

**DESIGN THINKING IN PRODUCT DEVELOPMENT - CASE STUDY:
LEATHER LIBRARY**

MARLENA POP

*INCDTP – Division: Leather and Footwear Research Institute, Bucharest, Romania,
pop_marlen@yahoo.ca*

Called “design thinking”, this human-centered method is the most advanced way to meet the requirements of clients or target groups. In the elaboration of the Leather Library, this method was experimented and verified, proving its efficiency in the development of creativity, problem solving and accountability of designers.

Keywords: design thinking methodology, Leather Library project, design students

INTRODUCTION

The material library is an object, a library of materials, but it is also a repository of knowledge of materials in a certain scientific, industrial, design, artistic field, etc. Basically, the material library is an archive of specialized materials, a cataloged sample tool of scientific work in different fields of economics. The Leather Library project aims to design this library of materials, unique in the country, as a specialized modular display, using the “Design Thinking” methodology. This design method, generated as a phrase by Herbert A. Simon (1996), a renowned specialist in the sciences of knowledge, since 1969, has been rediscovered and used as a design method by Stanford professors and popularized by Ideo in recent years, as a method of business development. Using this method, the design process is no longer linear, but turns into an iterative, spatial and empathic process, being centered in each stage on the requirements of the person who will use that product (Image 1). In order to verify the “design thinking” method in the design practice, a case study was created, the design of the leather material library, as a modular sample, together with the students of the European Politechnique Student program of UPB in collaboration with INCDTP – Division ICPI. The group of students consists of French, British and Romanian students.

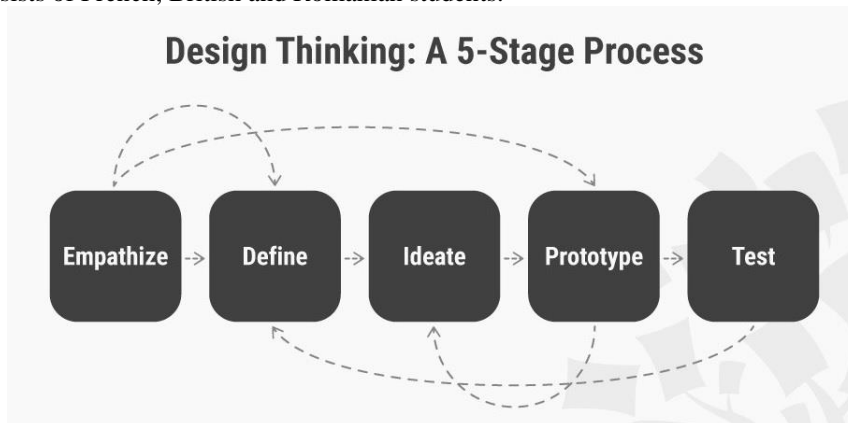


Image 1. The design process through the Design Thinking method (Interaction Design Foundation, 2019)

<https://doi.org/10.24264/icams-2020.V.10>

CASE STUDY – LEATHER LIBRARY/ DESIGN THINKING METHOD

The case study solves a deeply specific research situation, such as this challenge, of making a leather material library. That is why all the stages of the “design thinking” method were observed in the development of the design process, as follows:

1. Empathy - The First Stage of the Design Thinking Method

- Understanding design thinking and tools to stimulate individual and team creativity;
- Visiting a real material library, the one at Nod Maker and understanding its role in design, architecture and engineering;
- Online documentation: Specialized libraries in different fields, from UK, France, USA;
- Questions about the structure of the subject - Understanding the functions of this design product / service - A first impression, intuitive perception, without prejudices, of the library of materials.

2. Defining the Problem - The Second Stage

- Identification of project objectives: Identifying the design requirements of an object called the material library;
- Functional requirements: The material library must be an archive of knowledge of the field, by means of the technical sheet of material characteristics and tangible samples;
- Requirements for use: the material library must be functional, with easy access to both written information and samples, to allow the storage of several samples of material;
- Technical requirements: a body easy to handle and access, made of light but resistant material;
- Aesthetic requirements: the structure of the spatial body of the material library must have the best design, so as to respond to both the functions and the uniqueness of the samples and the particular aesthetic expressiveness of its object.

3. Ideation / Conceptualization / Elaboration of Sketches According to the Accumulated Information

- Knowledge of intellectual work tools: Open mind and brainstorming;
- Ideation requirement: Develop an intuitive sketch of the product - Leather Library;
- Issuing an incipient concept / developing the concept;
- Establishing roles in the team, based on the Ideation;
- Iteration and finalization of the design concept.

In order to develop a balanced accountability of design students in the project team, based on their first intuitive ideas (Image 2), each of them received a role for a specific conceptualization, as follows: project manager, 3D design manager, quality manager, environmental design manager and marketing manager.

