

DESIGN CONCEPTS OF MULTIFUNCTIONAL FURNITURE FOR SITTING AND LYING RELATED TO THE INDUSTRY

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ABSTRACT – Application of design values and interdisciplinarity in furniture design, oriented to the production and business sector, is one of the method and approach in students' projects conducted at the Department of Furniture and Wood products Faculty of Forestry in Zagreb, Croatia. The topic of the project was Designing an armchair / bed in hotels' rooms. The problem was related to the lack of space in the hotels rooms and users' needs, attitudes and activities, both family and business one. Often there is a need for a bed more. Problem also deals with the comfort, ergonomics, functionality, ecology, health and other designers' requirements. The aim of the project was to design a multifunctional and comfortable bed/armchair in cooperation with one Croatian company, leader in bed system and mattresses production. The article describes methods, conceptual ideas and the final result of the project and opens some new relations, questions and methods for the future work and investigations in the field of interior design in hotels; but also in combining design thinking, contemporary designers' approach, construction skills and upholstery knowledge in the business sector.

KEY WORDS – design / construction / upholstery / furniture for sitting and lying / interiors / students' projects

1. INTRODUCTION

Interdisciplinary cooperation between scientific institutions and the business sector is of great importance in research, development and product design, especially when students participate in it. In this type of collaboration are realized potential opportunities for further cooperation between students and manufacturers. Students gain practical experience of working in the company, and usually happen that several graduate students continue to work in the same or similar production environment with their own stability and initial experiences of the projects.

One of those examples is collaboration between the Department of Furniture and Wood Products, Wood technology Section at the Faculty of Forestry University of Zagreb, Croatia and the Croatian company Bernarda from Pušine achieved in the academic year 2013/2014 in the courses Design Furniture and Upholstered Furniture. Students in the courses was given the task to create concept (design) of a product that will meet the requirements of the market and the user's needs and propose visual and constructional solutions.

The article describes methods, conceptual ideas and the final result of the project and opens some new relations, questions and methods for the future work and investigations in the field of interior design in hotels or other spaces; as well as gives some new solutions in combining design thinking, contemporary designers' approach, visual, constructional and technological knowledge in the business sector.

1.1. Problem and aim of the Project

The topic of the project was Designing an armchair / bed in hotels' rooms. The problem is related to the lack of space in the hotels rooms and users' needs, attitudes and activities, both family and business one. Often there is a need for a bed more. Problem also deals with the comfort, ergonomics, functionality, ecology, health and other designers' requirements. The aim of the project was to design a multifunctional and comfortable bed / armchair in cooperation with the Croatian company Bernarda, leader in bed system and mattresses production (**A, 2014).

2. INTRODUCTION TO DESIGN METHODS

Design methods have many rules which one has to follow to get proper concept of a product.

There are two main phases in researching and development of the product:

- Analysis phase (research / conceptual phase)
 - 1.1. Research
 - 1.2. The Brief
 - 1.3. Concept design
- Implementation phase (development of the product)
 - 1.1. Design development
 - 1.2. Detail design
 - 1.3. Production

Each phase includes a few repeatable stages (Figure 1) (Milton – Rodgers, 2013):

- Understand (the problem)
- Observe (the situation)
- Visualise (the concept)
- Review (the ideas) -----
- Implement (the best solution)...

Each iterative cycle includes four distinct stages, which are usually passed through before either repeating the cycle to gather additional research data or satisfied with the research undertaken moving on to the next stage of the design process and the next cycle of design research and development.

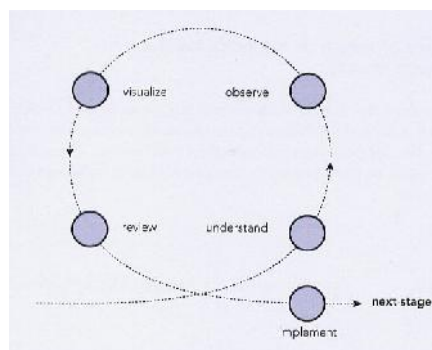


Figure 1. Four main stages in a design process (source: Milton – Rodgers, 2013)

3. PROJECT - STEP BY STEP

3.1. Terms of reference

Terms of reference consisted of a set of predefined parameters. Students had to research and define all terms and project tasks in order to specify the problems and define goals and requirements for their new concepts. Table 1 show the overall task (terms of reference) and its phases.

