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THE CARDBOARD HOUSE PROJECT: A CASE OF EXPLORATIVE DESIGN AND COMMUNICATION

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ABSTRACT
In university design departments, there is and has been an ongoing discussion how to accomplish both active design and scientifically approved research. The Cardboard House Project was an experiment intended to investigate industrial design as explorative force and driver of innovation. The project was accomplished at Department of Product Design, NTNU in cooperation with partners, and attracted considerable support from industry and official bodies. The direct subject was to explore how design solutions and new materials contribute to sustainable innovations for interiors and small buildings. Central in the project was the design of conceptual furniture and building elements in lightweight cardboard materials. The project culminated by building of a full scale model of a furnished cottage at the Technoport Exhibition in Trondheim in October 2007. The exhibition was a success in itself and the industrial partners were content with the results. The project demonstrated how design can actively contribute to innovation and open up for new ways of thinking by showing new ideas for more effective use of materials and energy. *Keywords: Innovation, design exploration, communication, conceptual design, cardboard*

1 INTRODUCTION

" The global challenges facing the international community can not be successfully addressed without the contribution of knowledge-based innovations drawing on all areas of education and research including humanities, social sciences and the arts" [1]. The knowledge triangle, with cornerstones; innovation, research and education, has recently been presented as The EU´s path towards the future. Within design departments, there is and has been an ongoing discussion how to accomplish a similar triangle with design based innovations and scientific research as basis for education.

There seems to be a general agreement about the importance of industrial collaboration in student projects both to make the students aware of their professional role in the future and to ensure training in appropriate professional skills[2]. *"..in education activities, it is always more important to stress the important role of design as an innovation driver in NPD processes. The best way to make design students understand this role, not just in theory but also in practice, is via a direct collaboration with companies*."[3] "*Working with 'live' projects enables students to acquire skills in e.g. marketing, concept design, detail design, analysis, manufacturing and prototyping."* [4]

Direct cooperation between students and industry is positive and inspiring for both parties. A more committing mode of cooperation is to develop Industry-University "Knowledge transfer partnerships" involving both staff and student placement in industry[5]. Current trend at universities, including design departments, is increased focus on research and publications, which is positive in many ways but makes it less actual for faculty members to engage in professional activities or real life projects. A model defining design practice as an important part of interaction design research has been developed at Umeå Institute of Design[6], shown in Figure 1. Here the space for design research is defined as a triangle with the three vertices "Design Practice" "Design Exploration" and "Design Studies". Design Practice and Design Exploration are both proactive in nature, but where Design Practice is framed by business and user requirements, Design Exploration becomes a statement of what is possible, what would be desirable or ideal, or just to show alternatives and examples. Design studies then cover the activities that closest resemble traditional academic disciplines[6].

