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SUSTAINABLE DESIGN TECHNOLOGY: A CASE STUDY OF A MASTER STUDENT'S LAMP PROJECT

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ABSTRACT
Creatively treated materials from nature transform, through technological processes and design practice, into cultural objects containing function and meaning. Views on nature, culture, and technology are gradually in a process of change and thus contribute to new practices. Multidisciplinary, innovative thinking within the Norwegian forestry industry has led to new, aesthetic experiences in nature that might influence product-design thinking. Forestry business with complex technologies has been linked in various ways to the built environment, architecture, and design. The research question of this study was: how sustainable products can be developed through an innovative combination of nature, culture, and technology in a master student project? This was illustrated through a case study of a master student's development of a lamp design. The product included semantic references to old woodworking techniques and cultural heritage, and evolved to an innovative product with commercial success. Methods used were document analysis and participatory observation. The product has contributed to a marketing strategy of corporate, social responsibility for the Forest Owners' Association. Students can get an expanded view of how design practice can be seen as an integral part of a sustainable worldview that includes both self-realisation and commercial realism. The learning outcomes from this study are related to knowledge, skills, and general competence.

Keywords: Forest ecology, sustainable design, cultural heritage, design literacy, master study

1 INTRODUCTION

At the meeting point of nature, culture, and technology a design object may emerge. Creatively treated materials from nature transform through technological processes into cultural objects containing function and meaning. A technological focus [1] does not always reflect a market showing renewed interest in products expressing nature, culture, and traditional production methods used in new ways [2]. Products related to handicraft traditions and cultural heritage have experienced a new renaissance in the design market.

2 BACKGROUND

The forestry business and wood technology have been linked in various ways to the built environment, architecture, and design, and the timber industry is constantly on the lookout for new industrial opportunities. Views on nature, culture, and technology are gradually changing and thus contribute to new practices. An example is Arne Næss' eco-philosophical view on nature [3]. This is a holistic worldview based on an ecological understanding of the world and the individual's place in this world. This could lead to design practitioners being influenced to make products that reflect such values.

2.1 Design and consumerism

In the research project Design Literacy (from primary education to university level), of which this paper is a part, the main purpose is to further develop knowledge of design education. Design has a wide impact on society, seen from a consumer perspective in light of sustainability issues [4]. Design education (from primary to university level) is, in this project, regarded as a key issue for developing a sustainable society, as choices made by the general public when it comes to design, touch the core of

consumerism. Designers, decision makers, investors, and consumers hold different positions in the design process, but they all make choices that will influence our future environment.

2.2 New sustainable thinking in the forest industry

Another practical result from ideas on sustainability [3] can be found in forestry where natural fallen trees, to a large extent, are left to decay to enrich vegetation identity and species diversity (Figure 1A). In addition, standing dead trees from deciduous trees and old pine are left after logging. This multidisciplinary, innovative thinking towards sustainable forest management within the Norwegian forestry industry, has led to new aesthetic experiences in nature. Several organizations had worked towards such sustainable forest management, but a Norwegian standard was first agreed upon in 1998 when the Living Forests [5] concept was established. Involved in the concept were stakeholders in forest management and the forest industry, environmental and outdoor recreation organizations, trade unions, and consumer interests. The standard has been revised several times and is currently located under the international forest certification system, Programme for the Endorsement of Forest Certification (PEFC) as the Norwegian PEFC Forest standard. An interesting part of Living Forests is that this holistic focus on sustainable forest management includes aesthetic perception of nature.

2.3 Design semiotics: the meaning of design products

Another understanding of environment on a product-design level is reflected in theory on product-design semiotics by Rune Monö [6]. He describes the elements of logic whole in design as the idea, function, ergonomics, and aesthetics that come together as product semantics. He claims that the meaning of design products has to be understood in relation to pragmatics and syntax as demonstrated in his product semiotics. This theory contributes to the students' holistic understanding of the design process through defining design elements, placing the design in a context, and relating it to similar designs. However, in a sustainable tradition [3] this is a too narrow theoretical standing point for design, because in order to see design products as a part of a larger system, a specific holistic view of the world is needed.

2.4 Sustainable perspectives

In an expanded view on design theory, nature and environment are relevant factors. In the search for such a constructive relation between theory and practice in design theory, it might be useful to learn through a qualitative study [7] from related fields such as architecture and urbanism. This has been exemplified in art seen as a part of the environment, not only from an urban perspective, but also as public health from a holistic perspective [8]. Critical Realism [9] can be seen as a relevant approach in this context, because design studies require interdisciplinary integration, an appropriate understanding of relationships between human actions, and physical artefacts, and a possibility for making "soft", qualitative predictions about likely impacts of proposed solutions. It has been claimed that critical realism matches these requirements better than many competing positions within the philosophy of science [9].

