The New Aesthetic of DIY-Materials

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Abstract: Materials embedded in artifacts determine the user's materials experience and influence the aesthetic perception. Currently, the widely use of perfect and homogeneous industrial materials is dictating our experience and guide our perception. However, in the last years, a new phenomenon where designers seem interested on recuperating control of the development and the design of materials is emerging. This phenomenon is known as DIY-Materials and is a way for designers to self-produce materials. Those materials appear to be a delightful source of richness regarding the perception and must be considered in designing for the next aesthetic. The paper aims to present some initial considerations and ideas for explaining the current investigation into the aesthetics of DIY-Materials. All the previous studies about the relationship between materials and their aesthetic attributes and qualities are under examination. We create materials boards using the extensive current cases studies, and we framed them following the settled kingdoms classification of DIY-Materials. As part of the study, we started to make some aesthetic considerations for each kingdom with the general purpose to move further formulating useful strategies for designers to self-produce their materials.

Keywords: DIY-Materials, Materials Experience, Aesthetics, Imperfection, Expressive-sensorial Characterisation.

1. Introduction

We live in a material world, and we are part of the material culture (Holloway, 1969; Ingold, 2012). In this world created either by nature or by humans (Braungart & McDonough, 2002), perception becomes a tool to understand and give meaning to the multiple signals and features arriving from everything that surrounds us. Some scholars (Nanay, 2015) argue to consider aesthetics as the philosophy of perception, which means that aesthetics deals with the study of sense perception. We believe the philosophy of perception is also about experiences and aesthetic is about ways of experiencing the world.

In the contemporary aesthetics, industrial materials play a key role, as they prescribe how things may look like based on the manufacturing processes enabling their transformation (Papanek, 1971; Ashby & Johnson, 2002; Rognoli, 2005). The uniformity, precision and repeatability usually associated with
the industrial materials provide a particular aesthetics that make recognisable the contemporary industrial status of artefacts. However, despite all technological and industrial developments of the last three hundred years (Kondratiev, 1998; Alexander, 2001; Moulaert, 2009), it is remarkable the reborn of the aesthetics of imperfection (Ostuzzi et al., 2011 a; Rognoli & Karana, 2014). In fact, the presence of imperfection is grown, generating a pleasurable balance that connects the mere essence of our humanity and naturalness. This aesthetics of imperfection is not a new issue. It belongs to the ancient world, where defects, inhomogeneity, signs, and traces, wear and tear were considered beautiful even before industrialisation changed the paradigm. The valorization of imperfection (Ostuzzi et al., 2011 a) provides more emotional bonds and emphasises the relationship with objects just because it reflects in endless ways, how human beings interact and live with them (Chapman, 2005). It is well known how the ancient Japanese tradition of Wabi-Sabi promoted the beauty of the imperfect things (Koren, 2002), where the beauty of the physical world reflects the irreversible flow of life (Juniper, 2003). Everything that is faded, eroded, oxidised, scratched, etc. goes beyond the beauty-ugly dichotomy and moves into the ordinary-extraordinary level (Sartwell, 2006).

Separated from the industrial materials, which are still dominating the aesthetics of products and their experience (Saito, 2007), an emerging materials experience arises. These emerging materials are known as DIY-Materials, and they don’t struggle with traditional material science but, in our opinion, it helps to balance the way we create, perceive and experience the materiality of daily objects. Recently, scholars defined DIY-Materials as “materials created through individual or collective self-production practices, often by techniques and processes of the designer’s invention. They can be totally new materials, modified, or further developed versions of existing materials” (Rognoli et al., 2015 a). It is already asserted (Ayala-Garcia et al., 2017; Rognoli et al., 2015 b) that the practices of development for DIY-Materials increase among designers for several reasons: concerns about sustainable futures, desires for unique material expressions, or an activist reaction to mass production.

In this paper, we turn our attention to the aesthetics of DIY-Materials and the perception patterns formed by attributes and qualities of this growing phenomenon. The principal question leading our investigation is: Which are the aesthetics of a DIY-Material? What are the most important attributes and qualities defining their aesthetic?