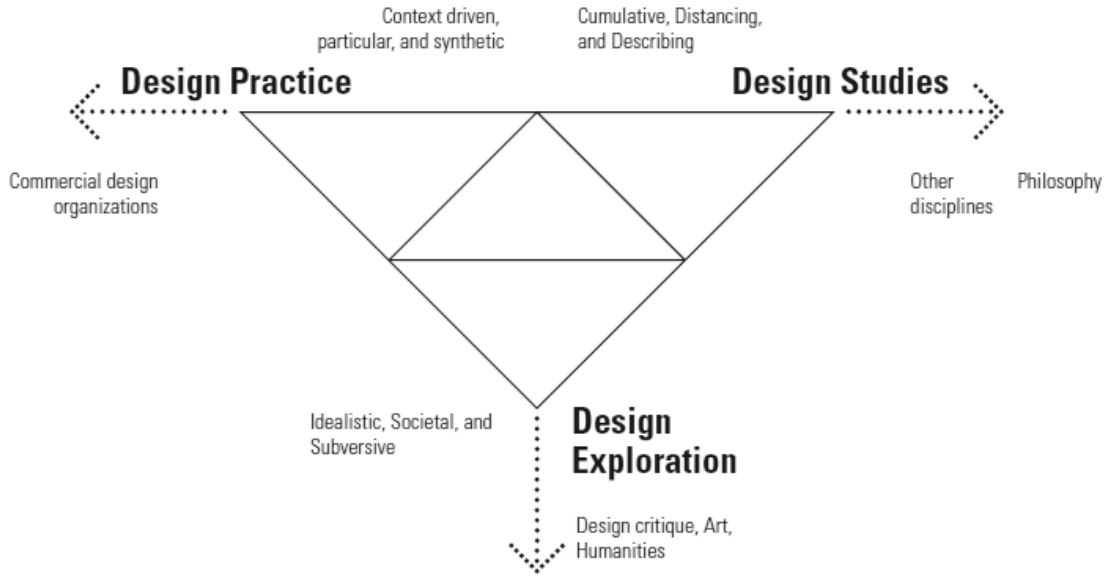

Figure 1. A basic model of design research[6]

Even if this model is developed for Interaction Design Research context, it also provides a meaningful terminological framework for discussing the relation between practice and research within industrial or product design.

The growing awareness of environmental challenges, in public opinion and by companies and legislators actualizes the quest for new product solutions. Focus is put on climate neutral businesses, reuse of materials, effective production; in general to obtain higher value for the end users with less use of resources. Ecodesign methods are well known by design students and researchers but to a lesser degree adopted by industry, calling for more radical approaches[7]. The aim of The Cardboard House Project was to develop new concepts for sustainable living, with a student home as the case study. By this we wished to motivate the students to look for radical innovations and explore the innovative potential of a design department, cooperating actively with industry and institutions.

2 BACKGROUND

Designer Guy Lönngren came to work as professor at NTNU after 40 year of experience as an industrial designer in Finland[8]. His vision was to unleash the creative potential of cooperation between education, research and industry and to show the role of design as the driver of innovation in product development together with technology and marketing.

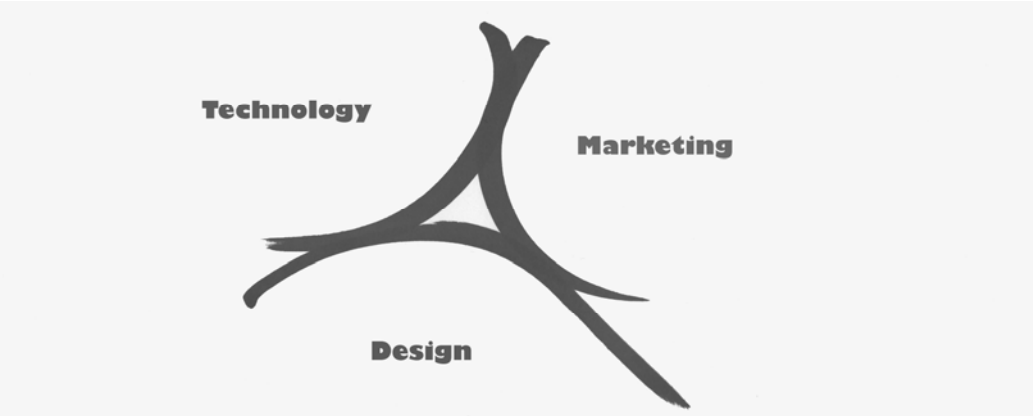

Figure 2. The three elements of innovation

In September 2006 Lönngren introduced a group of students to his ideas and formulated a course project in cooperation with a local company. This resulted in a concept study for furniture and interior

elements of a student home, (Figure 3.) all in cardboard, and in the course of the project we identified a supplier of sandwich plates ideally suited for prototyping cardboard designs; Wellboard[9].
The positive outcome of the student project motivated a large scale experiment where Lönngren drew on his long experience from design of yachts and small houses[8]. After a phase of initial discussions, the Cardboard House Project took form and a project group was established in March 2007. The primary subject for the Cardboard House Project was to explore and develop new solutions for housing and furniture both in private and public sector, using cardboard and other paper based products as the principal material of construction.

