still in debate on

the matter till this day. One thing we are sure of is that the olfactory system is very close to our limbic system. Our olfactory system is so close to the limbic system, the part of the brain structure responsible for emotion, learning, and memory, that they are only 2 to 3 synapses apart [8]. Because of such close association with the limbic system, memories evoked by odor have a stronger emotional impact.

Human beings breathe approximately 30,000 times a day, whether we are awake or asleep, in daylight or darkness. It is the basic instinct that signals us to either 'approach' or 'avoid'. If we smell something nice, we want to be closer to the source or be surrounded by that aroma; conversely, if the smell is bad, it might be something unpleasant or harmful and therefore we will stay away from its cause.

3 Research opportunity: Establishing olfactory identity

Every place has its own olfactory identity, most of the time occurring naturally. A fish market smells fishy, a fitness center locker room smells humid and sweaty, a barn smells like hay and other cut crops, a barbershop smells like hair product and perm solution, a gasoline station smells like petrol, etc...

Though we have learned to appreciate color, form, sound, and texture of a place, there has been very little appreciation of or focus on odor. Especially in the world of design, people tend to 'look' at a design and come to a conclusion, or pre-judge an object by its appearance. Undoubtedly, a well-designed object must have a pleasant visual form, but we should aspire to make all aspects of an experience complement one another. If we think carefully, we can probably remember the smell of our grandparents' house, the smell of a certain special summer night, or the smell of a childhood pet. But most of the smells of our surroundings usually happen uncontrollably, or at least without any strategic planning. In 2009, an exhibition at the Reg Vardy Gallery in England presented 14 extinct scents, including the scent of plants that are extinct due to climate change, as well as the scent of historical events. For this exhibition, Maki Ueda recreated the body odor of political suspects that had been preserved by the Stasi in order to track them with dogs. Christophe Laudamiel envisioned the smell of the atomic blast at Hiroshima. During the Cold War all subways that traversed the Berlin Wall

were blocked except one stop, Friedrichstrasse, which remained open as a transfer station for West Berliners. Sissel Tolaas recreated the smell of that subway platform- one of the few places for those of the free world to sniff the hint of communism [9].

In J. Douglas Porteous' essay, the author poses that olfaction often seems to arouse an emotional or motivational response, whereas visual experience is much more likely to involve thought and cognition [7]. Vision preserves a safe distance from an object, allowing us to frame a 'view' in the camera lenses of our minds; thus the likelihood of an intellectual response is considerable. By contrast, smells envelop us, they permeate the body and the immediate environment, and thus one's response is much more likely to involve affection.

Recent observation has shown that in a comparison of people who lost their sight with those who lost their sense of smell (anosmia), the blind reported being more traumatized initially than those with anosmia. But after one year, patients with anosmia had much poorer emotional health and continued to deteriorate as time passed [2].

It seems to me that the power of the sense of smell has great potential to play a major role in our everyday experience, but the difficulty is how to tactically manage such an obscure signal. The following research is a two-part study consisting of how people react to different scents and the prospect of establishing an olfactory identity for HDK- the School of Design and Crafts at Gothenburg University.

4 Methods

4.1 Smell survey

In order to understand more about how people perceive scent, I cast a number of items in plaster, so that the items are unidentifiable by appearance. A total of 49 casts were made, and 27 different items were used, some items are cast more than once in various concentration or temperature. These items were mostly food or spices that can be found in everyday surroundings. All of these items were cast in a simple cylinder shape (Fig. 1 and 2). I then asked subjects to smell these casts and tell me what they have in mind as they sniff them. They were asked to both provide an abstract description of the smell and to try to identify the object within (Table 1).

Item	Description
Amber incense	Temple, Asia, lime, perfume
Anise	Cinnamon, toothpaste, mint, holiday, winter, Swedish
Banana	Bread, yeast, something bad, wheat, half baked
Basil (dried)	Asia, honey, spice, pizza, dinner
Black tea	Earthy, tree, autumn, rain, sweat
Cayenne pepper	Pepper, Mexican food, emergency
Cinnamon	Play dough, cinnamon, Christmas
Coconut milk	Vanilla, exotic, yogurt, peas
Coffee beans	Coffee, espresso, bitterness
Coke Cola	Sweet, candy, vanilla, cotton candy
Cumin	Cinnamon, clove, holiday, family gathering, onion soup
Dish soap	Soap, cleaning product
Fennel seeds	Cinnamon, spice, stew, vegetables, camping
Garlic (fresh)	Garlic, something tastes good
Garlic (powder)	Garlic, spice, something bad, bread
Ginger	Cedar, mint, herbal tea
Green tea	Perfume, soap, seaweed, hay, ocean
Instant coffee	Coffee, mocha, charcoal
Laundry detergent	Fresh, spring, perfume
Lavender incense	Flower, shampoo, clean laundry, strawberry
Lemon oil	Lemon, candy, pine tree
Lime	Sour candy, cleaning product, forest, emptiness
Pear-flavored drink	Rubber eraser, candy, sugar
Spice incense	Perfume, mother
Soy sauce	Salty, something bad, soy sauce, BBQ sauce
Vanilla bean	Vanilla, comfortable, relax, cozy, warm
Vanilla sugar	Candy, vanilla, chocolate, rose, girly

Table 1



Fig. 1. Articles are cast in separate plaster cylinders



Fig. 2. All casts are similar in shape with slightly different shades.

The responses were surprising to me because frequently subject's descriptions were very far-off from the real thing that was cast in the plaster, and many people had great difficulty identifying the scent of very common objects such as banana and cinnamon. Cultural background plays an important role in how people responded to these smells. For instance, the smell of anise reminds Swedish people of holidays mainly because it's often used as an ingredient in holiday baking, but the very same spice is used in a common dish in East Asian cuisine usually sold by street vendors. This scent recalled pleasant memories for both ethnic groups, but in very different contexts.

4.2 Collecting smell within HDK

The School of Design and Crafts was established more than 100 years ago. As I step into the building, it is not difficult to sense the history of the school as the building itself was built in an old fashioned red brick and vaulted ceiling style. As I slowly walk through each

room, paying great attention with my nose, I collected a number of objects that presented themselves with a whiff of unique scent.

The method used to preserve these scents was extraction. By submerging an object in ethanol, ether, or hexane for a length of time, I was able to extract the smell of the object into the liquid (Fig. 3 and 4). This method allowed me to extract the more delicate smells from the following 15 materials:

Ash wood	Ash wood	Aluminum scrap
Cloth with paint stain	Grass	Grass (from nearby park)
MDF board	Modeling clay	Machine grease
Old magazine	Old magazine	Pine wood
Pottery clay	Soil (from nearby park)	Steel scrap



Fig. 3. Extraction of clay



Fig. 4. Extraction of cloth with paint stain

5 Proposal

5.1 The scent of creativity

There is a unique atmosphere in the school, made up by the physical material and the activities happening inside the building. The atmosphere of the school and the people in the building complement one another, together defining the essence and the spirit of HDK. What does creativity smell like? It should epitomize the environment and encourage the interactions within. Creativity whiffs down from the air duct as wood dust is sucked in under a saw bench; it twirls up with the curly metal bits that fall during milling; it leaks out from the colored marker as ideas transform into sketches; it comes with the breeze in the stretched corridor as discussion erupts spontaneously; it lightly blows on the face of a student listening to a colleagues' presentation. Creativity is the colorful paint that stains a work outfit; it is the clay trapped under fingernails; it is the steam coming off a hot iron; it is the sweat in the palm before a presentation; it is the red brick stacked to form the wall of the building more than a century ago. These together are the olfactory identity of HDK, the scent of creativity (Fig. 5), smells that interweave ordinary yet emotional events. The emotional leverage is endearing to us when past experiences are no longer recoverable except through recollection, and we value objects by the emotions they provide rather than their physical worth. It's why the memories of them often transcend everything else about them.



Fig. 5. The scent of creativity

Scent	Ingredient(s)	Impression
Tradition	Vanilla, cinnamon, and anise	The smell of vanilla often reminds of warm feelings. The smell of cinnamon and anise often relate to traditional events.
Workshop	Pine wood	Pinewood is often the choice of making study models and it releases a particular fragrance upon cutting into it.
Exploring	Old books	The strange satisfaction found in reading an inspiring book is hard to be replaced by new technology. The attic of our library is full of old magazine and books; it's the smell of hidden treasures.
Drawing	Pencil shavings	We started doodling with pencil before learning to use fancy software. The simple act of shaving a pencil symbolizes the irreplaceable value of sketching.
Inspiration	Lime and herbs	The acid in lime is often used to prevent oxidation, and the fruit itself is actually good for our body. Herbs are never the main ingredients of any dish, but they make different cuisines vibrant and authentic.

Table 2

5.2 Application

Every tiny bit of sensuous stimulation makes up the atmosphere; being able to smell is very much about where you are and what relation you have to other entities in time and space. Swiss architect Peter Zumthor believes that a place should have a distinct atmosphere that stirs our emotions; such atmosphere is a combination of light, sound, temperature, and scent [10]. His Swiss Pavilion at the Hannover expo in 2000 was constructed mostly with wooden beams; one immediate effect was the coolness during hot sunny days and sense of warmth during cooler nights. On a more delicate level, the choice of wood released a distinct scent into the air, giving visitors the sensation of being in an aged wood shed, and for many, evoking the feeling of being in Switzerland.

Similarly, the scent of HDK could be applied onto acceptance letters to incoming students so they can already 'breathe in the scent of creativity' before arriving on campus. The same smell can later be applied to entryways of special campus events such as the first day of semester (Fig. 6), using the scent as an emotional trigger to recall the excitement of receiving the acceptance letter with key campus events.

Shimizu, one of the largest Japanese architectural, engineering and construction firms, has been implementing customized scents into their projects for decades. In the late 1980s, they developed 'Aroma Generation System', where subtle fragrance releases into a building through its air-conditioning duct and vents [11]. Research results show enhanced efficiency and reduced stress among the workers that inhabit these spaces.

With the aforementioned studies showing that products with pleasant fragrances are preferred over unscented ones [2], another application would be to place the HDK scent onto open-house invitations. At the open house, small vials of the same fragrance could be distributed as giveaways for visitors. In comparison with printed information which most of the time ends up in waste bin, a vial containing the 'Scent of HDK' is more unusual and would evoke curiosity for acquiring further information on the web address printed on the vial (Fig. 7).



Fig. 6. Apply scent on information letter and select spaces.



Fig. 7. Using scent in information distribution.

Graphical imagery, such as a logo, is one way of representing an organization; it stands at the frontline of introducing a principal value and invites others to discover the characteristics behind it. A scent identity can be used to enhance the existing brand image, as well as to provide a different context.

The scent of HDK can be used to enhance a workshop organized by the school but held in another location. One important factor to keep in mind is that the usage of such scent is as delicate a practice as the scent itself; it can easily turn into an irritating matter without proper attention, such as allergic reaction or causing sick building syndrome. Conversely, appropriate application can undeniably expand upon the existing appearance.

6 Conclusion

With the vast amount of information to be discovered everyday, our society has placed most of the information-gathering burden onto our eyesight. There are more published prints than we ever had in human history, and with ever-increasing computer technology, we receive information mostly via visual and audio perceptions. Often our other senses have no chance to experience the object that our eyes see. The abusive use of our eyesight results in unnecessary mass printing, over-packaging of products, and ultimately, numbness towards visual stimulus.

The initial idea of this paper was to explore the sense of smell, and throughout the research and experiment process, it has come to my awareness that in order to take advantage of this sense, we need to consciously train our sense of smell. Fortunately, the sense of smell is, among all our senses, the simplest one to train. Just paying more attention to our everyday “smell experience” can improve our understanding of the information that our noses provide us. One of the benefits of training this sense would be a more acute responsiveness toward food consumption and

freshness. Another benefit would be more alertness toward hazards such as fire and gas leakage. On a less vital level, if a place has a particular olfactory identity, it will not only amplify the place’s character, but will allow us to recognize the place by its smell if our eyesight is hindered. Nonetheless, the use of scent should be an additional aspect of enhancement toward a more holistic experience.

7 Discussion

The amount of scientific research done on the topic of smell compared to other human senses is significantly minor. Consequently, the development of smell-oriented usage is still at its pioneering stage. If I may compare the phase of smell-oriented design to that of the visual-oriented design, the prior is still at the monochrome monitor era.

I truly believe in the prospects of integrating scent into design. If we understand the connection between different scents and their influence on our emotions, we can then apply usage of scent that will affect the outcome as a whole. Could we mimic the scent of a mother and apply such scent to a toy to make a child feel relaxed and secure? Would it be possible to design a classroom that suppresses the smell of food and other distracting scents? If subway seating was made with materials that absorb unpleasant smells, will we be more likely to reach out to homeless people on a train? The question I asked myself throughout the research process was, “Is this really a “design” project, and if not, what category does it belongs to?” I couldn’t help wonder if I have drifted too far away from design or, to the contrary, if the gap between science and design are too distant. The more I study the human senses in relation to our emotions, the more I realize it is imperative for designers to work closely with other academic fields in order to understand the complexity of human behavior.

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Wayfinding using colour: A semiotic research hypothesis

Abstract

The environments of our lives are ever more populated with signs of every sort. If cities and social sites are texts, their capacity for communication must be rather poor in view of the massive recourse to a crowding of signals which often risks negating signification with phrases lacking any reference points. How is it possible that when entering a public place our attention risks being distracted more than attracted by communication 'artefacts'? And how can we go round this paradox? We therefore need to think of communications in the environment which are less codified or rather of orientation semiotics which begin from the ways of expression, or types of signs, which come before the signification systems, which are strictly symbolic. One of the most powerful iconic and indexical elements is colour because colour, more than signifying, stimulates signification.

Keywords

Wayfinding, Colours, Icon, Index, Attention, Environment

I Beginning from a paradox

The environments in which we live are ever more populated by all sorts of signs, commercial signs, notices, lights and decorations. This is especially true for roads, squares and service buildings like stations, offices

and hospitals, which demand the widespread presence of this "additional text" to overlap the basictext, which is the acculturated space. If cities and social places are texts, as they are according to Ugo Volli [30], their capacity for communication must be rather poor in view of the massive recourse to a crowding of signals, which often risks negating signification through phrases lacking any reference points.

One of the bestknown cases in Europe is the so-called *Schielderwald (Forest of Signs)* with which even the German Automobile Association ADAC, that has estimated that at least one third of the traffic signals would be totally useless and in some cases even harmful, dealt. Another wellknown case is the one of the Dutch city Makkinga that some years ago has banned from its territory not only the traffic signs but also the pedestrian crossings and traffic lights. The surprising fact is that, in so doing, there was no longer any accident occurring in Makkinga.

But there are many more cases where the signal systems produce this type of paradox and where an abundance of signs doesn't correspond to appropriate communication effectiveness. I mean not only the capacity to communicate but rather – and above all – to produce a cognitive benefit (in terms of generating understanding) or an affective benefit (in terms of producing *wellness*). Maybe this is because the more communication in our environments depends on codes, or rather on instructions, which use verbal

or pictographic signs, the more spatial complexity produces cognitive disorientation.

How is it possible that when entering a public place our attention risks being distracted more than attracted by communication “artefacts”? And how can we go round this paradox?

2 ...basic wayfinding cues

Answers to these and other questions could be found if we put ourselves in the perspective of any subjectuser who is seeking directions to reach an objective. From this point of view the “finding the way” an action will – or should – result as an action that would be carried out by the body almost without the aid of thought and with the smallest possible cognitive and interpretational effort.

It is all about investigating every direction of the semiotic dimension, which is often hidden in the folds of our environments, that has been called by Kevin Lynch *Wayfinding* [15]. The term was later resumed by Romedi Passini [20] and Paul Arthur [1, 21] who extended the concept beyond the mere placement of indication signals, such as street names, commercial signs and house numbers. For Arthur and Passini, in fact, the wayfinding task is to ensure that an environment is able to make understand both *where you are* (favouring the construction of a mental map of the place) and *which path to take to get*, without physical or psychological impediments, to a particular *destination* (favouring the possibility of elaborating an action plan). “Many people think that signs are the most important means of providing wayfinding information in an urban or architectural setting. Without downplaying the importance of signs, it is nevertheless easy to show that the natural and built environments provide the wayfinding person with a great variety of basic wayfinding cues” [1].

The wayfinding then includes the engineering design of all those elements that make an environment an *organism that can communicate*. Not only signage systems, but also a way to rethink the architectural and urban planning. Which should be conceived as objects loaded with *semiotic affordance*: a call for the interpretation, the addressing of the choices, a guide to a solution. This type of affordance, combined with the development of graphic systems, is what makes the wayfinding a true and *proper environmental communication ergonomics* [32].

3 The signs between us and the environment

A semiotics that is interested in wayfinding may however be understood in two ways: on one hand, as a discipline of systems of signification proposing as a methodological contribution to the field of design of signs, and, on the other hand, as a science that is concerned with spatial behaviours in relation to environmental stimuli, and then, more generally, with the relationship between subject and environment. In this second acceptance – which is what creates the working hypothesis presented here – semiotics is concerned with the way in which we inferentially react with the environmental and spatial reality. In particular how we react to:

- a) *space*, understood as space, its neutral and abstract, general, measurable and calculable and not necessarily inhabited geometric dimension;
- b) *places*, understood as spaces individually considered, in their uniqueness and specificity, so one place is different from another place;
- a) *territory*, understood as a structured set of cultured places, domesticated both by virtue of the practices of agriculture or hunting, both by virtue of the culture of living.

3.1 A zoosemiotic perspective

In this regard, more than a wayfinding system entirely based on communicative artefacts, we must look to the ability of places to generate in the subjectuser a stimuli orientanti that call for interpretive activity. Wayfinding is more than Signage, but this more is paradoxically a less, a dispossession of the *Schielderwald*, to identify in the material and topological elements of the environments those *silent guides* that can determine, already by themselves, appropriate spatial behaviours. We know that animals of all species are able to find their way home (*homing*) or to explore the environment in search of food [18]. For this reason, the semiotic research can derive some benefit and indication from studies on the orientation of animals proposed by both the ethology and the environmental psychology [8, 19]. The theme of orientation, in fact, implicitly calls the semiotic perspective to embrace a perspective of zoosemiotic type [6], because the ability to “find the way” actually depends on the capacity to process and interpret the information coming from the environment. Spatial orientation doesn’t only depend on the capacity

to respond to the metalanguage of signage, but also depends on our “animal memory” which persists sidebyside with our most rational faculties. This means that the design of places and of communications, besides architecture, also involves undertaking a task of great scientific commitment in order to pinpoint the sign strategies which regulate, even under our awareness threshold, the *tendency* for certain spatial behaviour. In fact, “spatial behaviour is “adaptable”, because during our evolution we have developed an orientation capacity which is relatively independent of detailed and geometrically correct knowledge of an environment” [2].

3.2 Semiotics and the biological world

If we thus follow some guidelines by Thomas A. Sebeok, we could find some answers to our initial paradox.

Sebeok dedicated almost all of his activities to *non-verbal semiotics*, to those fields where meaning is manifested and produced even in the absence of that powerful system of signification, which is verbal language. In his vision, communication involves the whole vegetable and animal world.

One case, mentioned by Sebeok [24] is, for instance, the “minimal model” of *approach-withdrawal*, which is crucial for survival. This concerns two functionally opposing systems: one is the search for food and mates and the other is to flee from dangerous situations. This is truly a minimal model, but it has the advantage of evidencing how a sort of “Darwinian memory” is at the basis of our behaviour. On one hand, it pushes us towards the living world and towards the tensions involved in social bonding; on the other hand, it tells us to flee from dangerous situations. The *approach-withdrawal* model is very useful to represent the complex intrigue of relationships between the human being and the external world: objects, artefacts, machines, environments, organised systems, etc. In relation to our environment we activate both a behaviour to obtain benefits (*approach*) and a defensive behaviour in view of the risk of potential danger (*withdrawal*). It is as if we have one foot forward to seek and the other foot backward ready to *flee*. One eye explores the surroundings seeking to capture something and learn, while the other eye is focused on an escape path.

Sebeok in his conclusions, in fact, observes that the interpretive tensions, between the individual and his environment, are guided by numerous types of nonverbal signs and they are present in all animal

species. Of these nonverbal signs, he mentions the ones which Thure von Uexküll, the son of the biologist Jakob, and like him a scholar of biosemiotics, called *ordinator signs* (Ordnungszeichen), *localization signs* (Lokalzeichen) and *directional signs* (Richtungszeichen) – in addition to the signs that refer to content (*Inhaltszeichen*) and those that apply to the effects they produce (*Wirkzeichen*) [28].

Therefore, what results from the semiotic observation of the biological world is that interpretive faculties are manifested not only by the intellect but also from within the organism. As we know from ecological psychology [10], cognition is an “embodied” process and is “situated” inside the body. It emerges from the bodily interactions with the world, it depends on the perceptual and motor experiences. In this perspective, what vacillates is the separation between nature and culture, between biological life and semiosis, between act on instinct or intelligence: «That man is an “animal” is somehow well known, but it is with the new evolutionary biology, and then with modern genetics, with semiotics, [...], after that with zoosemiotics and ethology, [...], that it is no longer understood in a speculative way, but in a scientifically motivated form» [9]. And if this border is to be overcome and crossed in both directions, it is necessary for semiotics – and together with it design – to seek signification on this side of culturally defined systems. Because also sensoriality is pervaded by signs.

4 Semiotics of resemblances and connections

This means to think about a semiotics of orientation, which is stepping out from modes of expression [4], or types of signs, as theorized by Charles S. Peirce [20], that are preceding strictly conventional systems of signification. I mean *iconicity* and *indexicality*, with symbolism (as conventional signs) into the background. Iconicity, or semiotics of resemblance. If we avoid the mistake of considering as “iconic” only so-called “visual signs”, according to a naive realism to overcome, then the Piercean theory on iconicity presents itself in all its semiotic force. Iconicity is here understood as the capacity of a mind to interpret things and events through the recognition of their sensorial qualities and by their *resemblance* to an “object” already present in the mind of the subjectuser through the association of ideas and through evocative images. Iconic in their

nature are for instance the cognitive maps on which many ethologists and psychologists have investigated [27, 12]: the idea is that exploration and navigation require the construction in the mind of an animal organism, of a representation, albeit hypothetical, of the environment. It is important to note that these maps do not necessarily follow the Euclidean geometry and they are only by metaphor juxtaposed with actual maps. It is mostly *egocentric representations* of significant places that are basically elaborated on recognition of similar places [11].

Indexicality, or semiotics of connections. Again we must have a broad vision about indexicality [24]. Indexicality is, in fact, the capacity to interpret things and events by starting from their reciprocal connections (position, dimensions, orientation, logical causeeffect relationships). Indexicality is, especially, the semiotic mode which, even while bringing to life signals that are apparently invisible, is still the best mode to provide ambiances and artefacts with a form of communicative relationship, which is essential to complete spatial cognition: *directionality* (to know where to go), *ambiantation* (to know where you are), *ease* (to know what to do). Indexicality becomes crucial, for example, when we think that orientation cannot leave aside a “point of view”, a perspective. Studies on perspective orientation have identified two different ones, in relation to our position, real and mental, with spatiality: (a) the *survey perspective*, as a vision and recognition of territory from above; (b) the *route perspective*, as a vision from the ground and from inside, immersive, which is formed gradually through single and sequential indications. Here, the perspective route makes a very good account of how the exploration of the environment follows a primarily indexical semiosis, where the sense of orientation is the result of a chain of connections, which is a sign of the other.

One of the most powerful iconic and indexical elements is colour because colour, to paraphrase Wittgenstein, more than *signifying*, *stimulates signification*. In fact, when colours are not explicitly part of a codified system, they don't defer us to a content but rather suggest or produce behaviours through their capacity to impress themselves on the mind as a quality: they attract or reject our gaze and invite reaction. Besides, colour is part of our psychological and biological inheritance, as pointed out by Nicholas

Humphrey: “Even though the modern use of colour may frequently be arbitrary, humans response to it surely continues to show traces of their evolutionary heritage. So people persist in seeking meaning from colour even where no meaning is intended, they find colour attentioncatching, they expect colour to carry information and to some extent at least they tend to be emotionally aroused” [13].

But not only. As we will see, colour lends itself very well to enhance the detection and memorisation of *landmarks* and *props*, intended as possible points of a cognitive map, and thus a selfcentred geometry; in the same way, also the nodes within an environmental diagram (such as a fork, an open space, the beginning of a path) may receive more expressive quality from colour, as well as marking the edges of a border to a path.

5 Environment as a diagram

But why are iconicity and indexicality, rather than conventional symbols and codes, the semiotic matter, which must be involved in design? As we mentioned at the beginning, the contemporary semiotics tends to see the city, and with this all built environments, under the category of text [23]. But the idea of text suggests us a significant body, defined, closed, articulated and consistent. For a subject, instead, especially if nonhuman animal, the environment in which to move looks like a cognitively dark action field: it does not know where it begins or where it ends, of how many parts it is composed, it knows nothing of the structure underlying it. We should hence perhaps think, to give order to our way of analysing and thus design spaces, of an even deeper model. And perhaps even more “topological”, where relations between parts would not be of a syntacticsemantic order but rather of a logicalrelational one. If we think that the fruitful history of mathematical graph theory started from a question on the routes of a city – the famous bridges of Königsberg of Euler –, it will not be difficult to find this model in the *diagram*. Moreover, even the studies on the city, seen at the light of wayfinding, begin with a work of diagramming by Kevin Lynch [15]. As known, for this American architect *place legibility* – the ease with which a subject understands and builds a mental map of the place – depends on the overlap and intersection of five elements: *paths*, *edges*, *districts*, *nodes* and *landmarks*. The relationship between these elements is diagrammatic, as we know from the first, and

archetypal, London Underground map designed by Harry Beck in 1933: the first displaying in the form of the diagram metropolitan routes.

Starting from Lynch we can, following the indications of Quentin Stevens [26], (a) add the *thresholds*, points of transition from one area to another, (b) and expand the notion of *landmarks* to all those objects that, in a human or natural setting, acquire an idiosyncratic relevance, subjective and provisional reference points, footholds on which place the attention and to use as computing or memorising elements: the *props*. "This category encompasses a variety of fixed objects which are to be found within urban public spaces, such as public artworks, play equipment, and street furniture. Such elements may easily be overlooked as a part of the environmental structure because they are small" [26]. The spaceenvironment can then be thought of as a *field of relations* within which the orientation is in the form of an *dialoguing interaction*, a transition from one node to another, from one area to another, crossing thresholds and boundaries. A dialogue that consists of continuous *questions* (to the environment), and answers (in the form of interpretive actions).

6 Orientation, exploration, navigation

If environment and territory can be viewed as diagrams, which are the spatial behaviours that this model make possible? In our case, we focus our attention on three behaviours or modalities: *orientation, exploration and navigation*.

1. Orientation

Orientation answers the question "where am I": it is the ability of an animal organism to have knowledge of its location within geographical or environmental coordinates. To know how to orient oneself is to have direct knowledge of one's position within the semiotic field and to know how to interpret the positions of other elements belonging to the environmental diagram wherein one is located, to feel and test spaceterritory, producing actions understood as interpretive answer to the objective reality that shows itself up. The modality of interpretation is in this case of indexicalinductive type.

2. Exploration

Exploration answers the question "where could I / would I go": it is the movement that investigates and seeks to know the space and to translate it into a mental map. The exploring activity is an inferential process and an attempt to research. To explore means to know

how to interpret the properties and qualities of an environment, and to associate them with known mental models, owing to similarity and querying. The modality of interpretation, here, is of an iconicabductive type.

3. Navigation

Navigation answers the question "how am I proceeding": it is the competence in moving through the maps, using the already semiotised and cultured knowledge of environment. Knowing how to navigate involves knowing how to do calculations to determine the direction and distance from the goal, the ability to identify the nodes, to recognize *landmark* and *props*, to conquer areas. For human beings to navigate is to move toward a target within a spaceterritory set up as a coherent array and as a syntactic system. The modality of interpretation is of symboliceductive type.

In all three cases, the spatial behaviour is guided by external sensitive stimuli, the *orienting stimuli*: it is a response that interprets these stimuli through *sign mediations*, according to a triadic process [see 8.1. and Fig. 1]. In animals the orienting stimuli may be *visual* (in predatory birds), *acoustic* (in bats), *chemical* (in some insects), *olfactive* (in mammals), *electrical* (in fish), *tactile* (in spiders and scorpions). We can find an outline of how spatial behaviours take place in Vallortigara [29], whose view is that orientation in space may be based on three types of mechanisms, which although separate are used simultaneously or in combination:

- the *dead reckoning* (or *deduced reckoning*, the process of continuous updating of the position estimate based on movement speed, direction and duration of movement);
- the use of environmental landmarks (*landmarks* and *props*);
- the use of cognitive maps or representations of the territory, and thus communicative artefacts.

7 Colour and attention strategy

Among the semioticdesigned mediations to be adopted, the exploitation of the attraction force of colour merits particular consideration. Colour, in fact, lacks an expressive form. Like a liquid, it takes on the form of its container, but its signification doesn't reside in that form, it may be independent from this, as demonstrated by several works by Yves Klein. Colour is, above all, impact and attraction and therefore its use and planning lend themselves to become an attentiongetting strategy and a means to influence the direction of the gaze.

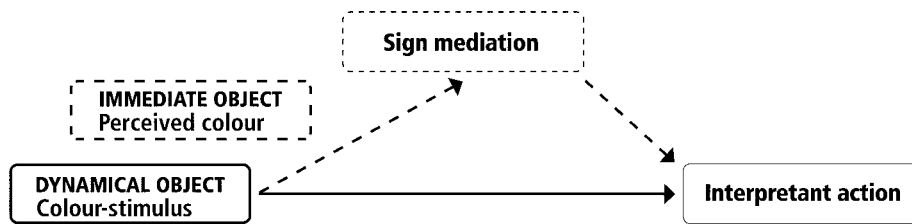


Fig. 1. The triangle of semiosis of Peirce. My adaptation to spatial behaviour.

This is also the case in the animal and vegetable world. Colour, in short, has a *conative* force: a pragmatic power of seduction, which may lead to another path or which may confirm continuing forward on the same one. Returning to the distinctions made by Thure von Uexküll [28], in the wayfinding design, colour can be used at the same time:

- as a *localization* sign (to identify a specific place within an indistinct environment);
- as a *directional* sign (as an index to suggest a possible path);
- as an *ordinator* sign (as a mark able to define hierarchy, establish measurements and distances and to articulate sequences).

In the orientation of space and in its exploration, colour contributes to the advent of the cognition of one's own position inside places and it activates connections between objects and positions because colour, as index, has the property of identifying attention points and of delimitating areas for action and because colour, as icon, highlights the recognition of sensorial qualities.

This makes the signature of chromatics one of the most efficient tools to overcome the paradox, described above, in view of the fact that colour is a sort of *transparent lead* which can be interpreted as a guide, can accompany us and direct our attention and our movements. It is, however, essential that this signature, which is *inside* sensorial perception, would be the object of study of projectual intention.

8 The colour variable

We have seen how spatial behaviour is dependent on environmental stimuli. These stimuli can be both primary elements of the built environment (a staircase, an opening, a wall, etc.) and one of their attributes (a shape, a building material, a paint, etc.).

8.1 Colour as a dynamical object

For the inferential semiotics, every element that may be, rightly or wrongly, understood as an orienting stimulus

is a possible *Dynamical Object*: it is the beginning of a process of interpretation. And, as stated in the triangle of semiosis, which we can derive from the writings of Peirce [22], a *Dynamical Object* produces an *Interpretant* (in our case an *interpretant action*), but through a *Sign* (or *Mediation by signs*): the comprehension of an explicit and properly said sign, one of its mental representation, or even the deduction that the object or one of its quality does not have value in itself but for what they are representing or referring to.

The sign mediation, in effect, is already starting at the level of the perception of a *Dynamical Object* (the “thing” with which we come into contact), which is categorized by the mind that perceives it as an *Immediate Object* (the external reality as represented by the point view of the subject). This theoretical model is indirectly confirmed by the International Lighting Vocabulary of the Commission Internationale de l'Eclairage (Cie) [5], which makes a distinction between the *colour-stimulus* and the *perceived colour*: the first is the physical entity that stimulates the peripheral organ of vision, the second is what the subject actually perceives [Fig. 1].

If then, the orientation is an interpretive response to the present stimuli in the environment, a wayfinding project cannot work on quality – and thus the semiotic potential – of these stimuli. On the quality of their significant form and on the quality of their syntagmatic relation in space: position, dimension, distancing, recurrences, readability, etc. Certainly the ways to make quality (formal, material, chromatic) of environmental stimuli are the subject of the inventive ability of design. The projects by Paul Mijksenaar [17] and Ruedi Baur are, among others, a testimony of this fact.

8.2 Visual variables

An important methodological indication in coming to our aid from the studies on visual variables made in the sixties by Jacques Bertin [3], resumed in more recent years by Narciso Silvestrini [25]. According to

this research domain, which was set off by the display systems in cartography, the elements of a visual field – real or represented – are distinguished by certain variables. A geometric object drawn on paper, such as a triangle, varies its significance, for example, depending on shape, colour, size, position in space, direction, texture, etc.

As we can see from Table I, Silvestrini reworks the previous classification by Bertin, and distinguishes eight variables, grouped into two categories: the *image variables* and the *separation variables*. The first ones (dimension, value, transparency and position) are responsible for the emergence of the “figures” from the “background”. The second ones (direction, texture, colour and shape) have the task of separate and distinguish the various parts of an image. All the variables have the following properties: associative / dissociative, selective, quantitative and ordinative. Now, in an environmental setting, colour is certainly not the only perceptible variable. But, following the pattern of Silvestrini (who calls, not by accident, “hue” what we usually call “colour”), it is safe to affirm that *colour* is the set of hue along with texture (and hence material), added to value (higher or lower brightness), plus transparency. Meaning, then, the variables of dimension, position and direction as shared by every object placed in a space (and therefore the variables of indexical sign character), we could get to the primary opposition *colour* versus *shape*.

I will come back to this aspect later. Now I will simply point out that coming into contact with the other variables, the colour can make at first discontinuous and then perceptually significant any visual field, real or represented. According to Bertin, the level of valence

(of associative, selective, ordinative or quantitative type) is given by the perceptual properties of the considered variable. In the scheme of Silvestrini we can observe how the hue has an *associative* and *selective* valence, as the texture. While the value and transparency variables have a dissociative and selective valence. Colour, in short, allows us to perceptually *associate* and *dissociate* the objects between them and hence to better select them. The associative / dissociative and the selective properties are, in fact, complementary. They help each other. If we enter in a fruit and vegetables store, it will not be difficult, for example, to “read” the grouping of citrus fruits, fruits that precisely are associated among them by their range of yellow to orange colour, in addition to the rounded shape. At the same time, the bright yellow colour will lead us to distinguish and differentiate the lemons within the group. If there are no critical situations, we will get without other mediations to our favourite fruit. It is true that this perceptualinferential process is helped, at least in the example, by our prior knowledge about fruit and how it is placed in the stores; but it is also clear that it is just this process that the mind activates whenever it *searches*. Silvestrini: “The colour variation allows a high and immediate selectivity of the components of visual field [...]” [25].

If we then move on to a concrete element of our urban landscape, it is not difficult to think about how, in terms of both aesthetics and usability but also for the historical cultural value or, usually, for the perceptual wellness effect, the *sense* we attach to the pavements is shifting [7]. In this case the variables at stake, together with colour, are those relating to the construction materials and the resulting texture.

VARIABLES	VALENCES				
Dimension	D	S	O	Q	Image variables
Value	D	S	O		
Transparency	D	S	O		
Position	D	S	O		
Texture	A	S	O		Separation variables
Hue	A	S			
Direction	A	S			
Form	A				

PROPERTY	
A	Associative
D	Dissociative
S	Selective
O	Ordinative
Q	Quantitative

Table I. Visual variables by Silvestrini.

9 Colour, a function

But, why has colour, which is basically a complement, an accessory, an attribute, so much attractive force? Even in this case, I think, it may be possible to advance a hypothesis of semiotic order. Here, we will not look for the *meaning* of colour, or in other words the possible structures or semantic associations (which are not missing, but that are to be found in signic, mostly idiosyncratic, expressions) but rather some of its *functions* inside a communications strategy aimed at the orientation in built environments. Colour is not just an attribute of shape, it plays a role in a game of communication [33]. In this perspective, colour should not be primarily associated with a semantic content, but more accurately with a *function* – in the mathematical sense of the word. In the sciences of language functions can also be qualified and distinguished, according to the model of Roman Jakobson [14], which associates a specific function with each factor of the communicative game. Reworking this model we can draw the scheme below [Fig. 2]:

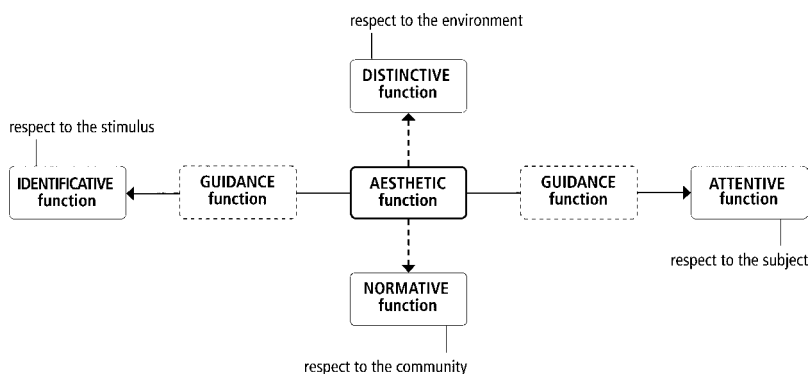


Fig. 2. The functions of colour. Reworking by Jakobson (1963).

This means that the qualitative nature of the orienting stimuli must have its own *aesthetic relevance*, capable of activating an *attentive function*, able to capture the attention of a subject and, consequently, having the ability to make itself *identified* and memorized. If these two functions do not come into play, it would be very difficult for colour to carry out a *guidance function*, similar to the phatic function of language, the one that has the task of maintaining contact between two speakers and thus keeping active the communication channel. In orientation the path is the communication channel.

In addition to this, when environmental stimuli are highly chromatic features, two more functions can come into play: the *distinctive* one, which aims to differentiate one object from another within the visual field (corresponding to the selective valence of colour), and the *normative* one, when colour is part of a more codified system or has the value of metalanguage. *Everything passes through the aesthetic function.* There is no recognition of objects (landmarks, props, nodes) if they are unable to attract the attention of a subject. The aesthetic function can certainly be not only visual, but also olfactive, acoustic, electric and magnetic. But here, for simplicity, we confine ourselves to consider this function as related to visual stimuli and in particular to the chromatic ones.

To say that everything passes through the aesthetic function hence means that the orientation requires (a) a reading of the orienting environmental stimuli, and then (b) the interpretive faculty to assign to these stimuli the appropriate functions, so that they are efficient and cooperating with the identification of the goal (the aim of wayfinding). Each function is generated by the aesthetic function.

The horizontal axis of the graph represents the relationship between the orienting stimulus and the subject. So, too, it shows the semiotic relationship between the natural dimension and the cultural dimension of orientation. In this case the functions that are activated are three:

1. The *attentive function*: the mind of a subject is attracted to an object in the environmental setting. What turns the attention on is an interest of the subject, his *orientation* plan. The mind tends toward a goal and the identified object can become a node, a passage or a mediation towards it.
2. The *identificative function*: the stimulus and any object that produces it are recognized as such, located in the scheme of the environmental setting, embedded within its own encyclopaedic system of knowledge, and then placed in their cognitive map.
3. The *guidance function*: attention and identification produce contact, but they also give way to it as a result. The phatic function, in communication, is ultimately the most indispensable function: without any form of contact, there can be no communication, either in physical or psychic sense [31]. In our case, the contact produces an indication of path, and then of guidance towards a goal.



Fig. 3. Project hypothesis by Marilisa Pastore for the Hospital San Carlo in Milan.

These three functions are the basis of the hypothesis project developed by Marilisa Pastore at the Faculty of Design of Politecnico di Milano [Fig. 3]. The project involved the repainting of the walls and floors of a sector of the Hospital San Paolo in Milan, so that the different chromatic variations would have an “orienting effect” on the visitors: the aim was to give colour a function of “silent guide”, implicit, to guide the user, emphasizing the arteries, the landmarks and the destinations. The color was thus conceived to recall attention, for example, to signal a turn or the presence of graphic signs.

Some nodal areas devoid of points of reference have been transformed into “chromatic props” to be better memorized as real and proper landmarks. So, if your main route requires a turn to the right, this orientation will, through colour, be complied in a “natural” way, while the reading of the signs (such as an arrow) could

result to be secondary or redundant [34].

The vertical axis of the graph represents instead what the aesthetic function produces (starting from the sensory quality). The functions that are activated are two:

4. The *distinctive function*: the object of attention is distinguished and separated from the environmental setting and is identified, in the sense of being “made individual”, inside a roughly confused mass of stimuli. This also entails a certain operation of hierarchization of stimuli, an ordination of them on a scale of values or of significant relevance.

5. The *normative function*: in this case the object fully becomes “semioticised”, it falls into a signic bi-planar relation: that is a signifier of meaning. In this manner it passes from the purely subjective sphere to the social sphere: not in a quantitative sense but in the semiotic sense. In fact, the encoded information, also by only a single empirical subject, is as such social.



Fig. 4. Project hypothesis by Nicole Bergel for the tourist routes in Bergamo Alta.

These two functions are the basis for another project hypothesis developed by Nicole Bergel, always at the Faculty of Design in Milan [Fig. 4]. In this case the project concerned the city of art of Bergamo Alta. The problem was how to ensure that the institutional signs, including the one dedicated to cultural heritage, should not result invasive and chromatically pollutant. Within the city there are, in fact, two types of metalanguages: the first consisting of the historical signs, all the toponyms that name the places of the city, with the chromaticity typical of the architecture of the place, and the usual institutional signage. If the first kind of signs (writings engraved on the walls, stone tablets) appears to be cohesive and well integrated into the urban textuality, the second has the critical elements that make it actually alien to the site. So, a stratification of signs, which over time have become a visually polluting element, producing a high *semiotic noise*, with an effect of disorder and estrangement that derive from a lack of formal homogeneity on a both chromatic and pictogrammatic level, is visible in the city. The design solution of Bergel thus aims to a chromatically neutral signage, syntactically minimal but exhaustive and complete in the information (landmarks, directions, distances, etc.). Thus, first of all, a “chromatic keynote” of Bergamo Alta was identified, starting from the different shades of the walls of the city: a rather homogeneous palette that passes from the grey shades to those of beige and pink. The guidance function was then obtained, as well as from the position of the communicative artefact, from the transformation of the historical pavement texture in distinctive elements – and therefore normative – of the different paths. The iconic modality, in this case, has a predominantly connotative value, that is to communicate a perceptual quality of the city and its trails.

10 Conclusion

The arguments set out above are intended to underline that a project of innovative wayfinding can only be addressed to if the communication design researches in the ethological sciences and the environmental psychology, the fundamental characteristics of human spatial behaviour in the environment. In this research program, semiotics can provide the necessary contribute as a “logic of signification”: the orientation is, in fact, an interpretive activity, both starting from the designed stimuli that are present in communication

artefacts (such as text and pictograms), and as a response to stimuli coming from the environment. Among the most powerful and effective stimuli there are the colours, which have a marked pragmatic influence and the ability to stimulate the signification: the colours attract attention and direct the gaze, give identity to places and define implicit ordinator systems. In this research, the communication design and the design semiotics must then think about the wayfinding as a text that has the task of making explicit the diagrammatic nature of environments, a set of nodes and routes, boundaries that define sociocultural areas and thresholds of crossing. But this is not a diagram that has a value only because of its geometric abstraction. An environment is not only an “Euclidean space”, it is primarily a “place” inhabited or habitable. In a place, what really affect the spatial behaviour are the sensitive values, qualities and forms of expression to be interpreted as an index of orientation. Precisely for this reason, a strategic environment, connoted by colour, can make more effective its place legibility. Not to mention that in the natural or built environment the colour is also material, texture, light sources and, in some cases, even tactile perception.

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Metaphor: Investigating spatial experience

Abstract

Taking “Metaphors We Live By” (1980) by Lakoff and Johnson as a starting point, the paper demonstrates how metaphor elicitation was used to understand users’ conceptions of spatial design and experience. Metaphor is often thought of as a device for rhetorical flourish, carefully crafted by talented writers, rather than used in everyday language. Lakoff and Johnson developed the notion that metaphor in fact governs everyday functioning and metaphoric concepts structure perception and how we relate to the world. Our conceptual system, which they argue is largely metaphorical, defines our everyday realities, and that what we do is very much a matter of metaphor. Like Mills, Lakoff and Johnson are aware that our conceptual system is not something of which we are normally aware. However, since the work of Mills, a body of linguistic research has grown to provide evidence that our ordinary conceptual system is metaphorical in nature. This paper presents the rationale and richness of using metaphor in collecting data on users’ subjective thoughts and feelings about architectural design experiences.

Keywords

Metaphor, Design and Spatial Experience, Qualitative Research

1. Introduction

C. Wright Mills states the value of empirical research is to ‘make arguments more fruitful by basing all sides more substantially’[1], which is what this empirical study aims to achieve: understanding users’ experience and conceptions of spatial design and experience, as opposed to the expert or academic reading of space. Mills’ notion of the ‘sociological imagination’ links individual experience with larger historical and social scenes, and the use of metaphoric images and language in my case study research was applied to capture the general and particular.

Human experience is metaphorical in nature [2] and the meaning of any experience is elusive. The use of metaphor formulates, communicates and makes understandable this elusive meaning. Since the pioneering work of Lakoff and Johnson, the study of metaphor has been a focus of considerable interest in the fields of linguistics, psychology, philosophy, literature and advertising.

Metaphor was used in two ways in this study: as a way for participants to talk about design and experience of an everyday designed environment in interviews, and to elicit those responses by selecting from categories of metaphoric images. The first section of the paper, ‘metaphors in everyday language’, outlines the theoretical background on metaphor as fundamental to language and thinking. The next section ‘metaphors in images,’ composes the rationale for using images as

metaphors to elicit metaphoric thinking and language in architecture research. The final section 'metaphoric language and images in architecture research' presents how I collected data using metaphoric language and images, and exemplifies some of the responses collected using the method. These sections show why and how metaphor can be used to investigate experience, and, through providing two case study examples, that potentially 'fruitful' research outcomes are achieved using metaphor.

The empirical study was undertaken in a series of new workplaces around the world. Workplaces were selected for the study because users have become familiar and highly involved with these environments through interaction on an everyday basis (unlike, say, with public buildings), yet removed from design decisions (unlike housing), and for other reasons such as similar participant backgrounds, making them ideal for this study of architectural experience and employing this research method. One on one interviews were undertaken on site. Images of various categories are shown to participants using a computer interface. They select and manipulate them to symbolise a thought or feeling of their spatial experience that is then discussed. The interviews were recorded and transcribed and the study was based on analysis of the transcriptions.

2 Metaphors in everyday language

Metaphor is pervasive in everyday language and thought. Lakoff and Johnson have found that it is 'perhaps the key to giving an adequate account of understanding'[3] because our conceptual system is 'fundamentally metaphorical in nature'[4]. The claim that the way we think and what we experience in our everyday functioning is a matter of metaphor is one of the reasons that metaphor was used in the study to understand an everyday spatial experience.

Metaphoric concepts structure what we do and how we understand something, usually without being conscious of the use of metaphor. For example, the metaphoric concept of time is money is a normal way of thinking about time in cultures where time is a valuable commodity. The language is not poetic, fanciful or necessarily rhetorical. Lakoff and Johnson would call it a literal metaphor. Expressions such as 'it was a complete waste of time', 'Do you have some spare time?', 'I ran out of time', 'the traffic cost me an hour' use a money metaphor because we conceive of time in that way.

It is not necessary for time to be conceptualised as money or a valuable commodity, and there are cultures where time is neither of these things.

Lakoff and Johnson find metaphors, especially those that reflect literal language to be one of a number of types, such as spatial ('It's under my control'), physical objects and substances ('his mind snapped'), containers ('she's out of the race'), personification ('inflation is eating up our profits'), metonymy ('She's in research'). Most are not noticed as being metaphorical. Many are related to bodily experience.

Raymond Gibbs warns against assuming that any particular concept can be comprehended via metaphor to some degree, and points out scepticism exists, especially from cognitive psychology, about whether metaphor is a part of human cognition and not just an aspect of language [5]. Overall, Gibbs finds more support for the claim that metaphor in thought and language interact, it is just that it is not clear how. The metaphorical structure of concepts are usually culturally coherent, especially the more fundamental concepts such as happy is up. However, different cultures and subcultures, or even individuals, have different values, so that a concept will have different metaphoric structures, such as those who own large cars will feel that more is up, whereas small car owners may believe that saving resources is up and more is down. I have observed this in my research. For example, some groups find spaciousness and quiet cold, while others find it clean and open. In my research, some groups or individuals will find certain design elements important, relative to what is important for them.

3 Metaphors in images

In 'Picturing the social landscape: Visual methods and the sociological imagination'[6], the editors, Caroline Knowles and Paul Sweetman find there are three approaches to using visual images in research: images as evidence, images to construct reality and a semantic approach where images are read as texts to uncover wider cultural significance. Images are a point of access to other social and cultural worlds. Researchers in this area use them to reach beyond common understandings and make connections – just as visual strategies do. The editors claim that: *The sociological imagination works particularly well through visual strategies, which capture the particular, the local, the personal and the familiar while suggesting*

a bigger landscape beyond and challenging us to draw the connections between the two [7].

