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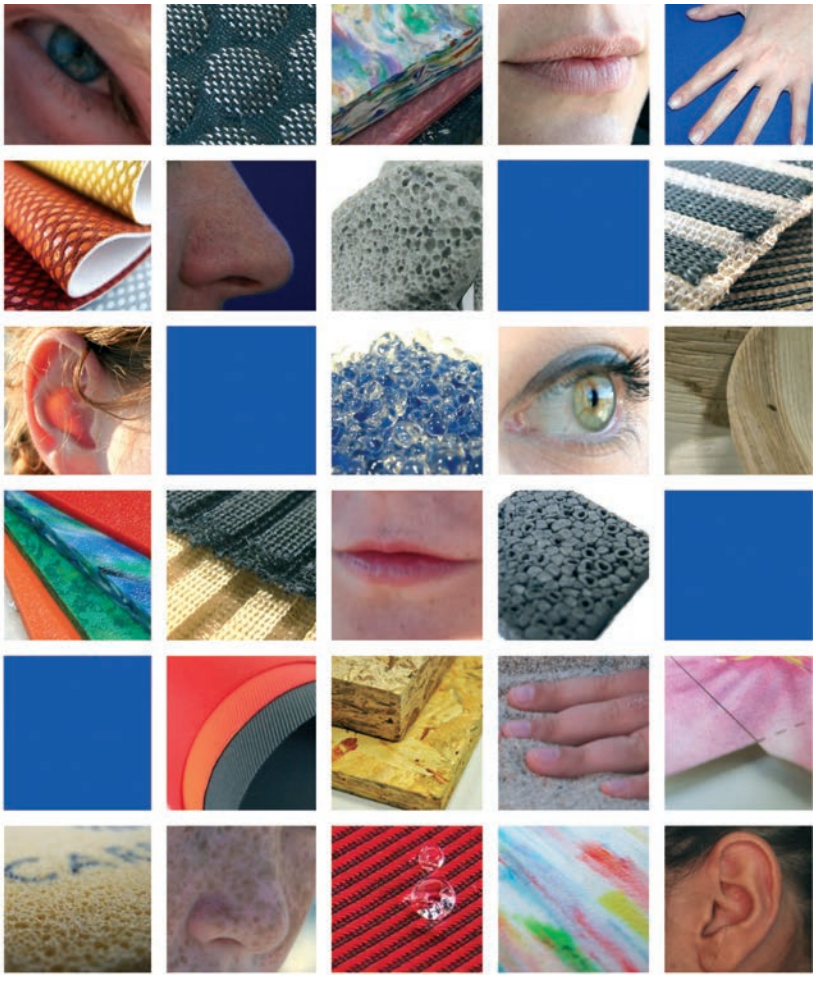
Design and materials

Sensory perception_sustainability_project



Serie di architettura e design
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Summary

Introduction

Design, sensory perception and sustainability

According to the most recent approach to design culture, the right materials for a product should be chosen as early as the metadesign stage because this will make it more important and meaningful. In fact, materials not only play a crucial and acknowledged role in design, they support its technical functions and shape its personality.

Until recently product materials were chosen at the end of the design process. Lately, however, people have begun to realise that choosing materials early on in the design process means the product will have a greater chance of satisfying the initial requirements.

Requirements which in the meantime have evolved: products are no longer asked to perform as they did in the past (regarding physical, technical, and mechanical features, reliability, safety, etc.), they are now expected to consider contemporary social changes and deliver 'soft' performances, such as greater sensory expressivity, and complex performances, for example designing a life cycle respectful of the environment.

In this increasingly complex scenario a designer must be familiar with all available options if he wishes to choose the right materials for his product early on in the design process; above all he must be able to analyse whether or not the materials suit his product. To help him make the right choice he must be able to access the criteria and methods he needs to interpret and assess their sensory and environmental performance.

The interpretation methodologies and criteria illustrated in this book are intended to give the designer a multi-criteria tool to interpret the sensory and environmental performance of a material. This tool can be used in several cultural contexts based on one premise: it is not important to talk about eco-compatible or sensory materials in absolute terms, instead it is more important to select materials, or a mix of relatively better materials, depending on the use, expected lifetime, and end-of-life of the products.

