

USING RECYCLED PAPER IN PRODUCT DESIGN APPLICATIONS

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Abstract: This paper discusses methods and options for interconnecting applied research, experimental development, and unconventional machining technologies within product design to facilitate integration of the relevant outcomes in items of everyday use. The applied research focuses on the properties of paper, cardboard, and recycling, while the systematic experimental development focuses especially on unconventional technologies (Laser / CNC plotter). For the purposes of recycling and circular economy, the preferred materials are corrugated board, paper, cardboard, and similar items. The basic applied features are presented on concretely designed and manufactured products that feature attractive design. These comprise, above all, everyday products such as hangers, clocks, interior accessories, and furniture. All of these components are made with respect to the requirements of recycling and circular economy, as they utilize already recycled materials. The research presented herein therefore has an impact on product design and interior accessories in terms of the social outreach of these domains.

Using modern methodologies in sectors and subareas where they are currently employed only marginally brings a potential for interrelating technology, the arts, and fine arts. Such innovative approaches bring competitive advantages to the market both economically and socially; the central potential of the outputs lies in product design, fines arts, and progressive technologies.

BimBam

Martin Holas

The BIMBAM pendulum clock utilizes ten sheets of five-layer cardboard with a thickness of 6 mm. The item is offered in a wide variety of colors and dial design options. The color is applicable to the face of the clock body and/or to the inner surface behind of the hands, and the actual hands can be tinted too. The clockwork mechanism is protected with a cover, which easily fits the driving groove after being inserted and rotated to lock.



Rocking horse

Jiří Tauber

The rocking horse is made of five-layer corrugated packaging cardboard. Generally, this fabric consists of raw paper, a material based on recycled paper with a share of virgin fibres and starch glue. The horse features light weight due to the material used and can be easily and safely carried by children. For a greater variability, the product is designed in three sizes. This ensures suitable ergonomics for a wider group of users.



Play Box

Jiří Tauber

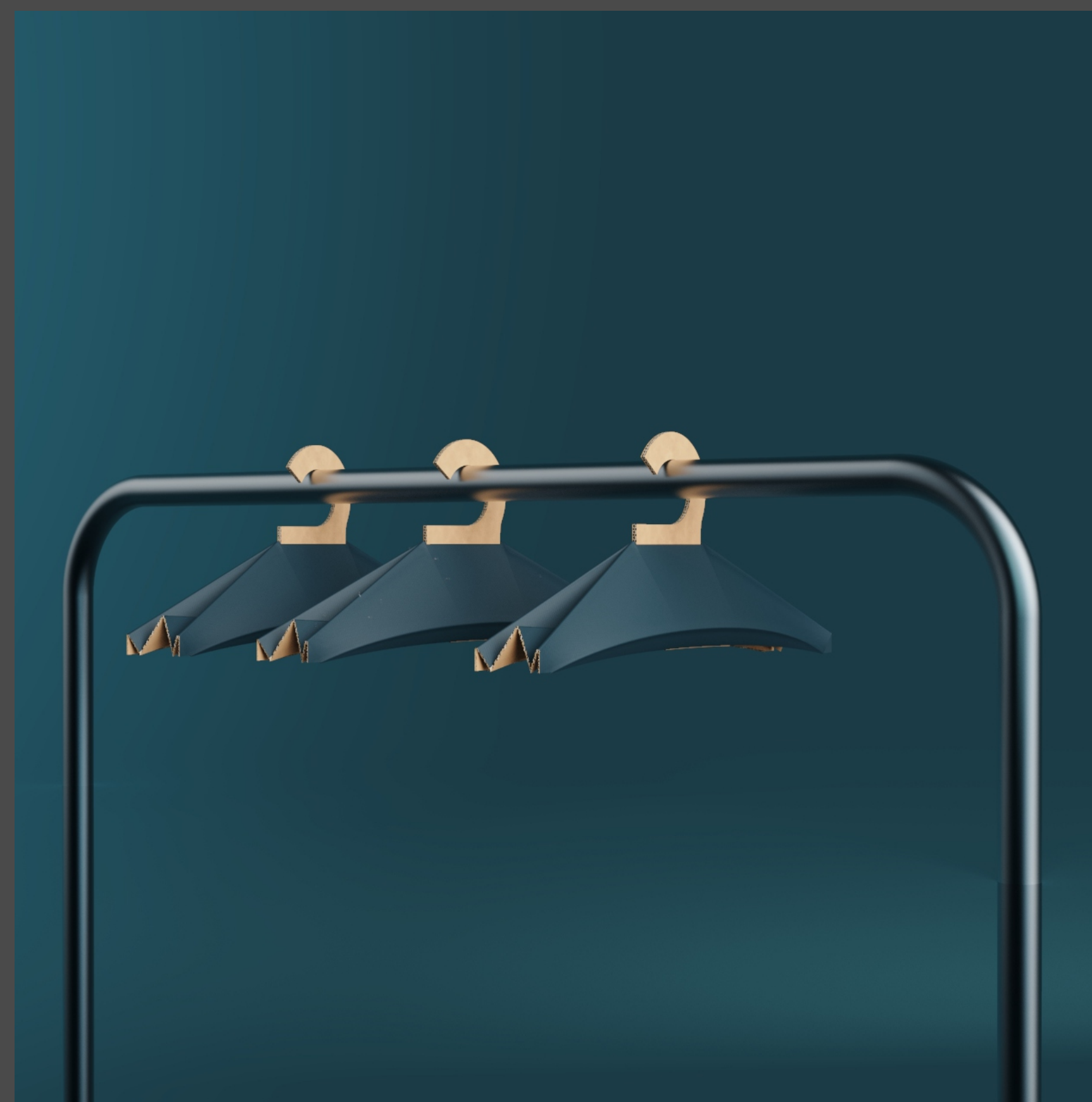
The product, aptly named the Play Box, demonstrates that there is a beauty and variability in simplicity. Designed for children and developing their creative thinking, the item can be used as, for instance, a table, chair, shelf, stool, carrying box, and moving box. The 3 basic elements can be used variably and are storable in a single crate. The Play Box exploits one type of material, namely, 5-ply corrugated cardboard; the product is strong, durable, and recyclable.