Further, they also state that visual techniques activate the sociological imagination in the broad sense that C. Wright Mills intended because they incline researchers towards tracing connections between things of different scales. The use of images in research methodologies is expanding, driven by an increasingly visual Western culture, but also by being a unique form of data that stores complex subjective meanings. People navigate the world visually. This notion was established by John Berger who famously asserted 'Seeing comes before words.... and establishes our place in the surrounding world'[8]. The connection between human existence and visualisation has never been more obvious where today the visual senses are prioritised over other senses. In my case study research the analysis is done using a familiar research medium, words in transcripts, thus avoiding much of the complex methodological and theoretical issues inherent in image-based analysis. Thinking about images as symbols is a cognitive capacity that starts to develop around ages 5 to 7 [9], and by adulthood, the ability to represent one thing by another is practically an automatic process. John Grady states that 'thinking, writing and talking about images can make arguments not only more vivid but more lucid as well'[10]. This is why images are used in research to stimulate discussion in interviews. Describing how images communicate is the basis of the theoretical framework of visual rhetoric. It is concerned with the persuasive meanings of images rather than their aesthetic qualities. It relates to semiotics, the study of signs and symbols and the things to which they refer. The image-as-metaphor in this study acts as an inherently arbitrary symbol for something else, its referent. Referring to Richard and Ogden's semantic triangle from 1923 [11], the symbol is the image selected by the participant, the referent a particular experience encountered in the workplace, and the thought/reference the participants explanation of the image selection.

4 Applying metaphoric language and images in empirical spatial research

This section outlines metaphor elicitation conducted in the empirical study and presents some examples from undertaking interviews in this manner.

To understand how users respond to one environment, 9-14 participants are interviewed. They were shown 12 sets of 12 or 8 images (a total of 136 images) on a computer interface. They are asked to explain their feelings, reaction and emotions about the design of their workplace as represented in their various selected images. The interview process required the researcher to facilitate the flow of the interview, such as moving to the next set of images or prompting for more information. The interviews are transcribed and analysed. The interview approach is 'unstructured'. Topics are driven forward by the interests of the person being interviewed. The topic is introduced through a set of images. The content of the discussion is based on participants responses to an image set. Image categories varied from abstract art, shoes, facial expressions, colour and food. Using images to elicit responses has been called 'photo-elicitation' by Douglas Harper who characterises the undirected nature of the process as follows:

A shocking thing happens in this interview format; the photographer... suddenly confronts the realization that she or he knows little or nothing about the cultural information contained in the image.... the researcher becomes a listener and one who encourages the dialogue to continue. [12]

This interview method could successfully investigate conceptions of the environment without structuring those conceptions. Regular interview techniques that involve questions organise and influence the perceptions of those interviewed. Researchers have found that research is more valid when human responses are obtained without supplying categories and values [13]. The sets of images can suggest general responses. To prevent any suggestion by the researcher at all, studies by Gerald Zaltman [14] in the field of advertising request participants to look for and bring their own images-as-metaphor to interviews, although this may result in less compatibility amongst participants and requires more participant effort.

In practice the technique calls for little researcher intervention. Prompts generally took the form of requests for further explanation of a thought or feeling (represented by the image) in relation to their workplace. Selecting images symbolising their spatial experience was quick and easy for respondents, but associating it with the actual physical environment









Example results from case study in China		
Image selected	Transcript	Area of workplace
	<i>Because it's very simple. Because I'm a Finance guy, I see simple. The message is very important. You can see the work environment that we have no doors. And, I think it's very simple. Simple means if you have a door, that means some people want to hide something, but the principle here, in X, is that nothing is confidential. Door is always open for you. Even the boss.</i>	
	<i>I think I will choose the bicycle. To work in X, everyday you feel you have full of energy. R: Can you pinpoint any particular things? For example, the environment here is always very bright. We have full abundant of sunlight coming from the window. So make you feel...have a good feeling.</i>	
	<i>This one is kind of like, it's very plain, lack of life. How can I say that? I mean there is no flower and no something live. Just very plain. And maybe it's better I think if you put some green plant or everyday you have some fresh flowers... because sometimes if you have some new things you will feel very excited. Maybe you don't know why because, but you think oh I'm excited. I'm very happy. And then you think of it. Oh yes I bought a new T-shirt just like that. But it will make you very happy I think.</i>	
	<i>This guy just all quiet and lonely in the deep ocean. Sort of this quiet individualism that when you actually sit down at your desk you know you're not really sure what's going on – the next person is 15 feet away and you don't – you can't hear anything you don't know what they're doing you know? Even though this is a very, very open office, because it's so big I don't feel like communication could flow as effectively as if we were quite frankly in a smaller space.</i>	

Table 1. Table of interview responses from Chinese case study. The images left are those selected that elicited the response in the middle column. The image right shows something of the physical workplace referred to in the transcript fragment.

was less straightforward. The images certainly enabled the discussion to flow. The images in this study are presented, selected and manipulated digitally. This worked very effectively as the process was also recorded for each participant for easy review later, but it also projected to participants that the study was modern and up-to-date. Additionally participants were not 'interviewed' in the traditional sense as they were not always facing the researcher but interacting with a screen, clicking on images and moving them about, thinking and talking freely. Anthropologist Sarah Pink has suggested that the future of visual research will depend on researchers using digital media [15]. It has become easier to use and economically accessible. Pink's future directions primarily refer to methods of collecting visual images as data (such as digital video), or using new technologies to present research results (as opposed to say a book or a film).

A feature of qualitative research is its reliance on fragments of transcript as evidence. The following figures present interview fragments as samples of evidence collected using the data collection methods outlined above. When writing up results, direct quotes are used to underline a point, illustrate an assertion or to develop an argument. This has its limitations, such as pretext and context, misunderstanding and misinterpretations; however carefully treated this research approach is acceptable and has a long and established history. The resulting data has been used to assemble aspects of work culture, illustrations of embodied practice and compositional routes through the workplace. Figures 1 and 2 following exemplify the data collected using the technique. The image on the left is the image the participant selected in the study, the piece of transcript is in the centre and an image taken by the researcher on the right showing something of

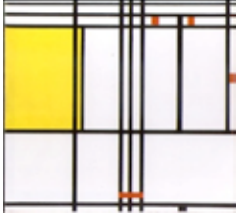







Example results from case study in Australia		
Image selected	Transcript	Area of workplace
	<p>Because it has kind of like direction, a certain layout, a certain uniformity and everything thing is like joined somehow. Its got six levels and it's got a common atrium on every floor.</p> <p>The thing that made me choose this is because it's got that. it runs through down the middle. So, it's like the way this building is set up. It's got this spine that joins everything altogether.</p>	
	<p>I have to say I think that one. The reason being is we do have a lot of breakout areas in our building so if you ever get stressed out or if you need to think about something you can always get a cup of tea and just go sit in the breakout area, take some time out. There's no breakout areas anywhere else that I've been.</p> <p>You have to actually physically walk out of the building and go across the road to a park or something like that. Whereas this one is like ready-available. The breakout areas are like right next to the atrium so you can actually look down and just kind of get away from like your headspace.</p>	
	<p>Because they're on the move. This building because it's so open and like people can see what you're doing and you can see what other people are doing. It makes you do things, makes you work.</p>	
	<p>Probably that's the one. There are divisions within the area, in the work area but they're not that high. So you still get a sense of even though you have segregated areas you still have ways in and ways out of them and you don't feel as though they're enclosing. It's as though you're actually walking above them.</p>	

Table 2. Table of interview responses from Australian case study. The images left are those selected that elicited the response in the middle column. The image right shows something of the physical workplace referred to in the transcript fragment.

the physical workplace referred to in the transcript fragment.

The resulting data can then be organised using grounded theory. Grounded theory is built out of data collected, rather than a preconceived theory in mind [16]. From the data collected, key parts are coded. These codes are grouped into similar concepts to make them more workable. From these concepts categories are formed, which are normally used as the basis for the creation of a theory. ¹

5 Conclusion

Responding to metaphoric images was used to produce richly layered accounts of the complex experiences of an everyday design experience. The examples above support the notion that metaphor is related to thinking and 'essential for how people communicate about abstract, difficult-to-talk-about ideas, and about aspects of ordinary experience' [17]. If participants in

the above example were not encouraged to think and discuss their thoughts using metaphors the research would not have yielded the same results. Metaphor can be used to investigate spatial design experience. Utilising Lakoff and Johnson's notion that our conceptual system is largely metaphoric and image-as-metaphor are steps towards achieving the elusive research aim of investigating users' experience of spatial design. In addition, data collected using metaphor focuses on the particular and can be analysed and interpreted to explore larger themes.

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The phenomenology of getting used to the new: Some thoughts on memory, perception, numbing and the Zen-view

Abstract

In this text I set out to reflect on the relationship between human perception and the usability of some designed artefacts. Beginning with own observations the text looks at the relationship between two phenomena: The ease with which we perceptually desensitise to conditions of our environment such as designed artefacts, and secondly, the designerly dilemma of innovative artefacts, that create an undeserved sense of trust that may result in unintended effects. It shows how these two phenomena are intrinsically linked to what the neuro-sciences describe as learning. Subsequently the text will look at several strategies that aim at preventing this type of adaptation. The text concludes with an example of a semantic designerly mapping that sustains the experience of initial surprise and prevents the effect of numbing. The paper argues that designers could benefit from a better understanding of the dynamics of human perception in order to inform design research methods and design education to consider these perceptual processes. The primary goal of this text is to create a debate around these phenomena and show their relevance to design problems.

Keywords

Usability, Human-Factors, Phenomenology, Design Research, Design Semantics, Design Methods

I Introduction

In 2006 Klaus Krippendorff created a comprehensive definition of design semantics that consisted of two distinct parts. The first part of his definition describes design semantics as *“A systematic enquiry into how people attribute meanings to artefacts and interact with them accordingly.”* [1] The second part as *“A vocabulary and methodology for designing artefacts in view of meanings they could acquire for their users and the communities of their stakeholders.”* [1] The following enquiry attempts to investigate the relationship between his first definition, *“how people attribute meaning to artefacts and interact with them”* and a phenomenon which media art historian Oliver Grau describes as an audience over time *“harden[ing] to [a technology’s] attempts at illusion”* [2]. This paper tries to investigate the relationship between these two states: How people create meaning from and interact with artefacts, and the effect of ‘hardening’ or numbing to a technology. Computer Scientist Paul Dourish writes in the context of interaction design: *“Meaning is an aspect of use, interaction and practice, it is something that resides primarily in the hands of the user, not of the designer.”* [3] It appears that the most a designer could do was suggest a meaning, and it was the audience’s choice to accept that suggestion or construct their own. Maker and user may have very different perceptions of what an artefact means. Krippendorff’s first definition is about about semantics,

the study of meaning. His second definition is about design semiotics, the study of signs. With the first definition the focus widens from the narrow field of a designer's repertoire of signs or what an artefact intends to communicate, to people's perception and how they view and use an artefact. This is a radical shift in focus when we think of design from the perspective of a rational engineering tradition. It moves the perspective from the relatively confined, clear, and safe terrain of methodically vindicating an artefact's properties by referring to an established design vocabulary into the much wilder, more complex and irrational world of how different individuals make sense of and construct reality. Traditionally this had been primarily the concern of fields such as philosophy, psychology, the social sciences or ethnography. So how do designers find out what is going on in people's minds when these engage with their artefacts? The rising popularity of qualitative design research methods, such as participative methods that involve stakeholders or various interview techniques, may be an indication for the growing acceptance of these systematic enquiries and their benefits.

The focus of the following discussion is located between these domains, people's perception and the surprising ease with which we become desensitised - or numb - to environmental conditions in general, and specifically to new technological artefacts. The text demonstrates some of the effect's negative and positive dimensions and introduces various multi-disciplinary strategies to contribute to a designerly debate.

The text will make use of the terms desensitised, numbing and perceptual adaptation synonymously, in the sense of a person's lack of conscious awareness of an environmental condition.

1.1 Numbing to the new

I would like to begin with two personal observations that I made, and which lead me to the insight that human perception is more complex than we might assume and that as designers we need a better understanding of how we humans process our environment and engage with artefacts.

My first example concerns watching the music video "Out of Space" [4] by the band Prodigy from 1992. When I watched this clip for the first time in 1992, I perceived it as being of unprecedented speed and without narrative. In my memory this 4:23 min video

consisted of a very rapid succession of short haphazard video sequences of low quality, juxtaposed in no clear relation to one another and edited at unprecedented speed. Watching the same video again in 2010 was a very different experience: Not only did it appear much less rapid and haphazard than remembered, but its speed was perceived as not very different to contemporary television advertisements targeted at a mature audience. It appears that either my memory is unreliable or my perception has adapted over time without my conscious awareness. This leads to the conclusion that the average video today may be edited faster than avantgarde videos were in 1992. I discussed this observation with peers and several agreed that they had had similar experiences. Conclusive evidence would require to compare quantitative formal properties of a selection of relevant historical videos to contemporary music videos, consisting of properties such as cuts, editing-speed, beats per minute, visual effects, colour saturation, camera movements, zoom effects and their simultaneous combination. However there appears to be some indication that a style of "radically novelty" has the power to surprise temporarily only and that our perception adapts over time leading to an increasing rate of stronger effects for music clips to capture our attention.

Related to the experience above is the second example, which is about another aspect of memory, about the disappearance of something quotidian from conscious perception. I believe many will have experienced surprise and disbelief upon the inability to remember the distinct appearance of a familiar building that has been demolished. Although, we may think, having passed by this building in the past, countless of times we may have difficulties to remember what it looked like. In our memory we may have a vague recollections of its height and shape but we cannot clearly recall details, especially if the building has no personal relevance to us. We may wonder how this happened, and why, despite having passed by it so many times, the building's details have disappeared from our memory? Such an experience questions the accuracy of our memories and our cognitive capacity to recall familiar environments. In that respect these experiences are deeply unsettling as they demonstrate that there are 'blind spots' in how we perceive and remember the world around us. Paradoxically it may exactly be this process of repeated exposure unassociated with a salient personal

experience that can be seen as the cause of this process of erasing it from our conscious awareness and memory. Neuro-scientist Wolf Singer writes about this filtering process: “We see, *what is useful to see*.” [5] Apparently if seeing the building is not ‘useful’ and nothing attracts our attention from its busy urban context, we cease from actively perceiving it. It blends into the background until a change may attract our attention again, such as when it has disappeared.

The opposite takes place when we visit a town for the very first time. While we still orient ourselves we will experience it in great richness and detail. Everything is perceived as new and unfamiliar. This ephemeral outsider’s perspective allows us to experience the place in a manner very different to that of the town’s permanent residents.

What combines the two observations? In both cases the perception of an artefact changes over the passing of time. The novel and highly unconventional form of a music video begins to appear conventional (tacitly compared to the context it emerged from), while the familiar memory of a building in fact is not familiar and not memorised.

How are these two observations relevant for art and design? Knowledge of such perceptual processes may be invaluable and inform our processes of conceiving and making. We now know that novelty soon wears off and that details of artefacts we do not use regularly are forgotten although we are not aware of this process. It appears to be a property of our perception that we become ‘blind’ to conditions of our environment that are not important or significant for other reasons. Media artist David Rokeby observes: “*It seems that we stop seeing, hearing, smelling as soon as we have positively identified something. At that point, we may as well replace the word for the object. Since identification usually happens quickly, we spent most of our time not really sensing our environment, living in a world of pre-digested and abstracted memories.*” [6]

Why does this desensitisation happen? How do we get used to things so easily? From an evolutionary perspective it may be crucial: Our attention does not remain locked upon the known and familiar, but is captured instead by the new and unusual. Would we, for example, continuously be aware of the sensation of our clothes on our skin we would have difficulties paying attention to more important events.

Is this, from a design perspective, a beneficial or an adversarial effect? Of key relevance appears to be the fact that this process is regarded as an important part of how intelligent beings learn when directly engaging with a new condition. “*When a new event is perceived it is first treated as a novelty, with either a positive or negative reaction. Then the novelty is replaced by an expectation. This is the basis of learning. When the expectation is not met, there is the accompanying emotion of disappointment or even anger or frustration.*” [7] Tom Mitchell, Chair of the Machine Learning Department at Carnegie Mellon, researches [8] the physiological processes between the brain and the central nervous system. He describes that, while initially an event receives attention *because* it is recognised as a *new* type of event, in a repeating encounter this curiosity and conscious attention is replaced through an *expectation*. Our perception is economical and selective in what reaches our consciousness. Speed of processing is given primacy over accuracy. Once we have learned how to use a new artefact, the novelty factor has worn off and we have certain expectations of what it affords. A continued treatment as novelty could be regarded as a result of amnesia, a loss of memory, whereas the ability to recall it in all its detail would be a case of eidetic memory, another medical condition in which photographic recollection of complex visual detail, so called eidetic perception [5], is seen as the result of a higher brain dysfunction.

There is evidence that numbing to the novelty factors of artefacts is part of how intelligent beings learn, especially to engage with technology in a continuously changing world. Numbing in fact is a useful function of learning would perhaps better be described as adapting. It allows our brains to adapt to change fast so that our limited attention is free again to select those signals that should be processed with conscious awareness.

What is the relevance of these neuro-scientific insights for designers? During the process of learning the artefact’s initially novel and intriguing capabilities gradually diminish behind their utilitarian functionality. In the beginning it may require time and effort to master the complexity of, for example, navigating the web with a web-browser application, but over time people gradually master this activity almost intuitively. In fact they may become so adapted to the browsers affordances that these soon are perceived as a precondition and they become reliant upon

them, similar to an intuitive tool that disappears from conscious perception once one has become accustomed to it. Then the initially new technological artefact may become seamlessly integrated into a lifestyle.

Though, if our expectations are not met, and for example the Internet connection is not working as expected, we will probably get frustrated. From a usability perspective this seamless integration is a best-case scenario and a sign for a successful design. However, while in some cases this process of perceptual adaptation may be beneficial, as in the effortless handling of computer mouse and web-browser and their seamless integration with short-keys that provide short-cuts for so called power users, this process of adaptation is not always desirable. Such an example would be the adaptation to speed for the driver of a car on the motorway. While driving the driver will adapt to the speed relatively higher than on conventional roads. When exiting the motorway the driver may seriously underestimate the remaining speed, and the car won't be able to stay on the tarmac. Unless the car is equipped with assisting technological features that automatically decelerate and control traction the car may leave the road behind. Many motorway exits show signs of motorists underestimating their speed. So while in some cases perceptual adaptation is convenient and even pleasurable there are critical individual exceptions.

From a design perspective this is another dilemma. While in most circumstances we want our designs to be most effective, there are certain cases when they prove too successful. To demonstrate the relevance of this as a designerly dilemma this paper will use two examples to illustrate the context, followed by a selection of strategies, some developed by other disciplines, that aim at preventing people from numbing their conscious awareness. While the paper is mostly concerned with research into interaction design, these examples include domains such as computer science, architecture, philosophy, spirituality, industrial design, fine art and psychology.

1.2 Example 1: The surrender of driver's responsibility to satellite navigation systems

Shortly after satellite-navigation systems were introduced in cars in the early 1990's media reported the first accident by a driver who had blindly trusted the system and driven consciously into a river. The road had



Figure 1: "Do Not Follow Satellite Navigation" road sign in Colchester, United Kingdom, 2007, (CC license from Unhindered by Talent@Flickr)

wrongly been assigned by the system as being equipped with a bridge while in fact a ferry service connected the two sides. Since then many of these types of accidents have happened in which motorists followed the instructions of satellite navigation systems without much conscious critical awareness. In this we see an example of how a technology can provide a false sense of reliability and safety. What makes drivers suspend common sense and completely trust a technology? What is taking place during this process?

From a perspective of trust the product is successful. Many users appear convinced of its accuracy that they trust it blindly. From a health and safety perspective it is precarious though. Here we have an example of a designerly dilemma. The design functions so well and is perceived as so reliable that many users do not question its accuracy and uncritically follow its instructions against common sense. While the responsibility may lie in psychological factors of the users this also is a design problem. What could be a design solution? The producers of these systems experimented with different male and female voices and text messages that remind drivers that they were driving, not the system. Yet, the problem still persists after two decades. Many communities in countries in which Satellite Navigation systems are common, have installed warning signs along designated spots that warn not to follow satellite navigation systems. While some of these signs are



Figure 2: "Type n Walk" screenshot of iPhone application demo video by 'Type n Walk,' which augments a live video feed from the built in camera in the background of the typing area. This allows to pay undivided attention to the screen and watching the immediate path ahead at the same time.

vernacular and hand-made, below is an official example from Britain installed by the city of Colchester after a number of traffic accidents in which trucks got stuck in a narrow street.

Without such a system many drivers would probably become aware of the hazard in time. Yet trusting the system, their awareness or alertness is somewhat suspended by the sense of reliability acquired while adapting to the system.

1.3 Distraction: Dividing attention between mobile devices and primary tasks

Other examples include users of mobile phones. Figures show that many humans have difficulties multitasking and dividing their attention between several activities at the same time. As a result of road accidents related to mobile phones many countries have prohibited their use for motorists while driving. There is no legislation in place yet for pedestrians, although these are involved in mobile phone related accidents as well. Recently a pedestrian in New York City was in the news having fallen into an open and unsecured manhole while typing a text message on her mobile phone while walking along a sidewalk. [8] This example may be less a design problem than plain frivolousness but it shows that we have difficulties multitasking.

Like Yin & Yang, the car introducing the car accident, technological disasters are out-innovated by new technical inventions, an arms race of design solutions leading to a continuously operating pyramid scheme of innovation mitigating old problems while causing new ones.

For the owners of iPhones there is an application that aims to ameliorate the dangerous implications of typing while walking. The application "Type n Walk" [9] uses the built-in camera to augment a live video feed behind a screen-based mode for writing. This live perspective of the view ahead allows the user to focus on the screen while typing and walking simultaneously, without having to divide the attention between the screen and the immediate path ahead. In its unique use of augmentation "Type n Walk" resembles telepresence, where people have the experience of leaving their local space and their body behind to feel present at a remote or virtual location. In this detachment from the physical world "Type n Walk" reminds of such a technologically induced out-of-body experience.

While this design solution aims at making texting safer and easier by being less distracted, there must be areas which require the opposite: Making the use of an artefact less easier but more difficult. In this area designers will consciously implement features that make the use of an artefact more difficult so that it requires the users full attention. In which domains would this be useful? Where do designers consciously design so users do not too easily adapt to an affordance? Where is it necessary not to numb but to stay aware or even alert? In this context safety critical artefacts such as child proof cigarette lighters and containers for hazardous materials such as medicine bottles or household chemicals come to mind.

2 Strategies against perceptual adaptation, which support conscious awareness and reflection

Our brains adapt to change with surprising ease and speed. This innate ability enables most of us to adapt successfully to a fast changing and complex technological world. On a daily basis we learn how to use new operating systems, new interfaces of game consoles, remote controls, mobile media, vending machines and atm machines. This change also entails mirroring social and emotional involvement via image, link, or

video sharing tools such as Flickr, Twitter, Youtube, Delicious and Facebook, via desktop computers and mobile devices. While most of these media and their interfaces have not been around a decade ago, they have become intrinsic parts of the lives of many. Effort has been made on both sides, by the makers and the users. These media have been designed with great care with, to paraphrase Krippendorff, 'a vocabulary and methodology for designing in view of meanings' but the design has been 'completed' by people's adaptability to 'attribute meaning from artefacts and interact with them.' Over time attributing meaning to an interface requires less conscious effort and is becoming a more deeply engrained ability.

In some critical circumstances the ease with which technology allows us to perform is deliberately impeded, some computer systems for example require to re-confirm critical activities such as deleting files or spending money during online transactions. Here designers have purposefully made an operation more complex than necessary in order to interrupt the flow of activity with the aim to receive the users conscious attention during performing their decision. From a designerly perspective we have to ask ourselves where it is necessary to hinder and interrupt a sequence of activity to enforce a moment of conscious awareness if not reflection? What could strategies in support of conscious awareness and reflection look like? Where are they useful and where are they not?

What follows are selected examples from different disciplines that argue in favour of reflective mental states and conscious awareness. Their strategies either sustain or regain a mental state of conscious awareness or they require conscious effort to perform a task. The first applications coming to mind are cigarette lighters with so called "child resistant" features. Their function as a lighter is purposefully made difficult in order to prevent children from being able to start a fire. The designerly solutions for these lighters are manifold and range from intricate covert mechanisms to rather unsophisticated triggers that simply require the brute dexterous force of an adult's hand to be activated.

In 2006 computer scientist John Lenaric published "The antiusability manifesto" [10] in which he argues that usability was not always desirable for ethical reasons. His rationale of ethics can be interpreted as being located in two domains. On one hand it was

ethical to allow users a conscious awareness in regard of choice and options. Lenaric writes "*To be automatic undermines one's opportunity for reflective choice*", thus emphasising the act of individual reflection and conscious control. The other domain is to encourage to design for a change of behaviour. "*The way one is compelled to use any device by virtue of its design can modify the behaviour of a user for better or worse. They can be either features or obstructions or both.*" For the latter idea we can easily see an application in artefacts, which display their consumption of energy, thus alerting users to conscious economic behaviour and sustainable conduct. Here the ethics can be interpreted as encouraging a change of behaviour as a result of increased transparency allowing reflective choice. Shying away from 'automatic use' may be an important requirement in future applications to save energy or resources. An elevator, for example, could recommend using the stairs and voice the number of calories that would be burned during this process.

Another approach was chosen by Lars Hallnäs and Johan Redström in their text "Slow technology: Designing for reflection" [11] published in 2001. Although emerging out of a computer science context their concept pertains to virtual as well as physical artefacts. Their reasoning is that as technology was increasingly extending beyond the workplace out into peoples everyday lives, efficiency was not always a necessary requirement. Their concept encourages states of reflection and contemplation over efficiency and performance by emphasising two factors: Slowness and aesthetics. The slowness is necessary to consciously reflect on a process, for example in a learning situation, and the aesthetics of interaction, which emphasise phases of transition. The authors point to architecture and interior design as examples of disciplines with more holistic views that take a whole environment into account. At the heart of their enquiry appears to lie an idealistic view of design that it should support the quality of life.

Through the ubiquity of high quality screens in mobile devices it is possible to see support for their claim for aesthetics. Highly aesthetic transitions, visuals and finely rendered typography are becoming standard 'eye candy' on ebooks and mobile applications. These may not be comparable to qualities of the natural world but add an emotional and pleasurable property to the interaction with digital devices in their own right.

An architect's strategy against adaptation is introduced with Christopher Alexander's "Zen View" [12] presented as pattern 134 in the text "A Pattern Language." Alexander writes: *"If there is a beautiful view, don't spoil it by building huge windows that gape incessantly at it. Instead, put the windows, which look onto the view at places of transition- along paths, in hallways, in entry ways, on stairs, between rooms. If the view window is correctly placed, people will see a glimpse of the distant view as they come up to the window or pass it: but the view is never visible from the places where people stay."*

The pattern's title alludes to architectural features recorded in monasteries. Often located in spectacular geographical settings allowing highly aesthetic vistas upon the landscape they often are architecturally inward oriented and surrounded by high walls. This constrains the perspective upon the surrounding environment during many activities.

Alexander's method requires little effort from its users. All thought and critical reflection has been put into place by the designer in a top-down manner. It is based upon the simple yet highly effective principle of limiting exposure to an aesthetic experience. It is temporary and ephemeral in nature and the combination that the experience may be the unexpected result of a mundane activity seem to contribute to the quality. As a result it is possible to enjoy the experience over and over again. This principle is also applied to artefacts that reveal an unexpected aesthetic side in unexpected moments. Examples would be software error messages in rhyme form, a colourful fabric inside an otherwise very formal jacket or the fine detail of sculptures on buildings that cannot be seen from street level. Becoming aware of the aesthetics and attention to detail in unexpected moments creates such an experience of the 'Zen View.' The principle works by radically limiting exposure. Media artist David Rokeby describes another method that succeeds through enforcing the opposite, an over-exposure:

"I had an experience in art school [...]. One of my professors told us one day that we would be looking out a window for the whole three-hour class. I was incensed. I'd been willing to go along with most of the unusual activities these classes had entailed, but I felt this was going too far. I stood at my assigned window and glared out through the pane. I saw cars, two buildings, a person on the street. Another person,

another car. This was stupid! For fifteen minutes I fumed, and muttered to myself. Then I started to notice things. The flow of traffic down the street was like a river, each car seemingly drawn along by the next, connected. The blinds in each of the windows of the facing building were each a slightly different colour. The shadow of a maple tree in the wind shifted shape like some giant amoeba. For the remaining hours of the class I was electrified by the scene outside. After fifteen minutes, the "names" had started separating from the objects." [5]

The method experienced by Rokeby appears to be related to Eastern spiritual thought and meditation such as described in "Zen mind, Beginner's Mind" [13] or "The Miracle of Mindfulness" [14]. Both texts introduce pragmatic methods to sustain states of conscious reflective awareness. Rokeby's method is based on over-exposure and is time consuming. It allows to regain a temporary outsider's perspective upon a well known scenery and can possibly be also applied to interactive scenarios.

The final examples emerged from a computer science background and are by William Gaver, Steve Benford and Jake Beaver. Their three ambiguities of design, described in detail in their 2003 paper "Ambiguity as a Resource for Design," [15] appear as three broad classes: Ambiguity of information, ambiguity of context and ambiguity of relation. They regard ambiguity as a rich resource for designers to encourage close personal engagement with systems. In their paper they analyse existing artefacts originating from art as well as design and describe tactics for emphasising ambiguity that may help to understand and craft its use. They see the advantages of ambiguous artefacts as experiential factors that make artefacts intriguing, mysterious and delightful. *"By impelling people to interpret situations for themselves, it encourages them to start grappling conceptually with systems and their contexts, and thus to establish deeper and more personal relations with the meanings offered by those systems."*

[15] Their rationale is also based upon the observation that digital technologies are increasingly used beyond the workplace in everyday life where efficiency and usefulness are not primary concerns. They conclude: *"Ambiguity of information impels people to question for themselves the truth of a situation. Ambiguity of context can question the discourses surrounding technological genres,*

allowing people to expand, bridge, or reject them as we see fit. Ambiguity of relation, finally, can lead people to consider new beliefs and values, and ultimately their own attitudes. In each of these cases, ambiguity frees users to react to designs with scepticism or belief, appropriating systems into their own lives through their interpretations.” [15]

To an extent design is taking on methods traditionally associated with the arts. Art often gains its power through its ambiguity and openness to different interpretations, while design mostly strives to be clear and intuitive. While art asks questions, design provides answers to clearly defined design problems.

2.2 Case study: Design semantics and ambiguity of information in Webpresence

In 2008 I began research on “Webpresence” [16][17], a project that indicated visits to the project website through a physical display in the office space. It was thought to add an experiential quality that would add a sensual dimension to otherwise abstract asynchronous website statistics. Three different displays were tested with varying results. An LED as display provided an unambiguous indication of a new visitor to the website but quickly lost its quality to delight within hours of installation. Additionally its semantic mapping of a blinking light was perceived as too haphazard and unrelated to the event of a visitor arriving. The second display, a miniature vibration motor, reminded of a doorbell. Semantically this was more appropriate yet the resulting sound was perceived as too disruptive and interfering with primary tasks at the workplace. The most felicitous mapping consisted of a curtain actuated by a silent fan. Semantically it evoked a visitor opening the door and causing a draft which in return would gently billow the curtain. Conceptually this approach mapped the virtual location of the website onto the physical location of the office, thus merging both formerly disconnected spheres in a one-way connection. Surprisingly this poetic display did not lose its appeal over time. It avoided the effect of adapting to it through exposure. Which properties of the display prevented this effect?

As the motion of the curtain was perceived as very natural and the fan was completely soundless, its function as a display was ambiguous. It was necessary to distinguish if it billowed as a result of a natural draft or a draft caused by the fan. This required to reconfirm

its cause by a quick glance if someone had entered the room. In these properties it resembled the ambiguity of information described above. Gaver (et.al.) writes that “they require users to fill in the gaps in information that is purposefully imprecise. When successful, such interfaces are not only aesthetically attractive, but conceptually appealing as well.” [15] As a result it is almost impossible to adapt to the billowing curtain indicating a new visitor to the project website.

Discussion and conclusions

As this investigation has shown the relation between perception, numbing, learning and the semantics of artefacts can be seen as a dynamic and paradoxical one. To numb, to learn and to adapt can be regarded as related aspects for human ability to successfully adjust to a continuously changing world. One way of viewing the overly negative association with “numbing,” is that we are very successful in learning and adapting to change, to integrate one experience and thus be ready for the next salient event.

The text introduced several design research examples that can stimulate users conscious awareness and thus may prevent numbing, among them: Opportunities for reflective choice, opportunities for change of behaviour through information and communication, a combination of features and obstructions, slowness and aesthetics, radically limited exposure while performing primary activities, radical over-exposure excluding any other activities, and finally three ambiguities as design resources: informational ambiguity, contextual ambiguity and relational ambiguity.

By expanding these strategies to involve users and capture the ways of how people create meaning, this could provide valuable contributions for a better understanding of the semantic dimensions of artefacts. This knowledge could again prove useful to inform the semiotic model of design theory.

Additionally we need a better understanding of the process of perception. This includes processing and memory: How we process our environment and how we remember experiences, as both are intrinsically linked to how we create meaning. This knowledge could be used to inform or analysis of own empirical data gathering in combination with bottom-up iterations of artifacts, created in participation with stakeholders and their needs.

Nevertheless, the ease with which we become accustomed to new artefacts may also have aesthetic dimensions determined by designers, and, not restricted to safety critical processes, these dimension may benefit under certain conditions, from a conscious awareness expressed through their design. The need for this could be seen in the designerly dilemma of people overly trusting technology against common sense, or frivolous behaviour, which again may have an appropriate design solution.

Perhaps it would be worth investigating some of the strategies above, such as ambiguity, in devices that have safety critical roles, as, for example, a car's accelerometer, this would not render the device 'unreliable' but require regular confirmation of their accurate operation. A state in which the perception of an artefact shifts between ready-at-hand (zuhanden) and present-at-hand (vorhanden) depending on the circumstances – yet without adding another layer of complexity. Informing the critical empirical design explorations by theory of the cognitive sciences could help to create better design research methods, inform design theory and may also benefit design education.

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Design semantics of connections in a smart home environment

Abstract

As the environments in which we live become more intelligent—through more computational power, embedded sensors and network connections between the devices that reside in the environment—there is a risk of leaving its users clueless about what is going on. User interaction changes from interaction with a single device into interaction with a larger system—an ecology of things. Physical things are becoming mediators between the physical world and the digital, invisible world that is inside and behind them. The work we present in this article is part of ongoing academic research on using explicit design semantics to convey abstracted models of connections between devices in a smart home environment. This enables users to understand and construct meaningful mental models of the smart environment and interact with it accordingly. We illustrate our findings by presenting a demonstrator that gives users physical control over invisible, wireless connections between devices in a home entertainment scenario.

Keywords

Product Semantics, User Interaction, Smart Home, Interaction Design

1 Introduction

As computers are disappearing into smart environments, like envisioned by the “Ambient Intelligence” paradigm [1], novel human-computer interactions will be needed to deal with the complexity of such hybrid environments, merging the physical with the digital. Ambient Intelligence envisions digital environments to be sensitive, adaptive, and responsive to the presence of people, and will change the way people will interact, not only with the environment itself, but also with the interactive multimedia through the environment [1]. Over a decade of research has led to several interesting interaction paradigms such as tangible interaction, augmented reality and mixed reality. Already in 1997, Ullmer and Ishii [2] introduced their vision on a new interaction paradigm for Ubiquitous Computing. By providing physical handles for digital information, users can use the senses and skills that people developed during millennia of interacting with physical objects [2]. Other related work presents solutions for simplifying configuration tasks of in-home networks by creating virtual “wires” between physical objects like memory cards [3] that can interconnect devices. Others propose to introduce tags, tokens and containers [4, 5] for tangible information exchange. Concepts like “pick-and-drop” [6] and “select-and-point” [7] are used to manage connections and data exchange between computers and networked devices, and augmented reality solutions

are considered [8]. The introduction of near field communication, using a near field channel like radio-frequency identification or infrared communication, allows for direct manipulation of wireless network connections by means of proximal interactions [9]. Related work is not limited to the network configuration tasks themselves. Visual metaphors to show the progress of making short distance wireless connections, such as Bluetooth pairing, and the affordances and aesthetics of making connections by physical contact between devices are investigated in [10]. What sets the work presented in this article apart from many of the earlier “Tangible User Interface” concepts is our focus on connections. Instead of giving digital information physical containers/representations as done in many tangible user interfaces, we allow for exploration and manipulation of the connections “carrying” digital information (pipelines instead of buckets). We see these connections as both real “physical” connections (e.g. wired or wireless connections that exist in the real world) and “mental” conceptual connections that seem to be there from a user’s perspective, and their context (what things they connect) is pivotal for their meaning. We aim to enable users to explore and make configurations on a high semantic level without bothering them with low-level details. We believe this can be achieved by making use of Semantic Web technologies and ontologies in an interoperability platform as proposed by the SOFIA project (<http://www.sofia-project.eu/>). Such a platform could be used to support semantic interaction in a smart home environment [11].

For users to truly benefit from smart environments it is necessary that users are able to make sense of such an environment. One way of facilitating this “sense making” is through design. Things make sense to users in different ways, by use and functioning, by appearing in language and human communication and social use [12]. If we look at meaning from an *Internet of Things* point-of-view, physical connections between artefacts, and conceptual and metaphorical connections play an important role. Artefacts can be physically connected by wired or wireless communication, but people also tend to group artefacts that are not physically connected together by finding resemblances in their meaning. In smart environments with many interconnected and interoperable objects—hiding their physical connections—these conceptual and

metaphorical connections become even more valuable, and maybe even crucial for the understanding of a smart environment. Without this understanding there is the risk of engendering a mismatch between the system’s model of interaction and the user’s mental model of the system. In these conditions, using explicit design semantics can be used to help users to construct helpful mental models, in order to minimize system and user model mismatches.

Our research is centered around developing visualization and interaction techniques for semantic connections/interactions, to support information presentation and to increase information and service awareness. Additionally, focus will be on user conceptual models, and developing ways to represent the configuration of, and information exchanged within a smart home environment. It is key to make proper abstractions of the network configuration, information exchange and available services, helping users to construct helpful mental models to understand a smart environment. When having a proper understanding of the smart environment and an increased awareness and manageability of available services, we envision a better user experience and a higher user acceptance. Design theory like product semantics is utilized to find handles for these new interactions [12, 13], and will be used to design meaningful objects and interactions. This will enable users to interact with a smart environment, through interaction with interactive objects.

2 Product semantics

Product semantics is a theory about how products acquire meaning. Product semantics was defined by Krippendorff and Butter in [14] as being both:

“A systematic inquiry in how people attribute meanings to artefacts and interact with them accordingly.”

and

“A vocabulary and methodology for designing artefacts in view of the meanings they could acquire for their users and the communities of their stakeholders.”

Product semantics shares many concepts with semiotics, the theory of signs [15]. Within the context of smart environments, an increasing amount of automation and increasing interconnectedness will have a negative impact on the meaningfulness of products. Of course, our understanding of products, and the way they acquire meaning, will also change. Nevertheless, in the envisioned smart environments, we need to provide

users with handles and clues to make them understand what is happening and allow them to be and feel in control.

The origin of many of the problems that arise lies in the difference in nature of, or more precisely in the incompatibility of the physical world we live in, and the invisible world within our products. In order to understand products and systems, we develop a conceptual model of how we believe things work and how they should be used. These User Conceptual Models (UCMs) as defined in [12] are usually an approximation or simplification of reality. This means that these models are often incomplete and different from reality, but as long as they work for the users they do not need to be true. As long as the underlying mechanisms of the working of products are simple and reside in the physical world, they have a bigger chance to be understood and to make sense, and thus have meaning to their users.

Traditionally, product semantics is mainly concerned with physical objects. But meaning arises at different levels. In order to design for sense making, we need to look for references and resemblances between the new and known concepts. We distinguish between first usage (*ratio facilis*) and second usage (*ratio difficilis*) [16]. If we want to understand the semantics of the desktop computer, as it exists nowadays, we need to look back to the context in which it was originally introduced. Computers needed instructions; in the time of the first personal computers instructions to them were given by text input. That is why keyboards are so close to typewriters. To be able to output something we gave them a possibility to write back; having a display, as we knew it from early TVs seemed logical. But also in the interaction with computers, the desktop metaphor was introduced, and our hand to “physically” move things on our digital desktop was represented by the pointer of a computer mouse, the digital extension of our hand. Metaphorical connections are strong and welcome if we need to shape new, unknown concepts. But there might be different and better ways of making sense (p. 5 of [17]): *“The essence of a metaphor is understanding and experiencing one kind of thing in terms of another.”*

If we have a look at the innovation smart environments promise, the step forward would be improved interoperability and the added value this interconnectedness and information exchange offers. Important to note is that this added value is

an addition to the existing, basic functionality of the devices. An example of this can be found in [18], where interoperability between existing applications (exercise monitor, computer game, phone and media player) enables a scenario where a game called SuperTux would award extra lives for exercising (using an exercise monitor), a mood renderer embedded in a media player would play music depending on the game’s state, and the game and media player would react accordingly if the person received a call. Additionally, connecting smart devices to one another makes it possible to support high-level services that would usually involve multiple steps on multiple devices. From a user’s point of view, streaming music from a mobile device to a home entertainment system is a single high-level task. In practice there are multiple steps involved, and if the devices involved are from different manufacturers, the user needs to learn the operational details of each device interface in order to perform the task. But how will these additional, high-level services make themselves known to their (prospective) users? How will users discover the newly enabled functionality and how will they decide what they want, but most important, what they do not want? In order to make sense of the added functionality and new services the smart space brings the users, they should be able to manage it. And in order to manage it, they should be able to, to a certain degree, understand it. For example: in order to use a vacuum cleaner one should know how to use it and understand that the power cord needs to be connected to a working power socket for it to function. One does not need to understand how an electromotor works; neither does one need to understand the physics of electricity. We can find meaning in different layers. We can find meaning in the appearance of a product, informing us about the function of the product. But there is also meaning in the appearance of artefacts in language (e.g. vacuum cleaner; meaning something that cleans using a vacuum, or suction). This type of meaning has its roots in conventions and metaphors, and can be analyzed with the study of semiotics. At interaction level we find another level of semantics; concepts like feedback, feedforward and ecological perception (affordance) [19] play an important role here. Affordance is the property of an object that appeals to our sensory-motor skills, like a doorhandle that “affords” to be grabbed and a chair that “affords” to be sit on. When the insights of



Fig. 1. The demonstrator in action

Additionally, it keeps the interaction simple and information load for the users limited and therefore might allow for a more aesthetic and pleasing interaction. A video of the demonstrator in a simple home entertainment scenario is available at <http://www.youtube.com/watch?v=vdZcjfq8RQ>.

ecological perception were introduced into design, it fueled the design community to try and solve many usability problems. It was also adopted as a key element for what was called a *direct approach*. In this view, the meaning of things is created in action and feedforward and inherent feedback are considered key in making the abstract concepts in consumer products accessible to users [20]. But we can also discriminate between different physical layers of meaning. The appearance of a vacuum cleaner itself informs us about its usage: wheels to make it mobile, a hose and a telescopic tube with an ending that seems suitable for moving it over the floor's surface while standing upright. But when we open it to replace the dust-bag, there are physical clues about how it fits in there. However, these clues are hidden during

normal usage, as it is not of your concern when using it to clean. Now, how can we use this semantic design knowledge in order to design meaningful interfaces for smart environments? Or how do we reveal new possibilities in a meaningful way, when a new smart device enters a smart space?

3 Design case

To illustrate the above-mentioned concepts and ideas, we developed a demonstrator. This interaction tile (figure 1), inspired by Kalanithi and Merrill's "Siftables" [21], was designed to explore the connections and connection possibilities and enable direct manipulation by making simple spatial arrangements. The interaction tile visualises the various connections by enabling users to explore which objects are connected to one another and what can be connected to what. Coloured lighting and light dynamics visualize the connections and connection possibilities between the various devices. This is done by means of putting devices, or for non-mobile devices their representations, close to one of the four sides of the tile. A user can check whether there is a connection and if not, whether a connection is possible. By simply picking up the tile and shaking it, a user can make or break the connection between the devices present at the interaction tile. The design of the demonstrator allows for an "on-demand" visualisation and manipulation of the connections. When there are many connections in a smart home this is especially desirable, since users will only be dealing with the connections that matter to them at that moment. We also expect that the rather active approach in exploring the connections might help to explore the smart space—and build a mental model of it—step by step.

3.1 The scenario

"Mark is relaxing at home when his friend Dries arrives. Dries comes with a portable music player loaded with his favourite songs. He wants to play some of his recent collections for Mark. Mark's home is equipped with a sophisticated surround sound system. They decide to enjoy the music from the music player on the sound system. Mark uses his Interaction Tile to see if he can connect Dries's music player to the sound system, which is connected to the home network. The interaction tile indicates that a connection is possible and Mark picks up the tile and shakes it to make the connection.

All the smart devices in the home have a cube-like representation that can be used with the interaction tile. The interaction tile shows the connection possibilities with a high level of semantic abstraction, hiding the complexity of the wired or wireless networks. By interacting with the objects, semantic connections can be built, redirected, cut or bypassed. Dries starts streaming his music to the environment. Now the room is full with Dries's music and they both enjoy listening to it. Recently Mark has installed an ambient lighting system that can be connected to the sound system and renders the mood of the music by dynamic colour lighting in the room. Mark uses the objects again to create another connection and now the room is filled with Dries's music and colourful lighting effects.

Mark's roommate Sofia comes back from work and decides she wants to watch a movie on the TV. She seems somewhat annoyed by the loud music. Mark and Dries do not want to bother her and they again use the objects to re-arrange the music stream. Now the music is streamed to Mark's portable music player while also playing back at Dries's. It is also connected to the ambient lighting system directly, bypassing the sound system. They both are enjoying the same music using their own favourite earphones (and the colourful lighting effects), but without loud music in the environment. Now Sofia can enjoy her movie without any disturbing music."

From this scenario one can see that there are multiple ways and different levels of interacting with the smart devices in the environment. There are high-level semantic interactions with the interaction tile (explore/make/break connections) and also lower-level interactions with the music player (play/pause/stop music).

3.2 Design semantics

The design semantics of the demonstrator are simple and straightforward. The tile-shape shows clear clues about orientation, e.g. what side should be placed up. The four sides clearly show four possibilities for placing objects near the tile; the size of each side restricts the number of objects one can place close to the tile. When an object is placed next to the tile, the lights give immediate feedback when the object is recognized (figure 2c). When multiple objects are placed near the interaction tile, it will immediately show the connection possibilities (feed forward) by lighting

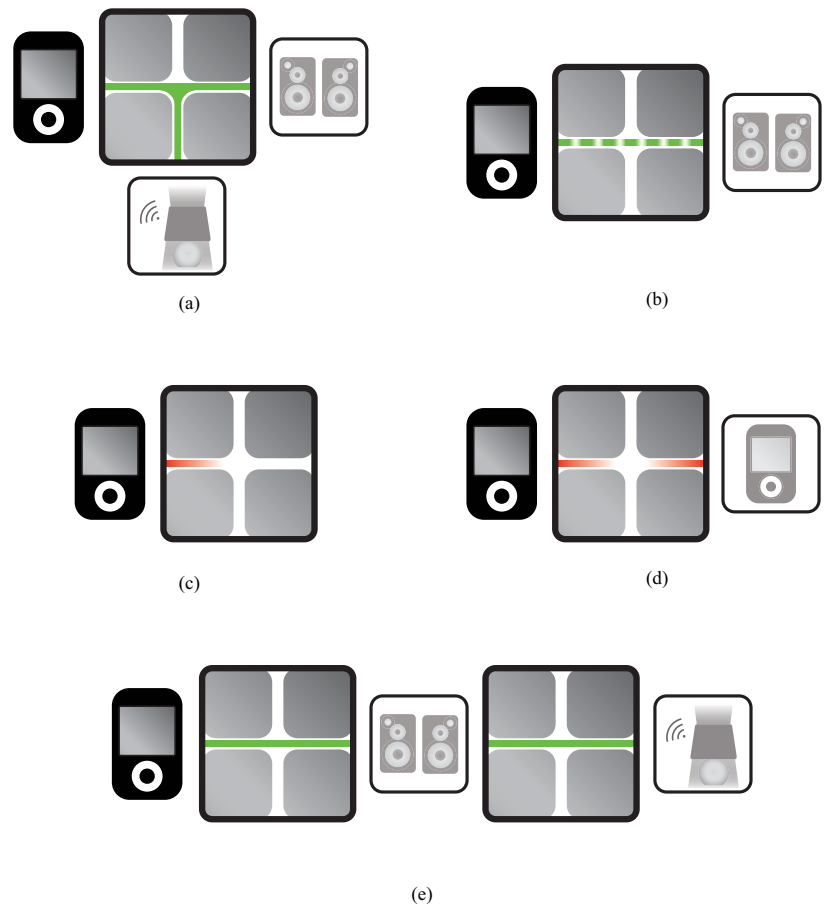


Fig. 2. Meanings of lighting colour and dynamics: (a) Green solid light means the devices present are connected; (b) Green, pulsing light means the devices are currently not connected, but can be connected; (c) Red solid light means device recognised, a second device is necessary to show connections or connection possibilities; (d) Red solid light means the devices are recognised, but no connections or connection possibilities exist; (e) Shows the possibility to use multiple interaction tiles to look into connections in a more detailed manner, however both (a) and (e) have the same meaning.

colour and dynamics. The lights' colour coding is simple and straightforward. Red colour means no connection and no connection possibility (figure 2d); green colour means there is an existing connection between the devices present (figure 2a/e) and green pulsing means that a connection is possible (figure 2b). To indicate that the interaction tile did sense the first object a user places near, it shows a red colour at the side the object was detected (figure 2c). Placing a second, third and fourth object, the interaction tile shows the lighting effect corresponding to their connection capabilities. By simply picking up the tile, and shaking it, the user can make or break the connection between the devices present at the interaction tile. The result of this action depends on the connection's current state, and the devices present; if the tile shows a connection possibility, the action will result in a connection event.