Figure 3. Cardboard furniture for a student home. 3.year students 2006

2.1 Why Cardboard

Paper and cardboard are produced from plant materials, mostly timber and are therefore clearly a renewable material source. Also, paper based products are easily recyclable, lightweight and versatile with regards to shaping and production. The material is not new to designers and architects. Well known is Frank Gehry´s collection of cardboard furniture, Easy Edges line[10] from 1970. The products were a success in the market, but Gehry of various reasons chose to withdraw the collection. An other architect working with environmentally conscious building concepts is Japanese Shigeru Ban, which as an example uses tubes of cardboard as structural elements.[11]
From the viewpoint of the designer, full scale models always give a valuable insight and an important corrective to representations and other scale models. In particular when working with buildings and spaces a full scale mock-up is rarely available, but the use of cardboard in this project made it possible to explore the benefits of full scale models.

2.2 Project organization

The project was organized as an external project at Norwegian University of Science and Technology NTNU, in cooperation with two external parties, Guy design Group in Finland and Garvins Konseptutvikling Ltd. The project administration was with NTNU, and Lönngren was the chief designer. Several companies and organizations were invited to participate, and twelve partners decided to join the project in varying roles. The project budget was approximately 200.000€. All partners signed contracts specifying contributions and expected returns. Amongst the partners were: Peterson AS, R. Kjeldsberg AS, Heimdal Gruppen, Innovation Norway and the Norwegian Housing Bank.

3 SHOWCASE "PAPPHUS"

Design of the house and other elements for the exhibition was completed by Lönngren during the summer months with support from the project group and students. Production and assembly was done by a dedicated group of students during a few hectic weeks in September 2006. The project is documented in a final report which is available from the website of the Norwegian Housing Bank (Husbanken)[12].

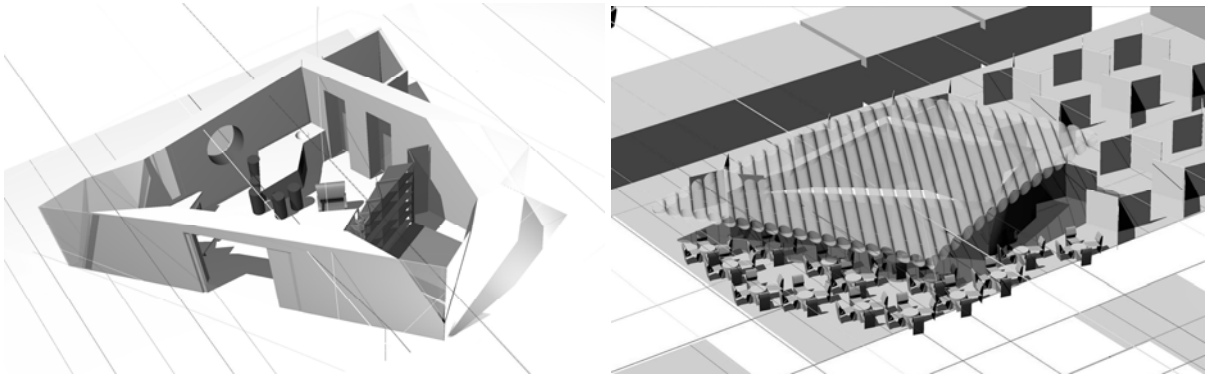

Figure 4. Left: Design of the House seen from above. Right: Plan for the exhibition area, house shown with a projected roof which was not installed at the exhibition. (Lönngren)

3.1 The Exhibition Arena - Technoport

Technoport is a series of annual and biannual events organized in Trondheim by the Norwegian University of Science and Technology (NTNU) and partners from business and society. The vision is: *"Technoport – the premier choice in Scandinavia for displaying and experiencing new technology"* [13].