Using the already existing DIY-Material classification (Ayala et al., 2017), we tried to provide tools for interpreting the aesthetic of DIY-Materials. It can be the starting point to understand one of the emerging trends for the next aesthetics in design. The present paper shows a series of boards as tools for the discussion around the topic, and it concludes with a discussion on how relevant is for the design domain, not only to be aware of the phenomenon, but also appreciate its aesthetics.

2. Early observations on DIY-Materials aesthetic

DIY-Materials denote an alternative to materials science development. In the DIY-Materials development, the designers, unlike scientists or engineers, are the primary drivers of the process. The designer outlines identity and meaning of the samples of material, characterising them from an expressive-sensorial point of view (Rognoli, 2010) and defining the pattern of the experiential qualities (Karana et al., 2015 IJD).

DIY-Materials usually derive from the transformation of unconventional sources (e.g., grown vegetables, animal constituents, basic minerals, recuperated waste or a modification of a standard material with any available technology). They respond to a critical purpose (e.g., tackle a wicked
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problem, give a particular statement or go beyond the mass customised solutions) and they result from various inspirations.

The sources of DIY-Materials are also the key elements for establishing a "new class" of materials. In fact, other recent studies around the phenomenon suggest an original categorization into different kingdoms based on their primary unconventional sources (Ayala-Garcia et al., 2017). The kingdoms categorization take inspiration from the first biological classification of the XVII century based on the work of the Swedish botanist, zoologist and physician Carolus Linnaeus, called Systema Naturae (Linnaeus, 1758). Comparable to Linnaean taxonomy, the DIY-Materials kingdoms principally refer to the sources or ingredients that allow the development of a particular material. The five kingdoms are named as follows: Kingdom Vegetabile when the primary source for a DIY-Material derives from plants and fungi. Kingdom Animale refers to sources derived from animals and bacteria. Kingdom Lapideum contains all DIY-Materials, which come from minerals: stones, sand, ceramics, clay, etc. Kingdom Recuperavit covers all sources society consider as waste but with the chance to transform them into a valuable resource. Kingdom Mutantis includes the DIY-Materials created from different technological mixes and hybridization of industrial, interactive or smart sources.

The perfect and uniform surfaces characterising the industrial materials, in general, provide an artificial aesthetics far from what our daily contexts usually exhibit. In fact, our everyday life is broadly identified with aesthetics based on imperfection and ageing. Gillo Dorfles (Dorfles, 2005) makes a clear statement around the topic when he states: "Imperfection, asymmetry and unfinished, even the broken the shattered and the reassembled are very useful concepts for the aesthetic enjoyment of the world around us". The DIY-Materials aesthetic seems to be more consistent with the real situation of the context we live.

In addition, it is possible to investigate a bit more and find that DIY-Materials have peculiar aspects characterising their aesthetic and affecting the user's materials experience.

Exploring standard samples of Iron or Aluminum (Figure 1), we don’t perceive their original sources (iron and bauxite) because their principal constituents are not evident. By contrast, if we consider a DIY-Materials sample such as Coleoptera by Aagje Hoekstra or Apeel by Alkesh Parmar (Figure 2), it is easy to recognise the origins and the compositions of both materials: mealworm beetle shells for the first sample and orange skin for the second.
Figure 1. Samples of Iron and Aluminum compared with their respective sources

As a result of this first step of observation, we can affirm that the aesthetic of DIY-Materials is described by the evidence of their principal sources.

Figure 2. DIY Materials made out of mealworm beetle shells and discarded orange skins
DIY-Materials provide then another aesthetical richness that is worth to investigate. In fact, the concept of traces originated by a craftsman’s hands work (Casciani, 1988; Sennett, 2008; Robbins et al., 2015), and the idea of serendipity (Walpole, 1754) become relevant topics for self-produced materials practices.