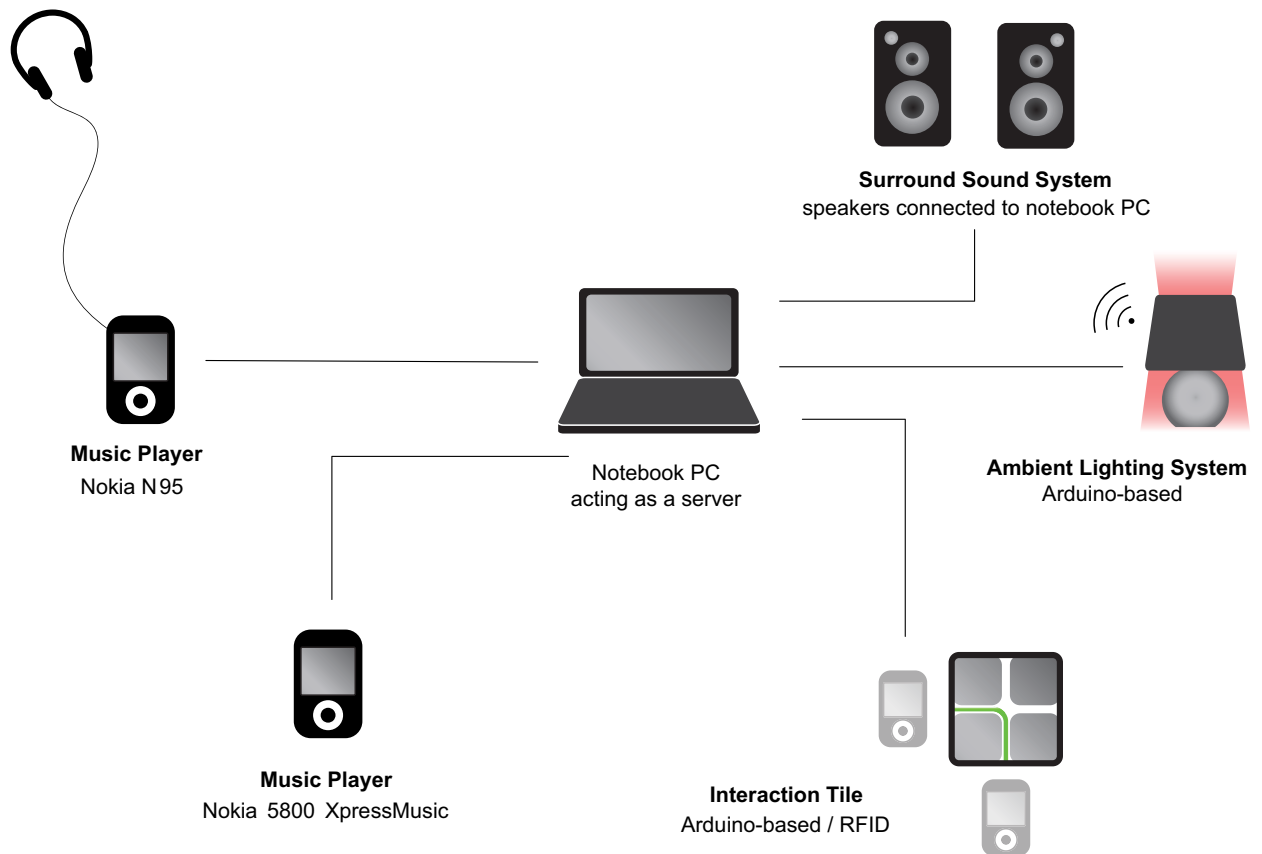


Fig. 3. An overview of the demonstrator

The same action performed when the tile shows an existing connection will break the connection. Although the expressiveness of the current demonstrator is limited because of its neutral shape and the use of single, multi colour Led lights, we see opportunities for further development.

We aim to enable users to explore and manipulate the connections within the smart space without having to bother with the lower-level complexity of the architecture. We envision this “user view” to be a simplified view (model) of the actual architecture of the smart space. Conceptually, the connections are carriers of information; in this case they carry music. Depending on the devices’ capabilities (e.g. audio/video input and/or output) and their compatibility (input to output, but no output to output), the interaction tile will show the connection possibilities. In our current demonstrator we do not distinguish between different types of data since we are only dealing with audio, but it will be inevitable in more complex scenarios.

We rely on the symbolic meaning of colour, green colour meaning, “proceed” and red meaning the opposite. Using the association of solid colour and

pulsing colour with solid and dashed lines we aim at referring to the “existence” of something and the “possibility” of something. This something is a connection, being invisible but with noticeable results (the sound of music out of a loudspeaker that you just connected to your MP3 player). We rely on iconic representation for the cube-like objects representing a stationary non-mobile device and on meaning resulting from direct manipulation of these objects we just described, representing other objects. People seem to be able to work with all these different (in fact rather complex) relationships at the same time, and our expectation is that we need the richness of all these mechanisms to successfully interact with our complex environments and the envisioned smart environments of the future.

3.3 Realization

The interaction tile acts as an independent entity, connected to the home-network. Figure 3 shows the system architecture of the current setup.

The interaction tile consists of the following components:

- Arduino board;
- RFID reader (MiFare);
- multi-colour Led’s;
- accelerometer;
- vibration motor;
- piezoelectric speaker;
- magnetic switches.

The demonstrator consists of the following devices:

- media players (Nokia N95 and 5800 XpressMusic smart phones);
- ambient lighting system (Bluetooth based);
- sound system (speaker-set connected to notebook PC);
- notebook PC;
- interaction tile.

4 Discussion

With the design presented in this article we made the invisible wireless connections visible. We also took it a step further by enabling users to physically explore and manipulate the connections. With this demonstrator we are exploring intuitive and appropriate ways to interact with the hidden digital world by enabling users to explore and control connections between devices. The current demonstrator helps us in defining more specific research questions and identifying key issues in using product semantics theory, to design for bridging the digital with the physical. Although simple, this demonstrator does show that making high-level semantic abstractions of normally low-level tasks has the potential to allow for semantic interaction in home-network configuration tasks.

Building this demonstrator also identified possibilities for improvements and extensions. As previously discussed, it currently does not distinguish between different types of information exchanged, nor does it show directional properties of the connections. By replacing the single Led lights with Led arrays we could show the dynamics of information flow. Using additional colour coding could show different types of connections (e.g. audio/video/text), or it could have separated modes of operation, where it only shows one type of connection at a time. Although currently all devices are represented by cubes, due to technological constraints, the cubes representing the mobile devices could easily be replaced with actual devices in future versions. When networking complexities increase and the connections among more than four devices should be explored/manipulated, multiple interaction tiles can easily be combined. Besides these observations, the demonstrator shows that even the slightest and simple ways of giving feedback (lighting colour and dynamics) can reveal meaningful information. To what extent users can extract meaningful information from the interactions with the smart space, and how they can use it to build a suitable mental model for understanding, is currently being evaluated.

Adding constraints, as in limiting functionality, or not using the full technological potential, is not necessarily a bad thing. These constraints are essentially guides and handles for users to understand what is possible and what is not, or what should be done in alternative ways. An example can be found in our implementation. When there are more than two devices present at the tile, indirect connections are also shown; in fact there is no difference in the visualisation between direct and indirect connections (as explained in figure 2a/e). To explore these connections in more detail, one has to explore and change the configuration to see how things are connected. It is a constant trade-off between the richness of complexity vs. simplicity.

Recent work [21] shows the ongoing pursuit of making digital information and content physical, to allow for a natural way of accessing and controlling such data. Bridging the digital and physical has been a topic of research for over a decade. Although there is rich potential in tangible interaction concepts, shortcomings and tradeoffs are inevitable. One problem that emerges is the trade-off between “generic” versus “task-specific”. When introducing physical objects to represent digital data, we need many physical objects that will have a more or less fixed physical shape. Very expressive physical objects will inherently have a very specific use. While very generic ones—like many objects featuring graphical displays and buttons—are not very expressive, and appeal less to our perceptual motor skills.

Another disadvantage of tangible computing is the introduction of many new physical objects into the environment. Leaving information in the digital world has advantages—we do not always want to have physical representations of all the information that we generate in the virtual world, which would mean overcrowding the physical space. A relatively unexplored approach is to use the existing physical (electronic) objects and devices in our interaction with the virtual world, going beyond using their (touch) screen and or buttons to interact with the information world. We propose to use the physicality of the objects e.g. their context, position and our usage of these object to generate new interaction concepts. We also expect that the physicality of the objects themselves and the context in which they are used, are the main providers of meaning. The connection created between a MP3 player and a stereo set has a meaning in itself, because of the resemblances in meaning of the two devices (being able

to play music). Putting a photo camera close to a smart phone could mean the user would like to exchange all, or maybe the most recent image between the two devices. It is our challenge to not only make it happen technically, but to enable users to express their desires in a meaningful way.

5 Future work

This research is to be considered a work-in-progress. We will continue to develop research prototypes to investigate new interaction mechanisms. We have developed a more robust version of the interaction tile and an alternative variation, which are currently being evaluated in a user experiment. Furthermore we will need to identify whether this way of interaction can be generalized and applied in different contexts in the home. Further research will attempt to answer questions like: How do we handle increased complexity? How should information about the information/content that is exchanged be revealed and how is control over the content provided? How can the design of physical objects (appearance and behaviour) enhance the creation of suitable mental models in users? Where smart systems or environments try to predict what the user is trying to accomplish, by being adaptive and anticipatory, we need to identify ways to give the users appropriate means to express themselves. The possibilities, available services and information that exist in the smart environment need to be communicated in a meaningful way. Only if this is done correctly will users be able to build helpful mental models of the functionality the environment has to offer, set goals and make plans on how to act. By developing novel and meaningful interaction devices, the user can then perform the necessary actions and the system can in turn try to understand the user's goals and make the match to its internal models. We see a vital role here for the theory of product semantics, the study of how artefacts acquire their meaning and use its theories to define common concepts and semantics. We are currently also working on making the match from the other side—the side of the smart environment. By using technologies originating from the Semantic Web vision and ontologies, to define common concepts and relations, we might be able to make a better match between system's internal models of interaction and the user's mental model.

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Designing for heart rate and breathing movements

Abstract

In this article we summarize a number of facts and design challenges related to the movements of our heart and how it interacts with breathing and stress. We take a design perspective, being interested in creating bio-feedback systems which empower their users in matters of health and coping with stress. Taking a design perspective also means trying to understand the working of the full loop which includes both the user and the bio-feedback device(s). The form-giving of the feedback to the user is an important design issue, which is still largely unexplored. We show some of our explorations, including a new representation called circle maps, based on Poincaré plots. Their usage for real-time feedback is new to the best of our knowledge.

Keywords

Feedback Design, Bio-Feedback, Heart Rate, Variability, Stress, Autonomic Nervous System, Visualization, Experience Design

1 Introduction

In the context of design and movement, some of the most interesting and vital movements are generated by the dynamic systems inside ourselves. In this article we contribute to exploring the design space of making some of these movements accessible to our conscious mind in ways which are beneficial to the user him or herself. In an earlier work we gave an overview of the

entire field of bio-feedback from a gaming perspective [1]. Now we look closer to one of the design aspects, namely presentation and form-giving of feedback to the user. The paradigm of bio-feedback emerges in the domains of relaxation, gaming, psychotherapy, and diagnosis. Whereas the relaxation and gaming applications are designed with attention for the aesthetics of the interaction, applications of psychotherapy and diagnosis are driven by medical needs and technical opportunities. It is interesting from a semantic point of view that bio-signals have meanings which are not so obvious (for example, high heart rate variability means relaxation). Moreover, any designed representation may carry additional messages.

Important benefits of perceived stress reduction, self-awareness and self-control are in essence experiential (although formal experiments can turn them objective again). Nevertheless, for the present work, which we like to report to the DeSForM community, we try to make use of understandings gained through medical science, engineering and design exploration to create beneficial experiences. The article is structured as follows. Section 2 is about the heart: we explain what heart rate variability is and why it matters. Section 3 is about breathing and its interaction with heart rate. Sections 4 and 5 chart the design opportunities and challenges. Sections 6 and 7 report on our own explorations. Finally Section 8 looks ahead.

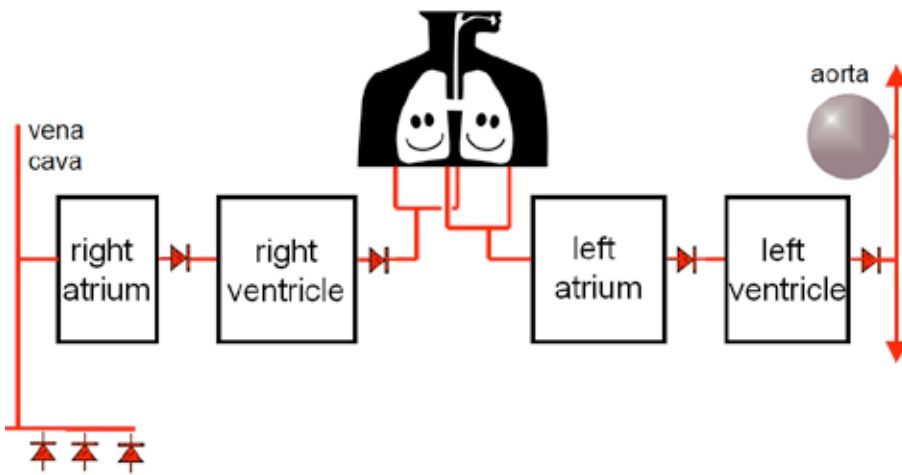


Fig. 1. Schematic diagram of the heart and its role in blood flow. The balloon at the right is a symbolic representation for the elastic buffer capacity of the big arterial vessels. The two atriums contract first, followed by the ventricles.

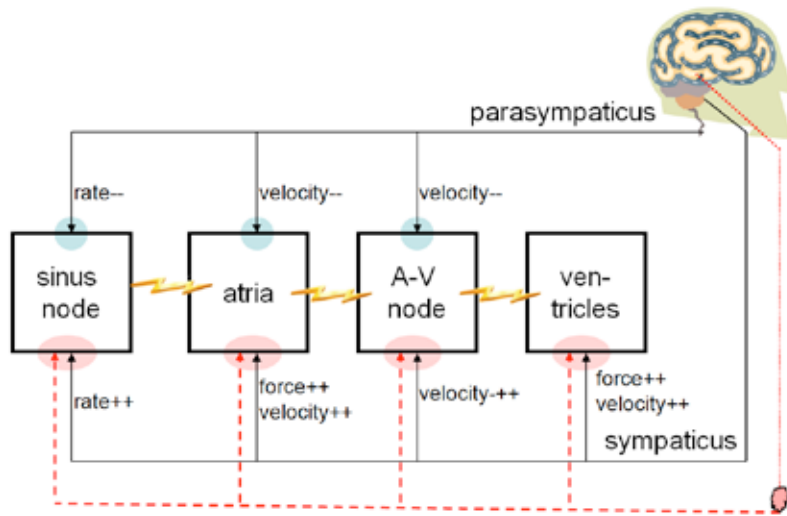


Fig. 2. Schematic diagram of the heart and some of the most important hormonal and nervous signals affecting the rate, force and velocity of the contractions [3]. The notation rate++ means that the rate goes up whereas rate-- denotes a signal which causes the heart rate to decrease. Both the sympathetic and the parasympathetic belong to the autonomic nervous system. The dotted line stands for the hormonal signals, notably adrenaline.

2 How the heart beat is regulated

The heart is one of our main vital organs. It is associated with the emotional aspects of life, because the heart needs to adapt continuously to all kinds of changes in the environment. An important function is to pump the blood through the body, as shown in Fig. 1.

The heart works as an autonomic oscillator. In other words, there is no such thing as a command “contract now” coming from the brain to the heart. But the autonomic nervous system controls the activity of the heart indirectly through a number of pathways, as sketched in Fig. 2.

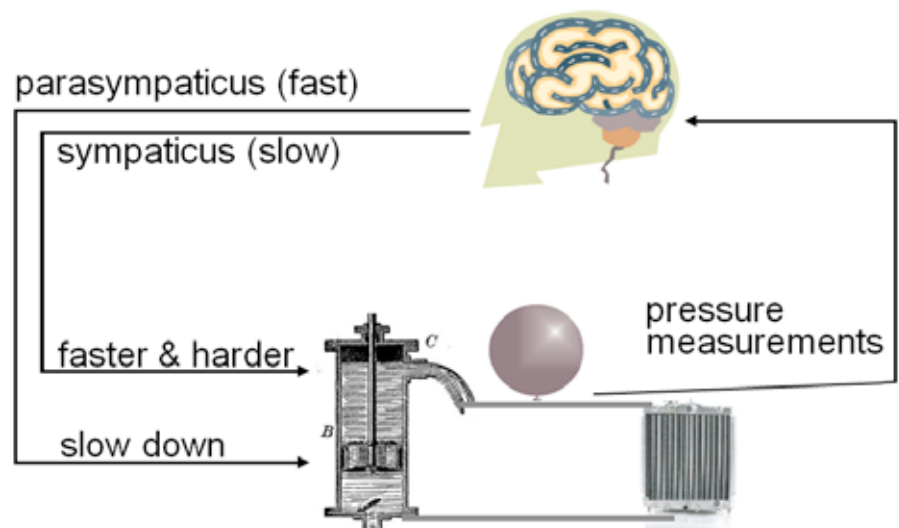
Next to hormones, such as adrenalin (epinephrine), there are two nerve-based pathways. The first is the sympathetic branch of the autonomic nervous system (sympathicus), which has the effect of increasing heart rate and force of the heart beats. The second is the parasympathetic branch of the autonomic nervous system (parasympathicus), which acts as a kind of brake. Normally both branches are active simultaneously and form an equilibrium (which is okay, unlike driving a car,

where it is a bad idea to apply the gas throttle and the brake simultaneously).

These pathways are part of a feedback control system, the main function of which is to adjust the blood flow to the needs and the anticipated needs of the body while keeping the blood pressure within safe limits. In the field of physiology this concept is known as homeostasis: keeping physiological systems constant, or at least within bounds. Examples of important physiological systems that are kept constant are body temperature (37° C), salt level (0.9% NaCl), sugar level (0.1% glucose), and blood volume (5-6 liters). The body has an extensive networks of sensors and effectors to maintain homeostasis.

The main feedback control loop for heart rate is summarized in Fig. 3. If the sensors indicate that the blood pressure is becoming too high, the heart slows down (baroreflex). At the same time, flow is helped by variable-width veins opening up. If the sensors indicate that the blood pressure is becoming too low, the heart rate increases and the heart beats with more force. At the same time, the variable-width veins close somewhat, thus restricting the blood flow.

Fig. 3. Schematic diagram of the heart rate control loop. The pump is symbolic for the heart, the balloon for the elastic buffer capacity of the big arterial vessels, and the radiator for the variable-width veins that can be controlled to either pass or resist blood flow.



The heart rate control loop keeps the blood pressure within safe limits, in the same way in which a thermostat regulates the temperature in a room. If the room is too hot, the heating is switched off, and perhaps cooling is added. If the room is too cold, the heating goes on. What traditionally makes feedback control design challenging is the dynamics of the system's behavior. It makes no sense just to study the thermostat or the heater, nor does it make sense to have more and more accurate measurements of the room. It is their interaction in a system which determines whether the temperature will converge to a set point (and if so, how slow or how fast, and with how much overshoot), or whether the system will enter into an oscillation. The best-known oscillation caused by feedback is the sound when a microphone is in front of the loudspeaker connected to the same amplifier. But oscillations also occur in economies where producers and consumers react to markets in combination with delays and storage capacities. The system of Fig. 3 is such a feedback loop. Indeed, there are delays (for example the slow neurotransmitters of the sympathetic) and storage capacities (the elastic buffer capacity of the big arterial vessels). In practice, the heart rate is not completely stable (not even when the person is at rest), nor does it enter an unbounded oscillation.

The variation of heart rate is known as HRV (Heart Rate Variability). A non-zero HRV is a sign that the feedback loop is working. The statistics and the frequency components of HRV are studied intensively in the context of stress measurement. For certain types of patients, low HRV can be correlated with certain heart- and blood-vessel related disorders. The literature on HRV is huge, and the number of measures to indicate the degree of HRV is huge, if not bewildering. There are tools such as Kubios to calculate a wide variety of HRV measures [2].

An interesting phenomenon in the dynamics of HRV is that the system tends to have an eigen-frequency near 0.1 cycles per second. The precise value differs somewhat from person to person.

Another interesting phenomenon is that under conditions of stress, the HRV tends to be lower than under normal conditions when the person is relaxed. This can be explained by the fact that under stress the parasympathetic brake function is so diminished, that it is not regulating anymore (note that this is the regulator with the fast neurotransmitters responsible for most of the fast dynamics). The mechanisms are by now fairly well understood, see for example DeBoer [3].

3 Breathing

Breathing is interesting because it can be done voluntarily, but if no attention is paid to it, an autonomic regulation will take over. Since ancient times, breathing has been studied and was used to develop methods and therapies empowering their users in matters of health and coping with stress. Without any claim of completeness we mention pranayama yoga, ānāpānasati meditation [4], and autogenic training [5]. Breathing influences the heart rate; an effect is called RSA (respiratory sinus arrhythmia). The medical term respiratory sinus arrhythmia sounds perhaps like a disease, but actually it is not, on the contrary, it is a sign of working feedback (homeostatis). When breathing in, the heart rate goes up, when breathing out, it goes down. Functionally, this link has ecological validity in that sympathetically controlled situations of activation (fight/flight) are associated with high heart rate AND breathing levels, whereas situations of parasympathetically controlled relaxation and vegetation are associated with low levels of heart rate AND breathing levels.

RSA can be deployed in a special breathing exercise called resonant breathing. It is based on the above-mentioned phenomenon in the dynamics of HRV that the heart control system resonates at a frequency near 0.1 cycles per second (the precise value differs somewhat from person to person). This is illustrated by the plot of an experiment done in our own bio-feedback laboratory, see Fig. 4. The user of our sensor was asked to breathe in a rhythm with a predetermined breathing frequency. Since the breath modulates the heart beat (RSA), the HRV tends to be highest when breathing at the person's eigen-frequency. For this person it was 0.1 Hertz, indeed.

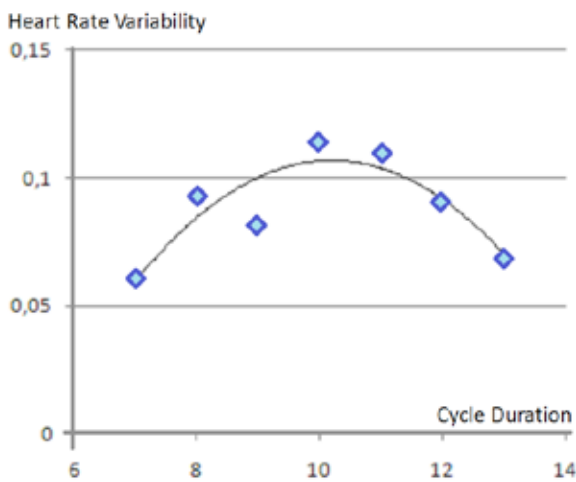


Fig. 4. Heart Rate Variability measured for various Cycle Duration times during 120 seconds for a healthy 36 year old male. Heart Rate Variability is given as the RR Triangular Index as calculated by Kubios. Cycle Duration is in seconds and was provided as feed-forward to the subject through the EZ-Air paced breathing program of BFE (Bio-Feedback Europe). The line is a 2nd order polygonal trend.

4 Design opportunities

It is possible to display HRV in some representation and provide this information to the user who may use it to train and gradually gain some voluntary control over his or her own HRV and possibly also his/her degree of relaxation. Usually this involves the usage of some special sensors, and a display which can be visual, auditory or even based on 3D movement. It can be combined with feed-forward and the measurement of other bodily signals such as EMG (electro-myogram), EEG (electro-encephalogram) or GSR (Galvanic skin conductivity). HRV can be derived from ECG

signals (electro-cardiogram) or PPG signals (photo plethysmography). HRV feedback has been reported to be helpful or probably helpful in a number of medical conditions, including asthma, fibromyalgia, depression and post-traumatic stress disorder [6, 7, 8, 9]. The development of the sensors is full of technical problems, but gradually they are becoming cheaper, smaller, more reliable, less obtrusive and more comfortable. We do not address the associated design issues here; it suffices to mention that in our lab and design studio we work with ECG (either adhesive or textile electrodes) and PPG (either at the ear lobe or at a finger).

Without claim for completeness, we give a short list of existing designs, which are commercially available devices and sensor/software combinations.

- Stress-eraser, a portable device, entirely based on pure HRV feedback, and bar-chart feedback on a small screen. The sensor is of the PPG type for one finger.
- Em wave, using a sensor to be connected to a regular PC and entirely based on HRV, usually taken with a PPG sensor. It offers a variety of graphical and chart-based feedback methods.
- Mind-surfer, using EEG signals with either graphical or audio feedback. To be used with traditional sensor head caps (we designed a special user-friendly alternative cap [10] but the design is not commercially available yet). The software runs on a regular PC.
- Journey to the Wild Divine is based on both HRV and GSR. It comes with special sensors with one PPG finger clip and two GSR clips. The software runs on a regular PC and includes beautiful scenery, Zen gardens, etc.

As a measure for HRV, most of these programs use the LF/HF ratio. [11] In this ratio, “LF” refers to the Low Frequency band around the 0.1 cycles per second as mentioned in section 3. This band is driven by both the parasympathetic and sympathetic loops of Fig. 2 and reflects the baroreceptor activity as mentioned in section 2. The High Frequency “HF” band is driven by respiration and appears to derive mainly from the parasympathetic loop from Fig. 2. This band is defined by variations between 0.04 and 0.15 cycles per second. So, the LF/HF ratio is a normalized merit in the frequency domain.

The design opportunities break down into the choice for an effective merit (in the time domain, frequency

domain or other), and the representation method. In the remainder of this paper we focus on these two aspects for HRV-based bio-feedback.

5 Feedback loop design challenges

Several fundamental questions concerning the feedback arise. A question already explored by Djajadiningrat [12] is whether the feedback display should be in the user's center of attention, or perhaps more in the background. The "Mirror of Emotion", as used in their study, puts them in the background; it is more a kind of warning system than a training tool that should be in the center of attention. In contrast, most devices designed for training purposes, assume that the user will focus on the feedback.

The designers of the Wild Divine clearly assumed that it would help for the sounds and the images to be beautiful and give associations with Eastern meditation techniques, Zen gardens, etc. Whether this is helpful indeed is still to be investigated. In theory, the images and sounds could be distracting from the task at hand. In fact, the notion of "task-at-hand" in itself is questionable too. There is a kind of paradoxical situation which arises whenever a relaxation or meditation goal is approached as a serious task to be fulfilled effectively and efficiently. When trying too hard, the task to relax becomes even harder or impossible. Another open question is the role of narrative.

Going further, let us assume that the task at hand is relaxation. Then it is not obvious what that means: mental relaxation? Physical relaxation? High HRV? Fortunately there is a lot of evidence that mental relaxation and physical relaxation are not independent. For example, in PMR (progressive muscle relaxation) as developed by Jacobson the method is based on the idea that muscle relaxation can only occur when there is mental relaxation and therefore it makes sense to train muscle relaxation when the goal is also mental relaxation. Despite the vast literature on HRV it is hard to find how long one should train to get effects reliably. Another design dilemma is about the reward scheme. Does it make sense to offer rewards, bonuses etc. for successful training (increased HRV, for example), or is it better to rely on intrinsic motivation and intrinsic reward? Also the internal nervous pathways of the training are not clear: is it possible to get control over HRV directly, or does one get control over other correlates or causes of stress and is an increased HRV

a consequence of that? Yet another alternative is that one just explores and trains breathing patterns which are effective to increase HRV.

Last but not least, a very important design question is how to give the measured information back to the user. This is the question we shall focus on in the remainder of this paper. It is useful to distinguish two layers of design for the feedback.

- Surface level design: choice between sound, visual, 3D movement, or tactile feedback. What colors to use, which forms, which narrative elements, and so on.
- Structural design. Which information is coded in the representation and what is the timing of that information in relation to the mental and bodily processes in the feedback loop.

5.1 Surface level design

Regarding the surface level design, the Journey to the Wild Divine has made a specific choice, assuming that beautiful scenery and sounds will be helpful. Indeed, it is well possible, even plausible, that this beauty and the associations that come with the scenery and the sounds induce relaxation, even without bio-feedback. Also in the Mirror of Emotions by Djajadiningrat [12] the mirror had to be a beautiful design sphere with esthetically pleasing patterns.



Fig. 5. Scenery from the Journey to the Wild Divine. The design is rich, full of narrative elements and aesthetically pleasing.

In the design of the StressEraser, the choice seems more pragmatic and minimalistic. The device is portable, mono-functional and hence avoids the unrest which normally comes with PCs. The StressEraser has a bar-chart display, as shown in Fig. 6.



Fig. 6. StressEraser. The design is minimalistic, sober and resembles a laboratory instrument.

The difference may well be explained by background, whether the developers come from a medical, technical, laboratory environment or from an artistic, humanistic or studio environment, or on how much development budget was available. But in the end, it has to be approached as a design question which has to deliver both effectiveness and cultural value. In our design education program at TU/e, the topic of feedback design is considered an interesting vehicle for learning and we have seen students create feedback forms such as tactile vibration-motor feedback, 3D geometric installations, flowers, and arcade games.

5.2 Structural design

Next we address the structural design. We claim that there are fundamental choices to be made, almost orthogonal (independent) to the choice for surface design. We show two different alternatives, to which we shall add a third alternative, which is new to the best of our knowledge (in Section 6). The classical alternatives are:

1. Representation of calculated HRV;
2. Representation of successive beat-to-beat intervals.

To get started, consider the following scene from the Wild Divine, which is based on the first alternative (Fig. 7).

The feedback in the first classical approach (Representation of calculated HRV) works essentially as follows: the internal game software calculates the present value of the relaxation, some measure of HRV, either based on statistical or frequency based analysis, and possible combined with the GSR according to some formula for weighted average. This value (a number) is translated into the height of the feather, so when HRV increases (or skin conductivity decreases), the feather goes up. Other tasks in the Journey to the Wild Divine are coded similarly: there are stones to be lifted,



Fig. 7. Task inside the Wild Divine. Help the feather float up to the top of the screen. With your mind.

fires to go up, doors to be opened, and so on. But note that this principle does not rely on the Zen garden narrative. The same fits with other narratives: the bird has to fly higher, the fish has to avoid the surface. It can be done in a laboratory-instrument styling as well: the bar chart has to up. It can be done in 3D forms (the geometric dome has to grow) or with light (the light has to glow brighter, get greener, etc.). In addition, the scenery setting of the Journey to the Wild Divine, triggers curiosity that is rewarded by progress of the journey. This could be another feedback method, making use of the paradox of balancing excitement with relaxation.

The feedback in the second classical approach (representation of successive beat-to-beat intervals) works as follows. Each beat-to-beat or “RR” interval is represented individually so that the respiratory sinus arrhythmia becomes noticeable as a wave pattern in the resulting series of representations. This is precisely what the Stress-Eraser does. The principle is also shown in the screen-shot of our own Processing software program [13] in Fig. 8, where also added the technique to let the older beats gradually fade away. This graph is sometimes referred to as “tachogram”

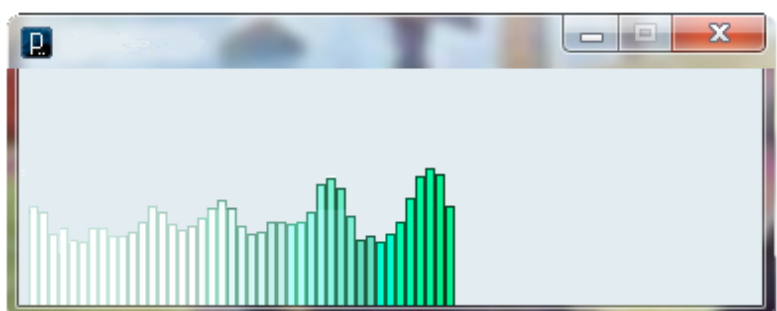


Fig. 8. Feedback by plotting successive beat-to-beat intervals.

During the forty-three heart beats shown in Fig. 8, the Heart Rate Variability is gradually increasing. The bar plots are built-up from left to right. The bar plot is showing waves of larger amplitude (the higher the bar, the longer the beat-to-beat interval).

6 Explorations

Focusing on the structural design aspects, we noted that the calculated HRV works on the basis of a slowly growing accumulative effect, whereas the presentation of successive beat-to-beat intervals is more direct. These two different merits, however, do contain different information aspects of the influence of the (para)sympathetic nervous system on the heart. For example, the 0.1 cycle per second signal as mentioned before, can only be recovered by measuring at least 10 heartbeats assuming the heart rate is 1 per second. So, the HRV merit from the frequency domain is intrinsically slow. On the other hand, the beat-to-beat plot includes high frequency information as the variation between two neighboring bars.

We asked whether it would be possible to go one step further, developing a presentation which is even more direct and accurate by focusing on the differences between successive beat-to-beat intervals rather than the intervals themselves. This turns out possible by adapting a way of data plotting which recently has become popular in the analysis of HRV [14], but which has not been applied for real-time-feedback, to the best of our knowledge. This is shown in Fig. 9. The notation RR_n means the n -th beat-to-beat interval whereas RR_{n+1} means the $(n+1)$ -th beat-to-beat interval. So after beat numbered n , the next interval is plotted on the y -axis and the previous interval on the x -axis. But for the next beat, the roles change: the value which was vertical is used for the x now whereas the next value, RR_{n+2} is plotted vertically. This way of presenting the behavior of a dynamic system is named after the Frenchman Jules Henri Poincaré (1854–1912) who studied complex dynamic systems and was one of the founders of modern chaos theory.

Compared to the traditional usage of Poincaré plots, in order to make them useful for feedback purposes, we have made three modifications. First, the plot is generated at real-time, not a posteriori. Secondly, we let the older dots fade away, so the image does not get cluttered up with too many irrelevant dots. Thirdly,

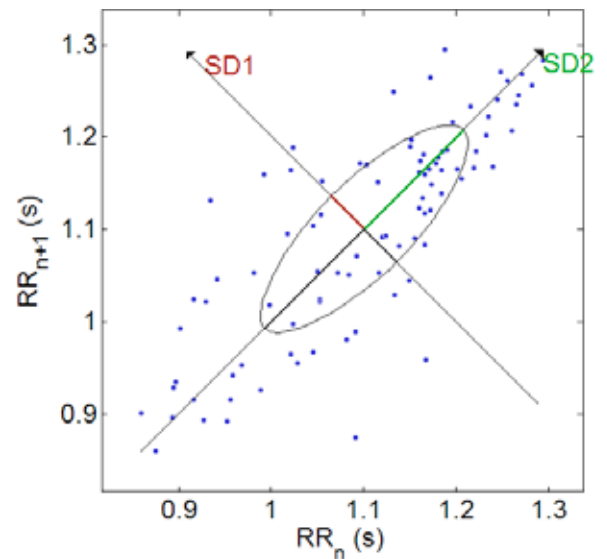


Fig. 9. Traditional usage of Poincaré Plot for off-line analysis of Heart Rate Variability. The graph is generated by Kubios Version 2.0. The RR interval (= beat to beat interval) is plotted vertically, against the previous RR interval, which defines the position on the horizontal axis.

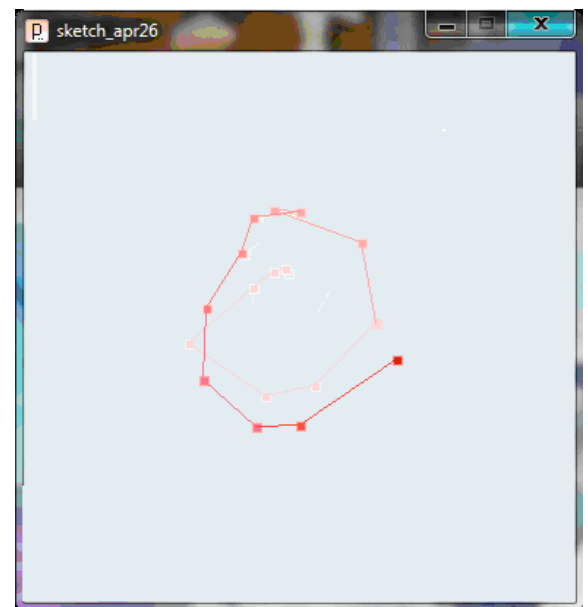


Fig. 10. Circle plot obtained by the principles of Poincaré plots, but transformed to resemble a circle rather than an ellipse. The Plot is built-up dynamically: each new beat appears immediately and older beats gradually fade away. The figure develops counter clock-wise, in this example spiraling outwards. Resonant breathing (see Section 4) is one of the ways to make the figure grow and spiral outward.

we rotated the plot over 45 degrees and changed the scaling of the axes so that a typical plot on average resembles a circle rather than an ellipse. For the formal details we refer to Appendix A. The screenshot of a plot thus made during a feedback session in our bio-feedback laboratory at TU/e is shown in Fig. 10.

It usually is a pleasurable experience to watch the heart beats go round. In fact, the beats tend not to be evenly distributed around a circle, but form clusters on one side, or even make a smaller orbit at a recurring position (this is visible in Fig. 10). The figure formed is sensitive: a worrying thought which pops up changes the pattern of beats immediately.

It is important to realize that, for each type of structural design decision, the surface-level representation still leaves a considerable degree of freedom for the designer to choose. For all three feedback types, the styling, for example, is still free. It must be said however that the calculated heart rate variability is easier to embed in a narrative (which is particularly interesting when the approach has to be based on an external motivation). It is easy to invent a story why the bird must fly higher, the fish swim deeper, the feather float upward, etc. To illustrate the claim that also for the circle plot there is still designer freedom left, we show a flower-style design in Fig. 11, based on the same heart beats as Fig. 10. The representation should be intuitive, meaning that a the opening of a flower, automatically drives the user in the right direction. One may wonder whether the aim of opening the spiral in Fig. 10 (representing more relation and so a higher HRV) is the most intuitive direction; vanishing the spiral into a vortex may be more self-explaining. More possibilities will be discussed in Section 7.

	outlier robustness	information richness	narrative adaptability
calculated heart rate variability	high	Low	high
successive beat-to-beat intervals	medium	Medium	medium
circle plot	low	High	low

Table. I. Strong and weak points of the three fundamentally different feedback types. High outlier robustness means that the user is not easily distracted or disturbed when an irregular heart beat occurs or when the sensor misses one or two beats. High information richness means that the user gets fast feedback on each beat rather than some slowly moving average. High narrative adaptability means that it is easy for the designer to deploy the feedback inside an arbitrary narrative, or game-like context.

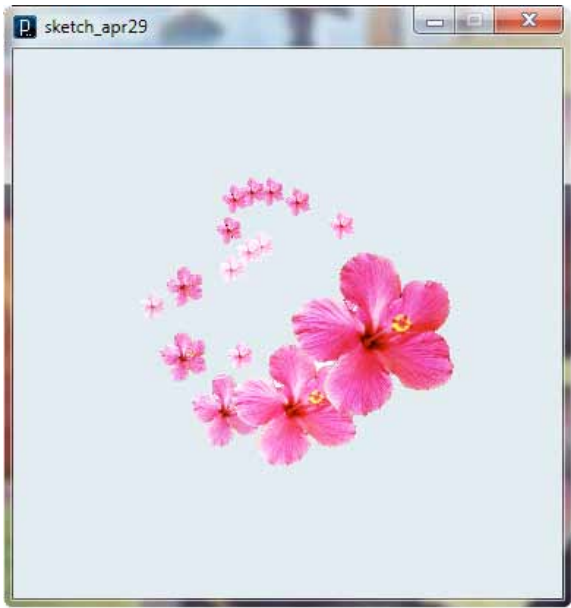


Fig. 11. Circle plot obtained by the principles of Poincaré plots and styled using flowers. It would also be possible to generate one dynamic flower, each leaf representing one beat. These are just examples, the point being to illustrate that structural design decisions, and the surface-level representation can be chosen (almost) independently.

So now we have three structural designs for feedback, viz. (1) Representation of calculated HRV, (2) Representation of successive beat-to-beat intervals and (3) Circle plot (modified Poincaré plot). We compare them in Table I where we have qualified the options by our best understanding. Whether the qualifications are perceived similarly by all users, should be determined by further experiments.

It is also possible to combine several approaches three or even present all three types of information to the user. The resulting feedback loop then becomes like a PID controller (proportional-integrating-differentiating – often used for mechanic feedback control systems). The calculated HRV, with its accumulative effect is like the I (integrated signal). The representation of successive beat-to-beat intervals is like the P (proportional, direct and untransformed signal). The representation by the circle plots is like the D (the differential of successive signals).

During the forty-three heart beats shown in Fig 12, the Heart Rate Variability is gradually increasing. The bar plots are built-up from left to right. The upper bar plot is moving upward (meaning more Heart Rate Variability). The lower bar plot is showing larger waves (the longer the bar, the longer the beat-to-beat interval). The circle plot is built-up in a counter-clockwise fashion, one dot per heart beat. The circle plot is spiraling outward and thus shows the same gradual increase in Heart Rate Variability.

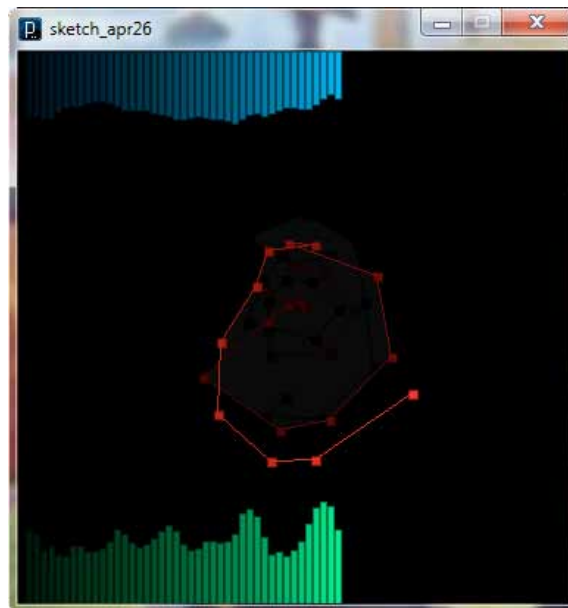


Fig. 12. Snapshot of one screen providing all three fundamentally different feedback types. The upper bar plot represents averaged Heart Rate Variability. The lower bar plot represents beat-to-beat intervals. The circle plot is obtained by the principles of Poincaré plots. It goes round, once per breath, showing one dot per heart beat.

7 Context of use

All design decisions should take the context of use into account. In the old meditation traditions such as mindfulness of the in and out breathing, the general advice is to find a quiet place. In the Buddha's words (MN118) [15]: "Here a monk gone to the forest or to the root of a tree or to an empty hut, sits down; having folded his legs crosswise, set his body erect, and established mindfulness in front of him, ever mindful he breathes in, mindful he breathes out." Contemporary Kabatt Zinn also points out how mindfulness can be practiced anywhere and anytime, summarized by the phrase "Wherever You Go There You Are". But the training of heart rate variability is more specific than a general present-moment-awareness. It demands awareness of the feedback information. Common sense tells that a quiet place will be helpful (it would be interesting to do experiments to see whether this assumption can be confirmed). It is the first author's personal experience that biofeedback given via a general-purpose computer brings the extra stress and frustration that usually come with computer-usage such as peripheral installation problems and associations with tasks such as email handling (in other words, using a computer to me *means* being very busy). By this consideration, a dedicated device is preferred. To design a dedicated room for meditation or relaxation can be done using objects and images of aesthetic quality and loaded with pointers to nature and meditation traditions (this is what we did for the biofeedback



Fig. 13. Biofeedback laboratory at TU/e. In fact the design and organization of the room is a compromise because of budget limitations and the need to include additional equipment for experiments.

laboratory at TU/e). On the other hand, if people could withdraw in a nice place for significant amounts of time, explicit techniques and biofeedback would perhaps not be needed at all. A portable device (cf. stress eraser) has the huge advantage that it can be deployed anywhere. A portable device offers, even for the user with a busy lifestyle, opportunities to pick the best possible (though not perfect) place and time to do the exercises. Each of the techniques of Table 1 can be mapped to either a computer or to a dedicated device or to an ambient installation (also see the next section).

8 Outlook

From the above examples one might guess that the research presented is only about 2D screen-based presentation, but actually it is not. It is well possible to present calculated HRV using an ambient installation or dynamic 3D object. A typical example would be a Buddha statue which would float higher when the HRV is higher (like the SOH19 States of Nature art work by Alex Vermeulen, but perhaps smaller, and driven by HRV, not solar intensity). Since calculated HRV changes only slowly, the technical problems are modest and even slow actuators can be deployed. Another example would be a lamp which gives less light or moves up towards the ceiling when HRV increases. For successive beat-to-beat intervals the same is possible, and the effect of high HRV would be that the object would engage in a kind of waving movement, following the user's breath. Clearly this puts extra

demands to the mechanism for the movement, which needs to be aesthetic and also fairly fast (at least one movement per second). For circle plots (modified Poincaré plots) it is also possible to present them in 3D space by a moving object, but now there have to be movements in two dimensions (perhaps like the lamps developed by Philip Ross and Philip Mendels [12] or the robots proposed by Alers [13]. For now we leave these as options to be explored.

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Appendix: Calculations

In this appendix we give the formulas for calculating the coordinates of the circle plot as used in our prototype software. Our prototype software is written in Processing, but the equations and assignments are easily deployed in any language of the reader's choice. These are the main equations:

$$\begin{aligned}
 x &= (RR - RR_{avg}) / 3 \\
 y &= -(RR_{prev} - RR_{avg}) / 3 \\
 x_{rot} &= (7 * x) / 10 + (7 * y) / 10 \\
 y_{rot} &= -(7 * x) / 10 + (7 * y) / 10 \\
 x_{plot} &= 2 * x_{rot} + width / 2 \\
 y_{plot} &= y_{rot} + height / 2
 \end{aligned}$$

In these equations RR refers to the last measured beat-to-beat interval. The notation RR stems from Willem Einthoven who described the various ECG elements, such as the QRS complex, in which R denotes the main peak in the ECG. Thus RR is the difference between two successive R peaks, that is, the beat-to-beat interval. We use the same notation also when the signal is derived with a PPG sensor, although formally it is not the same since pulse transmission times could play a role. RR_{avg} denotes the average value of RR. RR_{prev} denotes the previous value of RR. The first and the second equation make the initial x and y values relative to the average and perform a practical scaling. The third and fourth equation rotate the x and y values over 45 degrees. The value of 7/10 is used as an approximation of the sine of 45 degrees, so simple integer arithmetic suffices (more accurate would be 0.707107). The fifth and the sixth equation maneuver the results towards the center of the screen. At the same time the plot is horizontally stretched by a factor of two, turning a typical ellipse-like plot into something more like a circle. The notations width and height refer to the dimensions of the screen used (this is also the notation used inside the Processing programming environment). And the purpose of all this is of course to finally use the resulting x_{plot} and y_{plot} as coordinates. Finally we give two assignments to be executed after each beat.

$$RR_{prev} \leftarrow RR$$

$$RR_{avg} \leftarrow (23 * RR_{avg} + RR)/24$$

The notation \leftarrow denotes assignment (write = in program code). The first assignment serves to update the value of RR_{prev} before RR will be overwritten by the new beat. The second assignment calculates a weighted average over the RR intervals, giving higher weight to the later intervals, and gradually fading out the impact of intervals long ago. The time constant of this averaging process is 24 beats.

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PeR: Designing for perceptive qualities

Abstract

The design PeR was created as part of our research on how to design for perceptive qualities in objects. PeR, or perception rug, is capable of showing perceptive activity related to actions from a subject and related to other events. The integration of conductive yarns makes PeR sensitive to the touch of a subject. Furthermore the use of nylon threads enables a body of light to behave within its surface.

Keywords

Designing for Interaction, Perception Theory, Perceptive Qualities, Design Platform

1 Introduction

PeR integrates conductive and optic fibres, which respectively are used to sense the touch of a subject and to let a body of light act within the surface of the rug. The design is part of a research project that investigates how to design for perceptive qualities in objects.