Table 1. Terms of reference

Main title:	Integrated design project
Terms of reference:	<p>Introductory note:</p> <p>The terms of reference is performed as an integrated project of two courses (Design Furniture and Upholstered Furniture) at the University of Zagreb Faculty of Forestry, Wood Technology Section, Department of Furniture and Wood Products in collaboration with the company Bernarda.</p> <p>Bernarda is the Croatian manufacturer, fundamentally engaged in the production of mattresses and bed systems for equipment residential areas and public spaces such as hotels and apartments, hospitals, etc... The main product range of the company are the mattresses, beds, pillows and other production program that complements the bed system.</p>
The theme:	<p>Relationship HUMAN - (INDUSTRIAL) PRODUCT / RANGE OF PRODUCTS</p> <p>Furniture design for sitting and lying (rest) in a hotel room / Designing an armchair / bed in hotels' rooms</p>
Conceptual problem:	<p>Sitting/lying and rest in the performance of (occasional) action:</p> <ul style="list-style-type: none"> – resting/restless sitting (talking, listening, reading, watching TV, working on a laptop) ... – sleeping.
Main task:	<p>Design of a multifunctional product that could be adapted with its style, shape, size and quality to the area of the hotel room as a product for sitting and relaxing, as well as if necessary, could be easily turned into a so-called "extra bed" in a room.</p> <p>The level of the category hotel / apartment is not specified (almost all categories).</p> <p>Default conceptual problem has to be resolved with appropriate design (shape, construction, ergonomics...) solutions, adequate materials and upholstery, which will treat all design parameters to achieve optimal interaction in relation human - the subject.</p>
Environment:	<p>Default environment:</p> <ul style="list-style-type: none"> – primary: public space - hotel rooms, suites – secondary: living space and others.
Material selection:	<p>All available materials, with emphasis on the application of textile and leather products (decorative fabrics for upholstery), sponges, proper hardness, solid wood and wood materials (substructure and visible part of the structure) and supplement non-wood materials (metal, etc..) and other supportive materials. It is recommended to implement system for extending and retracting (scissors, fittings from company Lusch, but not a priority)</p>
The aim of the task:	<p>To design a product that will fit its appearance in different levels of equipment primarily in hotel rooms and suites, the secondary housing and other facilities; that with its multifunction solution of a structure</p>

allows comfortable seating and rest the dismantling of the product for lying. In brief - to design an armchair that converts into a bed. Innovative or redesigned concept of functional, stylistic, structural or technological new products primarily in a hotel, which ultimately will optimally achieved proposition in a given environment.

- Research and solve a given problem (actions) in the default environment, taking into account the design parameters: ergonomic, anthropometric, functional, aesthetic, structural, technical and technological principles of a product
- Analysis of ergonomic parameters - selection and analysis of the target population of users; anthropometric data analysis of the selected population in terms of age and gender
- Analysis of structural parameters (analysis of the application of the existing structural system of switching structure of the product in its entirety)
- Analysis of environmental variables (use of "healthy" materials)
- Analysis of the size and function of existing products (e.g. bed, armchair, chair, etc...); to research the compatibility of function, shape and construction of the multifunctional system (folding systems, deck chairs, folding chairs, etc.)
- Research and resolve the compatibility of all set of parameters for future products
- Improve and advance segments according to default requirements or innovations in its entirety
- Innovation in the use of materials, construction solutions, design solutions, ...
- Adoption of design methodology
- Adoption of two-dimensional and spatial (three-dimensional) presentation of detailed solutions, including the choice of materials and production models / prototypes in collaboration with the mentor.

Methodology:

- The analysis of a given problem and the relationship between man - the problem - the product
- Analysis of existing similar products that are aimed to please and solve a given problem (so called Index of design)
- The elaboration of sketches - a few preliminary conceptual designs (minimum of two to three)
- The development and design of feasible solution that optimally solves the problem (achieves an optimal compromise given and analyzed parameters)
- The presentation of conceptual solutions (designs) with content as described below, the A2 or A3 format, binding by agreement with the mentor.

3.2. Analysis phase

After getting information about the terms of reference, students started to research all demands and requirements as well as possibilities of the new design solutions. Numerous references related to the problem and terms of reference were used (Grbac, 2006; Kroemer et al., 2003; Neufert, 2000; Panero and Zelnik, 1987; ***a, 2014; ***b, 2014).

3.2.1. Conceptual solutions

The third step in the analyzing phase is to put some designers' concepts to a paper – sketching phase. Students made brainstorm for making ideas/products variations. In the planning process students made several variation of the concept and after that they chose the optimal idea.



Figure 4. Students' discussion of conceptual ideas

Students' ideas show a high level of design thinking, particularly for functional and anthropometric requirements. In function analysis, the product is considered as a technical-physical system. Figure 3 show students conceptual ideas.

