

MATERIALS DATABASE ORGANIZATION FOR THE DESIGN PROCESS

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ABSTRACT

The project process in design is a complex process of articulation between many material and immaterial factors intended to answer some ill-structured problems of open character. The choice of materials used in the making of prospective artefacts is a decisive moment in this process. It is more than just a choice that takes into consideration the costs, aesthetics, or even material resistance. The complexity involves the whole lifecycle of materials, from project to piece dismantling. The organization of this materials database and a construction of a materials library are not only a matter of reference cataloguing but also the creation of a supporting tool for the project. We established an analogy with the Case-Based Reasoning System, and we propose that materials can be organized by their superficial data (name, colour, family, etc) as well as by their future project utility (OXMAN, 1994). The (data) base is not supposed to be static, and one will be able to modify data associated to it through data use. For the construction of this system, we created a data conceptual model based on an Entity/Association graphic representation as well as a hypermedia information navigation model that allows for the construction of user interfaces based on computing systems. This investigation integrates the project for the creation of a materials library in a School of Design in the South of Brazil. The main purpose of this research is to build an intelligent system for the organization of materials through the association of concepts and other properties not necessarily connected the materials physical aspects. We intend to demonstrate the pertinence of a non conventional form of knowledge organization.

Keywords: Materials, database, design process

1 INTRODUCTION

The design process may be considered a process of construction of specific knowledge that serves to manufacture artifacts that meet human needs. Artifacts may be understood as objects, services, material and immaterial experiences produced artificially by a given culture, where designers play an essential role. Accepting the idea that the design process is a process of construction of knowledge, one could equally accept that several strategies are used in it. The search for pertinent materials to find, characterize and finally solve a design problem is certainly one of the important moments of the process. This paper aims to present a work being conducted at the Unisinos School of Design in Porto Alegre, south of Brazil, for the construction a Library of Materials – *Materioteca*.

The *materioteca* being constructed is based on two essential guiding concepts. First, we adopted the concept of a platform for the construction of knowledge for the project. It is not only a compilation of catalogues, materials, or information. A *materioteca* in a school of design should be a space proper for the scientific investigation and construction of new knowledge. *Materiotecas* are usually organized by explicit and technical data. This information is evidently essential to the project. However, there are other less precise factors, many times tacit and poorly made explicit, which could hardly be catalogued in a traditional way. Using the metaphor of a “platform of knowledge” we intend to define a proper space for the stimulus and exchange of individual and collective knowledge around thematic materials in order to reach other levels of understanding for the decision taking of a project.

The main purpose of this research is to build an intelligent system for the organization of materials through the association of concepts and other properties not necessarily connected the materials physical aspects. We intend to demonstrate the pertinence of a non conventional form of knowledge organization. The innovation proposed by this project is not in the design projects that may be built by the use of the

system. The innovation of this research project, still in its initial stage, is in the proposition of a system of data organization to store information that is not normally accepted by his kind of system.

The impact of this kind of system may result in the fact that the project might hardly be measurable. This fact is not exclusive to this supporting project tool. Nevertheless, it is not discarded the application of some kind of methodological tool like interviews, or statistical analysis of the use of the material library confronted with the results of the projects carried out by our students

Another concept with which we have worked and which is very much linked to what was initially proposed is the concept of organization or of the architecture of knowledge that will be stored in this platform. In this sense, we started from some experiences of construction of Case-Based Reasoning (CBR) systems. When proposing knowledge based on precedent for architecture, Rivka Oxman (Oxman, 1994) comments:

“A traditional way of formalizing the organizational structure of precedent knowledge has been through archival categories, such as name, historical period, style or location, which can be used as an index. However, in a design aid system, memory organization should reflect a cognitive model of design reasoning in order to support the retrieval of knowledge during design. A cognitive model of design provides for relevant connections to be made between the current problem and the design rationale and concepts underlying precedents.”