1.1 Theory

The starting points for this research are considerations of the phenomenology of perception [1] and the ecological psychology [2]. Based on these notions, perception, in this case, is described as inherently active. Perception is the result of actions we undertake and the consequent sensory feedback we experience. This

makes perception a very bodily and, therefore, personal matter. What I perceive depends on what I can act upon with the body I have. [3] Perception, being inherently active, also brings forward the idea that there is a pre-conceptual meaning of the world. In other words; the world means something to us before thinking and recollection. [4]

Merleau-Ponty's approach of the phenomenology of perception, in which perception is described as inherently interactive, is important for this research. Perception is an interplay between the perceiver and the perceived. [1] These notions have been recently operationalised by researchers at the University of Compiègne, France. The French researchers conclude that 'there are two kinds of perceptions over time: perceiving the other as part of the environment, versus perceiving the activity of the other perceiving me. It is by switching between these two kinds of perceptions that it becomes possible for one subject to understand the position from which the other subject perceives the scene.' [5] To make a feeling of sharing a common space between subjects possible, this constitution of the other subject's perspective or 'point of view' is essential.

Our main focus of investigation is if and how it is possible to design for perceptive activity in an object, in order to create perceptive interplay between it and the subject. As the working hypothesis for our ongoing research we state that this perceptive interplay, of

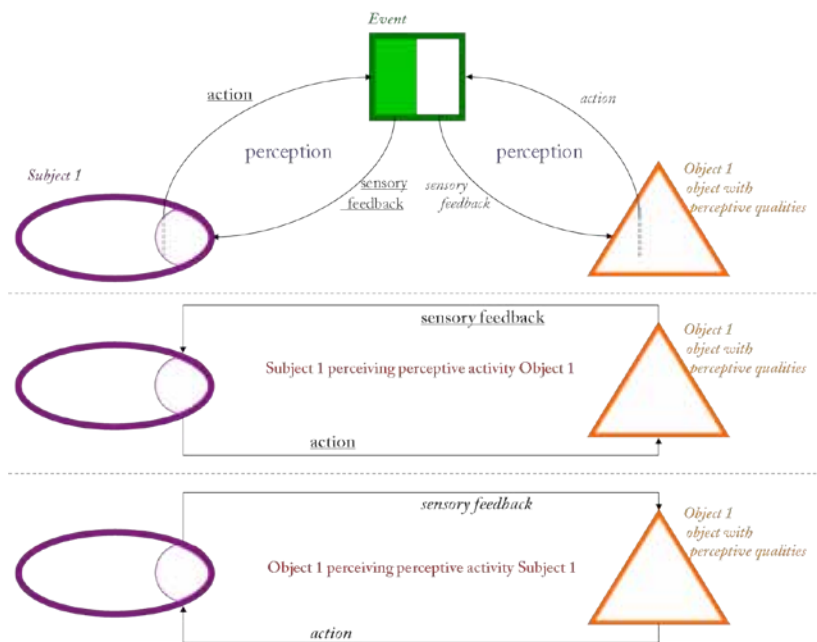


Fig. 1. Subject 1 is a person with normal perceptual capabilities. The subject perceives the object and an event as result of his or her actions towards them and of the sensory feedback gained by these actions. Note that sensory input can also evoke actions by the subject. Next to the subject 'Object 1' is presented. This object is an object with perceptive qualities (like PeR). This object is also able to perceive the subject and the event.

perceiving an object as part of the environment versus the object perceiving the self, results in a greater feeling of involvement of the subject [6]. The next diagram (figure 1) gives an overview of the perceptive connections between a subject and the designed object with perceptive quality. Part of this scene is also an event. Both subject and object with perceptive qualities could perceive this event.

A very basic example one can consider is an ordinary outdoor lamp. The lamp (Object 1) is capable of detecting the presence of an intentional subject as well as the outside lighting conditions (event). Also, the subject is able to perceive this event, as well as the perceptive capability of the lamp when it reacts to its dark surroundings and the presence of the subject by turning on the light.

2 Description PeR

PeR is an exploration of how the theory mentioned above is applicable in design. The structure and open form of PeR allows for the exploration and the design of different behaviours. This allows it to become a platform for design.

In between the threads of the basic rug, conductive yarns are integrated. These conductive yarns are connected to several capacity sensors. An electric capacity change is detected when the rug is touched by

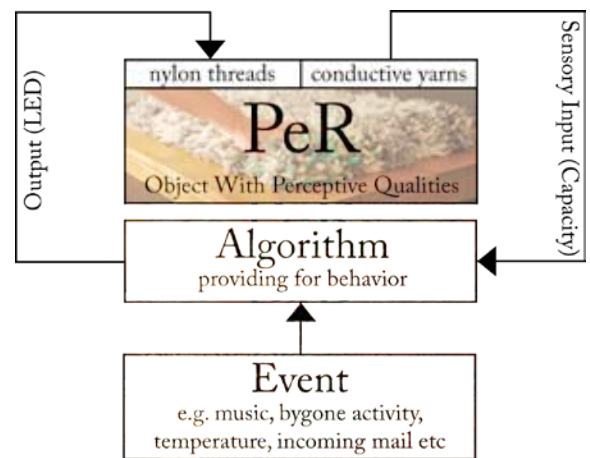


Fig. 2. Overview PeR, the perceptive action (the touch) of the subject results in perceptive actions by means of light.

the subject. This difference in capacity is converted into an electric signal by the capacity sensor, which, in turn, is read by means of an Arduino (electronics prototyping platform). The detection of touch makes PeR sensitive to the perceptive activity of the subject. PeR is capable of reacting to and evoking these perceptive actions of the subject by the behaviour of its integrated body of light. In addition to the conductive yarns, nylon threads were integrated in the rug. This thread has similar properties as glass fibre as it is able to transport light. The soft feel, transparency, and flexibility of the nylon thread make a smooth integration in the carpet possible. A grid of LEDs is mounted under the nylon threads. This enables PeR to show behaviour by means of light. The electric signals gathered by the use of the conductive yarns are used as sensory input by the algorithm behind PeR. Based on this sensory input the position of the body of light is adjusted. The algorithm allows for a smooth and natural-like behaviour as the position of the body of light is adjusted gradually. This body of light is reflected within the rug through the light of the LEDs spread by the nylon threads.

3 Platform for design

Through the integrated nylon threads, a body of light behaves within the carpet. The behaviour of this body is dependent on an underlying algorithm. The design can



Fig. 3. Impression of the light body following the touch of the subject

be used as a platform for the exploration of perceptive behaviour. For example the body of light can follow the subject's touch directly or on a humble distance.

In figure 3 an impression of the light body following the subject's touch is given.

Behaviour towards an event such as, reacting to music, to the dynamics of people, to incoming mail or to activity in time and over distance etc. is also possible. In this case PeR is the object with perceptive qualities. The behaviour of the body of light shows the perceptive capabilities to the subject.

Different design characteristics, like the size of the light body, the speed by which the body moves, its shape, focus and direction, can be adjusted in order to design behaviour. These characteristics could also adapt over time. This means that the light body could get notion of ongoing perceptions. For example, PeR gets bored, irritated or happy depending on its perception of the subject and the event. Notion of ongoing perceptions implies that PeR is sensitive to the dynamics by which it is touched. Hence PeR could show different reactions to, for example, stroking and hitting.

The design of perceptive behaviour is essential to our research and to our design of PeR. As static images don't show this behaviour we provide a movie at <http://dqi.id.tue.nl/per>.

4 Further research

PeR is a first example of why and how to design for perceptive qualities in objects. Next to PeR we have been working on a second research design PeP, short for perception pillar. This installation is specifically designed for research purposes. The integration of the theoretical notions in design is more closely investigated. Next to functioning as a platform for the design of

perceptive qualities PeR also adds value in building relations between the textile industry, high tech industry and design. The current prototype of PeR is handmade but the used techniques allow for some parts to be manufactured by means of existing production techniques like tufting and weaving.

Creating PeR by means of these manufacturing techniques also would improve the quality of the prototype. This is necessary for PeR to really function as a platform for design. Our research will benefit from a solid and easily accessible prototype.

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Singular or multiple meanings?

A critique of the index/Anzeichen approach to design semiotics/semantics

Abstract

Proponents of design semantics (e.g. Krippendorff) have questioned the adequacy of semiotic theories and methods in relation to addressing the meaning of things and, in particular, the role of design in meaning construction. Scepticism towards, not to say dismissal of, a semiotic approach seems to be based on an understanding of semiotics as a branch of linguistics, which, according to the critics, postulate that things are vehicles by means of which meanings are communicated. However, in the literature on design semiotics, another idea of the meanings of things was re-introduced 40 years ago by the Argentine architectural theorist and critic, Juan P. Bonta, who drew attention to the indicative function of design. Charles Peirce, whose predicament of the index was shaped 80 years earlier, is another theoretical source to this matter. Ten years ago, in the book edited by Dagmar Steffen (*Design as Produkt-sprache*), the so-called *Offenbacher Ansatz* to the 'language of products' (Steffen, Bürdek, Gros, Fischer) put forward another usage of the semiotic category of the index (in German: *Anzeichen*). The aim of the following is, first, to question the idea of design as communication as an adequate model of meaning construction in design objects, second, to throw light on the index category and its relevance to design semiotics/semantics in order to elaborate the phenomenal approach to the materiality of things as a meaning component. Bonta's and the Offenbach

positions will be discussed comparatively and elaborated with the purpose of preparing the ground for more inclusive inquiries concerning theory as well as practice.

Keywords

Meaning of Things, Design and Communication, Materiality of Things, Index/Anzeichen Function of Design.

1 Introduction

One of the most persisting challenges to design theory as well as to design practice is that of defining how meaning results from, and within, the relationship between humans and things. This challenge becomes even harder to take up if it is narrowed down to the task of specifying the particular role design plays in this connection. More specifically, the question is how agents of design either facilitate or hamper the formation of various kinds of meaningful relationships between objects of design and the human agents in their capacity of viewers or customers, users, possessors etc. of given objects for use.

Several approaches have been introduced since the 1960s, most of which describe meaning construction in design objects as a kind of communicative act or speech act. Basically, this implies that the traditional linguistic matrix of *sender-message-receiver* has functioned as a real or metaphorical scheme to be filled out and, at best,

adapted to represent the relations between *designer-object-user* in more or less sophisticated ways. However, this model applies only with difficulty to the real world of 'thing acts'. Many questions arise, for instance, is the role of the designer actually that of a sender? Why are investors, manufacturers, retailers, etc. only as rare exceptions attributed this role? Why choose the user as the privileged agent for the receiver position? And, in the end, does a design object really convey messages - apart from, of course, in the special cases of a communication design? [16], which, of course, should be acknowledged and studied as such. The following, however, is not about communication design; the concern is with design and objects of design in general. An alternative to *communication* as the theoretical and pragmatic modelling of meaning construction in things and the role of design in that context is *indication* and the various conceptualizations of the indicative sign function or sign modality in, first of all, Peirce, Buysens, Prieto, Bonta, the *Offenbacher Schule* and in the new material culture studies that combine an interest in the reciprocity of indexicality and agency.

What follows is, first, a rehearsal of the most basic elements of Peirce's definition of the index category within his rigorous, yet flexible semiotic systematism. Next follows a brief introduction to the Argentine architectural critic and design theorist, Juan Pablo Bonta's theory of indication as the nucleus of meaning creation in design. Subsequently, these theories are compared to the ideas of the 'Offenbach School' concerning design as product language based on the category of 'Anzeichen'- German for indicator [36]. Finally, the indication approach will be set against some new theories of materiality that have evolved recently in material anthropology. The aim here is to identify a shared interest among material culturalists, semioticians and representatives of design studies in re-attributing material qualities to things and to insist on materiality as a source of meaning in design. For this purpose, a *critique* of the index is needed, and a critique means an attempt to disentangle and elucidate the essential conditions for the function of this particular sign.

2 The problematic

The point of departure for the following considerations is that the model of communication, even if used metaphorically, sometimes with interesting results,

seems not adequate 'enough' to elucidate the processes in which human-thing interactions are actually performed, that is, in the immediate direct, physical encounter and in more regular use situations. Irrespective of how 'communication' is (and has been) conceived, a genuine and successful communication process has as its precondition a correlation of three elements: intentionality, conventionality and effectuality [7, 10]. In other words, the special standard case of interaction termed communication, may be identified and described in a minimalistic way as a process, in which one agent deliberately affects, by processing conventional signs, another agent in order to leave the latter, being aware of the first agent's intention, better prepared to act. Whether the actual, conventional sign used is a written text or a spoken word, a pictogram, a road sign or a policeman's uniform is of no relevance. In any case, the communicative meaning of the sign is only accessible on the basis of knowledge of the lexicon and codes of a particular sign system used in the transmission process. If this matrix is applied in order to describe how people do things with things, two problems arise. One concerns the very *process* of meaning production, the other is related to the question of *polysemy*, which, among others, Klaus Krippendorff claims to be a problem semiotics has created by - and only for - itself. It is "entirely semiotic" [21, p. 276].

From a *processual* perspective, then, the most precarious problem that meets any simple transference of the communications model to mechanisms of meaningful interchange between humans and objects arises due to the idealistic or metaphysical bias of the communicational mode of signification. An adequate theoretical model that is capable of accounting for how meaning is construed in humans must be a materialistic one, since focus is not on the human's cognitive relation to artefacts, but on a perceptual-operational appropriation of concrete material entities. Such a model does necessarily have to base its assumptions as regards meaning production in, with and in the vicinity of design objects on the material qualities of those objects. 'Design object' is not merely the physical thing, and the notion does not refer to aesthetics, nor to form as such, but the phenomenal thing, the meaning of which is neither 'objective' (residing in the thing) nor 'subjective' (in the mind of the recipient), but pragmatic and operational. To a certain degree, though

not entirely, this view is covered by James J. Gibson's definition of 'affordance' [14, 15] or Donald Norman's more simplistic notion of 'perceived affordance' [27, 28].

From an *analytical* (and also *historiographical*) perspective, it is equally important to develop a new approach to the problem of polysemy in things (and, consequently, objects of design). Polysemy, or the multiplicity of meanings in design, cannot be addressed productively as long as the design, layout or shape of things is conceived in terms of 'language' or 'language'-like artefactual forms. It will be argued in the discussion to follow that, instead of 'communication', it seems much more promising to employ the notion of 'indication' and the cognitive and operational logic of the sign modality which Charles S. Peirce labelled 'index'. Focussing on the standard (or regular or normal) situation, the indicative perspective on things underlines that things-as-signs are always polysemic, while signs-as-communicators never are; if a communicational sign is not understood or if it is misunderstood, the communication process is a failure. The solution suggested by some adherents of 'design semantics' or 'product semantics' that things may mean whatever the recipient, user, consumer want them to, is both in theory and practice unsatisfactory, since this position will render the role of the designer desperate, not to say superfluous. If material, form and appearance are of no importance, why then care about the form at all. Moreover, such a view on meaning production in, with and in the vicinity of things contradicts reality. Thus, polysemy is in fact a genuine semiotic problem, which the varieties of 'design semantics' have not been able to solve so far. Theories of indication and of the index sign point to the heart of problems raised here.

2.1 Peirce's index

Charles S. Peirce gave c. 1897 the following (not published during his lifetime, yet one of the most quoted) definition of the sign:

"A sign, or representamen, is something which stands to somebody for something in some respect or capacity. It addresses somebody, that is, creates in the mind of that person an equivalent sign, or perhaps a more developed sign. That sign which it creates I call the *interpretant* of the first sign. The sign stands for something, its *object*. It stands for that object, not in all respects, but

in reference to a sort of idea, which I have sometimes called the *ground* of the representamen. "Idea" is here to be understood in a sort of Platonic sense, very familiar in everyday talk; I mean in that sense in which we say that one man catches another man's idea, in which we say that when a man recalls what he was thinking of at some previous time, he recalls the same idea" [30, CP 2. 228].¹

This is not an occasion to initiate a detailed discussion of all the implications of this definition. Comprehensive, general and critical introductions to Peirce's theory of signs do exist. Unfortunately, however, most attempts to apply Peircean semiotics to design have hitherto been problematic since they tend to isolate and address only a section of the theoretical construct: the second tricotom, that is, the differentiation of signs into *icons*, *indexes* and *symbols*, and doing so only metaphorically, for instance, by claiming that meaning is a property of the object *per se* (e.g. Vihma [38]).

The definition quoted above states the principal points concerning semiotic inquiry. Attention should be drawn to the triangular structure of the sign. The sign is a relation of three terms: object, representamen, and interpretant. Sometimes Peirce is using 'sign' for the representamen position alone, but a sign process, *semiosis*, only occurs when all three relata are activated. Most importantly, the representamen – the representation – is physical by nature. It must be accessible to the senses. Semiosis is produced in an inferential act, when somebody draws conclusions as to the quality of the relationship between representamen and object, that is, the representation and what is represented. Thus, the conclusion is the meaning of the sign that is residing, as an interpretant, in the mind of somebody. On the one hand, the representamen represents its object, and on the other hand, the representamen is represented by the interpretant. Transposed to the world of objects, the foundation of the sign process may at this initial and seemingly pre-semiotic stage be illustrated as follows. Somebody sees a chair and concludes, on the background of his or her experience or knowledge, that the object qua its form is a chair, and consequently, the object and its utility, function, affordance etc. are categorized. Basically, a chair is not *per se* a sign, but as any object (and any objective cause of sense perception) may be

¹ References to Collected Papers of Charles Sanders Peirce, vols. 1-8, Cambridge, Mass.: Harvard University Press, 1931-1958, are given in the text in accordance with the convention. Thus CP 2.228 means Collected Papers Vol. 2, page 228.

² Among the best general introductions to Peirce's sign theory are (in chronological order) Johansen (1993), Liszka (1996), and Short (2007).

taken for a sign of something, so a given chair can be understood as a sign – as the manifest representation of what Peirce calls its object. Placed before an observer, a chair is a product. It came into being because a cabinet maker created it by using given materials and given tools, hence the chair is a(n index) sign of this production process. In the same way, it is a sign of the cabinet maker's outlook as regards questions of type, style, tradition, fashion, constructive techniques, etc. if somebody for one reason or another wants to see the chair as a token of, for instance, the state of the art within production technology at a given time, or as a sign of the inventiveness and skills of the designer and producer, respectively. The ability to identify this sort of sign function requires, on the part of the observer, a certain amount of knowledge of chair history. However, the more simple identification of the form and structure of an object as a generic chair is nothing but a recognition of its appearance as a materialisation, hence representation, of this particular cultural category, 'a chair'.

The sign function focussed on here is that of Peirce's index. An index stands for its object in a direct, factual way (e.g. [30] CP 2.92, CP 4.447). Contact, continuity, contiguity and existential bond are only a few of the many expressions used to qualify this relationship. One of the most illustrative cases of the index is the cause-effect connection between object (cause) and representamen (effect) (e.g. [30] CP 2.228, CP 4.531). Thus, the indexical sign process is brought into life as the interpretant establishes this cause-effect relationship. When an interpreter maintains that, for instance, the activity of the cabinet maker has caused the existence of a given chair by producing it, the interpretant, therefore, is the purposeful understanding of the causal relationship between object/cause (the cabinet maker) and representamen/effect (the chair). Two points should be made here. First, the latter example does not necessarily account for the user's encounter with a chair, but it exemplifies explicitly the interpretative approach of the design critic, analyst or historian. Each time a material object is being utilized by the historian for evidence, or as a source of historical information, the particular object is considered an indexical sign. If the historian has no access to the ideas, norms, values and policy of the designer/producer, this, of course, will not prevent the historian from engaging in an interpretative enterprise. Second, it is

the particular interest of the historian (or analyst or critic etc.) that characterises, focuses and confines or enlarges the search for potential or actual, physical relation of the material object to something else.

Thus, the indexical sign always has multiple meanings, depending on the interpreter's everyday needs or scholarly interests. No semiotician claims that polysemy is a property of a design object per se. Rather, they maintain that multiplicity of meanings is a consequence of the inferences made by the observer, the critic or the historian as to the factual relation of the properties of the design object to something else - not just anything, but the existential relation to something other than the object that makes it possible to construe the object as meaningful.

The representamen (the physical sign) may be related to its object in different ways. Peirce distinguishes between three modalities or three signs; icons, indexes, and symbols.

The icon is characterised by 'likeness' or 'similarity' of representamen and object, that is, the icon represents its object due to its resemblance to that object. In other words, the iconic sign is interpreted as a representation, the meaning of which is based on properties being shared by the representation and what is represented. Hence, the source of meaning in iconic signs is properties. The index sign is qualified as such by the factual (in some cases causal) relationship between representation and what is represented. The source of sign meaning in indices is relations between properties and their cause or context. Finally, the meaning of symbols is not the properties of the representation, nor the relations of properties to something else. The source of symbolical signs is conventions or traditions that institute and regulate the processing of cultural sign systems such as language and, more generally, any sign system conventionalised by a semiotic community in order to facilitate dialogues and secure broadcast and exchange of information, direction of behaviour etc. To put it in a simplistic way, a chair is in various respects an icon of any chair with which it has material, visual, functional etc. properties in common. This it is at the level of a chair as, say, (1) a specific type of furniture, (2) any singular manifestation of that type and (3) the individual chair in the series of token chairs – the unique, particular chair with its marks and traces of use and damages. The last category – the unique chair – may also contain all the 'invisible' marks that are

being attached to it by its user(s) (memories, traumas, obsessions etc.) during the social historical trajectory of the chair. Likewise, a chair may function as a symbol of something insofar as the particular cultural meaning of the chair is established by convention. This conventional meaning is only discernable by sign users (senders and receivers) familiar with the relevant sign tradition. Otherwise, the chair may function as an index or as an icon.

Peirce's sign theory is very complex. The above rehearsal is in fact simplifying a number of important dimensions of his numerous three-angulations of the theoretical project – Peirce's famous or infamous "cascades of triangles", as remarked once by the German semiotician Roland Posner [32, p. 185]. In the present context, the intention, however, is confined to a preliminary argument in favour of privileging the index sign in relation to design semiotics. Therefore, it seems relevant to foreground further consequences of applying this sign function.

The first consequence is that Peirce differentiates between three kinds of indexical signs. The index presented and exemplified above is what Peirce labels a *reagent*, in which the representamen is seen as the effect of an object (a cabinet maker's efforts, a set of materials manipulated, a class of furniture etc.). Another possibility is named *designator*, and this instances an index that functions as a demarcation of something (the object to which the sign (representamen) is still in a factual relation). The exemplary chair case may also include a situation where a chair (maybe a miniature of it) is hanging in a shop window or above the entrance. Nobody would expect to find food on the shelves of that shop. Anyone with a rudimentary knowledge of the shop system or the differentiation of the market place in a given retail culture would know that the chair indicates a special shop for chairs or seating furniture. It may also indicate a more all round furniture shop. In the latter case, the index functions in both ways mentioned. It is an index of furniture in general because it is part of the whole category of furniture (a reagent), and in the show case, it is an index of the commodities for sale in the shop behind the windows (a designator). The third index sign is naming, thus 'Charles' is an index of whoever is called Charles.

Next, Peirce's qualification of the index also may contribute to redefine, even 'solve', the uncomfortable question of 'connotation' as discussed in the 1960s and 70s under

the influence of the writings by Barthes and Eco. The two authors argued that things may have 'primary' and 'secondary' meanings and that the 'primary' meaning is translatable to 'denotation', while 'secondary' meaning equals 'connotation'. In Eco, for example, a chair's primary, denotative meaning is its function, that is, 'an object to be seated on', while the secondary, connotative meaning is 'an object to be seated on in a particular style' [9, p. 24]. In more general terms, both authors seem to assert that in the first place, we have a generic chair, whose utilitarian function is identified on the ground of its conventional appearance. Next, we have a particular chair that refers indirectly and in a mediated way to cultural values and norms of a specific seating culture. Is that really so? Is it not more correct to state that we only have one chair, and that we are capable of identifying the utilitarian function exactly because the chair is there, in front of us, as a material entity with specific physical properties in whatever style it may adhere to? If the chair refers to certain stylistic qualities, cultural values and, for instance, the taste of a particular class or cultural group, is it not just because it is actually a part of a given cultural segment or subculture? The elaborate ('connotative') meaning of the chair is not inherent in the properties of the chair itself, but in the properties seen in relation to something else. Is it therefore possible to perceive the chair as an index of that cultural unit, and not as an elaborated, yet (conventional) symbol? With reference to the indexical function of things, it seems more appropriate to state that the ability to grasp the meaning of a utilitarian object and its role in expressing a particular cultural outlook or a social status is part of a general cultural experience and knowledge of how to understand things and events in the cultural environment and to decide how to act accordingly in the real world.

2.2 Bonta's intentional indicator

The Argentine architectural critic and theorist, Juan Pablo Bonta referred only once to Charles Peirce's theory of signs. In a footnote in his book from 1979, *Architecture and its interpretation*, Bonta merely states that Peirce, Susanne K. Langer and Charles Morris used different terms for the structure and function of signs and that there is no direct equivalence between their terms reciprocally, and between their terms and his [3, p. 234]. Bonta's aims are stated explicitly in the introduction to his most elaborate discussion of design

semiotics. In his conference paper of 1972, “Notes for a Theory of Meaning in Design”, which was first published in the journal *Versus* in 1973 and later included in Broadbent, Bunt and Jencks’ collection of essays, *Signs, Symbols, and Architecture* [4], Bonta states that he wants to follow the line of semiological inquiry represented by the Belgian linguist Eric Buyssens and the Argentine semiotician Luis Prieto. By that, he wanted to present an alternative to Barthes and Eco, who, apparently, had functioned as the privileged reference for the majority of speakers and discussants at the conference during which Bonta introduced his application of European semiology initiated by Ferdinand de Saussure.

His reference to Buyssens is something of a paradox. In his reworked book from 1943, published in 1967 with the title, *La communication et l’articulation linguistique* Buyssens actually excludes the index and the function of indication from the field of genuine semiotic inquiry. Buyssens states the following concerning communication and indication;

“Semiology can be defined as the study of communication processes, that is to say, of the means used to affect others and which are recognized as such by those whom one wants to affect. [...] It is possible to affect others without intention; the way our friend talks suggests that he is in a sad mood, an unknown person’s pronouncement reveals that he is a stranger; the epileptic’s behaviour excites our compassion. It is about indices. We perceive them, we identify them, we interpret them, but this is not communication. Semiology does not study them, but confines itself to conventional means, that is, those means that are accepted as conventional” [6, p. 11-12, my translation, JG].

Excluding the index from the repertoire of semiotic problems, Buyssens nonetheless pointed to the challenge posed by the index to students of the materiality and expressivity of manifested signs. Building upon Buyssens, Luis J. Prieto almost simultaneously addressed the problem of indication. In his book of 1966, *Messages et Signaux*, Prieto explores the indicative function of signs (also communicative signs) in relation to the discursive formation and organisation of meaning. Prieto also maintains that all signs are indicators, and that the meaning of some

indicators is conventional. Such indicators are called *signals*, a term corresponding to Peirce’s symbols.

A collection of Prieto’s articles and essays, published in 1975 as *Études de linguistique et de sémiologie générales*, includes a couple of studies of particular interest for the present context. In a programmatic article with the title, “Sémiologie de la communication et la sémiologie de la signification” [34, p. 125ff.] he presents his arguments in favour of a ‘doubling’ of semiotic explorations and of putting communication and indication on the same footing. In another article, “Langue et style” [34, p. 34ff.], he carried through the doubling in a formal way and baptized the indicative sign as a pendant to Saussure’s communicative sign using the same, well-known sign structure to illustrate his ideas. To the sequence of the communicative process;

signe = significant + signifié = signification

Prieto now adds;

indice = indiquant + indiqué = indication

The motivation for introducing the indice is, firstly, Prieto’s interest in the way the linguistic sign materialises social, psychological and geographical conditionings of the sign manifestation, and, secondly, his preoccupation with aesthetic or stylistic aspects of signs used to enunciate artistic meanings, that is, aesthetic signs.

This is Bonta’s starting point, and he is particularly interested in sorting out the implications of the expanded theory of the sign to design practice. This means, however, that Bonta’s semiotic theory of design is normative, thus it somehow runs across the meta-analytical position suggested in the present context. Yet, it seems possible to enlarge Bonta’s view and thereby substitute the normative bias for an analytical approach (see [16]). Anyhow, Bonta is unsurpassed as concerns a theory of design semiotics. His theory is based on a differentiation between signals (or communicative signs) and indicators (or indices or indicative signs), and this differentiation is subject to further differentiations in order to emphasize the specific role of the designer in construing meaning in design. It should be noticed that Bonta employs a modified version of the matrix of communication processes to illustrate his conception of the interaction between designer and design object

and between design object and receiver/potential user. This is an indication of his loyalty to the European tradition, and it may explain why he did not engage himself explicitly and directly in a dialogue with Peirce's position.

In the texts cited in the present context, Bonta distinguishes between four signs. To begin with, he introduced three signs; *indicator*, *signal*, and *intentional indicator*. Later on, he added a fourth sign, the pseudo-signal [3], yet finally, however, he excluded this fourth sign modality [5]. His definitions are formal and concise. Of the indicator, he explains,

"An indicator is a directly perceivable fact, by means of which it is possible to learn something about indirectly perceivable facts. [...] Through the former I can learn something about the latter, consequently they are indicators [...] The indicative relationship is thus characterized as a triadic one (form/meaning/interpreter)" [4, p. 276-277].

The signal is defined in the following way,
"Signals are a special class of indicators that fulfil two additional conditions: firstly, they must be deliberately used – or eventually produced – with the purpose of having an act of communication; secondly, they must be recognized by the interpreter as such as having been deliberately used to have a communicative act. If either of these two conditions is not fulfilled, we may be faced with an indicator, but not with a signal. [...] Signals have form, meaning and interpreter, like indicators; and in addition they have an emitter. The interpreter of a signal can also be called receiver" [4, p. 276-277].

These two definitions conform to traditional predicaments of the two entities, indication and communication, although terminologies vary. However, Bonta's third sign modality – the most important in relation to his semiotic design theory – is an innovation. This third sign is termed *intentional indicator*. Prieto also had a sign category by the same name, but to Prieto an intentional indicator is a signal, or functions like a signal. Bonta introduced his third sign as follows,

"There is an entity which is neither pure indicator nor signal, though it is rooted in both. I shall call it an intentional indicator [...] An intentional indicator is an indicator which fulfils the first of the conditions of the definition of a signal,

but not the second [...] it is an indicator deliberately used – or produced – by someone to generate an act of communication, but which must not be recognised as such [...] on the part of the interpreter [...] the user or producer of intentional indicators cannot be properly called emitter, since we are not really dealing with communication: it will be better to call him the producer" [4, p. 279].

One of Bonta's principal points is that designers should avoid using signals to express the meaning of design objects. In other words, they should not see themselves as emitters. Therefore, the mediated interchange between designer and user via the object is not to be considered communication proper. Instead, Bonta claims that the design process, seen in relation to the true values of the professional trade, should be that of producing intentional indicators. Thus, as quoted above, the designer is not comparable to an emitter or a sender, since emitters and senders are processing conventional signs. Likewise, the receiver position is in fact the position of an interpreter, since an interpreter makes use of her or his general or ordinary experiences as to how needs, wants and desires are matched by the shape, substance and unmediated appearance of available artefacts. In the special case of the intentional indicator, the job of the designer is to activate all the professional skills and knowledge of the potential user's needs and the user's usual way of interpreting the appearance of things in order to identify their utility and performativity. In other words, the designer should appeal to the 'materialistic' common sense of the potential user by means of indices, that is, hints, and not by using conventional signs such as labels, instructions or traditional iconography. It should be noted, of course, that Bonta is not concerned with 'black box'-cases. In the original version of his theory, Bonta gives only few examples: a door entrance to a bar (which is also used as a case in the article from 1993), a screwdriver and chess pieces – the latter being the principal test case that he used in order to demonstrate a systematic approach to a definition of design as a semiotic enterprise. To Bonta, the chess case is exemplary of how a design tradition characterised by conventional iconography (towers, horses, king's regalia etc.) is difficult to get rid of, even if, in contradistinction to chairs, there is no logical ground for insisting on certain configurations of forms. From Bonta's reflections on the new sign category, the

intentional indicator, it becomes evident that he wants a potential user's perception of things to be an active interpretation of the performative capacity of given artefacts, not a reception of messages. At this point, it is possible to conclude that Bonta wants a design object to present itself to a user as a 'natural' sign that functions as a sign just like footprints in the snow do to the mind of an interpreter. This implies that the designer's strategy should be to avoid being too personal or subjective or too idiosyncratic in the choice of formal and constructive solutions. In other words, Bonta maintains the modern ideal of the anonymity of the designer. From his discussion of modern and modernist architecture [3] it becomes evident that he favours the cultivation of the expressive properties of architecture. However, he shuns so-called 'signature-architecture' – architecture, the most conspicuous characteristic of which is its dysfunctional and excessive expressivity.

Most importantly, with the stress on the designer as producer and the potential user as interpreter, Bonta emphasizes both the activity of the designer in his capacity of the cause of the design of things and the user's direct and active encounter with things. It is, of course, typical of Bonta's designer-approach to the issues he raises that he ignores a very simple fact: the designer does not produce the things the buyer/user/consumer etc. actually makes use of. Usually, the designer provides a model or prototype but it is the producer/retailer/gift donor who delivers the item to the future user. In any case, the ideal of anonymity may compensate for this flaw, and above all, it should be remembered that Bonta's focus is on the designer's strategy, and a crucial element in that strategy is the designer's ability to anticipate how the user will encounter and interpret objects for specific uses. To anticipate is not the same as forecasting on the basis of empirical market research, but with reference to the material logic of material, form and function. This implies that, in Bonta's theory, the process of manufacture is put in brackets, which is rather typical of designers' theories to conceive the manufactured object as an entity mediating the relationship between designer and user. Yet, the important idea to underline in Bonta is his focus on the direct, sensory contact between things and people, and this implies that the material – and expressive - properties and features of things are in the centre of concern.

3 Anzeichen and indicator

Bonta is no functionalist, even if he made pleas for the anonymity of the designer. To Bonta, architecture and design is always expressive, yet expressive in multiple ways. His view of useful artefacts in all scales is functional, too. His ideal is that expressivity and functionality combine into a coherent whole. In Bonta, expressivity is related to the sign function, which means that, since no specimen of an artefact can avoid being interpreted as an expression of something, the artefact is always a sign insofar as somebody actually perceives it as a sign. Thus, the expressive quality and the design values of modernist or functionalist architecture and design may be catalogued as; simplicity, austerity, sobriety, rationality etc. and, in a broader historical context, related to ideals such as democracy, freedom of alienating norms and traditions, free-mindedness etc .

Apparently, the impetus to the so-called *Offenbach approach* to consider design as product language is in explicit opposition to the stand taken by Bonta (and, in the end, Peirce as well). So, for instance, one of the founders of the Offenbach position, Jochen Gross, states in his review of the intellectual and political origins of the new approach that he and his colleagues wanted to challenge the functionalist idea of design (and architecture) as a 'dumb servant' [36, p. 12]. Now, the point is of course not that design should no longer pay service to consumers and users, but design should raise its voice and 'speak' loudly in a new key. Consequently, the Offenbach researchers and teachers introduced the notion of *Design als Produktsprache*, that is to say, they wanted to treat design as the language of designed objects, which means that the language like performance of design is the focus of the school's theoretical grounding. By choosing the American philosopher Susanne K. Langer's book, *Philosophy in a New Key* from 1942, as a master theory for their reasoning, they came up with the concept of *Anzeichen* to match the idea of design as a sort of object language [36, p. 62]. Focus on the *Anzeichen*/ indicator of design prevents Gros, Steffen et al. to suggest a simple, unmediated parallel to communication, and in harmony with Bonta, they argue in favour of a more inclusive conception of interaction between design objects and their users. Contrary to Bonta, the Offenbach researchers are generous as to providing concrete examples of how various features of form, material and construction objectify the indicative

functions of useful artefacts. Eventually, the Offenbach theory of product language is modelled over the communications matrix.

One reason for that is, perhaps, the choice of theoretical inspiration. Susanne K. Langer's terminology is not only rather idiosyncratic (cf. Nöth [29, p. 108-116]). She also revised it, yet only in a half-hearted way. In the first edition of 1942, Langer distinguished two main sign categories, signs and symbols. Signs *indicate* what they stand for, and as examples, she mentions natural signs, symptoms, signals etc. [22, p. 35-39], while symbols *represent*, which, for instance, pictures, names, notes etc. do [22, p. 54-67]. However, in Langer, to *represent* means not to stand for or substitute an object; "symbols are not proxy for their objects, but are vehicles for the conception of objects" [22, p. 61]. In the preface to the second edition of the book (1951), Langer admits after having read Charles Morris' *Signs, Language and Behavior* (1946) that she would have substituted sign by signal in accordance with Morris' terminology if the book had been subjected to a rewrite, which, however, it was not. The differentiation between sign and symbol, which Langer suggests is conventional in semiotic literature. To most semioticians it is, in fact, the basic division of the world of signs. This differentiation has, of course, been elaborated more or less systematically by a number of scholars in order to cover various ranges of phenomena. In Langer, whose sign theory initially was inspired by Ernest Cassirer's ideas of cultural symbols, the predicament of symbol includes examples that according to Peirce are not conventional signs ('symbols', in Peirce) but icons and indices. For instance, in Langer pictures are symbols in the sense quoted above; they bring forth a conception of what they symbolize. Proper names are also being classified as symbols. Though Langer cites Morris as concerns the sign (as opposed to symbol), Morris' definitions of the terms differ from Langer's use of them. Morris conception of *signal* (that approximates Peirce's definition of the index sign) is relativistic in that he states that "all signs not symbols are *signals*" and as an example he gives a person who "interpret[s] his pulse as a sign of his heart condition". The person's registration and interpretation of his pulse exemplifies that "such signs are simply signals; his resulting words – when substitutes for such signals – would however be symbols" [26, p. 100-101]. The words used to diagnose

the heart condition are symbols, while the registration of the pulse is an interpretation of a psycho-somatic condition. Morris gives a formal definition of the symbol by stating; "...a symbol is a sign produced by its interpreter which acts as a substitute for some other sign with which it is synonymous" [26, p. 100-101]. In other words, a symbol substitutes a signal.

In the preface of the 1951-edition of *Philosophy in a New Key*, Langer states that Morris' signal covers what she in the book had named sign. Morris uses the term sign to denote any conveyor of meaning. This principle would have been introduced if the book's chapter on the logic of signification had been revised. Concerning the use of the signal category, Langer further states here that;

"Naturally, the term 'signal' is widened to include not only explicitly recognised signals – red lights, bells etc. – but also such phenomena we obey as signals addressing our senses, for example, the sight of objects and windows by means of which we find our bearings in a room, the sense impression that is caused by a fork in the hand of a person, who thereby is induced to raise it to the mouth; in short, it comprises whatever I have called 'sign'" [22, p. 18].

The German translation of Langer's book, *Philosophie auf neuem Wege* from 1965, which is cited in Dagmar Steffen's presentation of the meaning of *Anzeichen*, is based on the original edition, which means that the 1951 preface is absent [36, p. 62]. Thus, the translation of Langer's 'sign', wisely enough, is *Anzeichen*, which in the context of semiotics and semantics usually means *marker or indicator*. Consequently, there are no *signals* in the German theory. Then, the question is whether the Offenbacher key concept really is identical with what Morris names signal (a naming that Langer *post festum* subscribed to) or to what extent it actually overlaps, even covers, the index as elaborated by Peirce and Bonta, respectively. If so, the above comments on technical terminology seem redundant. If not, the Offenbacher may have come up with a fresh perspective on meaning in design.

Just like Bonta did in his theory of meaning in design, the doctrine of product language promoted by the Offenbach School adopts a perspective from the inside of the designer's trade. This means that the theory of product language is partial from the very outset, directed towards designers and students at design

colleges. Certainly, this implies that the pragmatic perspective forces, so to speak, the protagonists to make theoretical issues clear and accessible and to sort out and arrange problems in models and tables that are designed to be easy to understand. Now, the perspective of the present inquiry is not the designer's, but more general in terms of epistemology, which means that the agenda here is to elucidate whether the theory of product language matches the general requirements of a theory of the indicative or indexical function of design. From this perspective, it is not relevant to discuss the applicability of the insights postulated by a theory to one among a great number of actor roles.

The second chapter of the volume, edited (and co-written) by Steffen, provides a comprehensive introduction to the theoretical stand that informs the theory of product language [36, p. 34-95]. The theory pivots upon object functions that are, firstly, divided into two main modalities called 'practical' and '*produktsprachliche*' functions, the latter being the functions of product language, also termed 'sensuous' functions. Secondly, the sensuous functions are again divided in two; 'formal-aesthetical' versus 'sign' (or semantic) functions. The third binarity is established as a differentiation of the sign functions in 'indicative' (*Anzeichen*) and 'symbol' functions. These are the basic components of the field that the Offenbacher want to address, and the field is illustrated in schematic overview [36, p. 34].

Irrespective of what the theoretical endeavours are called – design semantics or design semiotics – the three divisions are based on conceptual choices of great importance to the extent of the Offenbach theory of meaning in design. To begin with, it should be noticed that meaning is defined as a function, not a property of objects, and, further, that function is seen in relation to two entities; user and product. Thus, this view maintains that the relation between user and product is mediated by functions – not the form and material of an object but its utility. Concerning the three divisions (I-III) the following preliminary observations can be made. The distinction (I) between practical and sensuous (product language) functions is somehow surprising. What is the theoretical value and methodological point in isolating practical functions from sensuous functions? If the sensuous functions of the language of a given product are not being considered an integrated part

of the specific practical functions, whatever they are, does that not imply that product language tends to be perceived as mere ornamental rhetoric? What about the kinaesthetic experiences made while operating an object for use and realising the functional potentials of it?.

This is not simply a pedantic, theoretical question.

On the contrary, it points to the curious fact that the theory does not operate with further differentiations of practical functions. Apparently, they are seen as one.

The second division (II) concerns a differentiation between the aesthetic function of form and the sign function, that is, the meaning function of product language. This distinction is surprising, too, for, accordingly, aesthetic functions are viewed as something other than sign functions. Of course, aesthetic stimulation is one effect of the sensuous functions, but to exclude what people have of affections and sensations from the semiotic or semantic functions of objects seems unjustified, and in fact not well grounded in the presentation of the Offenbach project.

The third division (III) into indicative and symbolic functions also calls for a short comment at this stage. Both functions are conceived as sign functions, and the question is whether the two are identical with how the function of sign categories is defined in Peirce. Superficially, that is, as concerns terminology, whether the indicative and symbolic functions correspond to Peircean indices and symbols. However, Peirce's conception of symbol is considered too narrow with its emphasis on conventionality [36, p. 24], and in Steffen's chapter on symbolic functions [36, p. 82ff] it is stated that the Offenbacher subscribe to Susanne Langer's reworking of Cassirer as to the cultural meaning of symbolic forms. To this position is added some inspiration from Gestalt psychology (Rudolf Arnheim) and the psychoanalytical method (the so-called 'deep-hermeneutic method') proposed by Alfred Lorenzer. In accordance with Langer, then, symbols give rise to conceptions. In the Offenbach approach, conceptions are of what is symbolized qua the language of an object perceived as a sign. From both Steffen's and Gros' accounts of the symbol, it becomes evident that symbolic functions include a variety of sign functions that in Peirce would have been categorized as examples of the indexical sign meanings. Furthermore, the Offenbach symbol also comprises both a number of conventional signs and series of more or less unruly associations that may say something about a given

individual's imaginative power to get ideas or create phantasms, but nothing substantial about the object itself. So, for instance, possible associations are male/female, young/old, friendly/aggressive, stiff/movable etc. – all very elastic, all very elusive, as most affective reactions are. On the other hand, the category of symbol also extends to a great variety of stylistic features. Some are in fact genuinely conventional (e.g. company style, designer's style etc.), while other examples are not conventional in any proper sense (e.g. the style of an era (Baroque, Classicism, Modernism etc.)). A baroque joiner could not have decided to construct a modernist cabinet. Hence, a baroque cabinet is an index of baroque product culture, since its material and physical properties are perceived by the critic or historian and, in the same analytical operation, related to a past milieu. Thus, a cabinet from any historical and contemporary unit or segment of product culture may be interpreted as an icon (property). The properties are of interest as an index (properties seen in a causal relation to what conditioned them). A baroque cabinet manifests 'baroqueness', irrespective of it being interpreted or not. Baroqueness is a property or quality, and it only exists due to a great number of cabinets exhibiting shared visual and objective qualities. The label 'Baroque' is just a name, hence an example of what Peirce calls a designator index.

The classification of functions seems to come short of both the inclusive ambition, which is indicated in the schematic overview [36, p. 94-95], and the aim of focussing on human's sensuous encounter with the expressive functions of design. This statement is, as remarked earlier, not a criticism of the Offenbach approach, but just an element in a *critique* of the index category and the indexical/indicative function of things. The schematic overview cited above (construed by Gros and Steffen) is an excellent illustration of the whole field of inquiry addressed by the Offenbacher. A number of catch words organized diagrammatically according to further subdivisions of the three more principal differentiations commented on above demonstrates how valuable this approach is. The final part of the book is called "Product interpretations as cultural study", and it comprises a number of, for the most part, brilliant analyses of a great variety of cases. These case studies document the power of detailed scrutiny of indicators in the Offenbach style. In fact, most of the sign functions

in focus in the case studies are indicative functions, irrespective of the classifications commented on briefly above and illustrated in the tableau by Gros and Steffen. In that way, the privileging of indication seems justified. However, the theory of the Anzeichen could have been elaborated further and sophisticated in order to attain a more solid grounding of it. Even if the Offenbach approach provides one of the most comprehensive and focussed in the field, the ordering of problems and classification of functional and pragmatic aspects of meaning formation in design, leave a set of pertinent theoretical and epistemological problems open and partly unsolved.

To mention only the most acute problem, the classification of sign functions is not in accordance with the most accepted contemporary terminology, nor does this classification meet the requirements of common sense as concerns semiosis, the sign function. For instance, no grounds are given for handling (theoretically) the form-aesthetical issues as non-signs. The aesthetical functions of form are (in the style of Alois Riegl and Heinrich Wölfflin) organized in a series of binary oppositions of order vs. complexity (e.g. simple/complex, closed/open, clear/unclear, balanced/unbalanced etc.). It is difficult so claim such formal characteristics to be non-sensuous or non-expressive. On the contrary, as formal qualities they are essential ingredients of the indicative function of an object, and since the articulation of such qualities is part of the designer's job, it seems quite reproachable to exclude the aesthetic of form from the system of signs. If the Offenbacher had included the form-aesthetical qualities, the two signs in the classificatory system (indicators and symbols) would have been better described, and if the sign functions included in the latter category had been sorted out in icons, indices and symbols and organized in accordance with the comments given above, the whole functional logic of the theory of product language would have been transparent. Thus, objective properties and formal qualities could have been classified as icons, and focus on how overall qualities as well as the concrete details are 'addressing' or 'appealing to' the user would certainly have foregrounded the indexical sign function. In the Offenbach model, indexical or indicative signs are divided into categorical indicators (that allow an identification of both object category and a unique object's present conditions), and functional indicators (giving hints at the handling and

usage of an object, as well as its presence in time and space in the vicinity of the human actor). Both types of indicators may be natural (part of the object as such) or artificial (added graphic signs giving instructions on how to operate the object – “on/off”, “max/min” etc.). It should be remembered that what Bonta aims at as a professional ideal by putting emphasis on the creation of *intentional indicator* as the moral task of the designer is to eliminate artificial indicators – in his terminology: signals – from the genuine repertoire of the designer’s paradigmatic choices.

Another issue, which was pointed at in the beginning, is that of unrestricted semiosis. As mentioned, proponents of so-called ‘product semantics’ often claim that semioticians have problems with multiple meanings (e.g. Krippendorff [20, p. 98f., 21, p. 276-277]. ‘Product semantics’ allegedly has no such problems, nor do the Offenbacher have, for, as hinted at in the preceding discussion, they simply employ a very inclusive conception of the symbol category that apparently allows, even invites, all kinds of associations as adequate. There is a problem here, a problem that Peircean semiotics has a methodological answer to. The sign process, semiosis, emerges when a sign is interpreted, that is, when an interpreter infers the type of relationship between sign (representamen) and its object. This inference produces an interpretant, an understanding of that relationship, by (re)construing the object. In the first instance, the (re)construed object is what in Peircean terminology is the *immediate object*. Further scrutiny may result in a broader and more elaborated and precise understanding, and the resulting knowledge is termed the dynamical object. The identification of the immediate object may be uncertain and vague. However, the identification will, as one or more dynamical objects are established, gradually become either more accurate or falsified. This means that wrong ideas (interpretants) of what is represented in icons, indices or symbols will be detected. Thus, a sign – a material entity – cannot just mean what so ever, neither in semiotic, nor in semantic terms. An observer or a user may of course ‘read’ or attach the most idiosyncratic meanings to things, but this is of no interest methodologically. What counts in general, and for the designer in particular, are the meanings that actually are materialised in an object’s physical properties. What else?