Materials and sensory perception

There are many reasons why choosing the right material is not only crucial in the design of a good product, but also satisfies the newly revived senses of the public: increased interest in the expressive and sensory features of objects, the desire of consumers to manipulate, touch, and feel the products on their own skin, and the ensuing search to enhance products with sensory and sensual features.

Our body is the first material we use to build and change the world: it creates perception, memory, and images. We use our bodies to relate to the world. From time immemorial bodies have been stretched and 'lengthened' with artificial prostheses and devices which alter its possibility to interact: since our senses extend it beyond our own skin it's difficult to establish just where the body ends.[1]

The body plays 'a crucial role in the perception of the environment and in the construction of objects and meanings'.[2] It comes into contact with the outside world and with materials characterised by their physical elements, but also by colours, sounds, electric waves, sound waves, images, and words.

Our senses guide our body in the world: 'they structure our knowledge and experiences and activate the mechanisms of recognition and memory. […] When we look at an object the feelings

1 Fiorani E. (2000), *Leggere i materiali: con l'antropologia, con la semiotica*, Editori di comunicazione-Lupetti, Milan, pp. 51–53.

2 Ivi, p. 51.

it gives us differ from the ones we have when we touch or feel it. Hearing, taste, smell, and touch, don't just give us additional bits of information compared to what we see with our eyes; they are another way of acquiring knowledge. Every sense has its own language and provides a different kind of contact with the world. […] Materials talk to all our senses: they provide a multisensory vision of the world and involve a synaesthetic perception of tactile and visual feelings of sounds, tastes and flavours'.[3]

In today's world, man (for whom sight is particularly important) has distorted his sensory experience; he now bases it primarily on sight, and this has reduced the sensitivity of our other senses (touch, smell, and taste) and made them less important.[4]

Sight is a cold sense which rationally analyses things from a distance. Like hearing, sight acts from a distance and exerts remote control over our relationship with the world and materials. Instead touch, smell, and taste are hot senses which introduce us to something that is 'physical, tangible, and touchable'.[5]

Some elements of perception are common to all the senses. Every kind of perception has a dual quality. We can talk of the tactile quality of sight, and the visual properties of touch and hearing: we recognise 'synaesthetic expressions like clear sounds, dark sounds',[6] hot and cold colours, etc. 'The hand sees, the eyes touch. The hand sees, but not like our eyes, our eyes touch, but not like our hand. All the senses help to see'.[7] When choosing a product, contemporary consumers no longer consider just its function, but also how soft, delicate, and sensual it is. The smells, sounds, shapes, and colours of an object, and the feelings they inspire in a consumer, are becoming increasingly important.

Modern industries try to give products a sensory and sensual dimension in order to satisfy the demands of consumers who want to manipulate, touch, and feel them on their own skin. In particular,

[3] Ivi, p. 57

[4] Ivi, p. 58.

[5] Ibid.

[6] Riccò D. (1999), *Sinestesie per il design. Le interazioni sensoriali nell'epoca dei multimedia*, Etas, Milan, p. 76.

[7] Fiorani E. (2000), *Leggere i materiali: con l'antropologia, con la semiotica,* op. cit., p. 59.

sensory analysis and the design of new products with a special sensory feature are considered very important by the cosmetics and perfume industry. Just think of how important these feelings are in this sector: the feelings sparked by the perfume of a loved one, the fragrance of body products, the scent of after-sun creams drifting along city streets on a summer's day, etc.

This is why producers spend days and days designing the presentation of a product, starting with the packaging which, if it involves cosmetics or body products, provides a synaesthetic anticipation of their fragrance.

It is also interesting to see how make-up products can evolve in order to 'awake' the senses. These small products are considered by clients as 'little friends'; they want to be able to see and touch them because this arouses subtle feelings. The expectations associated with the packaging of these small make-up products primarily involve handling, manageability, shapes, and opening mechanisms.