2.1 Towards an DIY-Materials aesthetic map

In a situation where perfection saturates markets, media and products, DIY-materials emerge to create new aesthetics for an alternative future and people need appropriate tools to understand for accepting them. Due to an evident lack of studies and literature, we decided to start the investigation looking at the previous studies focused on materials and their aesthetic aspect. We collected all the sensorial attributes and qualities organised by scholars in different methods and tools for the qualitative evaluation of materials. Then, we tried to create a map including all the attributes and qualities we found. We explored various academic studies like: The Expressive Sensorial Atlas (Rognoli, 2010); The Multi-Dimensional Materials Charts (Ashby & Johnson, 2002); The Meaning-Driven Materials Selection (Karana, 2009); The Color Atlas (Boconcello, 2008); Designing With Wabi-Sabi (Ostuzzi et al., 2011); The Textile Atlas (Malvoni, 2009); The Aesthetics of Tactual Experience (Sonneveld, 2007); The Exploratory Procedures For Tactual Properties (Klatzky & Lederman, 1985); Materials and Emotion (Crippa, 2009); The Texture Atlas (De Sio, 2015); The Material Aesthetic Database (Zuo, 2010) and The Material Perception Tool (Van Kesteren, 2008).

As we agreed with the definition of aesthetic as a concept based on the philosophy of perception, we are creating the DIY-Materials aesthetic map as a collection of different attributes assigned to describe a sensorial/perceptive quality of materials [1].

The notable work still in progress aimed to realise the DIY-Materials aesthetic map is supported by the study focused on aesthetic attributes of every single kingdom. In fact, to test the map, we applied it (or part of it) to some case studies of DIY-Materials previously collected. For each kingdom, we realised the material board using meaningful images from the included case studies, and we tried to describe the collage of images using the aesthetic attributes and qualities of the map.

The next part of the paper is focused on the description of the results coming out from the application of the DIY-Materials aesthetic map to each kingdom.

2.2 Kingdom Vegetabile

Kingdom Vegetabile includes DIY-Materials with a primary source derived from plants and fungi. Composing and then exploring the material board (Figure 3), we noticed some similar characteristics common to all the cases studied. One of these is the traceability of the source, which means, it is possible to see and recognize traces of the main constituents (e.g. plant leafs, fibers and wedges). Another peculiar characteristic of the aesthetic exploration of the DIY-Materials belonging to the Kingdom Vegetabile is the imperfection of the surfaces concerning the touch and sight perception.
In most cases, materials show unevenness and roughness that provide some particular feature to the material itself or to the designed object that embodies the material. As a consequence of their natural and organic sources, it is clearly visible among all samples the short-life attribute of the material. Traces of decay, flaws and broken edges remind the fragility and delicacy of each material, even if the life cycle can be estimated in periods of years. The inherent degradability of the material is always present.

In the table below (Table 1), it is possible to find the aesthetic attributes and qualities listed looking at the material board. These attributes came from the DIY-Materials aesthetic map and they were listed from the authors.

| Uneven Texture | Expendable | Irregular |
|----------------|------------|-----------|
| Matte          | Formal     | Unsafe    |
| Textured       | Hand Made  | Traditional|
| Cheap          | Honest     | Light     |
| Common         | Rough      | Weak      |
| Rugged         | Coarse     | Patina of Time |
| Warm           | Freedom of Shape | Natural Color in Volume |
| Organic        | Non-Uniform Coloration | Signs of Time and Use |
| Unique         | Breakage: New Scenarios | Subtle Color |
| Smelly         | Fibrous    | Curly     |
2.3 Kingdom Animale

DIY-Materials belong to the Kingdom Animale refer to all material sources derived from animals and bacteria. Inside Kingdom Animale, some particular attributes are evident among the cases studied selected to compose the material board (Figure 4). For instance, it is possible to guess a high degree of malleability and flexibility of the material samples. Such characteristics can be associated with the fact that the majority of the samples are cells, skins or tissues. Another notable attribute of this category shows that even if the surfaces are rough and uneven, in our opinion, they express a high level of elegance and exclusivity.