4 Conclusion and perspective

Design researchers, both theorists and practitioners, are of course interested in establishing firm grounds for addressing how things appear and appeal to people, and, reversely, how people relate to things for different reasons. Designers and design educators may approach the problems discussed above in ways that differ from the ones employed by critics, theorists and historians. No singular path, however, represents the privileged approach, as long as concepts, categories and predicaments are kept straight and grounded in sensible and well argued definitions. The conclusion to the problematic of meaning in (and of) things is, in the present context, that to conceive objects as indicators and intentional indicators opens a way to a sensitive and detailed study of how makers and users actually relate to things in multiple ways. A focus on indexiality, as suggested here, allows much more sophisticated findings to emerge than metaphorical talks about things not communicators as communication (e.g. Barnard [1, 2]; Crilly [8]). As a matter of fact, then, design research (that is to say, design studies beyond marketing, shopping, consumption, identity building etc.) and recent developments in material anthropology actually meet in a common effort to give priority to the material quality of things. In particular, the posthumous work by Alfred Gell, *Art and Agency* [12] has marked the starting point of a new interest among anthropologists and art historians in the materiality of, say ‘aesthetic objects’ including (high) art works as well as humble objects for use. This new interest marks a paradigmatic shift – from the study of consumption as a key to an understanding of contemporary, late- or postmodern culture, to a study of the role of materiality in meaning construction (cf. Miller [24, 25]; Gell [11, 12]).

The idea behind the new approach is to focus on materiality as such as a source of meaning, and more specifically, Gell and protagonists (e.g. Pinney & Thomas [31]) even suggest the possibility of talking about objects having a kind of intentionality, without risking accusations of being animists or fetishists. In short, what is intended with this approach, is not to give a new or conclusive definition of the broad category ‘art’, but to define and analyse how and why people react in both rational and irrational ways to things. Especially, what is interesting is the social relations mediated by and with ‘art-things’. The relations of particular interest are those

that emerge and unfold in the special settings that Gell calls “art-like-situations” where ‘art-things’ function as indices. Gell explains; “I propose that ‘art-like situations’ can be discriminated as those in which the material index (the visible, physical thing) permits a particular cognitive operation which I identify as *the abduction of agency*” (Gell [12]; cf. also Watts [37]). Thus, the key words are ‘index’, ‘abduction’ and ‘agency’, and Gell’s idea is that observers and users of objects are, by inference, attributing agency to material things – an ability of things to act upon people, who subsequently react in accordance with the social conventions of ‘art-like-situations’. Such situations could, without any methodological problems, also include ‘design-like-situations’. The point here is that ‘design-like-situations’ are situations, in daily life as well as on special occasions (e.g. museum shows), in which observers and users of utensils relate themselves physically to, and thus are affected by, the material qualities of things. The relation comprises both motor functions and emotions. And also, such situations are characterised by the expectations from the part of observers and users – expectations concerning the material intelligibility of things. That is what the indicative sign functions in design are all about.

Acknowledgement

I want to dedicate this paper to my late colleague Anne Borup (1959-2010), who was killed in a tragic traffic accident on May 21, 2010. I’m grateful for her contributions to our intense discussions of the function of indicative signs during the spring of 2010.

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Seeing things differently: Prototyping for interaction and participation

Abstract

This paper reflects on the notion of prototyping for interaction and participation in design by looking at the arguments that have been given about its purpose and benefit. It then explores how these arguments play out in a practical case study in which design students set up participatory sessions and reflect on the effectiveness of prototyping in them. Conclusions include that the term 'prototype' remains a source of potential misunderstandings, that a true exploration of prototyping requires smaller exercises and more iterations, and that interactions in prototyping sessions need attention in order to enable participants to really explore future interactions.

Keywords

Prototyping, Prototypes, Interaction, Participation, Things

1 Introduction

People encounter and use products, systems and services in new and complex ways. This makes it necessary to prototype interactions early in design, enabling users and other stakeholders to experience (part of) a use situation before design concepts have been fully developed. Design prototypes have been described as explicitly representing the function, behaviour and structure of a design at each relevant

stage of a design activity [1]. Prototypes can also be tools to share knowledge, even implicit knowledge [2, 3]. Differently put, they can be catalysts through which implicit knowledge is made explicit. This we explore in this paper.

1.1 Prototyping in design

How has prototyping been used in design? Buchenau and Suri's 2000 conference paper "Experience Prototyping" [4] is popular and often used for inspiration by interaction designers and design students. While still highly inspirational in making innovative practical suggestions, it was not strong on arguing the advance in design thinking it represented. Perhaps our practical understanding in design tends to run ahead of our theoretical understanding? Consider how Buchenau and Suri described at the time what a prototype actually is. They stated that "'Prototypes' are representations of a design made before final artefacts exist." The purpose of prototypes is "to explore and communicate propositions about the design and its context." While Buchenau and Suri's prototyping and design research efforts were still mainly directed at "a design", developments in design research around the same time became more broadly directed towards lifestyles [4] product contexts [6], use experiences [7] and the "product milieu" [8]. In these, a variety of interventions conceivably contribute to the improvement of circumstances, via services, products,

systems or simply improved participation. Design is not just about new products and new technology, but also about the way (new) objects, services, systems and lifestyle choices fit into life contexts. Designers have to be able to make today's and tomorrow's digital and complex artefacts amenable to human interaction [9, 10, 11]. So design should also be about "encouraging social arrangements that provide for the necessary time and resources needed to incorporate unfamiliar artefacts effectively into relevant forms of practice", as Suchman [9, p. 182] advocates. Besides this, while design is often promoted as being able to generate innovation and hence new business opportunities and to make innovation acceptable, it can also extend into areas where it contributes to more participation in societal developments (e.g. [12]).

In prototyping interaction, one can look at any things, old or new, as experience prototypes in a context. Things always help to elicit and prototype experiences and interactions that people have. But is it just the objects we should be describing as experience prototypes? Will this not just throw us back on looking at the objects again, at "the aesthetics of appearance of [what we perceive as] behaviourally passive objects" [13]? They are seemingly epistemologically stable, because they have a physical manifestation. But we want to consider them in close connection with interaction, the "material without qualities" [14, p. 3].

Significant advances in this have also been made by Sanders [15] who developed sets of prototyping tools where both existing and imagined contexts and future designs are given abstracted physical form. Potential users can interact with those artefacts and manipulate their shape and configuration ("velcro modelling"). This produces insights on needs for future circumstances. This echoes Brandt and Grunnet's work [16]. They experimented with highly generic shapes in order to be able to project participants' stories and perspectives on them freely. Djajadiningrat, Matthews, and Stienstra [13] took a different route. They report on exercises in which they sought to make physical things express possibilities for and invite human bodily movement, thereby extending the field of attention from the objects themselves to the actions that are carried out with them. None of these authors provide explicit guidance yet on how designers can be enabled to generate and work with prototyping for interaction, and to understand the difference between working

on objects themselves and working on interactions of which objects are a part. Even representing the 'invisible' by abstracted physical objects (as Brandt and Grunnet [16] did) still holds risks for designers to focus again on the material qualities of those things, since this is what they are trained to do.

Our focus then, is on any kind of prototyping activity that might be used to direct our attention to the interactions in a particular context rather than to an intended design solution. We look at how designers can set up, carry out and evaluate this prototyping and its effects. We should treat any design efforts we make in setting up a prototyping session as just props in an interaction, and broaden our focus from what happens with an object to what happens in a context and how objects affect that. Buxton's [17] proposal in this respect was to even drop the term "prototype", and instead to talk directly about "sketching user experiences". What are prototypes if the goal is to investigate experiences and interactions? How are they used? The prototypes in question should not be seen as representations of a future design, but as [things plus interactions] of some kind that have some effect in a given context. They are carriers of insights that serve to inform future design efforts, but not in themselves representations of future designs. We are mainly interested in the process of prototyping.

1.2 Method: a case study on the prototyping for interaction and participation course

This paper approaches these questions through a case in which Industrial Design Master students use prototyping as part of stakeholder sessions in an elective course called "Prototyping for Interaction and Participation". This paper sketches the set-up of the newly developed course and how it seeks to put prototyping activities in the service of insights into a context. The aim of this case study is to gain insight into the effectiveness of interaction prototyping as a participation and communication tool for design. The students themselves contribute as student researchers to this research aim, reflecting on their activities in a structured way. While the empirical material of this paper draws on design education only, its applicability is seen as broader. It is part of an exploration of new ways of designing in which designers take on a role of facilitators rather than genial creators. The course was set up in such a way that students are enabled to make a transition from

looking at things as ends, to things as means. The goal for the students is not to design or redesign towards a final artefact. The artefacts the students generate are not representations of a design, but catalysts, exemplars in representing stakeholder perspectives and interactions. We are focused on how people interact with each other, as well as on the ways things play a role in their interactions. The course is intended to serve students in becoming attentive to the possibility of using their design skills and results as tools for inquiry. For this we derived some preliminary guidelines from initial reflections on our previous design education efforts [18]. In order to encourage students to see their designing as part of inquiry, we seek to:

- Build on students' enthusiasm for making things;
- Have them experience and play with the balance between appearance and content;
- Have them explicitly reflect on things they make from a research perspective: with research questions on situations and the role things play.

While our education efforts are intended to contribute to shaping a more inquiring designer, we also, at the same time, use the course to explore new research stances that are more suited to designerly modes of inquiry. We want to explore together with students how they can use their design skills and results as tools for inquiry.

The authors monitored all of the activities described above from an action research perspective (as laid out by e.g. Robson [19]). They observed and recorded the activities, while also being substantially involved in planning them. The students were also asked to reflect on the success of their own activities. This was a built-in part of the course, and simultaneously of the research approach. The collaborators on the course design, who are also the authors of this paper, also peer reviewed the success of the activities throughout the course. Because the monitoring went on throughout the entire course and because the research was exploratory, an open qualitative research stance was adopted, with attention to the three preliminary guidelines presented above. In a future inquiry that focuses more on specific details, a smaller sample of activities could be taken as data and specific design activity aspects could be investigated as in [20].

2 The course “Prototyping for interaction and participation” (PIP)

The course focuses on creating insights into the use of prototyping in stakeholder sessions. The students use research and design techniques in the course. They are not in the first place a designer generating solutions. Rather, they are a researcher using their design skills to generate insights and future directions. That is why we

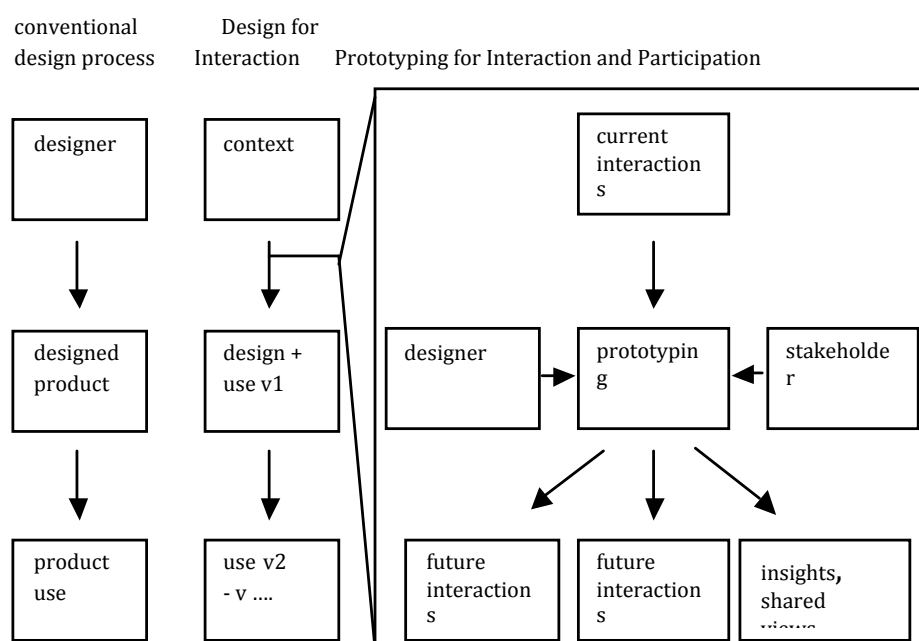


Fig. 1. A schematic illustration of differences in aims of the Prototyping for Interaction and Participation course and a design process: PIP is seen as a participatory rather than a design process. The figure shows that it can function as a stage in a Design for Interaction process.

use the terms ‘artefacts’, ‘props’ or ‘prototypes’ rather than ‘design solutions’ for the objects the students create as part of the course. The students prototype by creating participatory sessions in which they use props, sensitizing objects, future products, settings and scenarios to enable users to simulate existing and future interactions. In order to indicate how this differs from a design process, Figure 1 is used in the course to show how the course is aligned to a Design for Interaction perspective and process:

The aim of the course for the students is twofold, or rather, on two levels (see Figure 2). The course focuses on creating insights into the use of prototyping in stakeholder sessions:

- at an overall level, in which they reflect on their work as a whole: on how effective their chosen design and research techniques are in generating insights about, with and for people
- at a topic level, in which they generate and communicate insights for the case owners and stakeholders on the views and discoveries of the various stakeholders on possible future interactions.

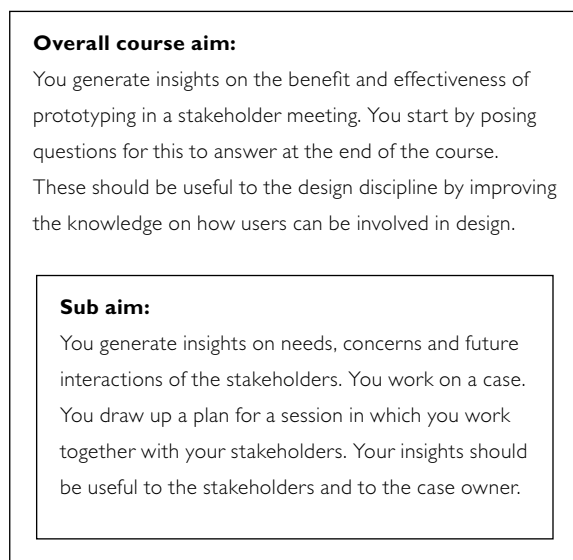


Fig. 2. The overall course aim and sub-aim as it is communicated to the students

The students work on cases that have several stakeholders with possibly conflicting interests. By working with the stakeholders in a participatory session, the stakeholders can become aware of each

others’ perspectives, needs and concerns, and they can explore future interactions together.

The course content is also reflected in the course approach. Each aspect of prototyping in stakeholder sessions is itself prototyped in workshop sessions with the students before they actually carry out the activity. Near the start of the ten-week course, there were lectures, workshops and exercises on the following:

- a lecture and collection of background literature on various techniques of prototyping for interaction
- a lecture and exercise on communication issues in stakeholder meetings
- a workshop on a practice topic that included prototypes and prototyping (Figures 3 and 4)
- a guest lecture on practical cases of using prototyping in service design.

2.1 Course topics

The topics for the course are chosen so that there is no clearly discernable product goal, but a context that invites some form of insight and intervention. This strategy is chosen in order to discourage the students from focusing on ‘their design’, where the context around it ends up peripheral after all. Rather, the strategy wants to encourage the students to fully engage with the context and the needs and concerns of the people in it. Any designs that the students make should serve to enable stakeholders to understand their own and each others’ needs and concerns, first. The students work in teams on a topic. The topic are pre-arranged for them, with initial contacts made available. The students have to make contacts with some of the stakeholders themselves. The topics were acquired by approaching companies and institutions, explaining the aims of the course and enquiring with them whether they have a question that fits the course aims. Two topics are discussed in this paper. Each topic was tackled by a team of three students.

“My first toaster”. Electric household products are increasingly directed at children through child-appealing design. Children as young as 2 years old are attracted to them. The Food and Consumer Product Safety Authority (FCPSA) assesses the risks of products to consumers and advises the government on how to deal with those risks, for example through legislation. Child-appealing electrical household appliances are a new phenomenon. How do these new types of

products enter the lives of families? Children are getting more used to owning electric and electronic products themselves. Does this bring changes in risk perception and behaviour? The challenge for the PIP student team is to devise a participatory session in which they enquire how parents and other educators deal with the risks their children face in daily life, particularly with regard to child-appealing electrical appliances and other appliances. The results of the students' work should be recommendations to the FCPSA for their policy advice. Stakeholders in this context are the children, parents, other educators, the FCPSA, and the companies that make and market such products. How can their perspectives be made heard?

“Technogirls”. Delft University of Technology (TUD) wants to increase the diversity of its students through activities directed at schoolchildren, particularly girls and children with an immigration background. For example, they run weekend workshops for girls of 14-16 years old, who at that moment have to decide whether to opt for technical modules at school. If they do, it prepares them to enter a technical university. The responsible TUD department has gained quite some experience in how to serve the needs and ideas of girls well. But the TUD thinks that more is possible. The schoolgirls who attend TUD events are welcomed and mentored by a specially trained team of TUD students. The PIP student team is challenged to devise a participatory session in which they enquire how the student mentors can work empathically with the schoolgirls and mentor them in a way that corresponds well with their life experience and perspective. The results of the students' work should be recommendations to the TUD on what they could do to advertise to schoolgirls better.

2.2 Course activities and results

The students started their practical work in the course with a practice session on a case that was provided, to explore prototypes and prototyping (Figures 3 and 4).

In their own work that followed, both student teams struggled to find stakeholder representatives and resolved this by first researching the perspective of some stakeholders separately and then incorporating it in a session with just one to two types of stakeholders. The students produced plans for their sessions and



Fig. 3. Students working on the practice topic: putting themselves in the role of stakeholders and brainstorming on stakeholder needs and concerns. Following this, they devise scenarios and prototypes using simple materials in which these needs and concerns come to the fore.

conducted one to two pilot sessions of their session set-up.

The *“My first toaster”* team conducted a session with four parents of young children and one child psychologist. The session had four kinds of prototyping in it (Figure 5):

- browsing a catalogue with a mix of child-appealing electrical appliances and actual children's toys in it. This was for the start of the session and for discussion of what kind of toys their child would like or had already.
- a role play of an early morning rush in a real kitchen and in two versions: with a child-appealing toaster and with a normal toaster. In each role play, one parent took the role of parent and another parent the role of a child. This served to enable participants to connect with real situations from their life both in terms of



Fig. 4. Acting out a scenario: a guest designer, asked for creative input by a company, converts all their grey ideas into colourful ideas (prototypes: turning white sheets into glossy colour sheets) using a magic pen trick (prototype: a particular movement with a stick in his hand).

things that are involved, as in terms of actions they do and habits they have. The participants could express their own insights from this in a discussion that directly followed.

- discussion of a metaphor, in the form of a set of four candles. The candles represent a safe and a non-safe, and a child-appealing and non-child-appealing product, respectively.
- making of an artifact. The participants were presented with a cardboard version of a toaster and invited to make the product child-safe, while remaining child appealing. A range of tinkering materials was provided, such as clay, paper and markers.

All four kinds of prototyping resulted in valuable insights. The catalogue, only intended as a warm-up, already brought insights into family rules. The role play provided insights for the student team when they observed it, providing insight into details and actual behaviour of the parents' lives with their children. The candle metaphor was the least useful because the participants took it literally rather than as a metaphor and started to discuss the dangers of candles. Participants also did not do anything with the candles, just discussed them – pictures would have sufficed just

as well. Nonetheless, discussing them provided insights.

The artifact making revealed details of what makes appliances child appealing and how this can be avoided where risks have to be prevented, for example touching of hot surfaces. But participants did not manipulate or modify the cardboard model provided as a basis. The students speculated on several possible reasons for this:

- because there was only one model to 'share' among five participants
- because the model was made by the researchers – suggesting ownership
- because the amount of tinkering material provided was overwhelming.

All of the prototyping activities included discussion, and this in itself brought many insights. The students uncovered many practical aspects of the prototypes that fostered or hindered the emergence of insights. For example, having only one catalogue and only one cardboard toaster hindered the participants' expression in terms of hands-on doing, but facilitated a lively discussion. Making a role-play with a hectic scenario introduced some stress into the session that hindered reflection on issues somewhat.



Fig. 5. From left to right and top to bottom: the catalogue, the metaphorical candles (top: child-safe products, bottom: non-child-safe products. With child-appealing styling elements on the left side, without them on the right side), the role-playing of parent and child in a rushed early-morning scenario, and the artefact making with a cardboard toaster (real toaster in the foreground).

The “Technogirls” team conducted a session with two male participants involved in mentoring schoolgirls during promotional activities of the TUD, and one female participant who was now an Industrial Design Engineering student but had to make the choice for a technical profile herself while still at school. The session contained three kinds of prototyping (Figure 6):

- a warming up at the start of the session in which participants were challenged to build the tallest paper tower. This was to generate energy in the session and to already appeal to a feel for and affinity with technical problems with the participants.
- filling an influence map game board. Cards provide topics to talk about and can be arranged on the map. The cards show people and topics that might influence schoolgirls in choosing or not choosing a

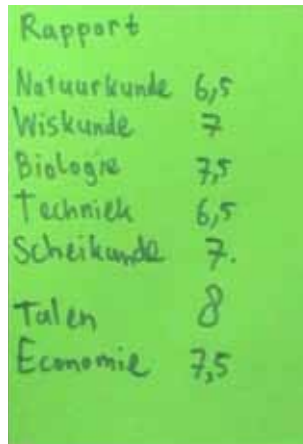
technical profile. Empty cards are provided for possible additional topics. The map has a positive and a negative half. The schoolgirl is represented in the middle. Rings represent lessening influence with distance from the middle. All influencer cards can be used twice: to represent a positive and to represent a negative influence. The participants are instructed to discuss the influences while filling the game board and to think of scenarios in which the influences come to the fore.

- two role plays: first, one in which participants play the most interesting scenario for a negative influence that emerged from the influence map game. This is followed by a brainstorm on possible solutions to undo the negative influence. Then, another role play that improvises a possible future interaction and its characteristics.

All three kinds of prototyping resulted in valuable insights. The paper tower challenge, however, brought the least insights. No explicit findings came from it. But it did function well as a high-energy warm up. The influence map, having gone through two iterations in pilot testing, worked well. Participants started using it with no hesitation. The board served as a ‘playing field’ for the discussion, and facilitated the discussion



Fig. 6. The prototypes used in the “Technogirls” case. Top row: the paper tower challenge. Middle row: the influencer map board game. Bottom row: the role play. First picture bottom row: a girl coming home with her end-of-term grades, not feeling confident and the parent discouraging choice of a technical profile. Second picture: grade sheet made up in the session. Third picture: a future interaction: information evening for parents and teachers. A university representative informs them that the same grades are often interpreted by parents and teachers as more fitting for a technical university study if they are a boy's than if they are a girl's grades.



of possible negative influences from people that were themselves participants in the session. On a down side, the discussions sometimes drifted into role stereotypes and superficialities. The role playing activities were somewhat hampered by the fact that participants' roles were partly so close to those played that they had difficulty sticking to their role, falling into their own role instead. Nonetheless, the role playing really contributed in that actions of stakeholders were explored in more depth and realism than in the influence map. The student group were satisfied with the outcomes of their session. However, they regretted not having included a more co-discovering form of prototyping in their session. The influencer map game was

something the participants clearly understood as something to just be used, not to be modified in any way. For the role play, too, the participants did not devote much attention to possible things involved in it, instead focusing on communication issues between stakeholders. They did, however, create a prototype for this: an information evening in which one stakeholder meets and informs others.

3 Reflection

The reflection is a result of the combined monitoring activities that took place throughout the course. The reflection is structured according to the guidelines the course organizers had set themselves in order

to foster prototyping activities that are oriented to interaction and participation. It includes the students' own reflection on their Overall Goal that they provided as part of their course deliverables and in a discussion that took place at the end of the course. The students' research results for the stakeholders are not included here because they contain stakeholder relevant results but do not contribute to the methodological aim of the course.

3.1 Build on students' enthusiasm for making things

In the course, the students are required to make things to be used as part of a stakeholder session. The assumption that lies behind this is that design students are intrinsically, and by training, interested in making things. Building on their design knowledge, skills and attitude helps them to become more confident about their abilities to conduct research and to experience the added value that designerly qualities can bring to a research process.

As could be expected, the students quickly came up with simple and effective artefacts for the practice topic as well as their actual topic sessions. However, the students spent less time and energy on the generation of props for the session than could be expected. Why is this? A possible interpretation is that they were distracted by the complexity of the issue they had been given to address. For the practice topic, they had been provided with a clear situation within which interactions could be imagined. Both of the actual topics they then worked on, however, implied situations that were not very easy to stage for the students. The "My first toaster" team had to engage with the situation of parents and young children in the home. They devised a role-play in which parents amongst each other played a parent and young child during the morning breakfast ritual. The "Technogirls" team were organising stakeholders among busy study advisors in schools and were trying hard to devise a session set-up that holds benefits and interest for the diverse stakeholders. They had to settle for a minimal version of their session because of stakeholder availability.

In their own prototyping activities, the students' main attention was on making the prototypes suitable for the elicitation of stakeholder perspectives. During the tutor meetings, too, most of the discussions revolved around the elicitation of stakeholder perspectives and the fit

of the students' activities with their research questions for the overall aim and sub-aim. What had not been put in the foreground was a playful, iterative and generative interaction with things, and how such interactions could be used to answer questions. This was so during the lectures and workshops at the beginning of the course, nor during the tutor meetings with the students. The students reflected at the end of the course that they were more occupied with planning the session and with getting it right for the stakeholders than with the prototyping.

In order to facilitate more playful design thinking in the course, and a more exploratory engagement with sketching and prototyping as a mode of inquiry, it is conceivably necessary to encourage and address this explicitly. A socially complex topic like the ones the students had been given, adds a lot of cognitive load for the students. It may be a risk with this kind of topic that students or designers get too focused on the perspectives and on social relations and actually lose too much of their focus on the quality of the prototyping process, the intended effect they want to achieve.

3.2 Let students experience and play with the balance between appearance and content.

Making things look 'too good' from a design perspective might make the people who will have to use and interact with the things feel reluctant, afraid to make mistakes or modifications. Furthermore, making things look 'too definitive' could give people the impression that there is no room left anymore for their own interpretations. Getting the right balance between appearance and interactions is therefore essential in successfully making things for research. The quality of the students' research can therefore conceivably be improved by having the students make and try out different versions of something, and evaluating critically the balance between design and research in their own work. The students successfully resisted making the artefacts fully designed or perfect. However, differences can already be discerned in how well different types of prototypes worked for the students. For example, the "My first toaster" team had a real toaster with presumed child-appealing elements made available to them, to use as part of their session. They included a re-design exercise for the participants of their pilot session. For this, they provided their participants with

the actual toaster and play-doh, so that participants could modify the toaster with it. Given the assumption that the students are enthusiastic about making things, this was surprising. It would have seemed to be more logical for them to make, for example, an abstracted, simplified versions of a toaster so that their research participants could manipulate and modify them more easily and more radically. In a tutor meeting, the students were advised to try exactly this, and they did: they created a cardboard version of the toaster and provided their participants with plenty of simple craft materials with which to modify the toaster model (image of this will be supplied with final paper). Still, as before, the participants were loath to modify the toaster model. The students concluded that this time this was because they had only provided one toaster model for five participants to modify together. The students' motivation to do so had been to encourage shared discussion rather than individual silent tinkering. The unexpected effect, the students concluded, was that the five participants were reluctant to make changes to the model that would be irreversible, thereby taking away another participant's opportunity to make other changes they in turn might want to make. The other student group did not make use of a ready-made product but made up prototypes that were tools for insight rather than actual 'things themselves'. They found it easier to modify those props and to make them well adapted to the participants' interactions with them in their session. As has been found elsewhere, it seems that here too, 'finished' things impeded rather than encouraged session participants to view and interact with things freely and generatively (e.g. [2]).

Finished-seeming or singular things can, however, serve another function. While the toaster and toaster model were not useful as participation tools in for example Sanders' [15] sense of co-creation, they did serve as tools for communication, as things to think with. Both groups reported that presenting things resulted in lively and insight-giving discussions among the participants. However, it remains unclear whether, for example in the toaster case, the participants thought they were being asked to explore their perspective towards the topic or whether they thought they were being asked to redesign a thing. The toaster was partly a representation of a design, and partly a tool for communication, with room for confusion for the participants between

these aspects. This needs to be addressed better in future iterations of the course guidance and students' prototyping sessions: types of things need to be paired up with types of interactions and it needs to be explored and tested which work best with which and what kinds of insights each combination produces. For example, finished things would be used to enact and explore existing interactions, whereas clearly unfinished things could be used for generative exploration of new interactions. More detailed assessments of the benefits of various combinations could emerge from smaller, more iterative experiments students could make in a future edition of the course. The students of this edition also came to this conclusion in their reflection.

3.3 Let students explicitly reflect on the things they make from a research perspective.

This was encouraged by making a reflection an explicit part of the course design itself. The students were required to produce a research plan in order to generate insights on the benefit and effectiveness of prototyping in a stakeholder meeting. They posed these questions at the start of the course, to answer at the end of the course. These should be useful to the design discipline by improving the knowledge on how users can be involved in design.

As is often the case, the students struggled to come up with meaningful research questions at the beginning of the course. This, however, was considered part of the learning experience. Only through experience one can come to meaningful qualitative research questions. And even then, important questions may emerge only during a study and cannot be anticipated beforehand – which is, after all, the benefit of qualitative, exploratory research. The students conducted one to two pilot sessions before their actual stakeholder session. During the pilot sessions they observed how the participants interacted with the things they had prepared, and quickly adapted the things to suit the dynamics of the session and the usability for participants better. They noted, for example, that size of the objects they had made mattered greatly in how well they allowed participants to interact with them. They found that once they increased the size of a game board they had designed (Figure 6), participants found it easier to use it, spending less time in trying to understand what was asked of them and instead being enabled to spend more

time actually using the artefact to explore the questions at hand. While with this the students had achieved the learning goal of being attentive to how their artefacts worked in the context, their finding remained as yet limited to mainly a usability issue. During their analysis phase, the students were advised to broaden their analysis to aspects like context, finished-ness of things, social dynamics of interaction with things, what kinds of insights different activities generated, and acceptance by participants. They did so in their reflective report, but later said to regret that they could only report on this in retrospect, but not do anything with it anymore, like for example comparing different types of prototypes directly.

The students became aware of the relevance of context because of large differences between their pilot sessions and their actual sessions in how their participants responded in their sessions. They conducted the pilot sessions with fellow students or with lecturers. While those had been chosen in such a way that they had some affinity with the session topic (the students had personal experience of having made a technical profile choice, and the lecturers were actually parents of young children), they acted quite differently to the actual session participants. The actual participants turned out to engage with the session tasks more enthusiastically than the pilot participants had done. This made clear how important the context is for the participants, and how important it is to be attentive to how they see their own role. The pilot participants' acquaintance with the students may also have played a role. At least this insight leads the students to reflect and focus on the perspectives and on social dynamics in a participatory session.

A related observation is that the terms "prototype" and "prototyping" continued to provoke questions throughout the course. What is a prototype? What is it a prototype for? When the students analysed their session data, they were asked to approach it by moving from their insights (derived from careful video analysis of the stakeholder sessions) to recommendations for the context, to examples of possible future interactions as prototypes of interactions. The terms "prototype" and "prototyping", and our choice of focus on the latter as an indication of the process, could be addressed more explicitly still in the course. Using both terms can help students understand the difference between them.

The next course will be more explicit in this. It will direct the attention to the use and effect of prototypes and how one can seek to facilitate it, and to contrast this with the making of a prototype as a goal in itself.

3.4 Conclusions on the reflection

The reflection that has been presented here, served to inform and enrich our considerations of what prototyping is and what its purposes and effects can be when the goal is steer designers' attention towards interaction and participation. We have identified some issues that deserve attention in developing a prototyping approach that is directed towards interaction and participation. Organizing participation and including stakeholder perspectives introduces complexities for designers, both on a content level and on the level of practically organizing a session. This complexity needs to be reduced if there is to be enough space for exploration. The first course set-up as presented here did not yet provide the students with enough opportunity to explore various combinations and configurations of [things+interaction]. Furthermore, the participants' possible expectations and interpretations of what they encounter needs to be explicitly addressed in the course. It emerged from the course activities that things used in stakeholder sessions can assume different roles for participants. Things can, for example, be viewed by participants as representations of a future design, or as tools for communication, and they act and interact with the things accordingly. This is something the students should be given the chance to explore and learn about in the course. The students themselves were disappointed with the small scope for co-discovery their game board offered, and with the reluctance of participants to modify the toaster prop. The course set-up should be more directed towards co-creation and co-discovery of and with things. Lastly, the scope for reflection on the effectiveness and benefit of prototyping in stakeholder sessions needs to be expanded. Again, the set-up of a session can influence the outcomes greatly. But also the clarity of the concepts used needs to be improved. Particularly the role of 'the prototype' and how it prototypes future interactions rather than future designs continued to be an object of discussion. Because as aspiring designers the students have already developed a sense of being responsible for the creation of artefacts, the difference in this course should be made explicit.

The guidelines mentioned at the beginning of the paper, derived from [18], are adapted on the basis of the insights from this study:

- Build on students' enthusiasm for making things and enable them to build, test and compare many;
- Have them experience and play with the balance between appearance and interaction with things (this being more specific than 'content')
- Have them explicitly reflect on things they make: with research questions on the situation in which things play a role;
- And additionally: guide them towards co-creation so that they don't end up with unilateral creation of things to be just used by participants.

4 Prototyping in design: looking ahead

The reflection on practical experiences with a course on prototyping for interaction and participation, brought to light a number of practical and conceptual issues. Looking back to the literature review presented in the introduction, we had found there that prototypes should not be seen as representations of a future design, but as [artefacts plus interactions] of some kind that have some effect in a given context. How did this play out in the practice of running the course? While the course ran successfully and brought valuable insights, it can be improved. It turned out to be difficult to stop the term 'prototype' from being used to denote the artefacts involved in the participatory sessions, both by the tutors and by the students. Perhaps it is simply the fact that prototype is a noun that makes it so tempting to apply it to the artefacts. This would mean that it is a lasting difficulty that will continue to cause confusion in researching and seeking to develop ways of designing for interaction. Perhaps this is also a starting point for a new handle on the challenge of directing attention to interaction and participation in the course. The term 'prototyping' needs to be unpacked. The challenge then becomes how best to describe and conceptualise the physical things involved in an interaction in such a way as to accord them a place beside everything else that is involved in the interaction. Everything else, it has been found here, is for example the participants' interpretations and experience of what is asked of them, the social dynamics of their interaction in the session, the participants' understanding and experience of interacting with artefacts in the session, and the framing circumstances such as the physical and social

environment in which the interactions take place. Developing a coherent vocabulary and usage for these various aspects, can conceivably reduce cognitive load for design students – and designers - in setting up participatory encounters. Each of these aspects, of course, has been and is being studied in relation to designing. This study seeks to contribute its insights. To start with, it might be best to refer to the physical things involved in prototyped interactions simply as 'things' or 'props'. Rather than drawing more attention to them as the terms 'prototypes' or 'artefacts' do, this may enable us to accord them a place on an equal level with other aspects of an interaction. For now, this leaves us with [things plus interactions] to use as guidance to draw attention to prototyping interactions. The reflection on this course has given us a lead on how to get closer to a workable view on using [things+interactions] to elicit stakeholder perspectives: by setting the course up as an experimentation on which pairings of things with interactions facilitate which kinds of insights. The experimentation should be broken down into small units so that students are enabled to explore and compare effects iteratively.

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Constructing a message by product design: The concept of product language in theory and practice

Abstract

Design and theory were developed separately in most cases. There is an applicability gap between theories and a direct access to apply them in practice. It is a fact that products bear signs and thus could be analyzed by semiotics; they can be decoded. But how are they encoded? This paper describes an approach to put properties and character into products by a multi-stage technique of association, concentration and concretization. The method was applied by students to 14 design studies. Three studies are presented here, and one is explained in detail. The examples show, that this method fits well to visualize the typical character of a manufacturer.

Keywords

Semantic Transfer and Form-Finding Process

1 Introduction

Product language is a common concept to all designers, although there is not unified definition yet. A practicable determination of this term should assume a systemic relationship between human, object and context, mediated by communication. Industrial products serve diverse expectations of the customer and user, from need satisfaction to the wish-fulfillment. The realization of these qualities is experienced, via impressions of the sensory modalities and their cognitive processing, when they are perceived and used.

Thus product language is the entire expressiveness of an object mediated by its design properties (technical, usage-related und aesthetic-symbolic)—for example, to achieve an emotional relationship, a better handling and a good tangibility of the product. This process of communication takes place by means of systems of signs and signals (medially attached to form, material, color, sound and so on) during the perception und use process in direct and metaphorical meaning.

The most comprehensive approach to this issue in Germany is the Offenbach Approach (fig.1) [1]. It is a method to judge and describe products with respect to their meaningful, maybe language-like statements, which are implemented in their visual appearance. This technique of analysis, reminding a bit to Panofski, may also help some skilled designers to develop products. But the approach implies one appreciable lack, hidden behind the overall enthusiasm for it. It analyses design, but is not at all an explicit methodology to concretize design during the form-finding process. Instead designers bypass this lack by their intuition, relying on their talent or experience.

Products may inform about their properties by means of their appearance: their temporal and regional origin, their designer, their manufacturing company and the distributor (fig. 2). Also the price and value is perceivable, the type of product and the

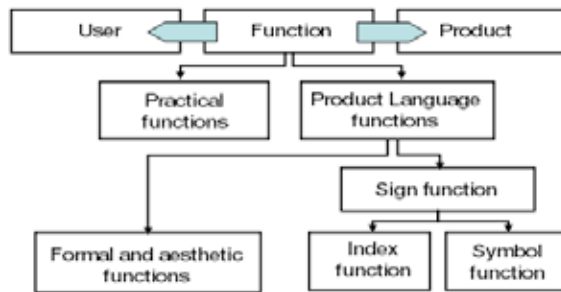


Fig. 1. Functions of products according to Gros. (Fig. Solis)

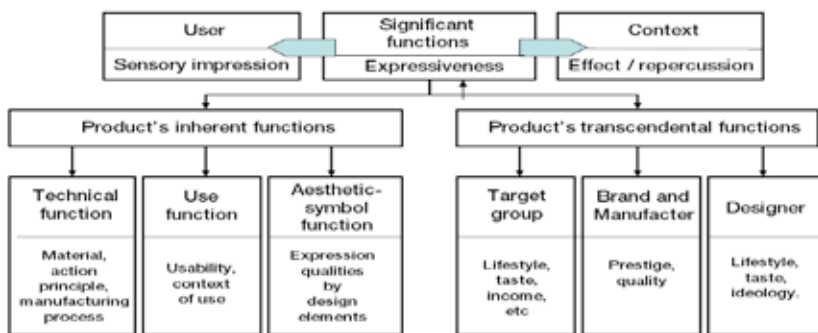


Fig. 2. Product as transmitter of information by significant functions. In similarity with the figure of Gros / Steffen [1] (Fig. Solis)

technical and use-related characteristics. Aesthetic and symbolic qualities referring to the physical and mental needs and preferences of users are obvious as well.

Thus products are mediators of communication, carrying numerous information. The designer encodes these messages during the process of form finding, as elements of design and joins them to a composed shape. The user decodes the messages by acquired skills and values during the process of perception and usage—he identifies cognitive patterns. The more this message fits the preferences and wishes of the user, the stronger the user identifies with the product. Thus the optimal interpretation and implementation of the users needs is of great significance for the success of the product in its market and also later, when it is used.

So it is obvious, that products communicate their properties through the visual and other sensory modalities—with varying success. These properties may ideally be recognized by the customer, and

analyzed—with a higher precision—by experts. But can designers purposefully encode messages into products? Is it possible (systematically or intuitively) to depict a thought, a character, certain properties or affiliations in a product? That was the central question in a course, held at the school of industrial design at Pforzheim [2] in winter 2008/09. The task was to put messages into practice by designing home appliances.

2 Setting und task

The first student project in Pforzheim takes one semester and is provided in the 2nd semester already. After an elaborate discussion on semiotics and product language the task was assigned: each participant had to design a household appliance, representing the formal language of a certain brand. Also the consideration of the target group, and innovations on the technical and usability sector were welcome.

The students chose a manufacturer, which they believed to be interesting and appropriate for this assignment: Braun, Krupps, Conran, Philips, Kitchen Aid, Alessi and others where selected. Each participant had the task to deliver a media based presentation, a poster and a design model at the end of the semester.

In the semester, the product language of the chosen manufacturer was analyzed, graphically and verbally disassembled and subsequently applied to the product they had designed. To identify the visual styles, historic designs of the manufacturer and the evolutionary development was regarded respectively. The typical character was defined and the elements going along with it. Semantic differentials helped to achieve this step. To link to the actual process of form finding, a method of Jürgen Lannoch, supplemented by contributions from Héctor Solis, was applied (see "methodical approach").

3 Methodical approach

14 participants attended the course, all studying in the 2nd semester of Industrial Design. In the first semester, they had participated in lectures about semiotics, aesthetics and design basics. The additional expertise required was presented in the theory section of the course. Alongside with design semiotics the teaching of the applied method was put at the center. It ties in with that developed by Lannoch, who has been professor in Pforzheim as well from 1987 to 2004.

Lannoch calls his method “semantic transfer”—it transfers meaning from one medium (speech) into another (space) [3]. He criticizes the spatial consciousness of our western contemporary culture that does not consider non-geometric dimensions of space. Even the education in design basics emphasizes the geometric aspects. He saw the need to integrate the numerous existing associations of meanings into our spatial imagination. Thus he proposed a semantic space which is accessible and analyzable by word associations, and categorized the associations into six dimensions: experiential qualities, orientation, state, comparative judgment, affordance, values and conventions [4]. At the same time, these are the dimensions that are critical to design.

First the method very freely seeks for associations of adjectives, expected to be significant to the design scenario. Associations could be as complex as visions of particular, imagined situations. Instead of using traditional metaphors, the procedure sets on at the process of creation of metaphors itself [5]. During the intrinsical “semantic transfer”, the emerged complex verbal imagination of the term is transferred into space. By associations according to the six different dimensions the sensory experience bound to them, should become effective in the process of form finding (see Table I).



Fig. 3. Synonyms of a term “hard” in German language. Attributes appropriate to be applied to the designed object are highlighted in color. (Fig.Solis)

Before the transfer into space was executed, the Lannoch method was focused by some further steps in this course. In order not to have too diffused associations, the terms should be as clear as possible direct synonyms. To differentiate even more sharply,

antonyms were collected as well. Then those among the found items, which were directly applicable to the design project, e.g. its material, shape, texture, consistency and more (fig. 3), were identified. In the following step, for the selected items, synonyms and antonyms were determined once again (see Table I). The resulting mental space, widened first and contoured then, constituted a reasonable and meaningful foundation for the following practice of design.

Phase	Step	Description	Example (Alessi Task)	Author
Analysis	1	Collecting attributes referring to the six non-geometric dimensions (p.4)	happy, lively, open, spirited, rather boasting, generous, rather, noisy, eccentric, polarizing.	J.and H. Lannoch
Association	2	Searching associations of the found words in other connotations	e.g. “open”: open door, open space, open minded, open ending, open heart, open wound...	J.and H. Lannoch
Generation of new metaphors	3*	Experimental definition of the words, metaphors and even poetic concepts	e.g. “open objects are running empty, are without value...”	J.and H. Lannoch
Concentration and focusing	4	Looking for synonyms; finding also antonyms, only to delimit the semantic space	e.g. “happy”: joyful, swinging, bright...; antonyms: sad, quiet, depressed, flat...	H. Solis
Concretization space/material	5	Selecting terms, that are applicable to material, shape and space	bright, shiny (chrome)	H. Solis
			swinging, wavy (line, shape)	

Table I: Semantic Transfer Model combined with concentration and concretization

The table shows the steps of Lannoch and Solis, as they were applied in the task. Step 3* was not executed in this approach, because it is too distant to design practice. Lannoch responded with this proposal to the lack of metaphors in design and the restrictedness to geometry those days. Today design has changed largely; there is no restriction to geometric functionalism anymore.

4 Results

To get straight to the point, the results achieved by the application of the method, seem to be a very impressive verification of the approach, both for the overall visual quality realized, and referring to the objective to visually characterize the manufacturer. The results were absolutely not expected to be delivered by students of such an early segment of their education. To illustrate this assertion, three concepts were picked to present them here: a coffee maker for Braun, a cooking pot for Alessi and a “toaster/sandwich maker/hotplate” combination device for Philips. In the first example (Alessi), the application of the method is illustrated step by step.

A cooking pot for Alessi

Alessi, the Italian manufacturer of housewares, has been going along with the overall development of products since the 1920s, providing some remarkable solutions. It always employed domestic and external designers of reputation, to reflect the zeitgeist or to bring it forward [6]. They were pioneering postmodern design, coinciding with the discussion about the application of product semantics. In figure 4 the development of the Alessi design is illustrated, showing the example of jugs.



Fig. 4. Jugs from Alessi, designed by renowned designers. (photo: Alessi)

Student Evelyn Schmidt found, that elements of playfulness, art-relatedness and provocation are still part of the product range of Alessi. A perceivable pattern (fig. 4) is the combination of a mostly simple

body with a shiny chrome surface and a smaller, functionalizing, but playful appliqué made of different material, appended obviously additively, or even with contrasting purpose.

The associated words (translated from German) the student used were:

happy	<i>lively</i>	<i>open</i>
<i>spirited</i>	<i>rather boasting</i>	<i>generous</i>
<i>rather noisy</i>	eccentric	<i>polarizing</i>

and more. Additional ideas were derived from the imagination of the “cooking” scenario, set in an upscale ambience and from historic inspirations (fig. 5).

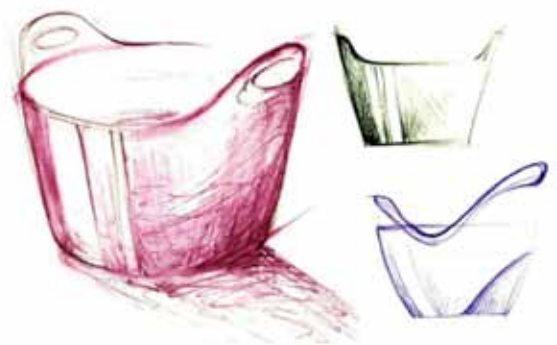


Fig. 5. Above: historizing metaphor (washtub); drawings by Evelyn Schmidt. Below: Proto model: Evelyn Schmidt

But how is it possible to use a simple term like “happy” or “eccentric” to achieve tangible design of a product that communicates these qualities? The creating phase is a very complex process. All collected information, data and analyses are relevant for the first time and have to prove to be meaningful. In the process of form finding, the aesthetical and symbolical properties of a product



Fig. 6. Modeling: Evelyn Schmidt, inspired by a sectional view on a tomato



Fig. 7. Prototyping (1:1): Evelyn Schmidt; photo: Solis (left), Schmidt (right)



Fig. 8. Left: Product family of radios by Philips (1970). Right: Roller Radio by Philips(1982) (figs. Philips)

are fixed. Here the Lannoch method has demonstrated its capability. Step by step, every association found widens, oriented to the topic, the still unknown semantic space in the mind of the designer. The complex verbal imaginations of a word are prepared for the transfer into the spatial dimension by this semantic analysis. Subsequently to this primal methodic approach, filters are employed in two steps, to concretize the semantic space. Synonyms and antonyms allow for more orientation in the yet free associations, as their character is more focusing. Finally the choice of terms from the collection of words, directly applicable to space and material, is the step to realize the representation of the visual qualities (shape, color, texture, consistency) of the creation.

Using the example of the cooking pot, the term "eccentric" is much easier to be depicted in space than the term "happy". "Eccentric" could be a description for both, persons and objects that have been observed. Furthermore this property is easy to implement in design, as "outside of the middle" or "asymmetric". Still more synonyms, like "bizarre", "twisted" and "shaky" are helpful for form finding.

The term "happy" in contrast does not allow the implementation into materiality just as direct. Indeed the property is visible in persons or objects, but the creation of a seemingly "happy" object is not possible in a straight way. There is an obvious difference between our passive and active abilities referring to product language. At this point synonyms provide further assistance. "Happy" also stands for "joyful", "swinging", "bright" or more.

Now the choice of synonyms, which could directly be implemented as visual qualities, takes place. "Swinging" could be the property of a line, "bright" is a character that a color could have (orange) or have not (olive).

Looking at the resulting design, one can see a "happy" coloring, "bright, shiny" chrome, "swinging" lines and the knob of the pod lid is "asymmetric" (fig. 6) and "out of center". The pot handle shows a "shaky", "twisted" and "wavy" character, it reminds a bit to the Möbius strip (fig. 7)

These two examples ("happy" and "eccentric") exemplify how the other primal associations (see above) were converted. At the same time they describe accurately the new created object. Finally the cooking pot could be assigned well to the product range of Alessi.

A toaster/sandwich maker/hotplate combination device for Philips

Electronics manufacturer Philips is not only one of the biggest, but also one of the most influential firms in this sector world-wide. It is known (among others) for the introduction of the Compact Cassette (1963) and the Audio CD (1982, with Sony). It is also renowned for progress and innovation in light, medical and home technology. From the designers perspective the shaver with three rotating cutters and the "Roller Radio" (fig. 8) are the most cited examples. The latter also iconically stands for postmodern design of the 80s.

Maturing an individual design character went on in many steps within the history of the company [7]. Initially it became visible in single designs; a design line

emerged rather late. In 1970 a somewhat unified style was recognizable (fig. 8). However those radios could also have borne a store brand or any other logo—an attachment to the Philips brand or character had visibly not taken place yet. The current Philips kitchenware shows both: a design line, visually connecting among its own products and at the same time supporting the character of the Philips brand, although the product types are entirely different (fig. 9).