Women insist on easy-to-hold packaging, especially small boxes and power compacts: the raised parts, grooves or surfaces facilitate grip and prevent them from slipping, while concave or curved shapes are easier to hold. Shapes appear more human and biological; they are rounded to feel softer to the eyes and hands. These products require interesting and sensual packaging: rounded and convex shapes, surfaces smooth or rough to the touch, or transparent or translucent to look at; shapes that facilitate easy, satisfying gestures, that reflect the pleasant sweetness and intimacy of the moment when a women does her make-up. Make-up shouldn't be something a woman hides behind, it should be a way for her to express her personality and moods. The closing mechanisms of new lipsticks,[8] for example the ones by Estée Lauder, will produce a unique sound and so will the company's compact powders; the sound of these products will be unique[9] and experiments are underway to install new magnetic rather than snap shut mechanisms.

[8] Delogu F. (2005), "Bellezza: ascoltare un profumo, sentire lo scatto di un pennello o il 'click' di un rossetto", *La Repubblica*, 01-10-2005.

[9] "Il rumore del lusso" (2003), *ItaliaImballaggio*, October.

In another, completely different field, air transport,Lufthansa has invested in its clients' sense of smell. It has scented its planes to reduce passenger stress by pulverising microcapsules with different scents on the carpeting in the cabin (vanilla, honey, milk, etc., in other words fragrances psychologists consider 'soothing'); when passengers walk on the carpeting they crush the microcapsules which release their fragrance.

The car industry has also focused its attention on sensory perception. 'After discovering that clients no longer appreciated the classic 'smell of a new car', Fiat hired air engineers to neutralise it and replace it with a pleasant but unrecognisable fragrance (timber) produced by a small piece of wood hidden under the driver's seat. The scent lasts six months (the break-in period) after which it is replaced by the smell of the owner, for which Fiat is not responsible. Instead in all BMW luxury models a scented interior is an optional: the client can choose from several fragrances introduced through the air conditioning system.[10]

Industry can no longer afford to ignore the sensory features of a product, whether it be a car or a lipstick; choosing the right material is a key factor in the revival of a good product. In today's increasingly virtual world, designers consider new materials for design and a sensory experience as a 'necessity' of life.

'Apart from visually perceived formal qualities, in the past sensory qualities didn't have to be designed: the choice of material implicitly included its own tactile, thermal, acoustic, and olfactory values. This is no longer true in a world of 'new materials'[11]: innovative materials acquire new characteristics which in some cases are disturbing. Thanks to countless studies in this field, and the search for made-to-measure materials, we now have soft flexible wood, transparent concrete, bendable tiles, etc. Sensory qualities can now be designed and their features have become an important field of research.

[10] Bonetti A. (2004), "Ci vuole naso", *Carnet*, May.

[11] Manzini E. (1990), *Artefatti: verso una nuova ecologia dell'ambiente artificiale*, Domus Academy, Milan, pp. 96–97.

Materials and environmental sustainability

Faced with the increasingly difficult conditions of our planet and the environmental disasters caused all too often by man's 'carelessness', there is a growing need for products to add respect for the environment to the newly adopted sensory dimension; in practice this means minimising the use of resources and environmental emissions.

The approval of several environmental laws to reduce energy use and the increased environmental awareness of final users prompted designers to adopt an approach called Life Cycle Thinking; in other words, if a product is to be truly eco-compatible during its life cycle it must minimise, if not eliminate, resource consumption (energy and materials) and emissions (air, water, and solid waste)

Based on this principle – adopted in design practice and culture, and now acknowledged and widespread in the world of production, economics and politics – approaches and tools have been developed to achieve product eco-compatibility during design. Methods and certification systems have been created to measure the real eco-compatibility of a product during its entire life cycle.

These design approaches and evaluation tools are based on the life cycle principle; in a more or less quantitative and scientific manner they take into account the fact that a product's life cycle is made up of several variables quantitatively characterised by a series of inputs and outputs which can be qualitatively described and dealt with.

These variables involve: thorough understanding of the pre-production processes and production systems used to obtain materials and components; correct selection of materials based on the transformation process of a product, its specific context of use, and envisaged useful life cycle; correctly planned assembly systems to achieve greater production efficiency; and, finally, simpler end-of-life disassembly. The latter is crucial vis-à-vis recycling or extension of the useful life of components and materials above and beyond the useful life of the product in which they are used. All together these variables influence the eco-compatibility of a product and when used pro-actively can direct the design process in different and sometimes even opposite directions.