Materials of animal origin such skin, shells, furs and horns were used by several civilizations to represent particular status or the achievement of a specific goal. It is possible that the materials of this category still inherit such cultural perception. The samples collected in the material board, together with the attributes listed (Table 2.), show how asymmetry and imperfection become important characteristics of material.

| Similar Colors | Granular                  | Natural Odor |
|----------------|---------------------------|--------------|
| Wrinkled       | Discontinue Surface Pattern | Natural     |
| Disorganized   | Crafted                   |              |

![Figure 4. Material board realized using images of the case studies included in the Kingdom Animale.](image)

| Table 2. Kingdom Animale Aesthetical Attributes. |
|---------------------------------------------|
| Uneven Texture | Patina of Time | Fascinating |
| Warm           | Organic       | Patterns on surface |
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| Soft          | Non-Uniform Coloration           | Colorful          |
|---------------|----------------------------------|-------------------|
| Light         | Intrinsic Color in Volume        | Organized         |
| Textured      | Unique                           | Natural           |
| Flexible      | Warm Colors                      | Crafted           |
|Exclusive      | Comfortable                      | Irregular         |
| Rough         | Tender                           | Expensive         |
| Elegant       | With Plasticity                  | Affective         |
| Elastic       | Temperate                        | Surprising        |
| Freedom of Shape | Admirable             |                   |

### 2.4 Kingdom Lapideum

Kingdom Lapideum contains all DIY-Materials coming from minerals: stones, sand, ceramics, clay, etc. Some example combines sources coming from other kingdoms, such as wool or cotton fabrics, but in a lower percentage compared with the main constituent.

Kingdom Lapideum, together with the previous two kingdoms, show the natural appearance of their main ingredients and sources. Although the degree of irregularities in the shape of the surfaces strongly diminishes, the samples of materials present corrosion, stains and random coloured surfaces (Figure 5). Minerals, stones and ceramics historically were used by craftsmen and designers to create objects exploiting the inner elegance, style and durability of the materials.

![Figure 5. Material board realized using images of the case studies included in the Kingdom Lapideum.](image-url)
These aesthetic characteristics are also present in the collection of samples of this Kingdom (Table 3.). It is important to underline that in this category the use of machinery and instruments is clearly visible, even if they enable low-tech transformations. Those tools leave some traces and marks above the surfaces.

Table 3. Kingdom Lapideum Aesthetical Attributes.

| Uneven Texture | Elegant | Breakage: New Scenarios |
|----------------|---------|-------------------------|
| Cold           | Not Elastic | Odorless |
| Hard           | Tough | Dry |
| Heavy         | Strong | Contrasting Colors |
| Opaque        | Patina of Time | Thick |
| Expensive     | Non-Uniform Coloration | Dense |
| Exclusive     | Irregular | Consistent |
| Lasting       | Color Induced in Mass | Packed |
| Formal        | Unique | Solid |
| Serious       | Signs of Time | Stiff |
| Admirable     | Multi-Colored | Durable |
| Pleasantly Surprising | Massive | Tough |
| Structured    | Brittle | Cold |
| Geometric     | Natural | |

2.5 Kingdom Recuperavit

Kingdom Recuperavit incorporates all the cases studies coming from sources possibly considered as waste but transformed into a precious resource. They often come from plastic, metal or organic waste, sometimes as side products of industrial production.

It is the kingdom with the biggest number of cases studies, and it is the more complex concerning aesthetical exploration. The different upcycled sources of the material samples (industrial excess, pieces of plastic, dust and leftovers of food) are observable (Figure 6). These DIY-Materials have to carry with the aesthetical qualities of the previous state of their sources. For example, coffee grains maintain their original colour and texture; plastic particles exhibit their vivid colour of smooth surfaces and wood scraps show their original fibres.
Certainly, it is possible to appreciate those embodied attributes or qualities when they appear in the previous state of the constituent’s material, but once they are mixed into the new samples, some people can appraise them as negative. By contrast, the fusion that appears inside some samples creates a fascinating appearance that suggests new possible scenarios of use for the new material. Form our personal evaluation we obtained the aesthetical attributes for the kingdom recuperavit (Table 4.)

| Uneven Texture       | Clever            | Common            |
|----------------------|-------------------|-------------------|
| Rugged               | Honest            | Youthful          |
| Trendy               | Hard              | Irregular         |
| Dirty                | Ugly              | Unsafe            |
| Irritating           | Modern            | Dense             |
| Color Imposed in Mass| Freedom of Shape  | Patina of Time    |
| Non-Uniform Coloration| Unique           | Signs of Time and Use |
| Breakage: New Scenarios & Fixture | Dry | Vivid Color |
| Contrasting Colors   | Thick             | Full              |
| Dense                | Consistent        | Packed            |
| Granular             | Clumpy            | Uncomfortable     |
| Disgusting           | Unsatisfying      | Rough             |
| Saturated            | Colorful          | Industrial        |
2.4 Kingdom Mutantis

Kingdom Mutantis includes the DIY-Materials created from different technological mixes and hybridization of industrial, interactive or smart sources. The combinations of different material sources originating from another kingdom but evolving into something particular with the aid of any technology are also present.