The Technoport exhibition in 2007 was a large scale event with more than 130 exhibitors with varied background; education, research, industry, consultancy and community to name some[13]. The event was aimed at the general public in Norway, but also seen as an opportunity for making professional contacts in an informal way. The area of the Cardboard House stand was 200 m^2, but the project also delivered exhibition system to a neighbouring stand so the area was in effect 300 m^2. See figure 4.

3.2 The House

The house with area of 36m^2, was modelled in full scale, a flexible space with three zones, living room, kitchen and sleeping. Due to limited time some of the planned features were not included at the exhibition, most notably the projected roof of inflatable plastic tubes and the bathroom which is sketched in Figure 4. The arrangement of the house focuses on effective use of space, flexibility and functional solutions.

Figure 5. Left: Assembling walls in the exhibition area. Right: Designer Lönngren and students discuss the result.

The open solution without fixed inner walls makes it possible to adapt the house to varying user needs.

3.3 Furniture and Interiors

A set of furniture consisting of different types of chairs, sofa and a table was designed within the project. These were based on the principle of cutting a single piece of cardboard sandwich plate and bending it in place and fix with two straps. The design is explained in Figure 6. showing the smallest chair in making. The chair is folded from a plate of 40 x 300 cm with punched holes and then strapped in place. In cooperation with NTNU Technology Transfer Office[14] an initial patent survey was run for design principle of the chair and sofa. This showed no similar existing patents so a claim was filed for a US patent the day before the exhibition opened.

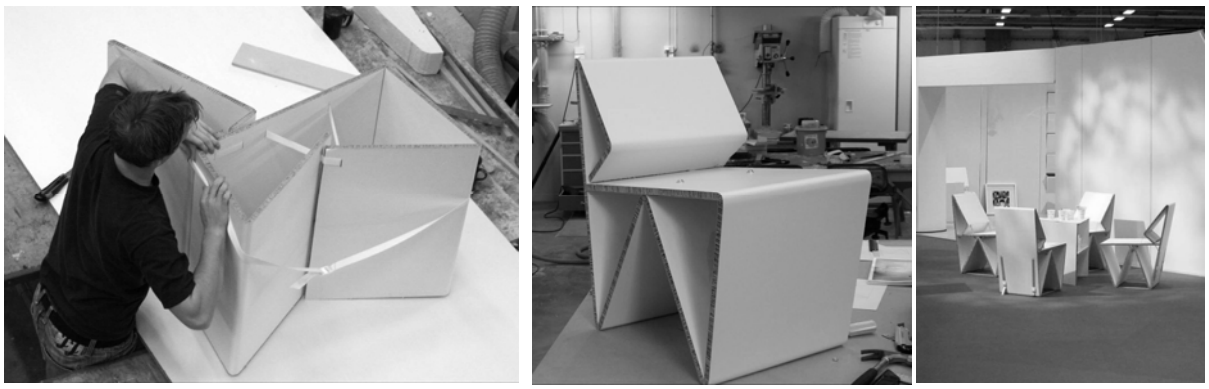

Figure 6. The chair is made from one piece of cardboard, stabilized by two straps.

3.4 Display system

Fairs and other exhibitions events are an important communication arena for companies and organizations. In relation to these events a considerable amount of waste is produced, or in the case of more permanent exhibition systems, heavy transportation units are required. The display system therefore was one of the obvious focus areas in the project. The goal was to design a flexible system which could be printed in close to the exhibition venue and then recycled as ordinary paper or transported lightly to the next exhibit. The system builds on modified cardboard plates[9], with connecting element in aluminium. For the Technoport Exhibition more than 60 m^2 of posters were printed and mounted on the system.