The problems associated with these variables cannot be solved by simply deciding which is the 'best' material'. Instead the designer has to adopt a design approach that contemplates all the possible effects his choice may have; he has to make sure that incremental improvements achieved during one stage do not negatively affect another stage and thus compromise the overall energy-environment balance.

With this in mind, it is reductive to think that a product is eco-compatible just because a certain number of eco-compatible materials are used to make it; and it is meaningless to talk about eco-compatibility in absolute terms.

Although several environmental certification systems of materials and products are now widespread, very few of them reward excellence or provide a list of the best 'green' materials. Instead most systems offer a multi-criteria interpretation based on several objective indicators regarding the life cycle performance of the material or product.

In other words, these certification systems acknowledge a designer's critical expertise and yet leave him alone to decide how to use the environmental data available and apply it during the design process. The methodological approach illustrated in this book will give the designer the tools to correctly evaluate the environmental variables influencing the life cycle performance of the product based on the different design contexts, a choice he has to make when choosing the material.

This multi-criteria interpretation system is based on representative qualitative and quantitative parameters of the performance of materials in relation to specific critical issues identified during their life cycle. The system will allow materials to be selected according to their ecological footprint in relative rather than absolute terms, in other words depending on the various design contexts.

The proposed parameters and criteria are not intended to be a definitive list of the best materials, but rather to help designers interpret the environmental performance of everyday materials as well as innovative materials, because we know very little about how the latter are produced or their end-of-life, and even less about their effects on the environment.

This analytical methodology, based on several parameters, will help gather accurate data about the life cycle performance of materials or semi-finished products; it will ultimately be useful in choosing and selecting the most eco-compatible materials based on the expected performance of the product during its life cycle in a specific context and, finally, when it is discarded and disposed of.

The role of designers in today's world

Selecting materials is a design choice and the designer is a key figure in this process; with his expertise and ability to merge different professional skills he is the lead player and link between the business world and the complex task of governing environmental and sensory issues. His role is crucial vis-à-vis the environment because 'eighty percent of the environmental impact of products, services, and infrastructures is decided during the design stage. These decisions shape the processes which determine not only product quality, but also the materials and energy required to produce them, their everyday use, and their final destination when we no longer need them'.[12]

A designer's role is crucial because it shapes and satisfies the new demands by consumers for sensory perception, appeal, and profound experiences.

As a result, sustainability and sensory perception involve not only ecodesign, but also design in general.

Only changes made in the preliminary stages to the cultural approach and initial strategies leading to the development of a product will make it possible to change business logic and rationalise the object and its entire life cycle; this will make products not only truly eco-compatible, but also representative of their expressive and sensory features.

[12] Thackara, J. (2005), *In the bubble: designing in a complex world*, The MIT Press, Cambridge.

Worldwide materials libraries and databases

There are millions of different kinds of materials in the world today and new ones are being invented all the time: 'a whole host of new materials is being produced everyday; their enormous technical and expressive options oblige designers to continually update their properties and possible applications'.[13] Designers and producers are faced with a vast (and growing) selection of options; materials and transformation processes can be combined in so many ways that it's been labelled 'hyper choice'.[14] In fact, one kind of material is no longer considered an almost obligatory choice for a product type, because several materials compete against one another: the best solution can only be chosen after a careful and thorough analysis of the entire life cycle of the product. 'Materials libraries' have been created to list, classify, and organise technical information about materials and products for the world of architecture, design, and industrial production. These archives showcase real and virtual samples of indexed materials and can be used by designers as a research tool to increase their knowledge of available materials.

The term materials libraries is a recent neologism invented to indicate physical or virtual places in which technical information about a wide range of materials is stored and made available, in particular, materials used in the world of architecture, design, fashion, and industrial production in general.

Material Connexion, founded by George M. Beylerian in 1997 in New York was the first materials library to be created; its subsidiary in Milan was inaugurated in 2002.