During the evaluating of the cases included in the material board of Kingdom Mutantis (Figure 7.), some challenges emerged. The convergence of technological, industrial and smart sources makes the aesthetical language more complicated. After evaluating the cases inside this kingdom, some similarities appear. All materials present some cleverness, which it means showing in their body and surface, the capability to respond to particular stimuli or invite a specific kind of interactions.

Figure 7. Material board realized using images of the case studies included in the Kingdom Mutantis.

Modernity, artificiality and futuristic look become attributes that prevail in our evaluation of the samples. (Table 5.) The high reflective surfaces, luminescent parts or translucent components make the connection with High-Tech or smart materials developed by science evident. This Kingdom differs from the previous four as these materials to exist, depends on specific technologies. In other words, to self-produce any of these materials, industrial aid and support of the latest technologies available become necessary. Despite the fact that this kingdom can be perceived very close to the high industrial materials of the science and engineering domain, the DIY approach provides the aesthetical value of imperfection that allows those samples to belong to the DIY-Materials class.

Table 5. Kingdom Mutantis Aesthetical Attributes.

| Characteristics |   |   |
|-----------------|---|---|
| Uneven Texture  |   |   |
| Cold            |   |   |
| Gloss           |   |   |
3. Discussion

We illustrated the possible pathway for a DIY-Materials aesthetic evaluation. Material boards for each kingdom were composed, and we assessed them using a collection of attributes and qualities taken from all the different theories and studies around the aesthetical and sensorial aspect for materials in the field of design.

Our intention is to demonstrate the aesthetic potential of DIY-Materials, pointing out the differences between the aesthetic dimension of an industrial material which is mostly affected by the technologies that process the material, and the aesthetic of DIY-Material which carry and express the values of the original sources and the designer’s purpose. It is established that people experience and perceive materials in different forms and the application of a material creates a particular material experience pattern (Karana et al., 2015). We expect in the following decades that the DIY-Materials will work as surrogates, according to what happened to industrial materials development in the past, to replace other materials used for different applications (Rognoli, 2005). Accordingly, it is important to highlight the attributes of these emerging trend in materials for design.

Thanks to the current classification of DIY-Materials kingdoms, we were able to highlight the aesthetic attributes and qualities for each kingdom. By doing so, we are formulating strategies to suggest to the designers how to develop their materials, foreseeing the aesthetic experience they could obtain.
4. Conclusion

The aim of this paper was to explain our in-progress investigation into the aesthetics of DIY-Materials. As is demonstrated, it is a growing phenomenon and we are sure that the self-production of materials will become a standard practice in a not too distant future. To answer to our initial question about which are the aesthetic codes of a DIY-Material? We gather the different studies on aesthetic attributes and qualities of materials and uses them to evaluate the emerging class of materials, known as DIY-Materials. The paper starts with a description of the difference between the aesthetic of industrial materials and the aesthetic of DIY-Materials.

The reasons of this in-progress research relay in the necessity to create a proper understanding of the second group as a phenomenon that can create balance in a material world that is currently submerged by an aesthetic of perfection. Homogeneity and uniformity, precision and repeatability are dominating the materials arena, thanks to the current industrial state of our society. By describing how the ancient Japanese tradition of Wabi-Sabi exalt the beauty of the imperfect things, we provide a visual explanation of how those values can be tracked and clearly identified in the DIY Materials Kingdoms. After an extensive evaluation of the different types of materials inside each kingdom, we were able to create a general picture that described the entire family by collecting and listing the similar attributes that emerged.

As the study is still in progress, for next steps we will create evaluation sessions with real samples instead of pictures, and we will organize different panels to assess the samples. In the future, we would like to have enough information about the aesthetic experience of each kingdom to be able to design a proper tool focused on strategies for developing DIY-Materials.

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