Fig. 9: Left: Current household devices by Philips (photo Philips): quite simple geometry, framing black edge to separate the parts of the shell and matte aluminum are typical. Right: sketches from Thilmany to approach the manufactures' visual code.

with associations like

<i>clear</i>	<i>strong</i>	<i>serious</i>
<i>peaceful</i>	<i>tidy</i>	<i>realistic</i>
<i>stiff</i>	<i>subtle</i>	<i>rigid</i>
<i>silent</i>	<i>authoritarian</i>	<i>playful</i>

The target group is young people in small flats, preferring a practical, time- and space saving product. The device is a toaster in the morning, a hotplate at noon and a sandwich maker in the evening. The transformation is achieved by change of insets and folding functions (fig. 10).

A coffee maker for Braun

The declared goal of student Nico Tritschler was to revive the genuine product language of home electronics manufacturer Braun from the 1960s and to interpret it contemporary (Fig.11). Here a certain appeal of today's Apple product design became also noticeable. Jonathan Ive, chief designer at Apple, describes himself, as a fan of Dieter Rams. The product museum of Braun in Kronberg near Frankfurt exhibits examples of Apple products next to their own, to demonstrate similarities, which indeed exist in considerable numbers (fig. 12). Dieter Rams in return praises Apple products, as they represent his own basic principles best [8].

The student wanted to develop a coffee maker with a volume and weight as small as possible, while accounting for a plain design and two-sided operability. Containers for coffee and water are located in the side frames (fig. 13, fig. 14), which are operated by touch panels on their tops (fig. 14). Faceplates at the front and back are removable and thus allow for customized color-coordination in the environment (fig. 14). The associated terms like

<i>purist</i>	<i>functional</i>	<i>clear</i>
<i>self-explaining</i>	<i>discreet</i>	<i>geometric</i>

served as access to form finding.



Fig.10. Creation by Thilmany: combination of toaster, hotplate and sandwich maker employing the semantic elements of the Philips range. Different functions are provided by change of insets (Fig, Thilmany)

That was the insight of student Sascha Thilmany, who developed, according to this design language (fig. 9), a completely new class of product. He started his analysis



Fig. 11. Braun products of the 1960s: white, geometric, simple. (photo Braun)



Fig. 12. Left: Similarities of Braun (above) and Apple (below) products.

iPhone software interface compared to calculator by Braun. The example “shows, that we often do not need something “new” but something “better” (Open-Source) [9].



Fig. 13 . Left: Front and back faceplates are removable. Right: Soft touch opens the tank. (Figs. Tritschler)



Fig. 14: The design of a completely new concept of a coffee maker is formally near to the classic Braun design and the recent Apple products. (Fig. Rust)

5 Discussion and conclusion

The examples presented here show clearly, that it is obviously possible to recognize elements of the product language of a company, to isolate them and to apply them again in new products, even for persons who are not employees and certainly not the creators of the respective design line. Here the method of “semantic transfer”, proposed by Lannoch and the multistage analysis by synonyms and antonyms is

helpful. The participants of this task only studied one semester design, and yet showed very good solutions in this regard. Maybe there are still (yet unexplained) heuristics, that talented designers may utilize, to attain that goal.

A systematic or even scientific method to recognize, process or generate elements of product language does only exist as an approximation. The process of

creation that took place here should be observed in detail, going along with interviews with the active designers. Thus it could be unraveled, which mode of action of the methods applied here, supply for the creative implementation to which extent. It would be a contribution to make the respective methods systematically available to the academic teaching of form finding and design.

Here, for a start, the respective language of the brand or manufacturer was analyzed primarily, but products transmit information on several further dimensions (Lannoch mentions six). The complex, multi-channel communication, that every product performs, would get more clarity from an approach, which was investigated systematically. Thus the semiotic expressivity could subsequently be used to communicate through products, actually with ordinary customers, users and beholders of design.

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Semantic dimensions: A web-based game to evaluate the meaning of form

Abstract

This paper presents a novel research tool to analyze the semantics of three-dimensional forms. We developed an online game that uses crowdsourcing techniques to gather data about the perceptions of form from different people all over the world. The aspired result of the tool is a collection of statistical data about the semantics of form. The data could be used by designers to better understand and control the connotative meanings embedded in the shape of their designs.

Keywords

Semantic Differentials, Crowdsourcing, Semantics of Form

1 Introduction

Product Semantics has been identified as an important research area in the field of product design. Not only the color, the material, and additional branding add to the meaning of an object, but also the shape of the product itself can support a specific message that the designer wants to transfer to the user.

However, it seems to be difficult to control the perceptions that the user or observer experiences when seeing specific shapes, since these are highly individual. The concept of semantics is based on the intuitive associations of the observer, as well as on collaborative conventions within a culture or community. Both,

intuitive associations and collaborative conventions might differ according to context and cultural background of the observer. Of course, there already exist some general understandings—you could also say ‘clichés’—e.g. that round shapes look ‘more feminine’, or that slanted shapes look ‘more dynamic and sporty’, but what is missing is an empirical analysis of such collaborative understandings of forms; as well as a structured database of such semantic shapes. The goal of our work is to develop a research tool to collect empirical data about a common meaning of forms. We want to discuss the following questions: How can the design of such a research tool motivate a lot of people to participate in the survey, and how can we ensure high quality of the collected data? The aspired result is a repository of semantic forms that could be used by designers to better control the connotative meanings embedded in their designs.

2 Related work

There have been numerous publications about product semantics, e.g. Steffen [1] summarizes the ‘Offenbach approach’ in her book “design as product language”. The term ‘product semantics’ was coined by Krippendorff and Butter [2]. They are in-line with Wittgenstein’s [3] definition of meaning as use, culminating in the axiom that “humans do not see and act on the physical qualities of things, but on what they mean to them” [4, pp. 47]. According to Wittgenstein [3],

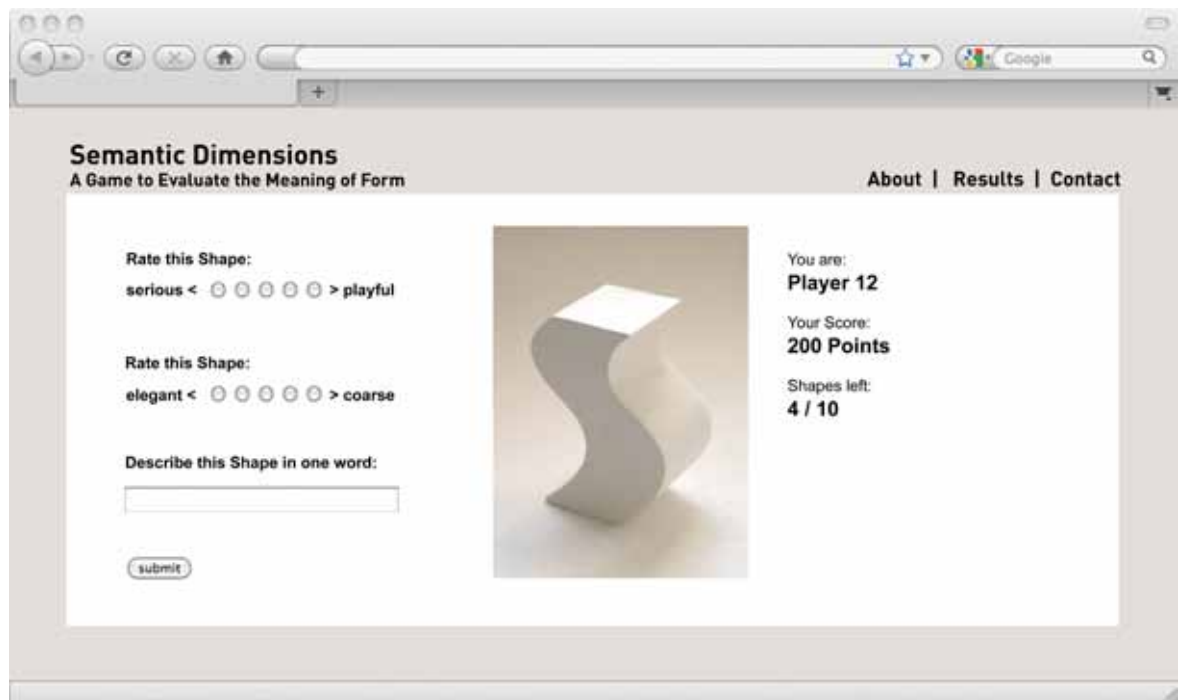


Fig. 1. Screenshot of the web application.

a person knows the meaning of a statement, if they can react in an intelligent way; they can participate in the “language game”.

There are some empirical analyses of semantic perceptions of form. MacDonald et al. [5] statistically analyzed the semantics of products by using the example of wine bottles. Hsu et al. [6] compared the semantic perception of users and designers for telephones. Petiot et al. [7] developed a method for evaluating product semantics and applied it for table glasses. However, all prior works analyze only a specific product type and use standard questionnaires for evaluating the product semantics.

Nowadays, the Internet allows different approaches for gathering data for example through crowdsourcing [8]. Crowdsourcing describes a model for problem solving or production using a crowd of people [8]. The problem or assignment is broadcasted to a group of people. Some of the people within the crowd submit a solution or participate in the assignment. In some cases this labor is well compensated, either monetarily, with prizes, or with recognition. In other cases the only rewards may be reputation or intellectual satisfaction. Examples of well-known crowdsourcing applications are Amazon’s Mechanical Turk [9] and Google Image Labeler [10] which is based on the ESP game [11]. Amazon’s Mechanical Turk is a marketplace for micro tasks, where users participate because they get monetary compensation for completing tasks. Google Image Labeler is a game where two players label a randomly assigned image. Both players get points when they tag one image with the same label. Both applications motivate participants to perform

useful but boring tasks that cannot be performed by a computer. The motivation of such applications is usually achieved through fun, monetary incentives, or additional usefulness for the participants.

3 Our approach:

The semantic dimensions game

Our concept is a web-based application in the form of a game that motivates people to participate because it is fun to play. The game is actually a research tool, to collect data about what certain three-dimensional shapes mean to people. Two players virtually play with each other by trying to label and analyze images of 3d shapes, that they are presented. The more similar the answers of both players are, the more points they get. For a screenshot of the web application see Figure 1. The design of the game motivates people to participate in a (usually pretty boring) questionnaire about semantic shapes (see [12] for the IT aspects of the prototype). Since they only get points, when both players give similar answers, they will be encouraged to give true answers, and cheating will be discouraged. The random pairing of two players who rate the same image, works as a quality control mechanism. Moreover the game will give the possibility to distinguish between different cultural backgrounds of the participants (by identifying the location) and to evaluate a possible impact of culture on the semantic perceptions of form.

3.1 Collection of shapes

The starting point of the project was to develop nearly 100 different plaster shapes to be presented to the participants of the game. For this purpose we developed

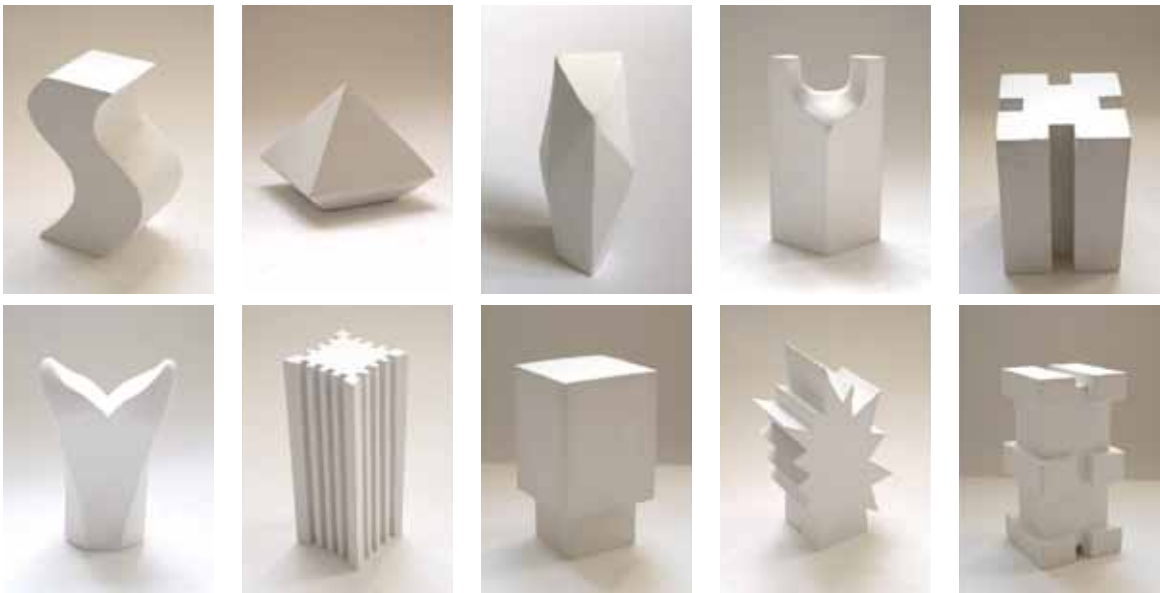


Fig. 2. Some examples of the three-dimensional shapes

an exercise for students of the 1st term 'product design fundamentals' at the Anhalt University of Applied Sciences in Dessau. Every student was given a single phrase from the list of semantic differentials (see section 3.2), and the assignment to design a three-dimensional shape representing that particular phrase. The shape should be derived from a cube with the dimensions of 5 cm x 5 cm x 12 cm in five similar steps. Therefore all the resulting shapes remained comparable. For our game we only used the final (fifth) step of this transformation. Some examples of the resulted shapes can be seen in Figure 2.

3.2 Semantic differentials

The focus of the research tool is to collect data about the individual perceptions of form—the semantics of three-dimensional shapes. We developed a list of semantic antonyms based on Osgood [13], but with a focus on the semantic—not the syntactical aspects of form. That means, terms that are only related to the syntactical aspects of form (such as rounded—edgy) were not considered, because we were interested in the individual semantic perceptions that could in a later stage be mapped to the syntactical form. Table 1 shows a selection of the used semantic differentials.

In the semantic dimensions game, the participants are presented with a picture of a particular shape, and additional questions in the form of a 5-point Likert scale, asking them to rate that shape according to the semantic differential suggested. Those semantic differentials are randomly picked from the list of predefined terms. Additionally, the players get an open question, which asks them to describe the shape in one word.

Term	Opposite Term
Arrogant	Polite
Aggressive	Peaceful
Safe	Dangerous
Conservative	Modern
Comfortable	Uncomfortable
Seductive	Reserved
Fast	Slow
Dumpy	Elegant
Friendly	Unfriendly
Healing	Toxic
Healthy	Unhealthy
Light	Heavy
Young	Old
Loud	Quiet
Brave	Anxious
Static	Dynamic
Cheap	Expensive
Precious	Worthless
Happy	Sad
Weak	Strong

Table 1. List of semantic differentials (Selection)

4 Conclusion

In this paper we present a tool, which can be used to empirically analyze the semantics of form. The motivational benefit for the participants is the fun of playing the game. To the best of our knowledge, the use of a crowdsourcing game with semantic differentials for gathering the meaning of forms has not been developed, so far. Future work is the empirical analysis of the gathered data; especially the effect of the syntactic form on the semantic impressions.

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Vehicle design and brand perception: An investigation into visually decomposing product forms

Abstract

Aesthetics and branding are important marketing considerations during the vehicle design process. This paper presents findings from preliminary research exploring the relationship between aesthetic features in vehicle designs and consumer perception of brand. Two key research questions are addressed, how might aesthetic features be identified and how do they influence consumer recognition of brand? To address these questions, a strategy to decompose vehicle exterior into aesthetic feature categories is first developed and applied to a range of vehicles. In order to address the second research question an extensive consumer survey was undertaken. Findings from the survey were used to discuss the validity of the strategy, and provide some insight into the influence of certain categories of aesthetic features on consumer recognition of brand. Findings highlight one category of aesthetic features (graphics) as having the greatest influence on consumer's ability to recognise brand and hence outline the area in which further research shall be conducted.

Keywords

Aesthetics, Visual Decomposition, Brand Perception, Vehicle Design

1 Introduction

Aesthetics play an important role in consumer perception of products and brand image. They can be the main factor influencing product's desirability and elicit intensely positive and negative emotions. As a result product manufacturers will go to great lengths to ensure that a product's aesthetic effectively communicates the desired message. Vehicles are often evaluated purely on aesthetic qualities; a contentious car design is often widely discussed. Consumers invest a large proportion of their income on a vehicle and hence aspire to own one that is desirable. From the manufacturer's perspective, producing new a vehicle requires great financial investment and risk making substantial losses. As a consequence of these factors, vehicle aesthetics are one of, if not, the most important areas in vehicle design. Bearing in mind these consequences, this paper explores and develops a strategy to decompose visual representations of vehicles in order to investigate the significance of geometries and features on aesthetics (appearance). An extensive consumer survey was then adopted as the method to evaluate the decomposition approach. This paper begins by discussing why appearance is of such importance to a product's commercial success (section 2) and examines the way humans perceive and consequently form judgments on products when viewing them (section 3). Section 4 describes the concept of decomposition and reviews existing research relating

to it. In order to contextualise the study, section 5 discusses the vehicle design process defining the way in which a vehicle's appearance is created. Section 6 proposes the method for visually decomposing images, while section 7 discusses a web-based survey to evaluate the proposed method. Results are presented (section 8) and are discussed in section 9. Conclusions are drawn in section 10.

2 Importance of product appearance

Page and Herr [1] state that aesthetics are the primary influence on the way one judges a product. Bloch [2] states that for almost every product bought, the consumer's first contact with it is visual, hence a product's appearance is of great importance to designers and manufacturers. Bloch [2] also outlines three main functions of product form in the market. Form can help products to stand out among other competing products on the market therefore increasing popularity and market share. Product form can also be used to communicate to the user mode of operation, and the manufacturer's values.

Perception of a product provides the basis of brand perception as products are identified as being the primary delivery mechanism for messages of brand identity. Van Rompay et al. [3] state that when lacking other sources of brand information, consumers base brand evaluations on product appearance. Nowadays consumers often buy into a brand's ideals rather than the functional values of the product itself. If brand is affecting purchasing decisions in this way, maintenance of brand image is of great importance to companies. Since much of this image is portrayed by products themselves, aesthetic impact becomes even more important.

Product aesthetics have a heightened importance in markets where technology has become standardized across industries. Warell et al. [4] state that companies that cannot use novel features to make their products stand out, rely more and more on aesthetics to influence consumer decisions.

Further complicating decisions on product aesthetics are issues associated with consistency of aesthetics in relation to brand image and future fashion trends. Moulson and Sproles [5] consider the compromise made by designers between progressive designs that stand out and less revolutionary designs that are easy to identify. A misjudged compromise risks damaging heritage as the

design may be poorly received or well received but by the wrong market segment.

These factors of communication, competition and brand image necessitate that mass produced products must rely heavily on their aesthetics having a positive effect on consumers to achieve sales and maintain popularity.

3 Perception

In order to better understand the effects of product aesthetics, perception of products and the basic psychology of the way products cause emotional responses must first be understood. Perception describes the idea of processing sensory information, hence the first stage of perception of visual forms is the way in which they are seen. There is general agreement that the way forms are seen follows 'Gestalt' rules, these suggest that things are initially seen holistically (as a single object). If this visual form holds attention or is of interest it is then viewed atomistically [2], in other words the different elements that make up the form are considered. Depending on the complexity of the form, a process of categorization occurs during these stages where consumers attempt to place objects within preconceived categories to better understand them. For example, one may see a form, say a chair, then categorize this form as a chair, and then if inclined, notice the type of upholstery, decorations on the legs and pattern of the fabric.

Having defined the way the information enters the brain, the way in which it is digested and processed can be considered. Norman [6] discusses the way in which people form an opinion of products and experience emotions as a result. He defines the cognition process in three stages, as much other literature also suggests. The stages consist of: one where the visual form is processed, one where experience of using the product is processed, and finally one where preconceived ideas or memories of previous experiences are processed. These factors are all considered and result in emotions leading to an appraisal and formation of an opinion of the product.

Desmet [7] concentrates specifically on the emotions derived by products and the way in which these emotions are elicited. His model is more simplified than the aforementioned three stage models, indicating two areas, concerns or pre conceptions of how the product should perform and the stimulus, the product itself. It is also stated that it is the personal significance of the product to the user, rather than the product itself

which causes the emotion [7]. Hence it is the concern or preconception of the product which dictates the personal significance and thus an emotion based on this. Warell et al. [4] build on ideas of a three stage perception of products to a model of brand perception. The three stages are defined as follows. The first is a 'recognition' stage, where product type or brand can be identified by prototypical features. For example a cheese grater's function can be identified by its grater slots. DeWalt power tools can be identified by their predominantly yellow and black colour scheme. There is 'comprehension' stage where expression of product properties, operation or performance can be identified through visual references. These identifications are more subjective, for example some may identify a large 4x4 vehicle used in an urban environment as a safe vehicle. Others may identify it as being wasteful and damaging to the environment. The last mode of identification is referred to as 'association'. In this mode, perceptions of brand and product heritage, values and origins are identified through symbolic signs such as logo or typical brand feature. Judgements through this mode are highly subjective as they are based on previous experience or knowledge of the brand.

4 Visual decomposition of images

In order to identify and isolate aesthetic features that constitute a product's appearance, a strategy to decompose vehicle designs shall be proposed. Here the term decomposition refers to the concept of breaking down images of products by isolating constituent geometries of the product form and representing them individually. The aim of this is to reduce the amount of information expressed in an image in order to better understand the effects of specific features of the design. This process has been undertaken in a number of different forms with different intentions.

Biederman [8] approached this topic from a cognitive psychology standpoint, investigating the effect of different constituent features in simple illustrations of commonplace objects. A series of experiments were conducted where participants were asked if they could recognize the different objects when 'degraded' to different levels. Biederman degraded images by removing lines and corners/angles in different percentages of the overall image. The findings showed that participants in the first instance could recognize degraded or incomplete objects. The study also found

that certain constituent lines/features encourage better recognition than others. The significance of the this study is that it demonstrates the principle of decomposing images and isolating constituent parts in order to further investigate their effect on recognition. More closely related to this study is the work of Cheutet et al. [9] studying "aesthetic key lines". These were defined as lines on a vehicle surface that were thought to be aesthetically important on vehicles. The aim of the study was to help preserve the original design intent through the complete vehicle design process. Previous work defined curve geometries in the terminology used by stylists. Vehicles front, side and rear views were decomposed into the aesthetic key lines and their aesthetic properties were reviewed. Data was used to create an ontology of curves linking quantitative properties from digital models with aesthetic properties based on stylists' terminology. The key relevance of this study to the work reported here is the identification, extraction and representation of aesthetic features of vehicles.

The works of Pugliese and Cagan [10] and McCormack et al. [11] in shape grammars also decompose images and extract aesthetic features. In order for it to be feasible for a shape grammar to generate car and motorcycle concepts, the parts and aesthetic features were simplified to two dimensional line representations. Shape grammars were then used to generate a range of concepts experimenting with aesthetic features and recognition of brand. This research shows that simple 2d line representations of vehicles can still contain enough visual information to portray some degree of aesthetic characteristics.

Related to this study is work by Tovey and Porter [12], considering sketching in automotive design and the technique of 'de-layering' to decompose drawings. The de-layering process consisted of taking sketches made by students and professionals and breaking them down into form lines, components, form shading and non-form shading. The study showed the form lines to be most expressive and carry the intentions of the designer. The study further shows that certain features may be isolated as containing the major aesthetic characteristics of a design.

Warell [13] investigates 'form-syntactics'. These are all features characterizing the aesthetic effect of visual form. The approach adopted to achieve this begins with the identification of these syntactics. In order

to investigate them further a syntactic analysis was conducted in which consumers were shown images of the same product where syntactic elements were either altered or excluded. Participants were surveyed as to how well different adjectives characterized the variant designs. Conclusions drawn from this study suggest that by using this approach it is possible to gather valuable information on the effects of particular aesthetic features. Karjalainen [14] conducted a similar study in which product ranges were decomposed and features identified as being characteristic of particular brands were isolated. These features were then used as a basis for designing different products but still identifiably of the same brand. Results showed that such analysis of the product range and isolation of features could be used as a basis to design products exhibiting distinct brand features. While all of these studies are relevant in their demonstrations of strategies for decomposing and isolating aesthetic features, no single method shall be adopted for this investigation. Rather elements from a number of the studies shall be drawn on to develop the methodology employed in this study.

5 Vehicle design process

In order to better contextualise vehicle designs that are to be decomposed, the initial steps of the process commonly followed to develop a vehicle's exterior design, shall be discussed. Following discussion with industry representatives and practitioners, a generalization of the steps taken by most design teams was established (Figure 1). It was found that the styling design process is the key stage in which designers work to create a visually appealing vehicle that communicates the values of the manufacturer, specified by marketing

and management departments to consumers. It begins with an ideation stage where designers think visually using sketches to begin to embody concepts. This stage is followed by realization of design where initial sketches are developed to the point where a full vehicle can be digitally modelled in 3d. These digital models are then refined and finally modelled at full size in clay. Based on refinements to the clay model a decision is made whether to proceed with design and so move onto engineering design activities.

It is in the styling and design process that designers work to create a visually appealing vehicle that communicates product and brand values specified by marketing and management departments to consumers. Cheuet et al. [9] state that it is the sketches which express the designer's ideas, and therefore implicitly contain the semantics of the context. As the study here investigates the idea of deconstructing designs to analyze communication of their aesthetic properties, it is crucial to analyze a design's construction and its aesthetic messages. Consequently, the initial stages of the styling process are considered in detail. As previously stated purpose of the decomposition, in the context of this study, is to investigate the information encoded in the aesthetic design of cars. This information becomes encoded as it is designed and much of this is done through the proposed vehicle's sketches. The approach reported here can be described using an analogy between physiology in the animal kingdom and the composition of vehicle's design. The first stage of the process of constructing the vehicle is to define its 'bones' or 'skeleton'. In the same way that the bones or skeleton define an animal's size and stature, they define a vehicle's general dimensions or 'volumes'. Sketching into this basic form the vehicle's daylight opening (DLO, also known as the greenhouse, these are the windows) defines the vehicle's stance or posture.

Once the vehicle has some proportions and rough dimensions, further detail is added to the vehicle's surfaces. Continuing the animal analogy this stage can be called 'muscles'. As with a skeleton, the bones define dimensions and proportions but much of the 'figure' is defined by the vehicle's surfacing. This stage details the vehicles surfaces with curves, edges and character lines which provide much of the vehicle's aesthetic intent. While the markings on an animal make no difference

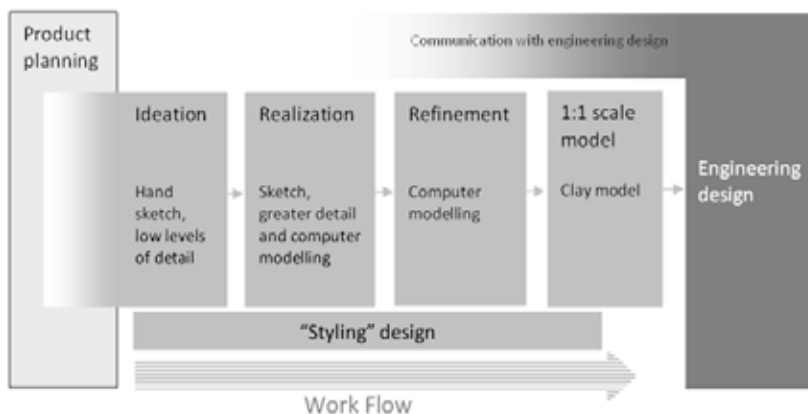


Fig. 1. Initial design phase of vehicle design process

to its size and figure, they are of equal importance to appearance. This is thought to be true in vehicle design too. The final part of this animal analogy is concerned with this idea of markings. The stage of ‘graphics’ consists of adding such detail as grills, head lamps, vents, as well as colour schemes, badges and logos.

6 Proposed decomposition strategy

Having discussed the use of isolation of features and decomposition of images to better understand the influence of constituent parts, and then explored the steps taken by designers to develop vehicle designs, the following decomposition strategy is proposed. The strategy is based on a reversal of the sketching process detailed in 5. The format is as follows: The vehicle skeleton or bones is interpreted as the vehicle outline including wheels. The vehicle’s stance or posture is defined when the DLO is added to the design, hence the second feature category is the vehicle’s DLO. The third feature category is the vehicles muscles or surfacing. This is any surface line or detail that is not included in the vehicle or DLO outline. The final feature category is the vehicle graphics. This is effectively any features that are not included in the above feature categories. The mode of representation of the feature categories draws on the examples of Pugliese and Cagan [10] and McCormack et al. [11] The images of vehicles are reproduced as black and white 2d line representations. The level of detail is low and the outline is represented as one shape as with the DLO. Surfacing is represented by curved lines tracing any hard edges in the surface. Graphics are represented by simplified shapes with the exception of the grill which may be shown in further detail. In order to assess the effect of isolating the feature categories, participants are shown individual feature categories and combinations of different feature categories (figure 2).

7 Evaluating the decomposition strategy

In order to assess the proposed decomposition method, a web-based survey was created and distributed. A survey technique was chosen in order to investigate whether or not consumers could recognize brand when shown different decomposition vehicle’s aesthetic features. A survey method was considered most appropriate given the requirement to obtain a generalised consumer perspective ie. a significant sample population.

Isolation of aesthetic features and decomposition into feature categories

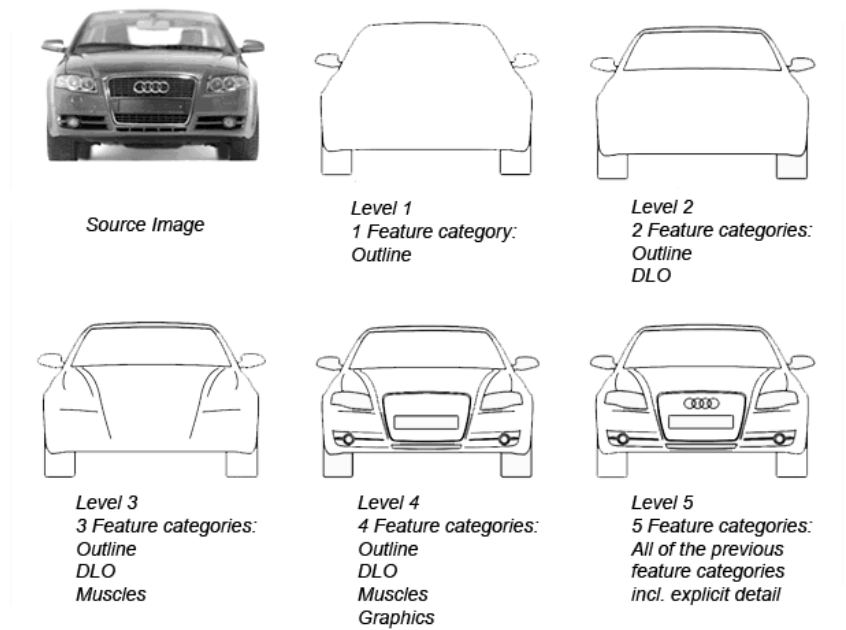


Fig. 2. Decomposition strategy

As the survey is primarily concerned with consumer recognition of brand, a basic question of whether or not brand can be recognised was posed. It is thought, however, that by posing additional questions, a further insight into what participants recognise from different decompositions can be obtained, thus providing better assessment and richer feedback of the decomposition strategy. It is acknowledged that brand is most embodied by the products it represents [15-17]. Thus the questions posed to participants shall address physical and subjective attributes that characterise the product as well as the basic question relating to brand recognition. Thus the following questions were posed to participants in a multiple choice format when viewing images of vehicles.

- ‘In which segment does this vehicle belong?’
- ‘Which emotions best describe this vehicle’s character?’
- ‘Which brand manufactures this car?’

For the purposes of assessing vehicle brand recognition, no filtering of participants was undertaken other than being over the legal age to drive a vehicle. This was deemed sufficient given the ubiquitous nature of vehicles. As this was only an investigation within the study into visually decomposing products, only the front views of five vehicles (BMW 3 Series, Audi A4, Mercedes-Benz C-Class, Ford Mondeo, Honda Accord saloons) were used. Using five vehicles meant that there were 80 decomposition images in total (16 possible combinations of decompositions per vehicle, using 5 vehicles). Including all of the images would result in

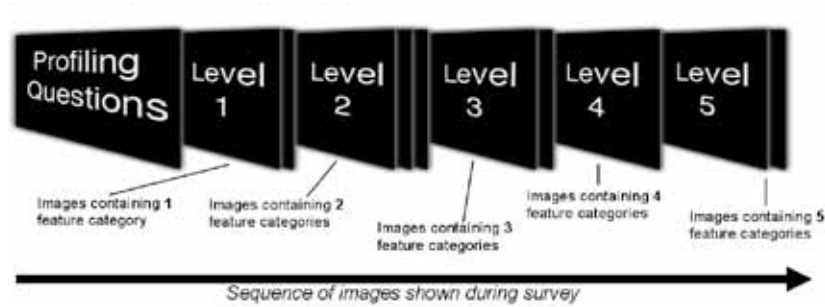


Fig. 3. Survey sequence and details of feature categories shown

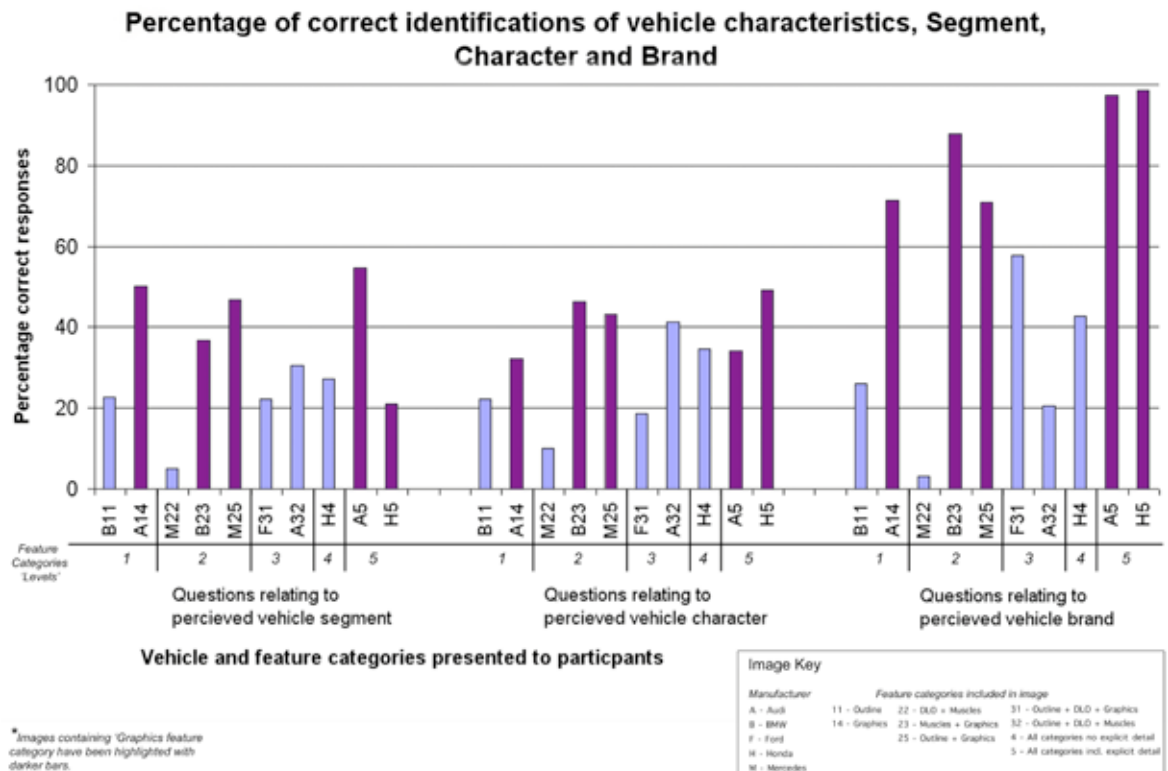


Fig. 4 Responses to survey

a lengthy and repetitive survey that few participants would take the time to complete. Some combinations of feature categories were thought to give away answers to subsequent questions, while others were deemed to be so obscure that any correct identification would likely be down to luck. As a result, a sequence of 10 decomposition images was selected (figure 3). This would show most of the feature category combinations using a variety of vehicles yet avoiding explicit vehicle identification too early in the survey. Participants were given 20 seconds in which to answer the first three questions. Once familiar with the survey format the time limit for each question was cut to 15 seconds. This was thought to encourage participants to record their initial perceptions and to shorten survey time.

8 Results

The survey was made available online for five days. A total of 220 responses were recorded. Respondents were members of the University of Bath, Mechanical Engineering department and affiliated public, aged between 17 and 63 years old. 86% of responses were recorded by male participants and 14% by female. Participants were also asked whether they held a drivers license, for how long they had been able to drive and the number of hours per week they spent in a car. This data gives information on participant's exposure to vehicles. As part of profiling participants were also asked to answer questions giving a self assessed measure of their ability to recognize different brands of cars. Participants were asked to record their confidence in being able to identify different brands of car. It was found that, of the vehicles included in the survey, participants were most confident that they could identify a BMW, with Mercedes second and Audi third. Honda was the

brand that participants felt least confident in identifying, followed by Ford as the second least confident. It was also found that 47% of participants held a car's styling as being 'very important' when considering purchasing a car while 43% responded 'mildly important' and 10% responded 'not important'. It was also found that 30% of participants held vehicle brand as being 'very important' when considering purchasing a car while 58% responded 'mildly important' and 12% responded 'not important'. Results from the survey are shown in Figure 3. Participants' responses have been broken down into categories such that they can be defined as 'correct' or 'incorrect'. Criterion for correct and incorrect responses were based on EuroNCAP [18] classification to define segment manufacture's literature on the respective vehicles to define character.

9 Discussion

The purpose of conducting this survey was to assess the validity of the decomposition strategy and obtain some initial insights on the influence of different aesthetic features on consumer recognition of brand. When first viewing the results Figure 4 it is instantly clear that different isolations of feature categories elicit different levels of response from participants. Thus it can be seen that despite the relatively high level of abstraction of images shown to participants, and the aesthetic features that constitute images are still rich enough to elicit a range of responses.

Over the course of the survey, the number of feature categories that make up an image increases. At the first 'level', one feature category is shown per image. One further feature category is added per image at each of the subsequent levels until level 5 where the complete design is shown. Hence, as participants progress through the survey, they are given increasing levels of information. However surprisingly, the number of correctly identified characteristics did not increase proportionally with the increasing level of information (number of feature categories included) in each image. In responses from all three questions, there are less correct responses at levels 3 and 4 than there are for some response at level 2. Namely questions referring to A14 (1 feature category/level) B23, M25 (2 feature categories/levels) received more correct responses than images F31, A32, H4 (3 and 4 feature categories/levels) to all three questions.

The results do, however, show a trend indicating that images containing the 'graphics' feature category produce a higher proportion of correctly identified characteristics than those without. Images B11, M22, and A32, all omitted the graphics feature category and all return a smaller proportion of correct identifications. Images including the graphics feature category are represented by darker bars in Figure 3, all of which return a greater proportion of correct responses. When reviewing data collected on identification of vehicle brand, it can be seen that some images containing graphics as well as other feature categories return unexpectedly low levels of correct responses. It is possible to explain this variation by taking into account participants' confidence in identifying different brands. In the profiling section of survey participants were least confident in their ability to identify Hondas and Fords. Hence the lack of correct identifications of images, Ford level 3 and Honda level 4, can be explained by participants being less familiar with these brands. It is not possible to see any clear pattern when reviewing responses with respect to particular brands of vehicle. This is due to none of the vehicles sharing a common combination of feature categories. As the primary objectives of conducting the survey were to identify aesthetic features and gain a basic understanding of their influence, it was more appropriate to investigate a range of brands but in less detail due to constraints on the length of the survey. As part of further work in this research, it would be worthwhile elaborating on this survey as part of further work to investigate potential patterns in decomposition of specific vehicle brands. This can be done by carrying out a more exhaustive survey which includes more combinations of feature categories of the vehicles.

Throughout the survey participants achieve less correct responses to questions on segment and character than to questions on brand. It is thought that verbalizing vehicle's emotional character was found by participants to be difficult, especially in reference to the low detail images. This could be tested and improved by repeating the survey using images with greater level of detail. The majority of responses to vehicle segment were also incorrect. The reason for this is thought to be due to fact that only the front view of vehicles was used. In essence it is thought to be difficult to guess vehicle segment based on its front view, as many manufacturers

use the same front end design for different vehicles in their product range. Another factor that is thought to have contributed to the difficulty in correctly identifying vehicle segment was the terminology adopted for the survey. Although the terms used to describe vehicle segments were technically correct (based on EuroNCAP classification [18]), it is thought they were somewhat ambiguous to interpret. Further experimentation asking participants to identify segment pictorially is suggested to remove this ambiguity. This method could also be adopted to help participants answer questions relating to vehicle character.

It is difficult to accurately identify the segment in which a car belongs purely from the front view as many manufacturers use similar, if not the same, front designs across a range of differently sized vehicles. Posing questions on a vehicle's character while providing limited visual detail, for many, was quite an abstract concept, thus also a difficult question to answer. There is some evidence to suggest that the trends seen in responses relating to segment and character correlate loosely with responses to vehicle brand. This could be because, when participants immediately identify a vehicle as being of a certain brand, they use their existing knowledge of that brand to fill in details of character and segment. If this is the case it concurs with established views of brand as a signifier of product attributes and quality when they have not been experienced first hand. This is something that could also be elaborated upon and investigated further by carrying out a longer more exhaustive survey which would include more combinations of feature categories. A multivariate analysis of results was conducted including information gathered in the profiling stage of the survey. This was done to ascertain whether the effect of participant's prior knowledge of, and exposure to vehicles had any effect on participant's ability to identify vehicle characteristics. Broadly, of the participants correctly identifying vehicle characteristics, the proportions of age, gender, confidence in identifying brands and interest in styling reflected those of the total participant sample. As would be expected, it was found that participants who could drive and spent longer per week on the road answered a greater proportion (5%) of questions correctly than those who did not. In this study the front views of vehicles have been analysed and decomposed. However when a person

assesses the appearance of a vehicle it is very rare that he or she judges it purely from this elevation. In other words it thought the front view of a vehicle alone is not truly representative of the complete product. Additionally, different elevations of vehicles contain different varieties of styling cues. For example a vehicle's side panelling often contains far less in the way of graphics while including far more in the way of surfacing treatments. A vehicle's rear elevation can offer designers more possibility to employ styling strategy as there are often less constraints relating to safety legislation and aerodynamics to consider. Therefore, immediate further work will be concerned with repeating the survey using images of the side and rear of vehicles.

Having found that graphics have a the most significant impact on recognition of brand and the characteristics that go with it, further experimentation could be carried out investigating geometries and relationships between features within the vehicle graphics. In this research 'graphic' aesthetic features would be further isolated such that their constituent geometry could be measured and the effect of alterations on brand recognition assessed. Hence following surveys of side and rear views, the next stage of research would consist of the development of metrics to allow a geometric analysis of aesthetic features. As previously suggested it is proposed that this detailed analysis, in the first instance, would be conducted with respect to a particular vehicle. Further brands, and possibly product types, would be addressed in testing and elaboration of the metrics developed.

10 Conclusions

Appearance has been highlighted as a one the influential factors leading to a successful product. This paper reports the development of a strategy to decompose aesthetic features that constitute a product's appearance in order to explore the influence of certain features on brand recognition. A web based survey was devised to assess the validity of the decomposition strategy and to gain initial insights on the influence of different decompositions of aesthetic features on brand recognition. Following this investigation it is possible to draw several conclusions. It can be concluded that the proposed strategy for decomposing product appearance into feature categories was successful. It isolated different geometries and features in designs

which lead participants to respond to different decompositions of the same image in different ways. It can also be concluded that some geometries hold more potency than others in their ability to influence recognition of brand. This was shown in participants' responses to images which included headlights and grill detail producing far more correct responses than those without. Due to the varying potency of different decompositions of aesthetic features (feature categories), it can be concluded that it is not the sum of information included in decompositions (number of feature categories) that influence responses, but the potency of aesthetic features included.

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Design semantics and company context: Practical packaging and branding development case for food industry

Abstract

It is argued that the basic functions of packaging are related to either logistics or market needs. Packaging is usually considered as a part of the product and the brand: a product property or characteristic. Packaging is also a concrete product attribute perceived by the consumers. This paper is an attempt to describe how a packaging design case proceeds in a food industry in Finland. We will also analyse the roles of packaging design research and consumer studies in brand development. The research method applied is a reflective case study. The outcomes of our case are based on research literature on packaging design, consumer studies and the empirical brand development and packaging design project of a newly founded Finnish egg producing company called Kieku Ltd. In the conclusion we will show how the key elements of a new egg brand under development can be transferred to the attributes of package design. We suggest that packaging design can be improved with constant and focused consumer research. It is suggested that packaging design elements can especially influence point-of-purchase communication in the case of new product introduction.

Keywords

Brand Development, Consumer Studies, Food Industry, Packaging Design

1 Introduction

Packaging is a quite ambiguous and multi-faceted phenomenon that serves several functions. Prendergast and Pitt [1] have argued that the basic functions of packaging are either logistics or market needs. In these terms safety, marketing, logistics and user convenience are the most important ones. Or as Silayoi and Speece [2] put it: “Whatever the functional aspects of packaging as related to logistics considerations, packaging is one of the product attributes perceived by the consumers. It cannot escape performing the marketing function (...)”. Researchers suggest that there are several packaging elements affecting consumer purchase decisions, which in turn, can be separated to two categories. The first is *visual elements* including graphics, colour, and placement of visual characters, size and shape. The second is *informational elements*: product information and technology image conveyed by the package. Another approach is suggested by Ampuero and Vila [3]. The researchers contemplate a clear distinction between two main areas of packaging design: *graphic components* (colour, typography, the graphical shapes and images) and *structural components* (shape, size of the container, materials used in the package).

In marketing literature, packaging is usually considered as a part of the product and the brand: a product property or characteristic. Others have defined packaging as an extrinsic element of the product. Underwood, Klein and Burke [4] suggest that price,

brand and packaging are the most important extrinsic elements when a consumer chooses a food product. Packaging is also a concrete product attribute perceived by the consumers. Packaging design can be seen as a function or a phase in the product development process in which properties of packaging are created in an innovative way. Innovative packaging can be a competitive advantage for a company. It can change product quality perceived by a consumer and even create a new or more beneficial market position amongst the rivals. Increased global trade, new lifestyles, smaller households and consumers' search for convenience are recognised as potential growth areas of the packaging industry [5]. After all, packages are basically the first things consumers perceive when they arrive at purchase decisions. Researchers in several articles have stated that Pilditch (1957) was the first one to define packages as "the silent salesmen" [6][7]. From the consumers' point of view, the package must come alive at the point of purchase in order to represent the salesman or boost the sales.

Researching packages and package design is challenging, firstly, due to the fact that packages are always a part of another product. Usually a package is secondary to the product it embodies or protects. Secondly, packages are everyday objects. Consumers choose, use and dispose of these objects on a daily basis. Despite the visibility of packages in fast-moving consumer goods and especially in food products, the design aspect is not studied in actual design cases. Instead, research on packaging and purchase decisions [2], consumer perceptions of product packaging [3], marketing dimensions of packaging [5] and packaging as brand communication [8] has been studied just to mention a few recently published articles. These studies have an important role since the information provided can be exploited in designing food packages. We do not concentrate on the issues of design management or the management process of packaging design. This kind of research has already been undertaken elsewhere [9][10][11].

The research questions we seek to answer are two-fold. Firstly, we describe how a packaging design case proceeds in a food industry. This will take place not in terms of process description but in considering the outcomes of packaging design. Secondly, we will analyse the roles of packaging design and consumer studies in a brand development process. Since healthy and

ethical consumption has gained importance in Western-Europe, the brand's ability to intensively communicate these aspects is vital to any food company. In spite of that trend, eggs are still considered as a bulk production without differentiating brands. The aim of our case is to research the goals and outcomes of a newly founded Finnish egg producing company, Kieku Ltd whose owners wanted to create a strong egg brand with distinctive characteristics based on: locality, product traceability, safety, health benefits, and responsible production methods.

The package was the main marketing means since the start-up company had limited media marketing resources. In addition, the administrative board decided to invest in a package that would attract the consumers' attention at the point of sale. Connolly and Davidson [12] have estimated that 73 percent of purchase decisions are made at the point of sale. This estimation is quite convincing since especially daily and grocery purchases require only low involvement. Therefore, it can be suggested that product packages and package design might have a substantial effect on consumers' decision making. It is the package that represents the product during the purchase process. Based on a case study we will discuss how the study of consumer preferences can support the package attributes development.

In conclusion, we will show how the key elements of new egg brand under creation can be transferred to the attributes of package design. We also discuss the elements of packaging design that existing consumer studies have highlighted. Of particular interest are the results of the studies that can be applied in order to support the packaging design of a company.

2 Research method and objectives of the study

The article is based on a documented case study in a newly founded (2007) egg distribution company in Finland. The focus is on a packaging design project that took place in 2008-2009. The research approach applied is a practical case study [13][14]. The case study approach is not a method in the strict sense. Rather, the case study approach could be defined as a research strategy that can embody various research methods and materials to study one or several cases.