Materials libraries were set up not only to make it easier for designers to access data about new materials, but also to help businesses established themselves on the market, become part of a community (and therefore access companies, public authorities and institutions more rapidly), create solid backing and advertising, and meet potential new clients or partners. Materials libraries were the answer to the demand by businesses and institutions for an infrastructure which could interact with users in a physical or virtual

[13] Langella C. (2003), *Nuovi paesaggi materici*, Alinea, Florence, pp. 75–77.
[14] Manzini E. (1986), *La materia dell'invenzione*, Arcadia Editori, Milan, p. 37.

environment, one which could be a sort of follow-on from portals (considered as containers of technical data) as well as a creative laboratory. Generally speaking, materials libraries function in the service sector by researching and classifying innovative materials: they use several means of communication, organise fairs and exhibitions, create newsletters, have user-friendly info sections, and publish books about materials commonly called 'showcase books'.

Materials libraries are constantly updated: those responsible for this service always have to be on their toes and research innovative and interesting materials or manufacturing processes in order to not only enhance and expand the data in the library, but also to compete with the new materials libraries that come on the market. In most cases materials libraries provide services and consultancy 'of a mostly commercial nature, and act as a network between interested parties: producers, designers, researchers, etc'.[15] Materials libraries are increasing in number day by day; their function now ranges from consultancy about innovative materials, to assisting designers during the design process, concept ideation, and prototyping.

'Some designers consider materials libraries chiefly as a place where they can find inspiration for new designs, places to be visited like a modern sculpture exhibition or a 'documentary source' of what's new; places where simple 'strange-looking' extraterrestrial materials become big stars or collection pieces […]. Others regard them as places in which to work, to fully explore a specific component, with the added option of being able to talk to a consultant […]'.[16] This is the best way to consider a materials library: a place of research and documentation where it's possible to touch the materials and get first hand information about their characteristics: a place providing information and consultancy to those who need to find innovative materials and technologies to enhance their designs and industrial processes.

Every library has its own classification method: all libraries usually classify materials according to their family of origin, to their physical, technical, and mechanical features, and current uses.

[15] Lucibello S. (2005), *Materiali@design: verso una nuova modalità di selezione su base percettiva dei materiali per il design*, Editrice Librerie Dedalo, Rome, p. 28.

[16] Campogrande S. (2009), "Diffondere i materiali", in Ferrara M., Lucibello S., edited by, *Design follows materials*, Alinea, Florence, pp. 66–67.

However, while some materials libraries provide a broad spectrum of all material families, others specialise in certain sectors or in a specific material category: for example Matrec®, the first free public Italian database focusing on the main ecodesign features of materials and recycled products, or Materioteca®, also Italian, focusing exclusively on plastic materials and already improved with an online site for education and research, and finally Materiautech, a French structure, also dedicated to research in the world of plastics.

Finally, the last step in the evolution of these materials libraries is to include the perceptive characteristics and eco-compatibility of materials in the classification criteria.

Having acknowledged the importance of tactile, visual, and other features of these materials, multisensory perception has become important in the classification of materials in materials libraries. Classification is based either on a technical approach (reflectivity, heat conductivity, acoustic characteristics, etc.), or on an empirical perceptive approach. Although it's true that the latter is based on how materials are perceived by human organs, practice is often preferred to scientific criteria.

Although some libraries use sensory words to analyse materials, their assessment is often manipulated by the classification team; as a result, the assessment is based only on the experience and knowledge of team members, and not on a good-size, scientific sample of trained 'materials tasters'.

Every institute develops its own classification and assessment system. Unfortunately there is neither a common language/vocabulary, nor a sensory assessment method based on clear and easy scientific criteria so that everyone – industrialists, producers, designers, students, etc. – can use the results of the tests.

The first thing to do is to develop a sensory assessment method which uses words, images, or other forms of communication to collect, translate, and comprehensively simplify sensory assessment methods and existing assessment scales.

A key issue for materials libraries is the (often inconsistent) assessment of the eco-compatibility of innovative materials. Materials libraries have already reacted positively to the demand to respect the environment, for example through the collection and assembly of new materials designed to be eco-compatible during