

## AT A GLANCE

**Company:** University of Camerino, Faculty of Architecture

**URL:** [www.unicam.it](http://www.unicam.it)

**Location:** Ascoli Piceno, Italy

**Industry:** Leading industrial design education center, with a specialty in furniture design

## Challenges

- > Integrate structural optimization into the first stage of the design process
- > Reduce use of material while maintaining the same product features and functionality
- > Provide students with experience in creating models to test architectural and industrial designs

## Solution

- > Eden™ 3D Printing System from Objet Geometries

## Results

- > Provides design students with advanced technology tools
- > Students understand how to reduce time to market for products
- > Structural optimization methodology was defined and tested

“ Using Objet’s technologies enables us to optimize our structural methodology process by allowing feasibility to be checked and tested during the first stage of design.

”  
Arch. PhD Student  
Luca Frattari



## University of Camerino Uses Objet 3D Printing System for Structural Optimization Methodology in Design Education Program

University of Camerino, Faculty of Architecture in Ascoli Piceno started to work on structural optimization in Industrial Design, has significantly improved its design verification methodology by using Objet Geometries' 3D printing technology.

Previously, the department presented an experiment to the Hyperworks Technology Conference in Berlin, showing how to apply Topology Optimization to create a passenger shelter. This year, they presented a new method of structural optimization to be applied in industrial design – creating a chair using Objet’s Eden 3D Printing System.

University of Camerino, Faculty of Architecture in Ascoli Piceno has a long tradition of innovation in design. Today, the Faculty is at the forefront in establishing new design methodologies. The undergraduate architecture program combines industrial and commercial experience with new models and techniques for computer aided design, including using the most advanced 3D printing techniques from Objet Geometries. One of the Faculty of Architecture specialties is the process behind industrial design, making it a major contributor to Italy’s innovation leadership in the furniture and industrial design industries.

### Objet 3D Printer Speeds the Design Process

The University of Camerino is currently working towards defining an innovative design methodology with a strong orientation towards saving materials and monitoring the shape and structure. The ultimate goal is to recycle materials, or use as little material as possible in creating a structure, while maintaining the design and structural integrity. Integrating structural optimization principles and rapid prototyping technologies in the first stage of the design process enables a valuable technology transfer from the mechanical engineer to the industrial designer. Using Objet’s system, designers can validate and verify their products’ structural efficiency and transform concepts to reality directly from their sketches, saving considerable time.

Chair models were used to test various methodology theories in the Eco-Design and Eco-Innovation Master Course. New chairs were designed using recycled aluminum instead of ordinary plastic. The designer was involved in the structural choices. Later, the strength of the chair was tested according to Italian standards. The high accuracy and fine details of models printed by the Eden made it possible to test the feasibility of a design sooner than was previously possible. That change has revolutionized the design process and will ultimately result in less waste and better designed products.

### Feasibility Questions Answered Early

Two different styles of chair were used to test the methodology of using rapid prototyping to determine feasibility in the first stage of the design process. Both chairs were analyzed by Luca Frattari, PhD student at the University of Camerino, Faculty of Architecture in Ascoli Piceno. Chair "B" was a rounded low armchair and Chair "V" was a square shaped chair without arms. Portions of the basic shape of each chair were removed, and then the viability of the chair was tested by printing a scale model of the chair during the initial design phase.

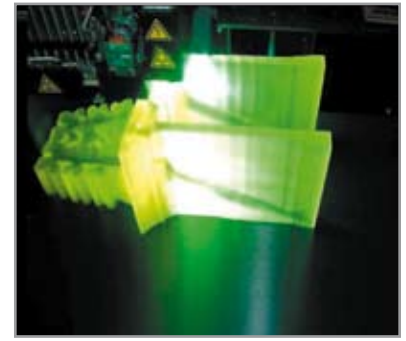
To redesign "B" chair Luca Frattari select a young designer of the Master Course in Eco-Design Lodovico Bernardi. This experiment consists in studying. It consists in studying the structure of the object and removing every part of material not necessary for its function. So the result is a chair made with the minimum possible quantity of material. The analysis was done with software called Altair Optistruct, generally used to build airplanes or performance pieces. The chair model is based on Jerszy Seymour's chair, produced by Magis."

The critical part of the design process was the model testing. Objet's Eden 3D printer enabled the designer to improve on Topology Optimization, an algorithm which defines the location and number of voids within a structure given a prescribed set of conditions, by proving that the chair would still be usable even with the desired changes. On the other hand, thanks to Objet, tests confirmed early that Chair "V" would be hard to manufacture.

### True-to-Life Model at a Lower Cost

The use of Objet within the development process affects the three critical elements necessary for a successful outcome. First, costs are reduced because testing and verification of basic structure is confirmed in the first phase of design. Second, lead times are significantly reduced as the product can be sent to production sooner. Finally, quality is to the highest levels of accuracy and finish.

With all factors taken into consideration there is no more preferable method to develop a product of this sort than a design methodology that involves Objet as the method of testing feasibility.



## About Objet Geometries

Objet Geometries Ltd., the innovation leader in 3D printing develops, manufactures and globally markets ultra-thin-layer, high-resolution 3-Dimensional printing systems and materials that utilize PolyJet™ Polymer Jetting technology, to print ultra-thin 16-micron layers.

The market-proven Eden™ line of 3D Printing Systems and the Alaris™30 3D desktop printer are based on Objet's patented office-friendly PolyJet™ Technology. Connex500™ is based on Objet's PolyJet Matrix™ technology, which jets multiple model materials simultaneously and creates composite Digital Materials™ on the fly. All Objet systems use Objet's FullCure® materials to create accurate, clean, smooth and highly detailed 3-dimensional models.

Objet's solutions enable manufacturers and industrial designers to reduce cost of product development cycles and dramatically shorten time-to-market of new products. Objet systems are in use by world leaders in many industries, such as automotive, electronics, toy, consumer goods, and footwear industries in North America, Europe, Asia, Australia and Japan.

Founded in 1998, Objet serves its growing worldwide customer base through offices in USA, Europe and Hong Kong, and a global network of distribution partners. Objet owns more than 50 patents and patent pending inventions.

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