¹There are about 3,3 million hens in Finland producing approximately 60 million kilograms of eggs per year. Eggs are produced in cage, barn and organic systems. The free-range system where hens have access to the outdoors is not used in Finland because of the cold winters. About 2 million kilos of eggs are imported and 10 million kilos are exported yearly. The yearly consumption of eggs calculated per Finn was 9,6 kilos in 2009. The consumption rates of the eggs have been quite stable during the last 10 years. Only in Portugal is the consumption of eggs lower than in Finland when compared to the EU15 countries [18].

The purpose of the case study is to produce knowledge concerning specific place and time bound circumstances, phenomena, processes, meanings and information [13]. The interpretation context of our case study is grounded in consumer studies concerning packaging design. By choosing this context we answer the question: “What does this case represent?” In other words, context and case are closely intertwined. Our case is the outcome of a single packaging design project. The outcomes of our case, the synthesis, is therefore based on packaging design and consumer studies and the empirical packaging design case. The context of literature reviewed in this paper steers the focus to the companies’ viewpoint: to brand development of newly found food company and on consumers’ perception of packaging design.

The case data was collected during the brand and package design project. The data set is the consumer research conducted for the packaging design process. The purpose of consumer research was to attain consumer knowledge on which the design decisions could be based on. In this sense the project’s aims were organised around the consumer or user-centred design thinking. Previous research on packaging design and consumer behaviour shows that particular brand choices and brand loyalty are not that common in fast-moving consumer goods. Especially eggs are seen as bulk products in the food industry and the main competitive strategy is price. This leads to an argument that packaging must communicate the advantages of the low involvement food product more efficiently than in other product categories. It is also suggested that consumers read label information more carefully than before as they are concerned about their health and nutrition [2]. According to Silayoi and Speece [2] convenience is another key driver or trend for food choice all over the world. These issues need to be taken into account when packages are designed.

3 The case of a new egg company in Finland – Kieku Ltd

Case study research is usually thought to provide a thick description concerning the phenomenon under scrutiny [15]. It would mean an act of providing an accurate description of the packaging design process. Instead of focusing on the process and the roles of the participating actors, we will examine the outcomes of

the project. The aim is to discuss consumer research generated information as supporting a serious packaging design in food industry.

This chapter will proceed as follows. Firstly, we will introduce the basic information about the company, and the specific characteristics of our case. Secondly, the consumer study concerning the Kieku company and packaging design related topics will be introduced. The first part of the study was conducted in order to gain knowledge about the egg markets in Finland. Altogether 448 test subjects answered a short survey questionnaire designed to reveal the consumers’ insights.

Seventy-two percent of altogether 448 respondents were women and 28% men. Most of the respondents lived in the capital city or an other major city in Finland. The age distribution was under 30 years (37%); 31-45 years (51%), and over 46 years (18%). Most of the test subjects were women. It is stated that though the role of women has changed drastically over the last 30 years, female consumers when co-habiting continue to take on the main shopping role [16]. Another study about the significance of gender for food choices by Beardsworth, Brynan, Keil and Goode [17] suggested that it was women who were mostly responsible for deciding what food products are purchased.

The interest of the survey was placed on “how”, “why” and “based on what” the consumers usually choose and buy their eggs. The goal was to obtain information concerning the general attitudes of the consumers towards eggs as foodstuff and detailed reasons for buying eggs. The knowledge provided by the basic study was taken advantage of in the brand and packaging design process. The second part of the study was positioned as to produce information for the actual packaging design. Questions concerning package colours, general aesthetics, health and nutritional communications (that would be printed on the package) and the final outer form of the package were included.

3.1 Profile of Kieku company

Kieku Ltd is a quite new egg-producing company founded in Finland in 2007 (www.kiekuoy.fi). Kieku is owned by 17 family-based poultry farmers devoted to further develop the egg business. All of the families have a long tradition as poultry farmers, and some of them have produced eggs for several generations. Overall the volume of Kieku’s production equals approximately 15% of the total egg production in Finland¹.



Fig. 1. New OmegaOptima™ barn cage and enriched cage eggs launched in April 2009 (photograph: VersoFinland Ltd).

The Kieku company is not just an ordinary egg producer taking advantage of the packaging design. The company has invested in research and development. The first innovation in improving egg fat composition was launched in May 2009 by the name Kieku OmegaOptima™. These eggs were the result of a long process of development of poultry feed together with Suomen Rehu (Finnish Feed Ltd). This new innovative feed is a combination of different ingredients, above all flaxseed, a high level of oat and prebiotic ingredient. All of these different components together affect the nutritional quality of eggs, including the quality of fat, in a positive way. The nutritional content of OmegaOptima™ eggs is closer to recommendations set by the food authorities. OmegaOptima™ eggs have: less than 0,2 mg cholesterol/egg, a high level of Omega-3 fatty acids, the Omega 6-ratio to omega 3-fatty acids is changed to optimal 2:1, and 68% of the total fat is unsaturated. OmegaOptima™ eggs are produced in both barn and enriched cage systems. In the enriched cage system, Kieku's hens have furnished cages which contain perches, nests, a litter area and more space per the bird than in conventional battery cages. In the barn system, Kieku's hens have the freedom and space to move around, stretch and exercise in the building. Perches are also provided for the hens to roost on as well as material to dust bathe and forage for food. There are nests where they can perform their nesting behaviours and lay their eggs in peace. The living conditions are as close to natural as possible.

3.2 Consumer research – The market and consumer choice

As stated earlier, eggs are perceived as bulk products in the food industry. Practically there is no branding in

the Finnish market. This is partly due to the fact that eggs are classified as low involvement products and the chosen competitive strategy is conventionally price. For example, price, type of packaging and product information are identified as the central purchasing attributes for fresh-cut carrots [19]. In many food cases the label “organic” receives greater purchase intention. It seems that general attitude in the industry is against serious branding since eggs are perceived as a cheap and bulk food stuff. This is one of the reasons why the general selling layout in the grocery stores is quite uninventive. Also the shape of a cheap egg carton with limited printing space provides hardly any opportunities to communicate brand or special brand elements to the consumer as the pictures in Figure 2 show.

In the beginning of our research it was noticed that it would be beneficial to acquire basic information concerning the egg markets and consumer preferences. Therefore, the first part of the consumer research embodied general questions. The questions asked were, for example, what are the main reasons for choosing eggs? Thirty-eight percent of the test subjects emphasised ethical and responsible living conditions of poultry (organic eggs), 33% answered that price was the most important factor and 10% highlighted the size of the single egg in the package (small, medium or large). Another question was about the most suitable size of the egg package for the consumer's household. The most popular sizes were 10 eggs (42%) and 6 eggs (25%) per package. Twenty-four percent answered that they prefer packages larger than 10 eggs. The research confirmed that the present packaging sizes in the market are the most preferred. Based on this information the packaging sizes of the eggs were not altered. The results can be justified also in terms of household sizes: 6-eggs packages were preferred by smaller households, while larger packs were popular amongst larger families.



Fig. 2. The typical sales layout and package of eggs in grocery stores in Finland (photographs: Author) .

Another general questions emphasised how people use eggs, what factors related to composition of eggs they were interested in and on what issues concerning eggs would they like to receive more information. Based on the answers it was decided that the nutritional information of the new packages has to be as concrete as possible and oriented to individual health benefits. The question, “what kind of benefits will I gain by eating OmegaOptima™ eggs” was to establish the base of nutritional information communication in the packages. The communication content of the health benefits was studied with several rounds of consumer’s tests. Also legislation has influenced the final formulation of printed package texts, but in this article we decided not to discuss text content creation further. However, the basic questions about eggs did not provide much information for a new brand’s visual communication. It is noticed that a consumer shopping for products in an unfamiliar category, or considering a less familiar brand, is likely to evaluate the packaging for these products more closely than they would a more familiar brand [4]. We suggest that above-mentioned can be extended to new products and brand extensions under development. Underwood et al. [4] conclude that a package picture seems most likely to help low familiarity brands with moderate to high levels of experiential benefits. In the case of new brand and product this is a desirable outcome, but not sufficient alone. The positive intention does not always convert into action: consumers are not necessarily willing to pay more for organic products. It seems that price

still dominates over other product attributes. The consumers’ answers might be normative: it is more appropriate to prefer organic products than cheap price. In our consumer research the case was slightly different. Ethical production and the availability of a natural living environment for the poultry were appreciated as much as price. The conclusion might state that most consumers appreciate lower priced products which are certified with ethical production. This paradox is solved in the market by the consumer preference: they prefer either low price or ethical production. Due to the research design of our study, we did not clarify this paradox any further. Consumers emphasised ethical and humane production systems and the option to choose organic eggs as important factors. Consumers also preferred low prices and existing packaging sizes. Other issues were appreciated as well: quality of the eggs, freshness and domestic production. Consumers criticised and boycotted battery farm production. At the same time, the higher prices of the ethical production were criticised. This contradiction was taken into account when the packaging colours were chosen. The colours of the new egg package needed to communicate both price and ethical production methods.

3.3 Consumer research – support of package design

Silayoi and Speece [2] found in their consumer research that graphics and colour, shape and size, and product information were the most often identified food packaging elements to which consumers responded. Eggs as a foodstuff to be packaged have several fundamental characteristics.

First of all, eggs are fragile products. This sets special demands for the egg package, despite the fact that the primary package – the egg-shell – is natural and in many ways an unbeatable pack. The secondary package is to protect the fragile, but otherwise excellent primary pack. Secondly, the packaging material is important. The present egg packages in usage are cardboard-mass based. This packaging material is environmentally friendly and above all recyclable. In this sense the material of the existing egg packages was ideal and it did not need any changing. Thirdly, and from the design point of view there are some other restrictions. The so-called MAYA-principle states that new designs should be the “most advanced yet acceptable”.

This means that a designer could not alter the original egg package too much. It had to be functional and recognisable. Consumers must be able to recognise the product as eggs by looking at the package. But still, a new product should be distinctive. It should stand out and differentiate positively from other products in the same product range. It is also a question of logistics: the package was to be designed in a way that it would be easily packed on mechanised lines and transported with existing methods and equipment.

The generally used, very low cost egg packages cover the safety, environmental and functional issues. Consumers are also familiar with the shape, but the conventional package did not offer enough opportunities for differentiation needed for the new brand. The space for printing was limited and the requisite package markings of the eggs would occupy all of the restricted space. The cheap “direct to the carton” printing method with smeary outcome confirmed the impression of low quality. Also the existing carton colours available were pulp grey, yellow and pink all of which were already in use by the rivals.

Designing and producing totally own egg carton was too costly for a start-up company investing already lot of resources in the modern packaging centre. Fortunately, there is Danish egg carton producer Hartmann (www.hartmann.dk) in the market who has a carton model that offers more options in terms of printing and colours. The product serie imagic® has large selections of carton colours and the carton shape was designed to have large flat top lid that could provide a place for the printed label as well as direct printing. Also it was possible to print inside of the lid and this space was possible to use for information demanded by legislation such as egg stamp information allowing more space to be available for brand building elements. The price of labelled carton was almost double compared to the lowest price category cartons used by competitors, but the administrative board of Kieku Ltd decided to invest in the package. For a start-up company, the package was considered as the main marketing mean. The administrative board of the Kieku company understood that in this case the cheap carton provides hardly any possibilities to add brand building elements in a differentiative way.



Fig. 3. Imagic® carton provides both colours and large space and quality printing options for creating distinguished graphic for the Kieku OmegaOptima™ packages (photograph: Author).

Determining consumers' colour associations is difficult; in most cases it is impossible. Consumers may have trouble articulating these complex associations if they even can actively identify those [21]. Grossman and Wisenblit [21] suggest an alternative strategy in the cases where consumers' associations seem to be out of reach: it is useful to create new colour associations which designers can control. Therefore, it is easier to create new associations for a new product than for an existing one.

Many famous and well-known brands are familiar because of specific packaging colours. When consumers learn colour associations of the products they seem to prefer certain colours for various product categories [21][22]. However, in the Kieku case it was clear that new colours were to be introduced to be able to create consumer loyalty and most important, to arouse the consumer awareness at the point of sale.

The designers made package prototypes with three different colours (brown, green and blue) combined with white. The production method was also communicated by text which was a visible part of the total package graphic. The consumer was asked with a comparative rating scale² if he or she would consider that the package on view contained ethically produced eggs. The finding was that in spite of clearly readable production method the brown package for enriched eggs were associated almost as strongly to the ethical production (53% agreed or strongly agreed) as the green barn egg carton (67% agreed or strongly agreed). And the same enriched egg package in blue was associated

²The Likert scale introduced to consumers were from 1 to 5. (1=Strongly Agree, 2= Agree, 3=Not Sure, 4=Disagree and 5= Strongly Disagree).

with both ethical and unethical production, but most of the respondents were Not Sure (40%) if the package contained ethically produced eggs³.

It is possible that the consumers were unsure whether enriched cage system eggs are ethically produced, but it can be concluded that colour associations significantly affects consumers' opinion. By changing only the color of the package, while the graphic and text content remained the same, it was possible to change the consumer's attitude to the desired direction. In this case the sought-after association was ethical production since the consumers in a previous research study revealed that ethical production was often a reason for the purchase.

Also the graphical and pictorial elements of packaging design are noticed to affect consumers' attention when they face time constraints searching for products on the shelves [2]. In Kieku's OmegaOptima™ package the main graphical element, the white hen silhouette, was part of the company's logo designed earlier and used on the old packages. It was decided to also add the hen silhouette to the new packages since it had received plenty of positive response in previous consumer researches. Since the hen silhouette has been used in brand extension before it was concluded that consumers are already familiar with the figure. Rettie and Brewer [23] found that recall is better for verbal stimuli when copy or text is on the right hand side of the package, and better for visual or pictorial stimuli when it is on the left hand side. In the Kieku case, the pictorial element – a figure of a hen – was placed slightly more to the left hand side and the text that indicates the product method to the right hand side in a large font size.

packing of information onto the label might lead to poor readability and sometimes confusion [2]. Also the welter of information might lead to the situation in which consumers are not able to distinguish the main information that communicates the competitive advantage of the product.

The size of the texts and the product information of the package was taken into account in the design process. The health benefits were highlighted by placing them in the hen figure area on the white background. The formulation of the health benefit texts aimed to limited amount of letters (naturally not diluting the intelligibility of the claims) that a larger font size would be able to use. The regulated product information and bar code were placed on the back of the carton and also inside the lid. The brand name, production method, single egg size and contact information was also printed on the front of the package because often the consumer sees only the front side of the packages on the selling shelf. The 12-egg carton has much more space for product information than the 6-egg carton. However, during the design process the decision was made that 6-egg carton design leads the project. The reason was that readability versus product information in the graphic is a much more challenged design task in limited space. This leads to slightly different graphic solutions between different package sizes. The 6-egg carton has for example only one GDA icon (energy/kcal), while the 12-egg carton has all nutritional icons that belong to the GDA bar and extended information on health and nutritional claims.

4 Conclusions

Packaging protects and preserves the product, facilitates distribution and promotes customer choice. It sells, informs and instructs the consumer, provides consumer convenience and helps contain prices. Packaging also promotes hygiene and safety, and it is innovative [5]. The package of a food product has several functions to serve. The packaging design can be utilised in various ways. This "multidimensionality" of the packs was the starting point of our research, and it proved to be both a concrete challenge and a possibility for the development process. We came to the conclusion that the factors related to packaging design would be best shown by utilising an actual case from the food industry. Eggs have traditionally been perceived as low-involvement, bulk, non-branded, of uniform quality and homogenous food products. In the case of low-

³To the question "Would you say that this package (blue enriched cage package on view) contain ethically produced eggs?" the answers of consumers were the following: 5% Strongly Agree, 23% Agree, 40% Not Sure, 27% Disagree and 5% Strongly Disagree.

The common consumer comment is that the manufacturers use small fonts and too dense writing on their packages. A part of this problem is due to the government regulations: certain information concerning food must be communicated to the consumers on the food packages. But also the manufacturers prefer to add all available product information to the package. Often in the case of brand or package renewal, the manufacturers are not willing to give up any previous information, yet the renewal process usually demands significant of new information. The fact is that the package has limited space to communicate the product information to the consumer. Extensive

involvement products, packaging is more important than in branded goods. The package is usually a part of product property or characteristic. Earlier studies revealed that packaging usually represents the product: packaging is related to the perceived quality. It was also stated that increased attention did not always result in purchase and product choice. Additionally, the conducted consumer research revealed that price, the production method and packaging size were the main issues that mediated consumer egg choice. The results showed that existing package sizes were preferred by the consumers and they wanted to have more health benefit and nutritional information on the packages. As discussed earlier, packaging is the crucial point-of-purchase communication vehicle. When compared to rival egg producers the Kieku eggs receive more attention by standing out from the otherwise colourless egg packages whose poor carton design forces them to be without graphics. The packaging design was not only styling of the old package or re-positioning of the old product. The product innovation was based on a newly developed OmegaOptima™ poultry feed. The producers wanted to better communicate the characteristic of the new product to consumers and boost the sales by applying contemporary packaging design.

The majority of consumers rely on packaging to aid in their decision-making at the point of food stuff purchase [7]. Packaging design is an important part of the brand-building and profit-making business in the food sector. Especially in the case of new product introduction, packaging design plays an important role. Other suitable situations for utilising contemporary packaging design are diverse: communicating product changes, product re-positioning or brand extensions. New package design can also update a product to correspond or even outplay the products of the rivals on the market. The next figure 4 sums up the major results of the Kieku case study.

Previous research has identified several elements that affect consumer purchase decisions. Silayoi and Speece [12] emphasise visual and informational elements. Another study provided by the researchers Ampuero and Vila [3] suggests that the two main areas of packaging design include graphic components and structural components. Although these two studies do

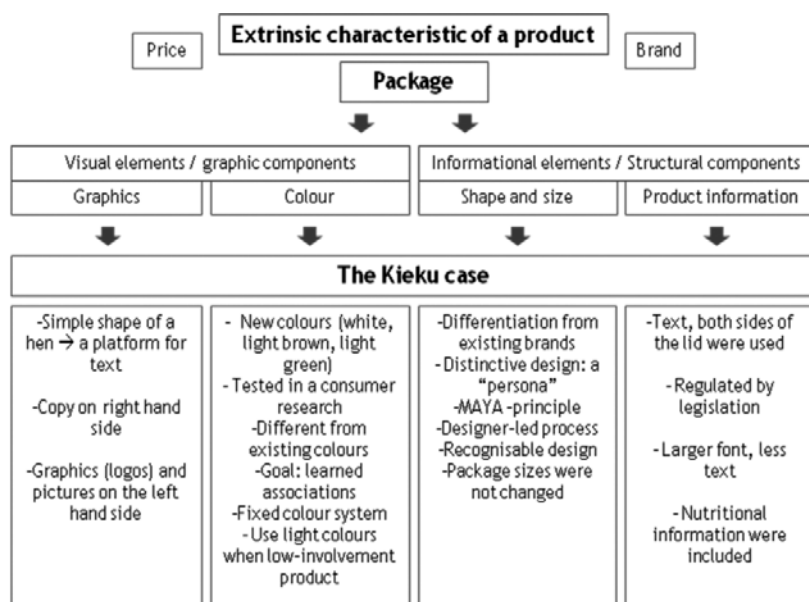


Fig. 4. Theoretical framework of packaging design based on consumer research literature and the Kieku case study.

not describe exactly identical factors, we interpreted that these approaches could be divided to four main components of packaging design: graphics, colour, shape and size, and product information. These were the characteristics that were taken into account in the Kieku eggs packaging design project.

The graphical elements on the Kieku package included a simple shape of a hen printed on the lid. This element was also a platform for the product-related text. Previous research had shown that copy will work best when printed on the right hand side and the graphic and pictures on the left hand side. These principles were utilised in packaging design.

The second element was colour. The goal was to create a fixed colour system that would communicate certain product features that consumers would also learn and adopt easily. In terms of distinction the colours should be different from existing colours used in egg packs: three new colours were introduced and tested in the consumer research. The main contribution of the consumer research was that changing only the colour of the package, without touching the graphic design, significantly changed the perception of the packages. The third element was the shape and size of a package. It was obvious that the new package had to be different from existing ones. The new pack had to be distinctive, but not too "futuristic" or "odd". The first consumer

research conducted during the package design project confirmed that the sizes of the packs should not be changed. The 6- and 12-eggs packages were introduced. The fourth element was the product information to be printed on the Kieku egg package. The Finnish and European Union legislation regulates the obligatory text that had to be presented on the package. It was decided to print voluntary information with a larger font and the amount of information was restricted. Despite the limited space additional nutritional information was included. The designer used both sides of the lid in order to get all the needed information printed on the package. Designing packages for the new products is challenging. Conducted consumer studies and research literature concerning packaging design helped in making crucial decision during the project. However, it became clear that every single choice in designing cannot be justified based on research. It is simply not economically viable. Some of the package design solutions have to be left to the professional designer. Usually the artistic solutions taking place in package design projects are in any case very hard to justify in terms of scientific research. Consumer research can aid the designers to choose between the different solutions designed by them. It is rather a tool to help decision making by designers. It is too early to estimate the monetary benefits of Kieku's new product innovation or the impact of packaging design on the company's or the farmers' income. The company is still quite new, and there are no previous points of comparison. What is clear is that Kieku has managed to cover 15% of the overall volume of the egg markets in Finland in 2007-2008. The new brand has also offered better margins of profit for the whole chain of production. This can be argued to be at least partly a consequence of new OmegaOptima™ poultry-feed innovation and the Kieku brand as well as well communicating new packaging design.

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Product durability for the experience society

Abstract

We live in a society in which products are too easily disposed of, thereby generating an unnecessary amount of waste. Improving product durability is one of the key issues toward creating a sustainable future. Product durability not only depends on physical durability but just as much on the semantic meaning that the product evokes. Semantic meanings are hard to predict and vary widely amongst individual users. Through various design examples I will introduce a new challenge in durable product design: behavioural obsolescence. In future designs of electronic products, designers not only need to find a balance between the material and non-material counterparts, they need to establish product behaviour, which is meaningful and pleasant to the user in the long run.

Keywords

Sustainability, Durability, Product Semantics, Consumer Electronics, Immateriality and Product Behaviour.

1 Introduction

For too long, design has been hijacked by our consumption driven economic system. When the world economic system came to a standstill during the great depression, market pioneers actively persuaded the world to consume its way out [1]. From that point onwards design became an important tool to stimulate

consumption, leading the way to designers such as Raymond Loewy, Harley Earl and Henry Dreyfuss to apply design as a way to boost consumer spending through product aesthetics [2,3].

Even today, design remains a tool to encourage consumer spending and will remain so as long as our economic system is based on thoughtless growth. Exactly this growth is one of the most important problems we have to face in the near future. We currently exploit our natural resources at alarming rates, consuming substances, which took millions of years to form, in a matter of decades. It is inevitable that major changes will have to take place in order to create a sustainable world.

As designers we can contribute in many ways; in this paper I will discuss the design challenges we face to discourage reckless consumerism by improving Product Durability within a future generation of products.

2 Product durability

2.1 Durability as a sustainable issue

Our Western civilisation and the designed world it has brought forward have initiated many problems that threaten our natural environment. For a long time we have been naïve and ignorant (pollution, diminishing the biodiversity or the depletion of natural resources). In recent years it has become more obvious that our natural environment can turn against us (damaged ozone layer, upcoming diseases or the greenhouse effect).

These natural disasters have stressed the urgency to create a sustainable world.

Product designers carry a high responsibility when it comes to sustainable issues, as their creations require material and energy resources. To diminish the environmental burden, designers could reduce the use of resources for new products, introduce renewable resources where possible or create products that last longer. The latter, is more difficult to resolve [4]. Whilst we can eliminate unsustainable materials and change production processes, the durability discourse requires not only a fundamental change in the product's *physicality* but also in the way we *perceive* products.

2.2 Physicality

Most companies are willing to reduce environmental impacts by reducing waste, energy consumption, and material usage, which are all measures that positively reflect their business revenue. However increased product durability implies a prolonged lifetime that is out of tune with universal economic principles of growth. Products that live longer cause a reduction in sales volume and minimise the option for product innovation. In reality, manufacturing products that last longer does not necessarily pose a threat to a healthy economy. Reducing the need for rapid product replacement leads to new services, possibilities to upgrade and above all, it allows products to become prone to aesthetic aging which will ultimately attract loyal customers [5]. Whilst improving the physical quality is a precondition, creating durable products requires more. According to Jonathan Chapman, if we limit ourselves to the physical durability we will simply end up with durable waste [4].

2.3 Perception

Ever since design has become more involved with styling than usefulness and quality, products have become susceptible to styling updates. This brings us to the biggest obstacle toward creating durable products, our drive to purchase new products despite the fact that the products they replace, still work.

Although design has become more related to styling, it cannot solely be held responsible for the lack of product durability. In the 1930's during the modernist period, the role of design was to represent the functional aspects of a product. It soon became clear that such an emphasis on pure functionality would cause a loss of attachment to products [6].

In many ways design offers the possibility to attach oneself to a product. A functionalist design approach may be criticised for not allowing space to create a meaning; yet even functionalist designs, such as Dieter Rams' creations for Braun, may become icons with a very strong meaning to its users [7].

To improve the product's lifetime, it is important that the product represents more than its functionality. Product semantics are an important design discipline that enables further understanding of these complex dynamics.

3 Improving durability

3.1 Underlying factors

It is hard to compare products based on sustainable criteria such as energy consumption, material usage, reusability or recyclability. Even for products of the same category it is difficult to judge the environmental impact because most sustainable criteria are complex and may not produce comparable results [8].

Comparisons are much easier when the product lifetime is considered. Products that last a long time are more likely to be judged the best sustainable choice, with the exception of products that consume a substantial amount of energy during usage, such as cars, fridges or light bulbs [5]. The lifetime of these energy hungry products may be challenged when they become less efficient in comparison with new technologies.

In general, extending the product lifetime is an important approach toward reducing the environmental burden. However, if product life is such an important issue, why are products replaced at ever increasing rates?

Shedroff and Walker name several factors that influence the end of a product's life. These factors vary from disposability, wear, non-reparability, functional obsolescence, technological obsolescence and aesthetic (psychological) obsolescence [8,9]. Most of these are directly linked to the product's physicality unlike aesthetic obsolescence, which is defined by the way we perceive products. I have used this distinction to classify these factors as either 'physical' or 'perceptive' (table I). For each factor I have added some common solutions on how to improve the product's durability.

3.2 Aesthetic obsolescence

Aesthetic obsolescence describes the urge to buy newer versions based on style differences, caused by either fashion or wear-and-tear. Products that experience

End of life	Cause	How to improve	
Physicality	Disposability	Legislation, Pricing, Inform Users [9]	
	Wear	Use Durable Materials and Stable Technology [8,9]	
	Non-Reparability	Provide Access, Separate Functional Components, Deliver Components [8,9]	
	Functional Obsolescence	Create Multifunctional Products [8,9]	
	Technological Obsolescence	Provide Upgrades [8]	
Perception	Aesthetic Obsolescence	Hard Qualities:	Simplicity, anti-Fashion, Aesthetic Aging [16]
		Soft Qualities:	Individual Meaning, Stories, Memento's, Tailored and User Inspired Design [5,13,15]

Table 1. Factors that influence the end of a product's life [8,9,10]

aesthetic obsolescence are disposed of for the reason that, the semantic meaning of the product has changed despite the fact that it may be in perfect working order. In terms of product semantics, aesthetic obsolescence is based on both the symbolic functions of the product and the meaning it generates to its user (cultural, social, technological, economic or ecological) [11,12]. According to McDonagh & Lebbon the product's functions that evoke emotions can be divided into 'hard' and 'soft' product functions [14]. Hard functions include how the product works, how it is constructed and what materials it is made of. Soft functions include intangible qualities such as emotional bonds, personal taste, touch, smell, feel and personality. I have used the same qualification to make a distinction between ways to reduce these so-called soft and hard qualities of aesthetic obsolescence (see table 1). For each quality there are a number of ways one can eradicate aesthetic obsolescence [5,13,15,16].

3.3 Reducing aesthetic obsolescence through user inspired design

One could reduce aesthetic obsolescence by creating a unique personal meaning, however this does not imply that every product should be tailor-made. Personal meanings generated by one user can inspire other users

to obtain a special product relationship. It is about generating a story around the product to strengthen its soft qualities.

In 2002 I conducted a research project, called "Wearable Dreams" to reveal individual relationships between users and their wearable objects [13]. The aim of the project was to develop a method to create new objects based on a unique user-inspired story that would harness personal meaning. In the project I challenged 20 subjects to reveal their personal relationship with one of their favourite wearable items. Each subject was asked to write a story unearthing the special bond they had with their favourite piece of clothing. I used these stories to generate new wearable items not necessarily of the same product type. One of the outcomes was a Compass Coat that indicates north through electroluminescent embroidered wires (figure 1). Each wire signifies a plant that becomes active when facing north.



Fig. 1 The Compass Coat contains 24 electro luminescent wires, which individually light up when facing north. The coat is inspired by the moss that grows on the side of a tree which gets most rained upon (major wind direction).

The coat was inspired by a subject's story about using natural elements to find your way home when lost: *"Lost in a new cultivated forest where every tree is planted in regular rows and every tree looks the same. There is a strong smell of pine. It's getting dark.*

Temperature is falling below zero. Dependable Colin knows how to use the side on each trunk on which moss grows to find north..."

The individually inspired approach proved not only beneficial to a single user but also to a larger group of users since it generates a story that facilitates the creation of meaning. It shows that not only hard product qualities, such as shape, usage, construction or materiality create a meaning; also soft qualities such as stories or mementos create a meaning which improves the product's durability [5,14,15].

4 A new challenge

4.1 From durables to consumables

Durable goods are generally defined as products of which the expected lifetime exceeds three years [17]. This definition would mean that mobile phones are consumables since the average life span of a mobile phone is no more than 18 months [18].

The average life span of electronic products is still decreasing, with the newest technologies taking the lead. Research showed that 25% of vacuum cleaners, 60% of stereos and 90% of computers are still in working order when they are disposed of [5]. With the latest technology, life times worsen; most mobile phones, when thrown away, are still in working order [19]. Electronic durables become consumables just like users become consumers.

Instead of improving the life span, fast developing technology has a negative influence on the lifetime of common electric appliances, such as toasters, vacuum cleaners or sewing machines. More electric appliances become electronic appliances through the addition of electronic functions such as timers, programmable settings or status indications. These additional functions make them more vulnerable, difficult to repair and sensitive to changes in technology and style, which negatively influences their lifetime. A straightforward approach to improve their lifetime would be to reject materiality and strive for immaterial products or services.

4.2 Immateriality

Immateriality has long been seen as a saviour to our material obsession. Many products such as analogue water meters, computer backup drives or books and newspapers have been replaced by an online service

or interface. We have to bear in mind that not many products can be transformed into a non-material equivalent and, even if they could, we should be careful not to replace the physical product per se but insist on a more meaningful solution.

I have challenged the view of a non-material future in a project called "Message in the Bottle" [21] in which I re-materialised a bygone product, an answer phone, into a new product experience. The answer phone consists of a wooden tray with glass bottles each of which can receive a message, represented by a flickering light inside the bottles, (see figure 2). By using radio frequency technology and electronic tags a new message can only enter an empty bottle; once the user opens a bottle the message will be audible; tilting a bottle will empty its contents. I developed a working prototype in order to share this pleasurable experience, which seemed so different to existing answer phone machines and non-material "voice boxes".



Fig. 2 "Message in the Bottle", an answer phone consisting of glass bottles which capture messages. The product can be experienced through its materiality; users may collect the bottles that contain special messages. In this concept, the non-materiality of voice messages is captured in a tangible object.

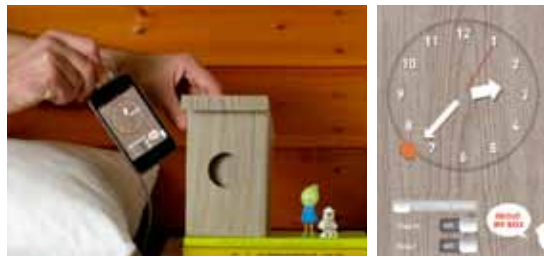


Fig. 3 The Birdbox alarm clock; the product consist of a simple box and a mobile phone application.



Fig. 4 As soon as the alarm sounds a video of real birds will appear in the opening. Whilst the product remains simple its interface can be complex yet easy to change or upgrade. The product shows a reduced materiality without compromising the pleasure and experience of a real alarm clock.

End of life	Cause	How to improve	
Physicality	Disposability	Legislation, Pricing, Inform Users [9]	
	Wear	Use Durable Materials and Stable Technology [8,9]	
	Non-Reparability	Provide Access, Separate Functional Components, Deliver Components [8,9]	
	Functional Obsolescence	Create Multifunctional Products [8,9]	
	Technological Obsolescence	Provide Upgrades [8]	
Perception	Aesthetic Obsolescence	Hard Qualities:	Simplicity, anti-Fashion, Aesthetic Aging [16]
		Soft Qualities:	Individual Meaning, Stories, Memento's, Tailored and User Inspired Design [5,13,15]
Performance	Behavioural Obsolescence	Soft Qualities:	Surprise, Mood, Support and Upgradability

Table 2. Completed overview of Factors that influence the end of a product's life

We need some kind of materiality to relate ourselves to our world. This project aims to demonstrate that simply removing the object itself does not necessarily eliminate the annoyance caused by the object but may actually introduce a less pleasant and meaningful relationship [20,21,22].

4.3 New product relationships

Designers should not feel obliged to replace physical objects with non-material equivalents. Instead they could strive to create more meaningful objects by establishing a balance between the material and non-material counterparts.

Recently new opportunities have appeared with the development of mobile phone applications such as i-Apps. Although many mobile phone applications are developed as an additional function for the phone, the first applications have emerged that derive their true meaning in relationship to an external product.

One of these products is the Birdbox, an alarm clock developed by Luckybite [23]. The actual product is no more than a cardboard box, matching the display of an analogue clock that can be downloaded on an i-Phone (fig 3). When the alarm sounds, whistling birds appear instead of the face of the clock (fig 4).

The Birdbox shows that products can potentially exist in both a material and non-material form. For the Birdbox, the material part is kept simple, light and easy to recycle. By separating the electronic component (which I refer to as the "non-material" part), products can remain simple and functional, which has a positive influence on their durability. The electronic component can be upgraded or replaced when necessary whilst the material part of the product can be reused, sustainable or subject to graceful aging.

4.4 Behavioural obsolescence

It's clear that the meaning of electronic products in the near future is not necessarily attached to their material content. More products will contain technologies that allow them to have a mind of their own, turning the semantic meaning away from the material to the behavioural content.

Product behaviour could manifest itself as a routine, which might be a pleasant reliable relationship but may just as well be a weary experience that challenges the product's durability. I would like to highlight this future challenge by introducing the term *behavioural obsolescence* (see table 2). Behavioural obsolescence manifests itself through the performance or the behavioural qualities we experience when using the product.

To overcome Behavioural Obsolescence designers should develop intelligent electronic products with 'behaviours' that can be supportive, witty

or even moody. When a product always behaves in an expected way it may induce boredom in its relationship with the user.

5 Conclusion

The lack of product durability is an important but difficult problem to tackle. Products with a longer lifetime are easily more sustainable than attempts to adjust the material and energy intake during production. Unfortunately, most products still show a lifetime much shorter than their materiality allows, in particular electronic devices. It is hard to increase the product's durability since it requires improvements on various product levels which involve different players. Firstly, on the physical level, any product has a limited lifetime due to its material components. Products are subject to wear and tear but might just as well be surpassed by a new technology or the impossibility of upgrading or repairing the product. Improving the physical durability involves convincing companies that products that last longer can fit with a healthy business plan.

Secondly, every product carries a specific meaning that is generated by the user. Products are sensitive to aesthetic obsolescence when the user is not able to establish a meaningful relationship. There are many ways to improve designs either through a product's hard or soft qualities.

A new, third improvement is necessary to increase the product durability. As products in general become more intelligent they show a certain 'behaviour', which shapes the relationship to the product's user. To overcome monotonous 'relationships' intelligent electronic products need to be fluid and easy to upgrade. This new challenge can be related to as behavioural obsolescence.

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Souvenirs – local messages. An exploration from the design perspective

Abstract

Souvenir products are probably as old as travelling. They materialize both personal memories and social encounters. In destination marketing, they may play an important role by word-to-mouth promotion. As emotional and narrative objects, they challenge designers' ingenuity. However, design studies have neglected the topic and theoretical approaches from a design perspective are lacking. This paper proposes a framework for the design of souvenir objects based on product semantics. First, it briefly resumes the state of the art in souvenir studies as achieved in social science. In a second and main part, it analyses existing souvenir objects using product semantics models. Finally, conclusions aimed at the outline of a design brief are drawn and discussed.

Keywords

Product Semantics, Souvenir Design, Destination Marketing

I Introduction

Souvenir objects are well known to all of us. We treasure them in our homes, our bags, and our pockets. They bear in remembrance remote places and times or past events. As "animated objects" [1, p. 52], they are able to trigger our souls. The word souvenir is closely tied to tourism and travelling and the borderline to merchandising articles is blurred. The intersection

of personal memory, product design and destination marketing is the subject of this paper. It examines travel souvenirs as a means of destination marketing from a design perspective. Thus, it focuses on souvenirs for sale; the so-called non-declared souvenirs, i.e. shells, sand, stones or place-name signs ranking quite high in popularity within the whole range of travellers' tokens are excluded.

The paper is based on an ongoing research project carried out at the Lucerne School of Art and Design in cooperation with five commercial partners. The title "Souvenirs: Destination Marketing and Design" indicates the project focus. The results aimed for are twofold: On one hand, new souvenir products for specific destinations will be developed, on the other hand, a framework for souvenir design in tourism will be generated. The design part took place in summer 2010; the final report will be available in spring 2011. This paper presents preliminary results as achieved by end of August 2010.

Souvenir studies from a genuine design perspective are rare. Textile designer Beverly Gordon states in an often cited article that souvenirs are important economically, psychologically and culturally but have "never been looked at categorically and phenomenologically" [2, p. 144]. Design studies have not yet explored *product semantics* and the *contexts* of souvenirs in depth; theory-driven reflections are lacking. Nonetheless, souvenirs have been a concern in design practice and

design education. Most of the time, the conventional commercial range of products on offer is criticized “to be trashy kitsch”, as Widmayer [3, p. 106] observes, and she pursues: “This is probably mainly because they are often inadequate or incongruous in their shape, colour, materials used, dimensions or in the sheer quantities they are produced in. (...) There is hardly any product group that is the subject of quite so much derision and ridicule and which still enjoys such high sales.” Consequentially, the typical design approach to the subject has been the improvement of the artistic quality of souvenirs. This perspective emerges in the 1920s parallel to the Modern movement [4, p. 26ff]. Later, Museums of arts and crafts broached the issue with exhibitions concerning “good form” and souvenir quality. These shows were realized in cooperation with design organisations such as the German Werkbund [5] or with national tourism organisations [6]. The redesign of the Bremen Town Musicians in 1991 provides a more recent example [7]. In the frame of a design competition, well-known designers such as Alessandro Mendini, Michele de Lucchi, Ron Arad and many others delivered new interpretations of the traditional town symbol. Unfortunately, the winners’ redesign never went into production since it turned out to be too expensive and retailers showed no interest in the design.

The inefficacy of such design initiatives proves clearly that theory-driven reflections are lacking. Artistic quality or so-called “good design” might be desirable or even essential, but it is not sufficient for a successful launch of new souvenir objects. We therefore suggest a more holistic view. Our hypothesis claims that the context – i.e. the destinations where the souvenirs will be sold, the propensity to consume and bias of the tourists, last not least production and costs – has to be taken into consideration as well.

This paper first shortly resumes the state of the art in souvenir studies as achieved in history, social science and tourism research. Secondly, it analyses how local reference may be materialized in souvenir objects. Selected examples are discussed using a semantic approach. The third and final part proposes a framework for souvenir design briefs.

2 Souvenir studies

Various disciplines have dedicated research to the history and character of souvenir objects. They have

been a topic both in the humanities and in social science. Social and cultural sciences, for example, have studied how travel souvenirs are produced and consumed and how they unfold their fascination. The essay collection “Souvenirs: The Material Culture of Tourism” offers a wide selection of sociological, anthropological and ethnographical case studies [8]. German readers find similar approaches in a recently published conference reader [9]. A comprehensive catalogue covers historical aspects [10]. Last not least, travel souvenirs have also been a topic in tourism research [see e.g. 11, 12].

2.1 Souvenir history

Souvenirs are probably as old as travelling. They are the material outcome of cross-cultural encounter due to trade, pilgrimage and sightseeing. Ever since humans started to visit places far from home, they brought back material token from those journeys. Miniatures of Artemis’ temple in Ephesus, one of the Seven Wonders of the World, count among the earliest examples of industrially produced souvenirs; Greek writers mention the presence of souvenir retailers near famous and therefore frequently visited sights [3, p. 104]. Cultural tourism with all its consequences is not an invention of our times: “As early as the Hellenistic era (ca. 300 BC), antique sources confirm that travellers broke off little pieces of statues or buildings in order to take them home as souvenirs. The antique patriarchs of the art were forced to consider how the plundering could be stopped. So they invented surrogate figures of clay and loam. In order to protect the originals, they forged them, and sold them piece by piece.” [Bazon Brock, cited in 13, p. 72]

Each epoch produced its own travel cultures and related souvenir styles [10]. Still, some characteristics of travellers’ token remain unchanged for centuries as we will see further on.

2.2 Making money with memories

Since antique times, travel and souvenir industry are inseparable and the commercial relevance of souvenir objects is quite high. American Tourists, for example, spend about 33% to 56% of their travel budget on shopping and a good part of it on souvenirs [11, p. 153, 12, p. 364]. The sales volumes on souvenirs affirm their economic importance. In the United States end of the 1990’s tourists spent 20 billion dollars yearly for souvenir purchase [14, p. 149], in Germany beginning of

the 1990's around 1 to 1.5 billion Euros [3, p. 106], and in Switzerland in 2004 around 67 million Swiss Francs [15, p. 8]. Business economists are therefore very interested in learning more about tourists' consumer behaviour. One approach explores tourists' and retailers' perception of souvenirs [12]. It aims at matching product assortment better to the needs of visitors. Thereby, retailers should be able to improve their incomes. However, quantitative empirical data are difficult to obtain and do not deliver clear evidence [12, p. 374].

2.3 Strategic branding for destinations

An economic view on souvenirs also considers their role in destination marketing. With a daily revenue of 2 billion US \$, travel and tourism form the second largest world industry [16, p. 611]. In this highly competitive market, distinction becomes more and more important. Strategic branding is mandatory to achieve success. Well-designed souvenir products may support a destination's image and its marketing strategy. On one hand, souvenirs are able to incorporate and materialize symbolic brand attributes; on the other hand, they trigger conversations about their provenience [16, p. 619ff]. In tourism, worldwide more than 1'480 billion US \$ are spent for marketing [16, p. 623]. Nonetheless, word-of-mouth remains the most important mean of advertisement. Souvenirs as messengers of the local count therefore among the most valuable brand elements.

2.4 Individual identities and social glue

Souvenirs fulfil two different aims: They serve as personal mementos and they accomplish social needs. These two functions generate different research fields. The first perspective conceives souvenirs as constituents of an individual's identity, as "narratives of self-identity" [17, p. 31] and "traces of authentic experience" [18, p. 135]. Cultural studies oriented research takes up this perspective. Such investigations interpret souvenirs as biographical testimonies, as "museum of the personal" [19]. Psychology as well contributes to this field by studying individual's relationships with artefacts [20, 21]. The social dimension of souvenir objects is manifold. It has been studied by disciplines as different as ethnography, cultural anthropology, sociology, geography, tourism research and economy. Research questions concern production, distribution, and consumption [8, 22]. These studies explore how

production and consumption tie different social worlds and what happens on both ends of cross-cultural encounter mediated by souvenir retail. Furthermore they examine how the involved actors, i.e. the souvenir producer and the tourist, deal with meaning and identity and to what extent souvenirs are still part of cultural capital. Another field of research concerns the impact of tourism on local art and craft.

3 A design perspective on souvenirs

One of the basic assumptions of our research conceives souvenir objects as signs resp. symbols (depending on the definition of these terms). They commemorate remote places, events and personal adventures of the owner. In contrast to common everyday objects, this is the first and most important function of souvenir objects, even if they might offer also some utilitarian function. Thus, souvenir retailers tag the practical function of souvenirs as "second use". Since the meaning, the stimulation of memories and associations is distinctive for souvenirs, design semantics offer a suitable theoretical approach to the field. In the following, we refer to the conception of symbols as described by the American philosopher Susanne Langer [23, p. 60-61, 64]. According to her, a symbol comprises four components: First, the subject, i.e. the person, to whom a symbol means something and who interprets the symbol; second, the object in reality which is also entitled referent or content; this is for example the Eiffel Tower in Paris; thirdly, the symbol, i.e. the vehicle for the conception of an object; in this case, it might be a miniature replication of the Eiffel Tower, a photography of the monument, a postcard with an image of it or even the term "Eiffel Tower" as such; and fourth, the conception of the object which covers both denotations (the explicit meaning or dictionary definition of a term, devoid of emotion) and connotations (the subjective meaning of a term resp. a symbol, closely connected with emotional associations and one's own experience). Symbols, according to this model, are not just given but can take various forms. They arise from a creative process. The meaning of objects is not fixed; it varies depending on users' cultural and social background and, especially in the case of souvenirs, on life and travel experience. We will now discuss several aspects essential for a holistic perspective on souvenir design. *First*, we explore semantic factors in more detail, provide a souvenir

typology and examine selected examples (3.1). *Second*, we consider the perspective of destinations or event organizers and discuss how souvenirs may support strategic branding (3.2). *Third*, we briefly look at the tourist and souvenir purchaser (3.3). We thereby develop a triangular model comprising the souvenir object, the destination or event to be remembered and the user of the object.

3.1 Symbols of the extraordinary

Adopting the perspective of design semantics, souvenir design equals symbol creation and has therefore to consider questions concerning reference and connotation. First of all, souvenir objects must represent the place where they come from. Thus, the first crucial question is: *What reference is appropriate in order to communicate the destination?* However, there are various possibilities to indicate the geographical reference of tourists' token. In this respect an analysis by Gordon is instructive for design [2, p. 139-144]. She constructs five typological subcategories for souvenirs. Even if there might be overlap in some cases, the typology is suitable to offer a starting point for the design process:

- A. *Pictorial images*. Postcards are the most common type of contemporary souvenirs. Picture books, drawings and photographs as well belong to this category. Holiday snapshots unfold great authority; they serve as witnesses and "frozen-in-time reminders" of ephemeral adventures [2, p. 140].
- B. *"Piece-of-the-rock"* souvenirs. This type of souvenir objects, which are literally "part of the whole", includes all kinds of natural material such as shells from the beach, stones or pinecones but also pieces picked up from the built environment. According to Gordon, the "hunting or gathering need not have been carried out by the person bringing home the souvenir" [2, p. 141]. Piece-of-the-rock souvenirs may as well be customized and commercialized as canned air from Los Angeles, certified pieces from the Berlin Wall, or cut out and petrified parts of green turf from World Cup soccer fields prove.
- C. *Marker*. The easiest way is to mark souvenir-suited objects – T-shirts, peaked caps, neckties, mugs, decorative wall plates, ashtrays, key rings etc. – with the name of a destination. Astonishingly, the simple application of a few words to such very common,

run-of-the-mill objects suffices to add emotional value: "Like a magical incantation, the words 'souvenir of ...' give power where none was before." [2, p. 142].

- D. *Symbolic shorthand*. Typical monuments like the Statue of Liberty, the Eiffel Tower or the Brandenburg Gate represent their location without the need of any marker. Natural landmarks like the Matterhorn or the Niagara Falls achieve the same effect. In miniature, they serve as stenographs of their provenance.
- E. *Local products*. This category includes various objects, ranging from indigenous food (Greek olive oil) and food paraphernalia (Mexican tortilla press) to identifiable local clothing (kilt from Scotland) and all kinds of local crafts.

For sure, this typology offers a useful starting point to set up a design briefing. The creation of *symbolic shorthand* is probably the most challenging task. If a designer is charged with a new souvenir design, she has to choose a suitable referent. Of course, the Statue of Liberty or the Eiffel Tower are unmistakable references of New York or Paris. But on the one hand, many tourist destinations or events have no such famous monument or attraction at their disposal; on the other hand, these one or two dozens of world-famous sights became clichés or petrified stereotypes since they were reproduced for millions and millions. Understandably, some tourists are bored or disgusted by iconic miniatures of such monuments. Thus, in order to satisfy more discerning customers, the designer has to create a fresh re-design of a famous referent or she has to create an appropriate new symbol (Fig. 1).

The East German city of Weimar, for example, mostly known for its cultural heritage including the Weimar Classicism of Goethe and Schiller, has no significant monument representing the place. Thus, a collection of souvenirs designed by students at the Bauhaus University embraces various items that show no authentic locally routed forerunners [24]. A pair of tights (with the so-called Gretchen question printed onto) named *Gretchen's Masche* ("Gretchen's trick") and a plaited pastry *Gretchen's Zopf* ("Gretchen's braid") serve as example for this type of newly created souvenir object. Both designs refer in a quite sophisticated way to the location. They hint at the literary character Gretchen in the magnum opus *Faust* by Goethe.

Clearly, these souvenirs incorporate narrative elements, they invite to tell the background story – an aspect mainly suitable for culturally interested tourists belonging to the educated middle class.