The investigation conducted by Rivka Oxman and other researchers in the 1990s sought to create support and stimulus tools to project ideas. Behind these systems lies the idea that when we face new problems of project we will find signs and references in similar situations that can be adapted to the new context of problem of project that we are working on. Similarly, we could conceive the organization of knowledge contained in a *materioteca* not exclusively based on its physical and structural characteristics but on the different applications of projects for which they may be associated. Through organizing and indexing the *materioteca* with these indexes a possibility to explore and discover arises. Thus, we are closer to the ways of thinking of designers, when many times subjective issues linked to the different interpretations and significations that a material may have are at least as important as its explicit and technical characteristics.

For the beginning of this investigation, we sought to contextualize the problem of the creation of a *materioteca* for the Unisinos School of Design.

2 DESIGN AND MATERIALS

The selection of materials is a determining aspect in the design of products as a technological factor for the innovation and minimization of project flaws. We believe that the space of design consists of a space of propositional mediation of strategies that add value and increase competitiveness. Again, we are referring to the concept of a platform of collective construction of knowledge. This is a strategic dimension that designers should have today if they wish to be inserted in a highly competitive and global world. Therefore, the implementation of a library of materials becomes vital.

The first stage of implementation of this *materioteca* requires the cataloguing of materials. In this stage, its respective information will be clearly and precisely defined. Ashby (1999) believes that there has never been an era in which the evolution of materials was so fast and the scale of its properties so varied. According to Ljungberg (2007), one estimates that there are over 100,000 types of commercial materials in the market, including all the variants in composition, mixtures, thermal treatment, etc. The fact is that not only the objective methods for the selection of materials are to be considered but also the subjective ones, which makes the selection more complex.

Silva (2005) and Dieter (1997) also consider that the importance of selection of materials in Design has increased in the past years. The scale of materials available to designer is much broader than in the past, giving more opportunity to innovation, allowing for greater performance at a lower cost.

According to Ferrante (1996), the process of selection of materials must be considered an essentially interdisciplinary task for which knowledge and information of other areas are necessary, such as marketing and strategic planning. For Kindlein (2002), the selection of adequate materials is essential in the development of project, and public acceptance and the good performance of the final product are consequences of this stage.

Ashby (1999) considers that materials have attributes, and the problem is to identify the desired profile of the attribute, then to compare it to those materials proper of engineering to make the best choice. In order to assist in this selection, it is necessary to create assistance tools, and for this the *Materioteca* – Library of Materials – is extremely important.

For the development of this work of formulation of a new *materioteca* for the school of design, first we made analyses of several similar spaces existing both in Brazil and abroad. Based on these analyses, the first concepts and characteristics were defined for this space:

- Tactile and visual exploration;
- Educational spaces that form Human Resources;
- Partnerships and exchanges with other *materiotecas*;
- Being a space for technical lectures related to materials, processes, and products;
- Creating a space for exhibits of companies of materials;
- Launching of company products.

3 DATABASE FOR A LIBRARY OF MATERIALS

However, the essential issue for this library rests on the “design” of the architecture of the information that will be used in order to favor the organization and recovery of useful project knowledge and the search of materials. This work is still in its early stage. However, it springs from a tripartite structure where each material will have a *name* that characterizes it, a set of *technical information* and a set of information linked to design *problems* and *solutions*. Figure 1 represents this structure. Even if the search may still be made through the traditional elements that characterize materials, our proposition includes data that associate each material to one or more design problems or projects. Thus, the search may be from the project context.

This type of structure will require an effort at the time of initial cataloguing of materials. We do not expect this work to be done in a brief space of time. On the contrary, the idea is to create a dynamic base where corrections are permanently made. The base is fed and corrected by users themselves. Again, one resumes the concept of collective construction of a type of support knowledge to the project. This type of database will demand at least and at first the figure of an administrator that will work as a moderator. At this moment, the most important step is the creation of the database model and the several paths that information may take in its interior.