Noon hanger

Martin Coufal

The author was inspired by the Japanese origami culture. Similarly to the origami designs arising from a single piece of paper, the Noon requires only one slice of cardboard to be fabricated. The advantage over a traditional wooden or plastic hanger lies in the simple manufacturing and reduced environmental impact. The applied shapes ensure positive tension in the hanging garments; further, the hanger tightens itself progressively with increasing load, and thus it will not disintegrate. When decorated with the graphics, the component embodies a playful, functional, and environmentally friendly product. The hanger was nominated for the Czech International Student Design Award 2021.



Trapez

Jiřina Koukolová

The TRAPEZIUM cardboard table is made of five-layered cardboard, the construction of which is not used adhesive. The entire costal torso is enveloped by surfaces which are folded into a "C" shape and anchored in grooves, which completes the final shape of the table. The whole structure is dynamic and airy. A combination of white dyed ribs and admitted cardboard texture elegantly.



Tube

Martin Zach

This furniture design project exploits paper tubes and multi-layer groove cardboard as the source materials to emphasize and promote waste recycling. The aim lies in utilizing waste paper-based matter to create cheap, low-weight furniture that offers broad applicability in multiple sectors. The output of the project comprises two seating elements and two small tables, all together forming a functional set suitable for occasional sitting and light meals. Using the furniture in the exterior is not recommended, due to its structural properties; the target areas include, above all, public interiors. The individual tube components are cut obliquely at joint spots, with integrated slip tongues and springs delivering effective load performance. The table top design is inspired by organic shapes. Both the seating elements and the tables can be dismantled into partial components.



Conclusion: The paper outlines alternative approaches to product design, exploiting specific practical examples and recent achievements within the domain to illustrate the overall problem. The presented student-made artifacts were fabricated at Mendel University in Brno under supervision by the authors of the paper. The set of these products includes, among other items, the outcomes of the systematic efforts pursued by the above-mentioned nominees for the Czech International Student Design Award 2021. The design respects the current ecology-related requirements, utilizing recycled corrugated board, paper, and cardboard. The general design, especially as regards the applied material, allows further recycling and application of the principles of circular economy. The actual concept of the products integrates applied research, experimental development, and unconventional machining technologies (Laser / CNC plotter) to deliver a unique and fully functional design. At present, environmentally friendly products are relatively easily available to customers; however, their prices often markedly exceed those of conventional items. This drawback is partially eliminated by state-of-the-art technologies, which render the merchandise competitive both economically and socially.

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