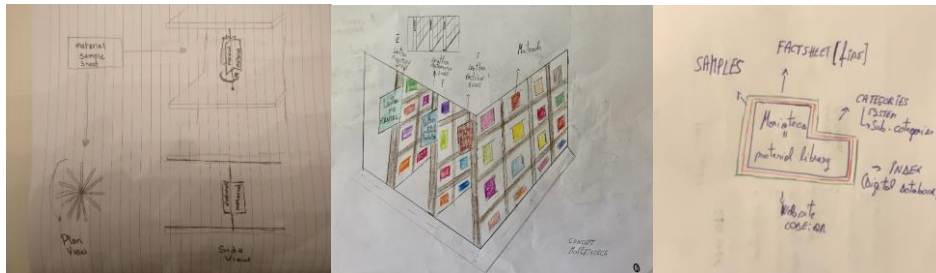


Image 2. Primary ideation, intuitive sketches

The Ideation process consisted of:

- two brainstorming sessions to define product functions;
- ideation process: intuitive idea sketches, not conceptual;
- drafting the initial specifications of the project;
- the method of the conceptual mix for defining the product concept.

Iteration is the most important creative stage that leads to the clear conceptualization of the ideas of a project and the elaboration of the final concept. According to the students' sketches, J.'s idea, a rotating cylindrical body, combined with D.'s boxes, received the most votes from the team. Elaboration of the final Leather Library concept will consist of seven vertical modules: the module will be called "Soldier", authors: J., D., L. (Image 3).

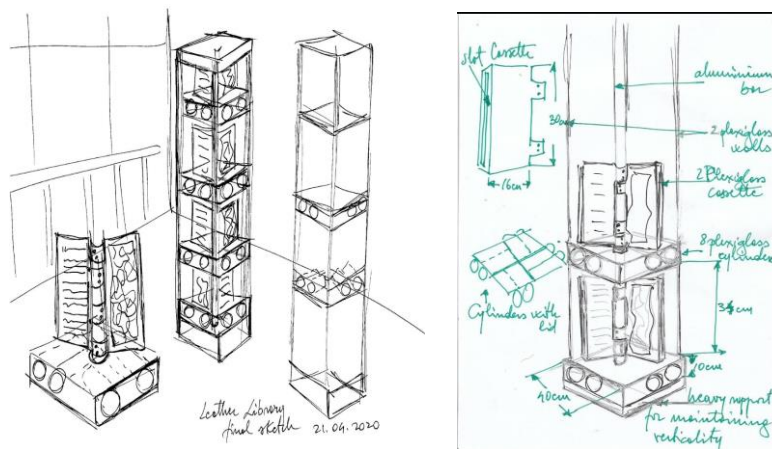


Image 3. Development of the final concept for Leather Library

Designing the technical data of the material library:

Technical data of the Leather Library - 7 modules called "Soldier" with the dimensions of: 200 / 40cm,

Mass properties of The Soldier:

Mass = 53.61 kilograms

Volume = 63911.97 cubic centimeters

Surface area = 21959154.22 square millimeters

<https://doi.org/10.24264/icams-2020.V.10>

Center of mass: (millimeters)

X = 401.99

Y = -92.53

Z = 832.47

Principal axes of inertia and principal moments of inertia: (kg* square mm) Taken at the center of mass.

$I_x = (0.00, 0.00, 1.00)$ $P_x = 1329687.86$

$I_y = (-0.35, -0.94, 0.00)$ $P_y = 23851394.01$

$I_z = (0.94, -0.35, 0.00)$ $P_z = 23870826.61$

Moments of inertia: (kilograms * square millimeters): Taken at the center of mass and aligned with the output coordinate system.

$L_{xx} = 23868207.11$ $L_{xy} = 6184.43$ $L_{xz} = -69548.32$

$L_{yx} = 6184.43$ $L_{yy} = 23853583.82$ $L_{yz} = 69622.11$

$L_{zx} = -69548.32$ $L_{zy} = 69622.11$ $L_{zz} = 1330117.56$

The space destined for the exhibition of the Leather Library, the ICPI lobby, was designed for two situations: 1. Permanent exhibition; 2. Specialized event, which requires the placement of furniture.

4. Fourth Stage - Prototyping

The technical design of “Soldier” (Images 4 and 5) in 2D and 3D was made by the Romanian student, in online collaboration with French and British colleagues, in the difficult situation of state of medical emergency, created by COVID 19.