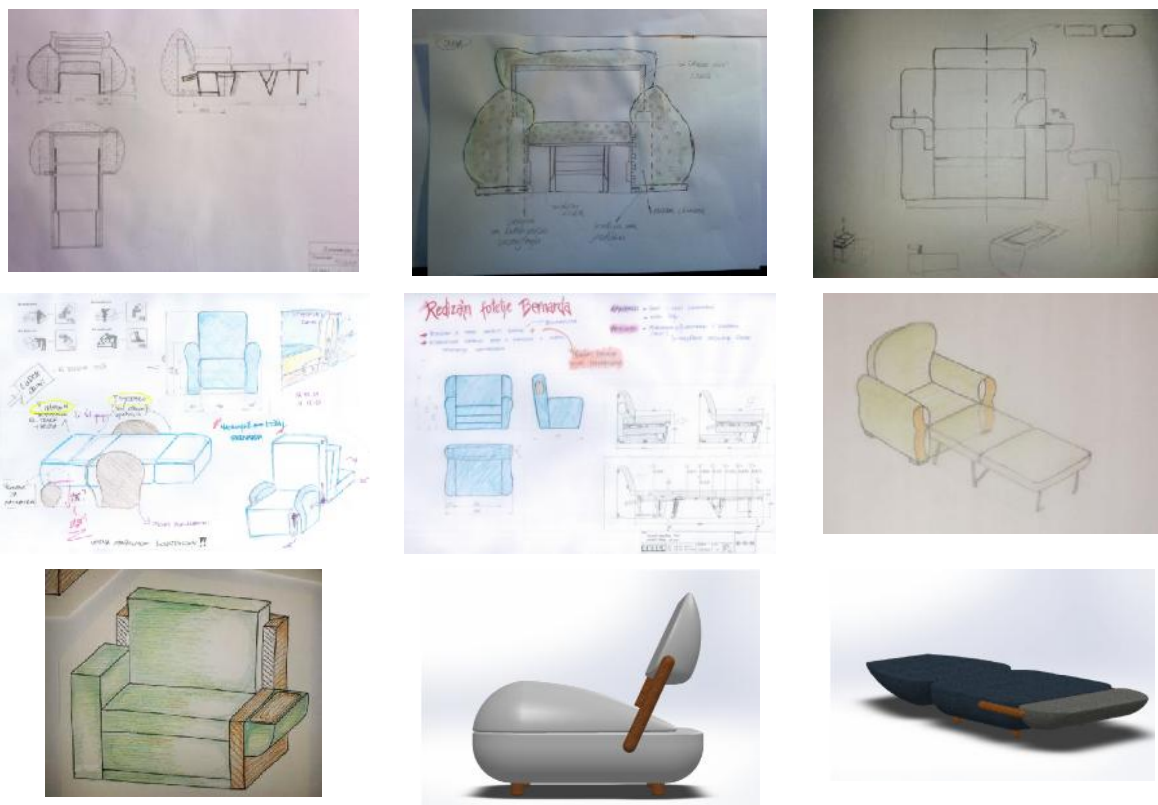


Figure 3. Students' ideas and concepts

The product functions, because it consists of a number of parts and components which fulfill subfunctions and the overall function (sitting, lying, ...). By choosing the appropriate form and materials, students can influence the subfunctions and the overall function. Some of them were related to the fittings of the company Lusch (**b, 2014). Ergonomics analysis was done as well, using anthropometric manuals,

studies and references (Panero and Zelnik, 1987). After all, product concepts were an approximate description of the working principles and form, function, technology, ecology and ergonomics of the product.

3.3. Implementation phase

The implementation phase is the next step in product development, after conceptual and drawing phase. Unfortunately, the project stopped at this stage due to the end of the semester and lack of time for further development (three month). Continuation of the project will occur in consultation with the company, when some of chosen concepts will be detailed developed in design, function and construction and produced as a prototype.

4. CONCLUSION

Research and development (R&D) is one of very important steps for each product design. Design methods and above all, "design thinking", are close related to R&D. It means that for all phases of R&D subjects has to be interdisciplinary cooperative, analytically and functionally oriented to the consumers needs on the one side as well as to technology in the company on the other. For R&D it is needed minimum one person who has experience and could lead the team step by step through R&D phases, as well as time especially when in a team are students which doesn't have any or have less experience in R&D. The project described in this article is an example how students ideas could be transformed in the first phase into excellent concepts. Also it is good example how two or even more courses at the Faculty led by cooperative colleagues could be interdisciplinary connected in team work and be motivated to students and their ideas and goals. The authors hope that projects such these will be continued in the future.

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