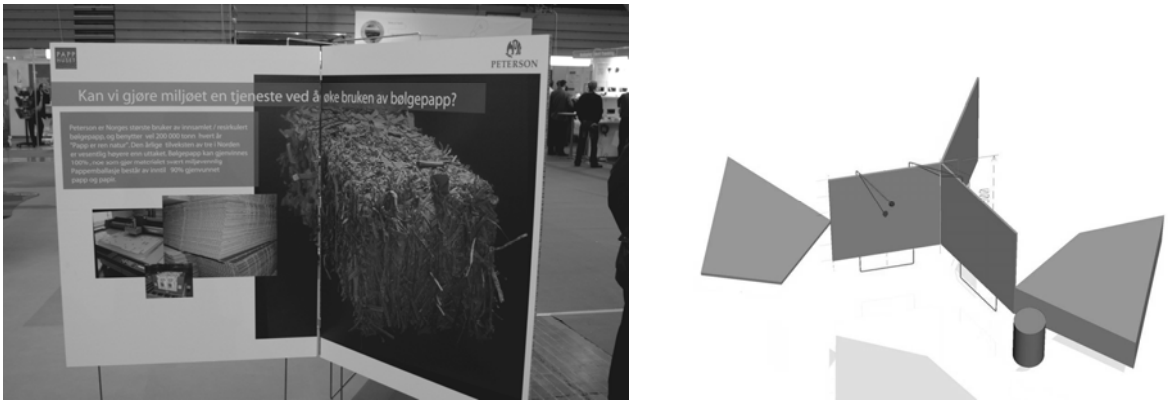

Figure 7. The display system

4 PUBLIC INTEREST AND RESPONSE FROM INDUSTRY

From the beginning, the project attracted interest from public and media. A presentation of the building process appeared on a nationwide TV-channel and local media followed up. At the exhibition, most of the guests found their way to the Cardboard House and the stand was elected by a public vote as the best stand of Technoport 2007. The provocative idea of using cardboard as a building material in Nordic climate gave rise to many good discussions, in particular with engineers. What about fire, rain, wind and wear; were some of the typical questions around the project.

After the exhibition, meetings and presentations were held with all main sponsors and project partners. The response was positive, the following being the most central points.

- The focus on innovative design for the future gave inspiration to the companies and their staff.
- The project gave the partners insight into design thinking and methods, and how this is a way to create innovative solution.
- The full scale “mock up’ proved its value as tool for communication and user involvement.
- Participation in the project has expanded the professional network of the partners.
- The exhibition and the good public response, has profiled the project and the partners as environmentally and socially conscious business parties.

In the discussions, several of the partners signalled interest for continuing the cooperation into the next phase of the project, which was planned to continue with product development and industrialization of the concepts from the showcase.

5 CONCLUSIONS

The project demonstrated how design can actively contribute to innovation and open up for new ways of thinking by showing new ideas for more effective use of materials and energy and is as such a good example of explorative design. Several product concepts were developed and tested for an open scene as full scale “mock ups”, which proved an effective way of getting input and feedback from a large number of people. As a communicative effort the project has been highly successful attracting interests from public opinion mass media and industry. Many of the companies involved in the project saw this as a direct effort to strengthen their image as environmentally and socially conscious business actors. For NTNU the communicative effects were not assessed, but obviously such positive attention strengthens the image of the institution and in the end attracts new students.

The display system elements and some of the furniture produced for the Technoport exhibition have later been used on occasions for exhibitions by NTNU and others, while most of the cardboard materials have been recycled into model making in the departmental workshop. The preliminary patent application for the chair was in the end withdrawn, as the efforts to create a consortium for continuing the project did not succeed. Several meetings with industrial actors showed positive interest for continuing the project, but in the end the change in global conjectures in 2008 put an end to the efforts of continuing the Cardboard House Project.

Within the Department of Product Design the project occupied much space and the people involved worked long hours. In retrospect one can admit that the project was perhaps too ambitious and should have been better integrated. This is however not straight forward as university culture and routines are essentially different from the work ways of industrial designers and communicators. Still the project was a valuable experience for the department, showing the potential for explorative projects in cooperation with industrial partners. Finally the project showed how innovative design with light and renewable materials gives a flexibility to develop a variety of new products and solutions interiors, adapted to the different needs and wishes of individuals.

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