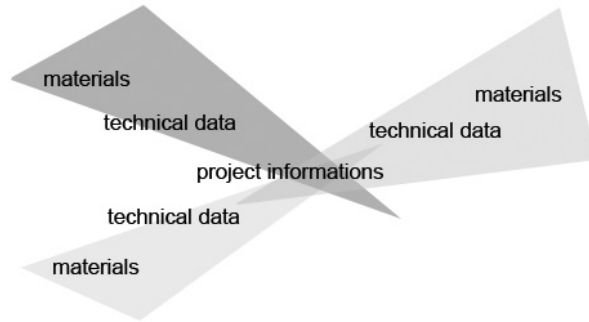


Figure 1 Simplified diagram of the organization of data in the materioteca. Source: authors

In order to represent the knowledge of the library, following we describe a conceptual model of data based on graphic representation of the Entity/Association model, as defined by Chen (1976). The choice was due to the fact that this classic model allows us to reach two essential objectives: (i) to make an inventory of all the information or concepts of the system of organization of materials, and (ii) to define the relationships and conditionings between them.

Figure 2 describes a first launching of this model. It is a work under construction, in which materials are presented as a central entity of the database, articulated to three other entities: property of the material, project problem, and concept. The first entity refers to the traditional way of organization of a materials base and will be associated to their physical-chemical proprieties, such as resistance, chromatic aspects, texture, etc. The second entity, i.e., design problem, aims to associate materials to typical and exemplary cases where they are used, for example, a complete project or in response to a partial problem of a design project. At this point, we are close to the concept of an organization of cases. The third and last entity refers to design concepts that may be associated to materials. It is a quite subjective and mutable interpretation which may be made to each material, requiring the definition of a protocol to regulate how it will be made. Certainly it is one of the challenges of this work. Thus the objective is to enable for this type of association that may surprise those that make use of the materials base. And surprises are part of the process of design.

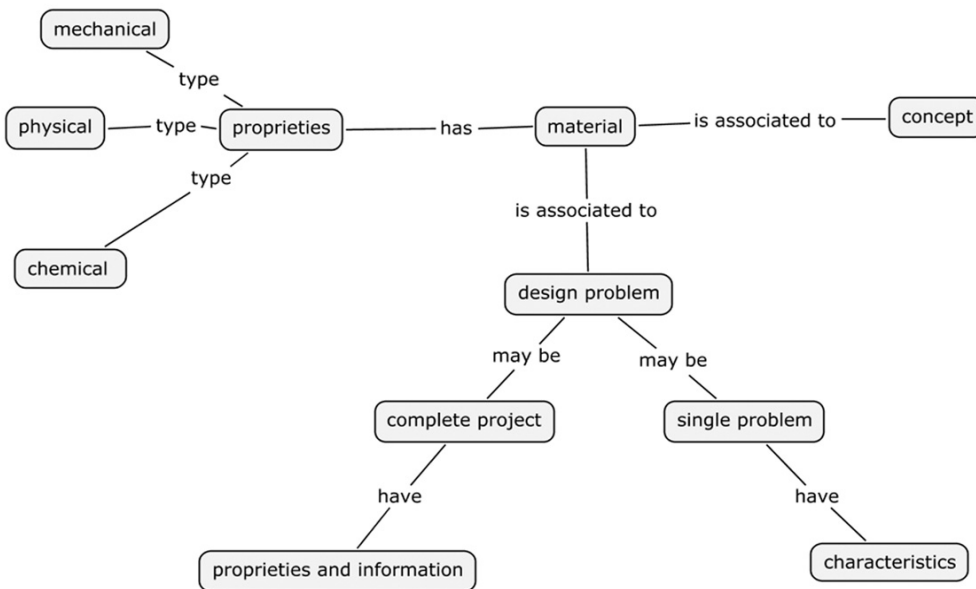


Figure 2 - Initial conceptual representation of the data. Source: authors

This work is still in its initial stage. Many definitions still need to be provided and corrected. However, we have started from a clear definition of not organizing the knowledge associated to materials only by means of technical information. To accomplish this it will be necessary, for example, to get into networks of research on design & emotion, which are capable of measuring in some way the emotion of the consumer in the process of design to the materials selection. We try to solve the subject of how to choose the right material that is more or less innovative, and evaluate it.

The strategy for the construction of this database is to gradually advance in the collection and organization of materials obtained. Parallel to the organization of the first materials, we expect to tune in the processes developed for this intent. After the consolidation of this conceptual scheme of data we will start the modelization of possible paths that information may take so that we are finally able to imagine a possible interface to allow for the interaction between the user of this database and the *materioteca* itself.

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