Fig. 1. Souvenirs from Weimar: Gretchens Masche, a pair of tights (design Natalie Ahrens) and Gretchens Zopf, a plaited pastry (design Christiane Rimek)

On first sight, the category “piece-of-the-rock” seems to be rather inapplicable for a design approach since it is linked to the tourists’ creative or sometimes even subversive act of appropriation. Still, the souvenir industry offers convincing examples: Bags, backpacks and folders made out of discarded Swiss army blankets demonstrate how an original design idea can transform “piece-of-the-rock” materials into attractive, authentic and useful products communicating their origin (Fig. 2).



Fig. 2. The Army-Recycling-Collection: Various bags and backpacks made out of discarded Swiss army woolen blankets

The category *markers* also seems to be exhausted and tedious. Nevertheless, a close look at his type of souvenirs reveals differences and slight shifts concerning the range of objects as times goes by. Out-dated product categories such as hankies with embroidery vanish while new categories such as USB-sticks come along. Indeed, this category is an old one. Historical souvenir studies document for example how local industry supplied pilgrims with such objects in 19th century Jerusalem [25]. In the same epoch, visitors to the German castle Wartburg were sold cups and mugs marked with painted pictures of the famous monument

[4]. Some markers are very obtrusive while others mark a product in a more sophisticated or subtle manner. Young designers challenge this category not inventing new carrier media but new ways of marking. The objects marked basically remain unchanged – cups, plates, textiles, etc. – while markers’ graphic design introduces fresh looks on familiar topics.



Fig. 3. Souvenir caps: Swiss cliché and innovated Berlin skyline on popular products (left: <http://www.shoppingland.ch/>, right: <http://www.fraujaeger.de/>)

Last not least, *local products* reach far back into the past and are often closely tied to local materials, craftsmen techniques and distinctive ornamentation. Local knowledge and tradition offer rich potential for seducing design updates anchored in cultural heritage. Yii design, a project initiated by the Taiwan Craft Research Institute [26], for example, transforms traditional craft through design. Creative director Gijs Bakker enhances an approach developed earlier: the fusion of local and global, producer and designer, user and creator, traditional and contemporary [27]. From the design perspective, each of the five subcategories offers starting points for innovative drafts. Good knowledge of the place and its visitors will inform a successful decision.

After coming to a decision on the reference, the designer has to clarify a second crucial question: *How does the reference or the content become manifest in the material object?* Basically, this is a question of style as various interpretations of the Brandenburg gate demonstrate. Objects range from naturalistic miniatures, snow globes and sheets of construction paper for do-it-yourself to humorous and minimalistic re-interpretations (Fig. 4). Even though they indicate the same referent, the messages differ obviously. Due to its iconic qualities, the miniature replication shows how the monument looks like while the snow globe adds a humoristic flavour. Further, the brush presents



Fig. 4. Souvenir objects representing the Brandenburg Gate in Berlin: a small size replication, a snow globe, and a brush (brush designed by Vogt + Weizenegger)

a very abstract and somewhat accidental interpretation; without adding the name of the capital, it would hardly be possible to identify the referent at all. Most likely, these souvenirs appeal to distinct target groups.

Another peculiarity of souvenirs should be taken into account in respect to their character. According to Gordon, vacation and travelling is experienced as an extraordinary condition when tourists are “not working, not serious, not responsible, and not thrifty”. Due to these circumstances they tend to “spend money on small, foolish items (...) or waste what they usually would be much more careful about” [2, p. 139]. Thus, the childish, corny, humorous or surprising character of so many souvenir objects responds to the attitude of certain tourists in extraordinary conditions; they become part of the inversion of everyday life and normality.

3.2 Local messages materialized

Strategically designed souvenir objects and giveaways have the potential to strongly support a destination's image and marketing for a long time – and to promote the destination or event in an indirect but efficient manner. In order to do so, the actors – destination marketers and designers – have to be aware of the destinations identity and the message they intend to communicate. Strategic branding is mandatory to achieve success. Nonetheless, a survey realized in the context of our research project indicates that tourist destinations make little use of this potential. Souvenirs as powerful messengers of the local are fairly underestimated; souvenir design does not receive special attention, and souvenir objects lack distinctive character.

In this respect, event marketing is a step ahead. Numerous examples demonstrate how event organisers utilize products as markers to both announce an event and make money at the same time. This can be observed in the context of sports as well as in the context of cultural events. Again, both questions have to be answered in order to design congruous objects: *What reference is appropriate to communicate the destination?* And: *How should the reference or the content become manifest in the material object?*

The central organisation of such events is without doubt an advantage for strategic branding. It helps to create, shape and cultivate a distinct brand identity and philosophy. Souvenir design then becomes an integral part of the overall branding strategy. The 1972 Summer Olympic Games in Munich provide an informative case on this behalf. Otl Aicher, one of the founders of the Ulm School, and his team were responsible for the corporate design of the games. The briefing demanded to avoid pathetic seriousness and to emphasise cheeriness, optimism and playfulness. It was a necessity to generate income by means of licences for Olympic souvenirs. Aicher, who was overcritical in regard of superfluous gadgets and trash, agreed to design a mascot – by the way the first official Olympic mascot. Deliberately, he avoided traditional symbols of power, heraldic figures such as a spread eagle, or a lion and even the colours of the German flag [28]. In compliance with his design philosophy, he created a product of some practical value, a toy, and at the same time a sympathetic figure that symbolized the spirit of the games: a funny, short legged, long-eared dachshund, named *Waldi*, with vertical stripes in three colours of the five Olympic Rings around the belly (Fig. 5). Traditionally, this dog breed is associated with Germany and with attributes such as resistance, tenacity and agility also typical for athletes [29]. Thus, the symbolism of the mascot backed up the corporate identity of the games; souvenir object and intended message corresponded convincingly.



Fig. 5. Waldi, the mascot of the 1972 Summer Olympic Games, designed by Otl Aicher

Another and more recent example for conscious coining of product attributes to nation branding is the so-called *DeutschlandKollektion* (GermanyCollection). Since 2009, this range of products serves German diplomats around the world as souvenir giveaways in various occasions [30]. Also in this case, the design

brief was straightforward: The former chancellery minister declared that the Federal Government attaches importance to how the country is represented by products and brands. Giveaways should symbolize “a modern and outward-looking country” as well as “innovation, performance, creativity, charm and ingenuity” [31]. Additionally, the briefing set a prize limit of 20 Euro since more expensive presents pass for bribery. Students from four academies (Hochschule für Gestaltung Karlsruhe, Folkwang-Hochschule Essen, Hochschule Burg Giebichenstein Halle and UdK Berlin) designed a range of both functional and playful products. To give an example: “Twelve commandments” are a dozen mat boards inspired by the blue-and-white mandatory-signs with icons of typical German objects such as the cuckoo clock, pretzel, dachshund, VW beetle, etc. The message shifts between an ironically overstated image of law and order and products and preferences traditionally associated with the country.

Another example is the re-design of the Brandenburg Gate in form of a magnetic fastener for paper-clips (Fig. 6); the new object named “Brandenbüro Gate” refers to the well-known monument and the colours of the flag but also to a country where a high amount of the national product is generated in offices (office = büro). The common denominator of all giveaways is, according to Volker Albus, “representation with a twinkle in the eye” based on wordplay, ironic interpretation and twist of the familiar [31]. In retrospect, the responsible professors stressed that discussion with diplomats and politicians during the design process was crucial for the success of the project. No doubt, knowledge about cultural heritage, current state of mind and self-image of the client is important to create appropriate representations.



Fig. 6. “Twelve commandments”, designed by Markus Gläser (HfG Karlsruhe); BrandenbüroTor, designed by Daniel Schulz and Robert Zeise (UdK Berlin)

On occasion of the World Expo 2010 in Shanghai, students of the Lucerne School of Art and Design developed a souvenir collection by order of Presence Switzerland, the governmental office in charge of country communication and nation branding [32]. In close cooperation with six producers, students challenged common Swiss clichés. Cows, chocolate, cheese and the inevitable Alps were scrutinised. Should contemporary souvenir design take up these well-known references or should it question them? Are these stereotypes suited as symbols for a highly developed country? Such questions troubled the young designers after the briefing. First conceptual drafts showed fresh approaches, for example omitting the flag colours red and white or combining traditional rural images with modern urban signs. However, the principles turned out to have less willingness to take risks than their German pendants. The finally produced collection now on sale affirms established conventions: white crosses on red back, mountain views, edelweiss, ibex and cows applied to T-Shirts, scarves, umbrellas, mugs and sketchbooks [33].

Three years before, Swiss and Chinese design students sketched new souvenirs in the frame of a cross-cultural summer school held at the Zurich University of the Arts [34]. In this case, however, there was no official assignment and no commercial proposition. Students worked on a notional briefing without restrictions related to price and production. The aim was to fathom out new ways for innovation within the limits of cliché and stereotype. “Milkhorn” shows the possibilities of such an endeavour (Fig. 7). Its message is double-coded since mountains as well as milk are typically associated with Switzerland. The design fascinates by an unusual and playful combination of these well-known elements.



Fig. 7. “Milkhorn”, prototype for a milk glass, designed by Urban Würsch (Zurich University of the Arts) and Xu Jiang (Jiangnan University Wuxi)

The examined design projects point both to the importance of a precise briefing and the importance of dialogue with the souvenir purchaser. At the end of the day, production costs and sales figures – or in case of giveaways, staff members of the involved organisation – will adjudicate upon the success of a souvenir product. Many an awarded design souvenir either was never produced or sold only in limited edition.

3.3 Tourists' motivation

While most companies hold a clear image of their customer groups, in the case of souvenir objects the target group is much more blurred. Actually, it is the most vague dimension in our triangular model of product-tourist-destination. The applicability of conventional target group models such as age groups, lifestyle groups or Sinus milieus is limited. More useful are approaches that investigate the influence of travel motivation and tourism style including personal values and attitudes towards other cultures on souvenir purchase. Since these criteria correlate with each other in some way, insight into travel motivation may help to predict souvenir purchase intentions [11, 35]. Tourism styles are usually defined in relation to travel motivations. According to Kim and Littell, the aim of a journey may be leisure, sightseeing, search of authenticity, or adventure, among others. Accordingly, tourists will get more or less involved with the host culture and will buy different types of souvenirs. Tourists interested in nature and outdoor activities most probably will go for T-shirts, drinking bottles and other equipment marked with the name of the destination while tourists interested in ethnic culture and art, for example, prefer to buy local products including handicraft [11, p. 156].

4 Creating souvenirs in collaboration

The practice-based research project “Souvenirs: Destination Marketing and Design” brings together designers, producers, touristic destinations, and touristic service providers [36]. In a radically collaborative research process, it aims at both specific and generic knowledge that is concrete proposals for souvenir objects as well as an abstract code of practice. Concepts for new souvenirs were developed and evaluated in a summer workshop; parallel to the design part, the research team sketched out a first draft for a process manual. It considers the already mentioned

triangle product-tourist-destination. It also keeps in mind the above-discussed crucial questions concerning choice and manifestation of souvenir references. The manual takes into account the following questions and aspects:

A Destination marketing and branding

What does the souvenir represent? What is the message it has to communicate? What kind of story does it tell? What does it remind of?

- country, monument, landmark, historical character
- myth, legend, saga, fairy tale
- touristic destination / region, holiday resort
- museum, cultural offer, theme park
- other: ...

Which values does it comprise?

- tradition bondage
- modernity, innovation
- reinterpretation of tradition
- luxury, exclusiveness
- service, customer orientation
- humour, irony, wit
- other: ...

How should the content become manifest?

- company style, style of destination
- design attitude

Who will sell the souvenir?

- retail trade
- tourist information
- service provider
- other: ...

B Identity and motivation of target tourist

age and biographical situation

- single, couple, family, senior citizen, ...

socio-cultural background

- group tourist, day-tripper, mature traveller, postmodern sceptic, pragmatist, ...

geographical origin

- regional, national, international; European, Asian, American, ...

travel motivation and interests

- leisure, travel, adventure, ...; culture, nature, sports, urban life ...

product expectation and value orientation

- main focus on souvenir function and self-expression
- main focus on practicality
- instant use, consumable and edible articles
- gift, souvenir present

C Characteristics of souvenir product

practical function (utility value)

symbolic function

- remembrance
- self-expression
- self-assurance
- other: ...

local or regional geographical reference by

- pictorial image
- "piece-of-the-rock"
- marker
- symbolic shorthand
- local product
- other: ...

style attribute scales

- naturalistic vs. abstract
- comical vs. serious
- stereotyped vs. authentic
- self-explaining vs. mysterious
- ...

material and manufacturing technique

price category

size and weight

5 Discussion

Design is without doubt able to challenge souvenir clichés and stereotypes. Nevertheless, destinations, retailers and tourists will not always and not necessarily reward such innovation. In order to innovate commercial souvenirs successfully, designers need to collaborate with all responsible actors involved. They need good background knowledge and comprehension of the local lure. The triangular model outlined in this paper provides a useful basis. However, the users' angle in this model needs further investigation. Tourists and their purchase motivations are somewhat of an enigma in the discussed setting. Astonishingly, neither tourism researchers nor tourism entrepreneurs dispose of reliable data. Ethnographic enquiry may help to learn more about souvenir preferences of different target groups since quantitative research seems to be inappropriate. Hence, in a next step the research project "Souvenirs: Destination Marketing and Design" will interrogate souvenir purchasers to evaluate acceptance and potential of the developed new souvenir objects. The final version of the process manual will incorporate these findings.

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Urban museums: Bringing traditions to the contemporary urban surroundings of Barranquilla

Abstract

Barranquilla is a city located at the Caribbean coast of Colombia, which has a rich culture but a very young design history. For many years the citizens of Barranquilla depended on foreign products, which are designed for contexts that present different conditions in terms of culture, ergonomics, weather, modernization processes, etc. This project analyzes the Barranquilla urban surroundings and all those foreign objects which were introduced but do not satisfy expectations in terms of functionality, usability and particularly in terms of culture and folklore. Traditionally, Barranquilla's public space has been used for different kinds of meetings where citizens play domino, talk about diverse issues and practice dances for their annual Carnival but these activities, which make part of the cultural identity, have not been supported by urban objects. For that reason the young designers of Barranquilla (at Universidad del Norte) are initiating a change, which involves a research of traditions and cultural expectations in the design of diverse objects that make part of the public space and shape the idea of the Urban Museums.

Keywords

Culture, Design, Urban Space

I A big picture of the urban Barranquilla

Despite the cultural richness present in every aesthetic expression of Barranquilla (architecture, graphics, food, fashion, etc.) the lack of design is felt in all urban aspects that make part of this Caribbean place, and lately has created a dependency to foreign products, which have arrived without taking care of the local requirements and imposing conducts that do not share the Barranquilla culture or take into account the context conditions. Simultaneously, this entrance comes together with the mass consumption phenomenon that during years has strongly influenced the behaviors of new generations; as a consequence is easy to find a sense of misinterpretation about the own culture and its components. The only aspect which is well recognized is the Carnival (Intangible Cultural Patrimony of the Humanity according to UNESCO) thanks to its attachment to the people and its capacity of regeneration year after year, however the rest of elements are getting isolated because don't have the proper tools for competing with the new and brandy stuff (objects, expressions, fashion, etc.) that constantly get in the city with all the shine that the elements of the folklore are losing. The result is a city where the foreigner is highly appreciated and is smoothly covering interesting aspects that identify the folklore of Barranquilla without leaving an evidence (on young citizen's minds) of the authentic features that have built this popular culture and the transformation process that

folklore has experienced throughout the time.

Thanks to its geographical position Barranquilla has an average of high temperatures over the whole year (between 27°C and 32°C) and a vegetation quite exuberant that in some places neutralizes the effects of the weather (only where it is well preserved), therefore the citizens spend the majority of their days outdoors where the biggest trees refresh the environment, giving the public space an interesting use because it becomes an extension of their homes; in fact it's quite common to find people celebrating different occasions in front of their houses, talking to their friends while they are seated on the sidewalks (Fig. 1), playing domino under the shadow of some trees, or closing some streets (with containers) for practicing the dances of the Carnival parades.



Fig. 1. A usual meeting in the urban space.

Currently these behaviors are part of the Barranquilla cultural identity and not only some particular consequences of the climate; unfortunately the city institutions in charge of the urban space have not noticed this special interaction between inhabitants and their own city, and for that reason Barranquilla is mostly equipped with foreign urban furniture, which just in some cases satisfies some basic functions (like seating, walking, waiting, etc.) and the most regrettable part is that it doesn't fulfill at all the cultural needs that are present at every moment. This situation is quite common in different places around the world where not only Design is in its infancy but also where Design has been understood as an self-sufficient tool: *"Designers dealing with design problems related to the "public interest," such as public space and the furniture installed in it, tend to set up restrictive standards that may not meet the actual needs and preferences of the users"* [1]. As an example of this situation the bus stops of the city were designed for Bogotá, a city with different conditions and needs in comparison with Barranquilla; the weather of Bogotá

is cold and dry, one of the reasons for choosing cold rolled steel as the main material, which in Barranquilla gets scalding hot and therefore, rather than welcoming and sheltering people, turn waiting for the bus into an unpleasant time; it is therefore not strange to witness that the favorite bus stop in Barranquilla is in the shadow of big trees (Fig. 2).



Fig. 2. The favorite bus stop in Barranquilla is the shadow of big trees – taken from <http://www.publicidaddebarranquilla.com/elementos.html>

Some people's answers to these specific circumstances are quite improvised and in some cases barely help to the deficient possibilities that urban spaces offer; one of the examples can be seen in the trees that beautifully played the role of bus stops but they are found only in some streets of the city and is not easy to count with them in every corner where the buses stop. Another quite common situation is the use of home rocking chairs in front of the houses for the daily meetings among neighbors; despite their weight, people take them outside and enjoy the freshness of the afternoons

with a nice talk. In fact “users have their own preferences and their own creative ways (or tactics) for dealing with user-unfit designs” [2], as Kin Wai Michael Siu says in the article Users’ Creative Responses and Designers’ Roles.

Nevertheless there are still some urban practices, which haven’t found these creative possibilities that in someway replace the urban paraphernalia needed for their performance. The consequences of this deficiency together with the influences of the global society are directly affecting the preservation of some practices that identify this Caribbean culture, according to Richard Kurin (director of the Smithsonian Institution Centre for Folklife and Cultural Heritage) “An international awareness of and discourse about the consequences of globalization had increased dramatically. Many cultural observers around the world believed that local, regional, even national, traditions were devalued or endangered or both” [3].

In Barranquilla this lack of tools, for carrying out urban/cultural practices that make part of the citizens routines, is added to the massive arrival of foreigner lifestyles (through mass media), which causes that the characteristics that build up the cultural identity of this place get in an imminent risk of disappearance. As a matter of fact, at the moment, the practice of traditional dances can be seen just in the streets of some popular neighborhoods, most of the young people don’t play domino outdoors and the meetings in front of the houses are perceived like old habits that new generations are not interested in preserving. Finally, for closing this big picture, it is important to describe a contradictory aspect of the interaction between the inhabitants of Barranquilla and their city, because despite the use of the public space and its importance in citizens’ lives, as it was explained before, the city suffers a constant aggression from most of the people who litter everywhere and attack public furniture. These adverse behaviors show the need of a deeper relationship with the city and its objects, where citizens could slowly get in a process of *falling in love* with their surroundings.

Undoubtedly this is a long process where key objectives should lead to design public furniture able to provide different kinds of pleasures that carefully meet the historical, social, emotional and cultural background of users [4].

2 Traditions and public space together for the wellbeing of the urban Barranquilla

The starting point for proposing this research was the big picture of the urban Barranquilla where three factors summarize the whole idea: the importance of public space in the cultural identity of Barranquilla, the lack of urban paraphernalia that stops the continuity of some cultural practices, and the negative aspects of the relationship between citizens and their city.

This project aims at involving emotional design as a tool able to join the three aspects mentioned above in an articulated way, which could develop a future process where first the citizens find in the public space objects that facilitate the performance of their habits, second the citizens start getting an experience in the urban surroundings that responds to their cultural necessities and third the creation of a positive interaction that in the end may change the aggressive behaviors against the city. Certainly these ambitious aspects are a chain of results that we will be able to measure in future projects because at the moment the resources are covering just a first stage of the research, however inside these first steps we have proposed the entire research looking for a continuous development and feedback, which will be explained in detail in the Methodology.

Cultural identity and human emotions are categories that belong to different sciences but nevertheless are entwined in our society, there are always different feelings from love to hate which are awoken when people get any kind of approach to cultural elements thanks to trips, lectures, TV documentaries, etc. Inside this complex system the own culture makes people feel pride, aversion and other emotions that are still difficult to name or classify, this can be exemplified when Italian and French people enthusiastically discuss about their food, the Indian women proudly wear their saris, or in some African countries the female genitals are mutilated in religious rituals. All of them move a sensitive part of human beings and in some cases, which are the ones we are interested in, an emotional commitment for preserving them [5].

In the case of Barranquilla there are some positive feelings (related with its folklore), which are already interconnected with the urban space and this is the advantage of this project, because “emotional design” can help in the development of objects that gather

the existing emotions and reflect them for a better understanding between citizens and their city. Currently Barranquilla is inside of a governmental process called POT (Plan de Ordenamiento Territorial - Plan for the Organization of the Territory), and with this research we are looking to give some tools, from a different point of view, to the designers that are involved in this important process for the city, the idea is to provide some concepts that not only define the aesthetic, the materials, etc. of the urban furniture but also the deepest aspects that these objects should have for the human interaction and the encouragement of cultural behaviors. The objects of the city should have a meaning that bond users with their past and remind them the beautiful experiences when, for example, they were children and their parents made their birthday parties in front of the house, and from these memories build a relationship in a contemporary Barranquilla where, despite all the changes brought by the global culture, the uniqueness can be maintained thanks to the urban furniture that not only allow people to remember but also to keep the practices that have made them happy [6]. In terms of culture this method can show how “*emotional design*” can give a new perspective for keeping alive the cultural identity, which nowadays is quite fragile because all the phenomena that come together with globalization have introduced in the city new archetypes and objects (fashion, food, urban furniture, etc.) that slowly are moving away the popular richness that characterized this Caribbean city. Many different places worldwide are facing this kind of situation and is quite important to give answers and new perspectives from several professions that help to adapt the traditions, which make unique each culture, in the contemporary and changeable world [7].

On the other hand is important to underline that with the application of this research we want to propose a city that is not only an utilitarian place where people walk to work, take a bus, etc., but also a place to be loved and cared because it gives their citizens positive experiences and memories that are part of their cultural reality. At the same time is necessary to project these aspects to new generations, who throughout the time should learn to recognize the emotive meaning of the positive cultural behaviors and their recreation, thanks to the stories told by their older relatives and their own interaction experience, which could simultaneously help in the development of a sense of esteem for the

Barranquilla urban surroundings because this is the context that contains these happenings.

Thanks to Design is possible to create an atmosphere of wellbeing in the urban Barranquilla because the city can become a place that comprehends its importance in the daily life of its people and furnishes its surroundings depending on the expectations of its citizens for making the urban environment a place where people like to stay because there is an adequate system of objects and spaces that is synchronized with their culture and emotions. If the place where we develop our daily lives responds in such a friendly and homely way to our expectations the effects will be benefits beneficial not only for the users’ souls, who will realize the value of this renovated home, but also for the context (in this case the urban Barranquilla) which can be loved and therefore cared by its citizens. To exemplify this idea there is a case in a Colombian city called Medellín where the cultural richness is the inspiration of the Colombian artist Fernando Botero, who throughout his paintings and sculptures has showed the traditional daily life of the city and region in different places around the world; people from Medellín have a special attachment to this work because they see themselves in every piece of art. Even in 2000 they got the opportunity of having this work in their own public space because Botero donated to Medellín twenty three (23) sculptures, which became part of *Plaza Botero* (a Medellín’s square). People have got the chance of seeing themselves in each sculpture, realizing the uniqueness that characterized them and the meaning of preserving their identity throughout the time. Currently the positive effects of this approach have developed two processes: the first is related to culture and its safeguarding and the second related to the development of a special regard for *Plaza Botero* because is the context that contains not only the art pieces that reflect their identity but also the real daily events (Medellín’s cultural identity) that inspire Botero’s work.

These are the two aspects that this research wants to project after its implementation in the POT (Plan de Ordenamiento Territorial - Plan for the Organization of the Territory); each of them has an important significance in the daily life of the city and in the wellbeing of all the elements that make part of the Barranquilla’s territory and throughout the use of

emotional design there can be considerable changes in people's attitude towards its culture and city.

3 The idea of Urban Museums

3.1 Where is the cultural heritage?

Right now traditions are goods that can be rarely seen in the contemporary lives of different cities around the world and in the Colombian case small towns which still have a shallow influence of modernity and mass media are some of the few places that allow people to keep the uniqueness of their routines, inherited throughout centuries, in a kind of isolated context; some people from the cities who want to have a contact with their past go to these places but sadly the contact is during short periods (holidays or work visits) and despite the pride and the emotional connection alive, this intangible patrimony stays in those hidden places and, in the end, they go back to their lifestyles where there is not a recognizable place for those goods that are facing a serious risk of extinction because they have not the necessary tools for adapting themselves to the changeable reality of the cities (that make part of the global world), which strongly imposes another kinds of lifestyles. One interesting case of this situation happens in a small Caribbean place of Colombia, where from the 17th century a group of African slaves ran away and founded Palenque de San Basilio; the Intangible Cultural Patrimony present in this place is nowadays an important testimony of the heritage that African cultures left in our country (music, dances, rituals, etc.), but it's quite difficult to access there for the conditions of the roads, therefore only some researchers and people deeply interested in the cultural wealth, that exists in *San Basilio*, take the chance of traveling there and get a slight approach and an opportunity of submerging in the daily life of *San Basilio* and perceiving its patrimony with a deeper experience, but sadly only few people have the possibility of living this enriched encounter and even a smaller minority decides to learn and take some elements of this cultural patrimony as part of their routines.

Museums are another kind of places where people from the cities can get an easier chance to see and sometimes interact with their cultural heritage, in fact this possibility is generally more accessible than the one described before because most of them are located in the heart of the cities and frequently encourage

people to see their exhibitions with different kinds of strategies. But, despite the entire information gathered inside, visitors get a fossilized picture of the past and its identity, which is definitely unique and authentic but after the visit people get immersed again in the city, where the reality is totally different to the image showed in the museums and just sometimes few tiny spots of the city evidence the presence of this past. Unfortunately after these visits the habitual lifestyles come back and don't reflect the values exhibited in the museums, then the romantic idea of uniqueness and cultural heritage get stocked in places where people occasionally go; then the question arises: is this Cultural Patrimony really part of the identity of the city and citizens?

3.2 A necessary proximity

Intangible Cultural Patrimony can face an imminent risk of disappearance if there is not a deeper contact with the communities that theoretically bear it; this situation along with the influence of mass media can easily make communities to forget the relevance of the continuous folklore recreation and transmission to future generations. At the moment modern cities don't give their people the right resources for getting closer to their heritage and contemporary lifestyles don't have a relevant place for cultural practices in their daily routines; in addition, and despite of the existence of museums and towns like *San Basilio*, where the authentic folklore wealth can be found, cities like Barranquilla don't have their own urban systems able to provide a closer and daily encounter between people and its Culture for strengthening and reinforcing what have identified them throughout history.

Safeguarding measures should not only preserve the cultural heritage but also allow it to get immersed in the current context and support a controlled influence, because Intangible Cultural Patrimony, like any living body, needs to evolve according to its environment for getting stronger and well prepared for facing the diverse circumstances of the contemporary world that constantly changes and as Wim van Zanten states in his article *Constructing New Terminology for Intangible Cultural Heritage*: "However, culture can only have continuity if people enjoy the conditions to produce and re-create it. Furthermore, in the present context of globalization, there is a re-ordering of relationships between communities". [8].

Museums preserve quite well a picture of the cultural heritage but in most of the cases this picture is stuck in the past and out of the current reality, as professor Jean-Loup Amselle has affirmed: *"It is this political use of pre-colonial fetish objects, namely their intangible aspect that has been concealed by colonial museification. Paradoxically, the isolation of these objects in museum cases has resulted in a loss of meaning"* [9]. Now that there is a global concern about these cultural issues, is clear that people need a deeper and frequent interaction that clarifies the characteristics of their own identity and heritage and besides generates a bunch of positive feelings, which go from respect to love.

Urban surroundings of modern cities could be the ideal places for bringing traditions, that are getting stuck in museum exhibitions and little towns like San Basilio, to people's daily life because they have a constant and unavoidably contact with citizens and visitors, which can be an advantage for introducing in citizen's routines aspects of their past that can still be retaken and also for showing visitors cultural facets, which may be different to their owns. Throughout Design new objects can be set up in these public environments and become part of a process where Intangible Cultural Patrimony interacts with modernity and its people and gets out of places that just allow people an experience of *"looking without touching"*.

This is the core of Urban Museums, a concept that wants to give people a profound proximity to their Intangible Cultural Patrimony for developing an entire process of safeguarding where the community itself reinforces, values and transmits its identity as a natural part of its daily life despite the circumstances that globalization inserts into contemporary life. Throughout the analysis of Barranquilla's urban furniture and its deep correlation with cultural behaviors, the idea of Urban Museums was emerging and giving us some new perspectives in the field of cultural safeguarding and the role of design in this challenge.

3.3 Urban Museums

The concept of Urban Museum suggests the creation of a furniture system for the public space of the cities, where every piece complements one to another and interacts with people everyday; this interaction will be focused in bringing back to the cities their own cultural

backgrounds, which are facing an extinction risk or have already died, with the help of Emotions. Thanks to a daily interaction people can remember, revalue, retake, reincorporate and reinforce it's Intangible Cultural Patrimony and therefore its identity, however not all the elements will be able to complete this process because as the UNESCO has declared in many opportunities about intangible heritage safeguarding: *"As any living body, it follows a life cycle and therefore some elements are likely to disappear, after having given birth to new forms of expressions"*.

On the other hand despite the challenging framework that globalization imposes, traditions and modernity will be coexisting in the same context and Design will give traditions the necessary tools for enchanting citizens, situation that will create an enriching relationship where community, past and modernity nourish continuously and generate new expressions (as the UNESCO mentioned) that can become part of the identity, which will be able to evolve according to the complexity that the context presents instead of being isolated in inaccessible places. Furthermore the open space, that the concept of Urban Museums wants to give to cultural elements, creates a proximity to the citizens without restrictions, which generates a different interaction with the public space where emotions can be involved for developing a deeper approach that can complement the efforts of traditional museums because is significant to people not only to see their cultural heritage but also to feel it and live it as a real part of themselves.

4 Methodology

For the development of this research it has been quite important to understand citizens as an integral part of the design process, *"Community Participation in Design"* by Henry Sanoff is a significant concept that although needs a careful tracking of theory and practice (because in terms of human character every community has its cultural particularities) could lead us to results that reflect a synergy and understanding between citizens and their urban space.

As professionals able to participate in public projects, designers should recognize the extended human variety and its continuous changes, which needs a special approach where designers must get closer to people's routines in order to understand their real expectations. Inside this process is also important an evaluation stage where the *"community participation"* not only will



Fig. 3. “Viernes de Barrio Abajo” (Fridays at the neighborhood called Barrio Abajo)



Fig. 4. Electronic bollards for enclosing some streets – project developed by Beatriz Vizcaino and Tamar Guzmán.

establish a valuable feedback but also will lead to results approve by the final users. As Henry Sanoff states in his book *Community participation methods in design and planning* “The activity of community design is based on the principle that the environment works better if the people affected by its changes are actively involved in its creation and management instead of being treated as passive consumers” [10].

In addition, UNESCO highlights the importance of the “community participation” when the projects involve the safeguarding of cultural practices: “Some noted their own national experiences where safeguarding efforts developed with communities succeeded, while those developed without community involvement or consent failed. Finally, some members suggested that the criteria should focus on the substantive involvement of communities rather than the formalities of demonstrating their consent; if they

were truly involved at all stages that was the best evidence of their consent” [11].

Despite the few resources obtained for this research there is an initial stage that has already begun, where it was determined the whole structure of the project based on the concept of “Community Participation”(during the collection of information, analysis, evaluation, etc.), and even though the project won’t be completed after few years, there will be an outlined path that could be nourished throughout its execution with the help of different workshops (developed inside of the Industrial Design program at Universidad del Norte) without forgetting the community involvement. On the other hand, before manufacturing the prototypes, it has been arranged some evaluations where the community participation will be a key point for taking the final decisions in the design process.

4.1 First approaches

The first approach brought researchers and students to the streets for collecting pictures and observations of Barranquilla's urban space: its furniture and the interaction of citizens with the whole public system. At the same time, it was important to come closer to the users and start to create a relationship where users could feel comfortable with researchers for expressing their desires and not only be observed by an external analyzer.

The first results were a wide amount of information that has been analyzed according to the usual categories such as function, users, ergonomics, materials, etc., but there has been a special attention on users and the *"real use that they give to objects"* for adapting the public space to their real needs and expectations, aspects that have a deep correlation with the cultural background.

From this point the design possibilities get an interesting complement where cultural aspects get the chance to be involved in the design process for determining the characteristics that are going to make the urban objects able to response to the community requests.

As part of this first stage of the project some students of the Industrial Design program at Universidad del Norte designed some products that respond to this proposal, and their involvement was an interesting part of the project because after knowing the objectives of the research they analyzed their own context and developed a wide amount of possibilities that enriched the initial vision. This participation was even more precious when they collected some stories from different members of their families, which were full of memories and emotions that gave students a meaningful picture of their city, which in the design process was an advantage because it provided the possibility of introducing emotion and sensitivity for pleasing the users in a mode that goes further than functionality.

One group of these students, after a meticulous exploration realized the importance of the urban space for the dance groups when they are practicing for the Carnival parades and other different celebrations (Fig. 3), but despite the antiquity of this practice and the cultural meaning it has for the citizens, it's still common and necessary to use different objects and improvised systems (like big containers joined by ropes) for closing the streets.

The design proposal of this group was a set of electronic bollards that during the nights of practicing

enclose some particular streets, that the dancers choose according to their location in the city, extension and freshness; with the help of an illumination system that transforms the atmosphere with colors and different intensities and during the daylight the bollards are hidden in the pavement avoiding to stop a fluid circulation (Fig.4).

Thanks to these the public space could become available for the groups in an adequate way and somehow this kind of objects give these cultural activities and behaviors a special place in the city that shows its importance and encourages its continuous performance.

5 Conclusions

Even though this research was initially projected to a specific city, we consider that this is a model that could be applied in other places where the cultural identity is facing the same risks and from the perspective of Design provide innovative practices that help to safeguard Intangible Cultural Patrimony. Currently the research is defining a method where all the stories, observations and experiences collected, which show a relationship between urban surroundings and elements of the of Barranquilla's folklore, can be categorized according with the type of cultural activity (celebrations, relaxing, recreation, traditional medicine, etc.) and these categories will outline the different typologies of furniture that the urban surroundings should have in the new Plan for the Organization of Barranquilla's Territory.

An open-air museum is not a new concept because many cities have in their urban space an interesting group of buildings, monuments, landscapes, etc., which become significant references of the history and identity of a community, but in this proposal Design is looking for an additional and innovative perspective where urban furniture complements those existing elements with an interaction (that goes further than a visual experience) able to involve the Intangible Cultural Patrimony, because as Michel Van Praët said: *"Scientific exhibitions, museums, and parks must bring into play the participation, emotion and aesthetics, which elicit each visitor's maximum attention. But the visitor cannot, however, make do with merely 'visualizing' perceptible fields within the duration of a visit"* [12]. Therefore this proposal wants, throughout Design, to create urban furniture that can get closer to people and stimulate a regular

use, which provides emotional encounters with their past despite the contemporary surrounding that tries to leave in the past the cultural richness that differentiates communities in the global society.

Another key point of this proposal is the frequent and necessary use of urban furniture inside any city, which throughout the time creates not only a proximity between the citizens and their city but also can reinforce behaviors, modify habits or discourage routines; these aspects are an advantage for this project in terms of reinforcing practices that are part of the cultural identity because the unavoidable urban context of a city could become a meaningful system of objects that could influence the safeguarding in the community itself without intermediaries and in a natural way. Finally, it is important to emphasize the role of emotions in this research because Urban Museums will get their goals just if the interaction stimulates in the users positive feelings that encourage a meaningful safeguarding of their cultural habits, and for this reason the design of the objects, that will be part of these museums, must be thought as a coherent unit of aesthetics, functionality, ergonomics, etc., without forgetting that all of them have to trigger memorable and pleasant emotions.

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Global locality: A study on redesigned examples of Turkish traditional tea/coffee tray and tea glass

Abstract

Focusing on later interpretations of two local Turkish objects, this paper examines effects of globalization on human beings, everyday social life and design, with concepts of civilization, identity, differentiation, tradition and, beyond all of them, meaning. Starting from the point where the strategy of globalization has changed, effects of local cultures on this change are briefly studied considering how and in which forms the local still survives, and whether its survival is conceptual or meaningful. Thus traditional objects of Turkish material culture which are tea glass and tea/coffee tray (askı) and their redesigns for global world are analyzed and the conclusion is the evaluation of this analysis from the perspectives of semantic and semiotic approaches.

Keywords

Material Culture, Meaning, Identity, Differentiation, Standardization, Local-Global, Tradition

1 Introduction

The power of globalization makes services, places, experiences and products enclose our environment, which is sometimes perceived as some kind of standardization that makes people equal and comfortable under standardized services and places. However, people are looking for meaning and differentiation in their lives at the same time. Many of them who want to set their

personal standards turn to local cultures. That becomes a cultural dilemma where people start questioning their identity, culture and traditions: People wish to keep their local rituals - or be part of some others - but they also want to be part of the global world. Moreover, there are designers who create new products from traditional objects, try to show them to the world and wait for acceptance. It is a little bit unclear whether they succeed it or not.

Under main titles of locality and globalism, this paper examines the consequences of turning to local cultures and traditions in everyday life and design field. Starting from the point where the strategy of globalization has changed, effects of local cultures on this change are studied considering how and in which forms the local still survives. Finally, all mentioned issues are connected and used to analyze two traditional Turkish products, the tea/coffee tray and the tea glass, and their re-design for global world where cultural heritage and meaning are also discussed.

2 An overview to the survival of local

As Axelrod [2] mentions, we appreciate globalization and this common culture when it allows us efficient communication, hinders conflicts across different cultures and answers some global needs such as sustainable growth. However, he adds that this situation results in the loss of many cultures which means loss of

the wisdom for human beings and loss of the chance for people to live with this cultural variety [2]. The same concern is shared by Gomes [8] where he approaches the issue from the global marketing perspective. According to Gomes [8], the concept of 'global identity' caused standardization among many products and made them uniform where it damaged the 'unique values' of products and therefore left no place for cultural diversity. Thus, people started to get uncomfortable with globalization where experiencing the same places, same services, same life styles became boring [6]. On the other side, locality stood as a precedent of difference and uniqueness with its cultural heritage including meaning and wisdom. Objects and rituals that belong to local cultures become more important and remarkable. They transmit "meaning which overflows the object's use" [3]. That has reasons such as being cumulatively developed through history and being a product of the culture that has the traces of that specific local culture; the usage, the form, the material etc. Here they can be similar to what is called 'handicrafts'.

The fascination of handicraft derives from an object's having passed through the hands of someone the marks of whose labour are still inscribed thereupon: we are fascinated by what has been created, and is therefore unique, because the moment of creation cannot be reproduced. Now, the traces of creation, from the actual impression of the hand to the signature, is also a search for a line of descent and for paternal transcendence [4].

From this point of view it seems possible to make an analogy between handicrafts and local cultures according to their relation towards human beings: People are looking for objects, products etc. that still carry their creator's traces, that is the work done by the artist for handicrafts and similarly, the cultural heritage cumulated by a local society. The 'traces of creation' [4] by which people are fascinated do exist in both cases. Moreover, they have become one of the most important things that make people prefer one thing with respect to the other because every *moment of creation* is unique and specific to its situation.

2.1 Identity and differentiation

A description of identity as made by Hall [10] is: When you find out everyone excluding you is like, you are

the one who is not what they are. This supports that we live and exist in a system of differences, similar to Saussure's definition of what language is [14], we are defined by what we are not, that means, our differences from others make us unique and that is how everyone wants to be like. Furthermore, Lacan [12] mentions that identification and differentiation are what human beings are looking for through their lifetimes, starting from childhood – even at the infant stage. According to this kind of approach, it is clear that identity and differentiation are concepts that are related to each other. Since differentiation becomes less and less possible due to globalization, and personalization of objects depends strongly on differences [5], people find local cultures more unique, interesting and special.

3 Local objects redesigned for global world: A Turkish approach

In this section, two traditional objects of Turkish culture and their redesigned forms for global market are examined. All the issues discussed above are taken into consideration by the way. Keeping the reasons and results of local effects on globalization in mind, Turkish tea glass and tea/coffee tray with modern interpretations by designers are studied.

The reason for choosing these objects that belong to tea culture is that tea drinking is very common in Turkish society regardless of the social status of people. That is why many companies and designers try to design and produce objects related with tea drinking culture. From the perspective of interpreting local habits and cultural heritage, this area is very rich for designers.

There are various types and designs of objects such as teapots, tea glasses, saucers, tea/coffee trays, however this study deals with traditional *ince belli* (thin waisted) tea glass with a domestic and also public use. The other object that is being examined is the traditional *askı* (tea/coffee tray) which is only used in public places such as coffeehouses, rather than being a domestic object.

3.1 Traditional tea/ coffee tray and "Tipsy"

The traditional tea/coffee tray is used in Turkish restaurants, cafes and coffee houses. It serves to carry a certain number of tea glasses and coffee cups in public places so that they can be served at one time, and when they become empty they can be collected altogether.



Fig. 1. Traditional tea/ coffee tray

Traditional Turkish tea/coffee tray which is known as “askı” (hanger) in Turkey is one of the most noticeable examples of center of gravity and balance where it also visualizes the physical fact that three points can form a platform. There are some specific qualities of this tray: As shown in Figure 1, its basis is circular, there are three pipe-formed extensions that are fixed on the curve of this basis on different points vertically and their other ends band together over the basis; on this point where all of them come together, there is an extension that serves to hold and carry the tray. The traditional Turkish tea/coffee tray is generally made of some metal material such as copper. Waiters who serve with them usually swing the tray while they carry it; the tray is not a static object, it adapts itself to its carriers' movements and speed which makes it very functional. This ‘swinging’ becomes a show most of the time that proves the carrier’s talent who can serve tea and coffee without spilling them. The origin of this ‘swing’ movement actually depends on traditional Turkish coffee houses where a lot of people sit during the day drinking tea or coffee, chatting and playing some card games. These coffee houses are generally small places and therefore tables and chairs where people sit are placed very close to each other. That is why the waiter ‘swings’ and also why the basis of the tray is circular: The waiter has to serve many people really quickly so that no one’s tea or coffee gets cold. While he is serving through narrow spaces between the tables the tray can accidentally touch or hit people who are sitting there. Since the waiter can swing the tray according to the way he walks and the circular basis does not include any corners or sharp ends this possible hitting would not be harmful at all. In addition the circular basis gives reference to the circular tea glass saucer, and speaks the same language with them. Figure 2 shows “Topsy” that Turkish designer Koray Ozgen has designed; it is an interpretation of the traditional Turkish tea/coffee tray [9]:



Fig. 2. Topsy

Examining “Topsy”, it is remarkable that the basis is cornered not circular and the part that serves to hold the tray is a little different than the traditional one. Still it has its main function and meaning. Ozgen claims that his product is “the translation” of the traditional Turkish tea/coffee tray to a different language. In addition, he mentions that this product gives semiological clues about its use for people who are not familiar with Turkish culture [9] and that actually is his purpose: The product that comes out of a local culture influences the global culture since it is functional and rich in cultural context.



Fig. 3. Topsy in use

Moreover in Figure 3, Topsy is in use as it is in the traditional way: Somebody is swinging the tray while he carries it. The tray is dynamic as usual and can still carry a certain number of glasses and cups. Thus it keeps its function and locality while its shape has been modernized and made more similar to global tray products. Still it is remarkable that the loss of circular basis is a sign that Topsy will not be used in small traditional Turkish coffee houses where people sit very close to each other. Moreover, the visualization of the perfect balance is also missing though it is sure that the new product would not be out of balance.

The most functional quality of Topsy is that its holder is made of some fabric material and it can be totally separated from the tray basis when it is not used. Thus, it can be stored where it needs less space and all trays can be put on each other which would not be possible with the traditional one.

Like the most traditional artefacts, the aski is an anonymous object, yet – again, like most traditional artefacts – it is a source of inspiration for modern product design. Both in terms of its functionality and also its unique structural properties, it has been the subject of modern product design. Defne Koz and Koray Ozgen have reinterpreted this traditional tray with new materials and production techniques suitable for stacking and other criteria, but unlike modern tea glasses, these designs are not distributed widely in the Turkish market and so, unfortunately, cannot be part of daily life [13].

The reasons that these trays could not be part of Turkish daily life, can be depending on prices, distribution, designer's own preference or the social behaviour of public and domestic users. Anyway in the following chapter the tea glass is examined and one of its redesigns has a different situation in marketing because it's having more users from day to day.

3.2 Tea glass, “Eastmeetswest” and “Istanbul Serisi”

Traditional Turkish tea glass is famous with its thin waistline as in Figure 4. The form has been designed in order to solve a problem of economy and production: This tea glass that was produced first in Beykoz, Istanbul in 1900s, was easier and cheaper to produce than tea cups that were produced in west since they had handholds or stands [11]. The form of the tea glass is conventional and important for Turkish people and some Turkish people never drink tea in another glass or cup. However this local habit is not without function: The conventional form of the glass is easier to hold in hand where its thin waistline prevents its sliding from the hand. Moreover it divides the glass in a certain proportion and helps to determine for the taste of the tea whether it will be strong or light. Most of the time Turkish people decide how strong their tea should taste while its steep is being poured from the teapot into the glass. Thereby the lower part of the glass helps to find out the right proportion where the steep accumulates.



Fig. 4. Tea glass

Erdem Akan who designed “Eastmeetswest” (see Figure 5) kept the traditional look of the tea glass while he actually changed its shape with the help of glass' transparency. He defines his product as the combination of eastern tulip shape with western lean geometrical form. Moreover, he says that it creates a feeling as if fluid floats on air; through its double glass form tea stays hot for longer time and the person who drinks it does not burn his or her fingertips [1].



Fig. 5. Eastmeetswest

On this product, the local (the tulip shape inside) with its cultural heritage is surrounded by the global (outer lean geometrical shape) and still sits in the core of the global where it tries to fill the lacking cultural heritage. The invisible synthesis of the local and global that we experience every day in our lives becomes kind of visible through the transparency of a piece of glass and tea [1], metaphorically. However, some points of this synthesis can be discussed: This product does not really need a saucer, which is actually an essential part of traditional tea culture. What Akan believes 'through its double glass form tea stays hot for longer time and the person who drinks it does not burn his or her fingertips' can

also be taken as prohibiting heat transition from the tea glass to the hand in a negative way since this transition enables the user to feel the warmth of tea in a cold day which is not only a physical benefit but also a part of tea drinking ritual. Another aspect is that the easy grip of the waistline is lost while it 'seems' as if it is there. That this tea glass is not widely used in Turkey can be the user's or the designer's preference, finally the designer mentions that this product aims the global market.

Another interpretation of the traditional tea glass is made by Faruk Malhan who is an architect and the founder of Koleksiyon, one of the oldest furniture brands in Turkey. Malhan claims that his reference point was mainly functionality when he designed Istanbul Serisi. He was uncomfortable with the traditional tea glass and its saucer because the tea glass does not really fit well on the saucer and it slips while carrying them which also causes spilling of tea onto the saucer. This accidental issue actually makes also the tea drinking process uncomfortable. In order to avoid this problem, Malhan created a little bulge in the saucer and a little cove on the bottom of the tea glass. Thus the tea glass becomes kind of locked with its saucer, and slipping problem is solved (see Figure 6). Considering on the form, the designer softly interpreted tulip shape where the holding and drinking process did not really get changed.



Fig. 6. Istanbul Serisi - tea glass

Malhan's tea glass is getting widely used in Turkey, since it is sold in many places such as supermarkets where its price is actually not high. That is also what the designer aims because he claims that he wants that this tea glass should be easily bought and used by a wide range of people [15].

4 Conclusion

To conclude, locality is usually perceived as face-to-face communication [7] where individuality and differentiation can exist. Globalization, in opposite, has become a concept of distance where differences are no longer possible and do not really matter. However, people always want to be unique and different; that is the nature of human being. Thus they get interested for local identities and cultures while being surrounded by globalization.

Objects and rituals that are rich in cultural context are very useful in design area because they let themselves to reinterpret. Designers who internalize values and meanings of cultural contexts try to redesign traditional objects with their point of view. Some aim the global area and some aim the local one; they send local signs to the global world or global signs to local areas. The two traditional objects and their modern design for global world examined in this study are just two examples from Turkish culture. In both cases, all arguments mentioned above are easy to notice: They both serve to differentiation, have some cultural heritage, show how the local survives and how locality effects globalization. The reasons for the interest in local cultures do mostly depend on psychological and social aspects. The important thing while combining local and global in design is to prevent the lacking of cultural heritage. It should be well considered what elements of local and global let themselves combine. Otherwise we have to deal with images that are totally foreign to us, that are without content, and the more we stay in interaction with them the more we become similar to their emptiness.

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