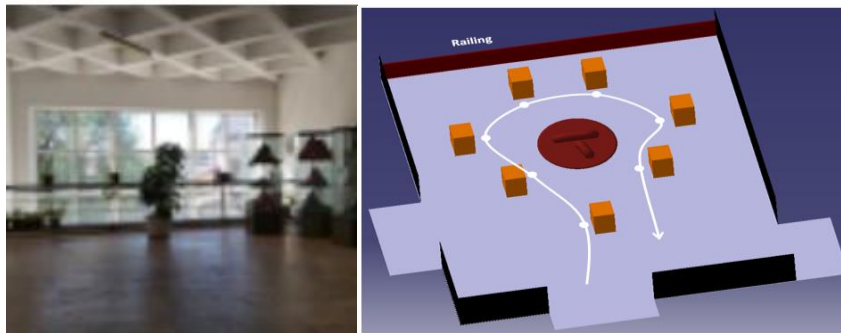


Image 4. The ICPI lobby and 3D design of the Leather Library

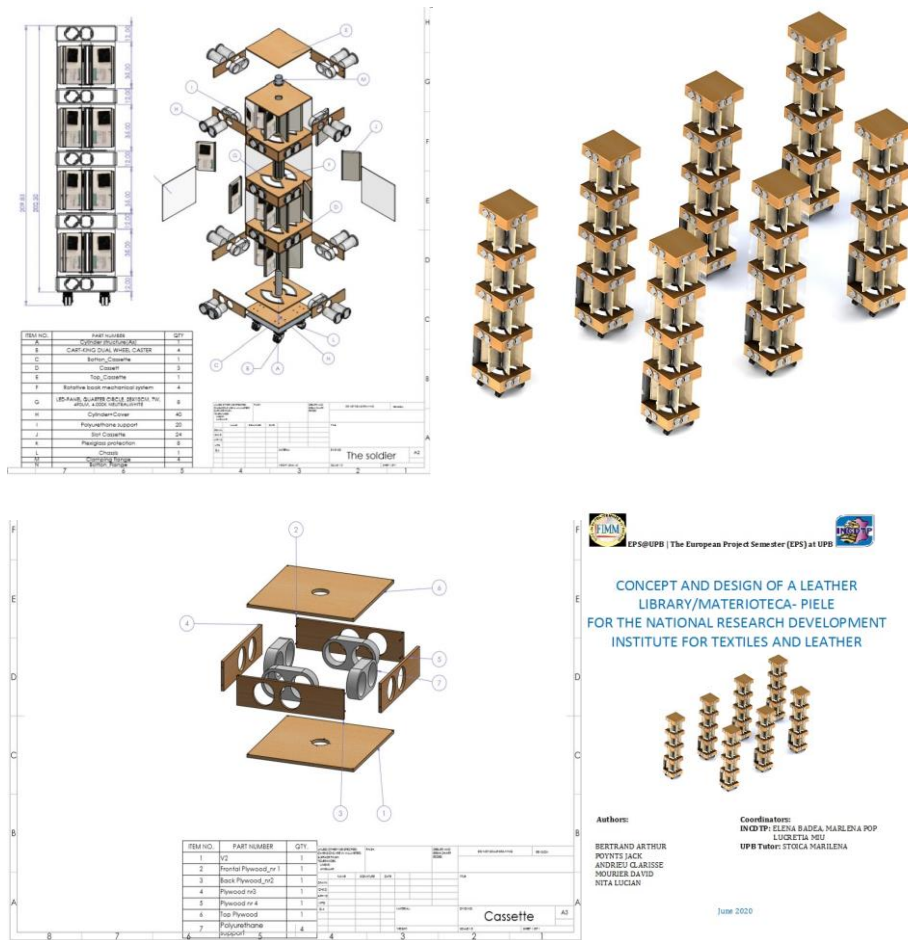


Image 5. Technical design of the Leather Library

5. Virtual Prototype Testing

The fifth stage of design thinking, that of testing, through virtual simulation could not be achieved because the universities were closed due to the medical context, and the necessary equipment could not be accessed.

The case study demonstrated that the “design thinking” method solves a much larger number of problems that the design of an object or process raises and leads to the development of the design team through the complex practices learned by students during the project.

CONCLUSIONS

Through the European Polytechnic Student Project of ICPI in collaboration with UPB, a research / development project in product design was carried out between March and May 2020, called LEATHER LIBRARY.

<https://doi.org/10.24264/icams-2020.V.10>

- The Leather Library is an archive of information-structured materials and stored by sampling in cylindrical boxes, and presented using rotating boxes that contain the technical sheet of the leather assortment and its sample. The library consists of 7 mobile modules called “Soldier”, each specializing in a specific subfield of advanced research of materials that have collagen in their structure.

- The design method used in product development was Design Thinking, a complex method that starts from the problem and continues with documentary research, ideation, iteration, conceptualization, creative design, environmental design, communication design, technical design and development (layout and prototyping).

- As the EPS students say in the project to support their activity, from the research coordinators “We have learned a lot from a cultural, technical, managerial and human point of view”.

REFERENCES

- Anderson, L. and Shattuck, J. (2012), “Design-based research: A decade of progress in education research?”, *Educational Researcher*, 41 16-25, <https://doi.org/10.3102/0013189X11428813>.
- Interaction Design Foundation (2019), “Design Thinking”, available at: <https://www.interaction-design.org/literature/topics/design-thinking>
- Kimbell, L. (2011), “Rethinking design thinking. Part I”, *Design and culture*, 3, 285-306, <https://doi.org/10.2752/175470811X13071166525216>.
- Simon, H.A. (1996), *The Sciences of the Artificial*, 3rd ed., Cambridge, MA: MIT Press.