Critical realism not only welcomes interdisciplinarity, but also considers, for ontological reasons, interdisciplinary integration as necessary in arriving at valid knowledge. Critical realism's conception of causality, where causes are understood in terms of the generative powers that things may have, means that designed artefacts also hold causal properties. This is exemplified in the enabling or constraining of human actions or triggered perceptions to which the individual may attribute aesthetic value. The artefacts are also liable to be influenced by other causal powers, including the actions of human agents. The causal influences, as seen in critical realism, are not deterministic. They may be counteracted or strengthened by other causal mechanisms operating at the same time. They should therefore be understood as tendencies, not as constant conjunctions. This way of understanding causality makes it possible to make sense of the ways in which designed artefacts matter to people by being useful, beautiful, ugly, impractical etc., and also how new designs and materialised artefacts can be developed and created through human agency. Moreover, a critical, realistic view on possible research-based predictions squares well with the qualitative impact assessments of alternative solutions and the modest, context-adapted estimates of how a designed artefact is likely to fulfil its intended functions be they instrumental, symbolic, or aesthetic. Opportunities from within these standpoints may be detected for the field of design education, as they signify basic new ways of thinking regarding design practice.

The research question was how sustainable products can be developed through an innovative combination of nature, culture, and technology in a master student project. A master student project was chosen because it was relevant, at hand, and useful for learning outcomes that were achievable. The aim was to identify realistic learning outcomes [10] for product-design education that emerged from a student practice which also had proved to be a business success.

3 METHOD

The research question was explored through a case study [11] of a master student's development of a lamp design [12]. It was possible to learn from this approach and through theoretical perspectives that enhanced the validity of the findings [13, 14]. The product included semantic references [15] to old woodworking techniques and cultural heritage [16], and evolved to an innovative product commercialised and sold by Bolia Furniture Company. There was documented analysis of the student's master's report, practice report, magazines, and web sites that presented the product [11]. Data was collected through participatory observation in supervision of the student. Categories were identified through concept mapping [17] and pattern matching [11] in relation to the presented, initial theories of product semiotics [15], Deep Ecology [3], and critical realism [9]. The aim was to expand the understanding of elements of these theories through analysis of a practical, student-design project [14].

4 RESULTS: REFLECTIONS FROM A MASTER STUDENT

The reflections are documented from the student's master projects, highlighting some relevant categories:

Figure 1 ABC: A: Living Forest. B: Woodwork bench C: The lamp Turn, by student Caroline Olsson

The student was fascinated by old woodwork techniques that she thought were connected to cultural heritage and noble, handicraft traditions: *The lamp was inspired by the old workbench (Figure 1B) often used in wood workshops in Norway.*

Emotional recognition: *There was a product line in my study where products were connected to each other through the use of associations, materials, colors, and working method…*

Conceptual representation, emotional recognition, and branding: *During the project there has been a desire to promote a stronger relationship between the products and what is around the brand "Caroline Olsson". Concerning media exposure it is not always easy to control what the outcome will be. A valuable marketing example was when the lamp "Turn" (Figure 1C) was pictured in the design magazine "Wallpaper"…*

Corporate social responsibility, conceptual representation, and self-realisation: *Other examples were the products pictured in the journal "Skog" [Forest] promoting ideas on how the forest could be used in new ways. In this journal, products and the ideas behind the products were portrayed in a way that had an affinity to the way I work and the ideas behind the products - which together help to build up a kind of brand…*

Conceptual representation, nature, and technology: *The logo was designed with inspiration from the furniture tools, and an added value was that it can illustrate growth rings in a tree - a mix between the machine and the natural…*

Emotional recognition and interaction revitalise cultural heritage: *You can decide how bright you want it to shine by turning the tightening mechanism…By using an old technique as a mediating tool in a*

new and innovative way, values are added to the product which may cause the user to be more connected to it through association, and this might create a desire to keep it for a longer time. The new and the old together thus may create more long-lasting and sustainable products and, in addition, may contribute to revitalize cultural heritage.
Business, emotional recognition: *Through larger production the product can be more accessible to people in price and show continuation of our cultural expressions. In mass production the product can still, through the associations evoked by its design, contribute to a sustainable product, if it is seen as meaningful to own… (Ohlsson, 2013)*
The lamp *Turn* came into being by showing threaded timber in a new way in a new product, and it preserves and commemorates an old craft tradition rarely used today. Some other categories that emerged in the analysis were material expressions: vegetation identity, species diversity, contact with nature, and contact with the material. *Turn* further encouraged the desire to generate memories of childhood woodwork classes and old craft traditions. The lamp encourages interaction between user and product. The user must touch the lamp to turn the light on and off. Materials are birch and mouth-blown glass. It is manufactured by the furniture company Bolia. The product has contributed to a marketing strategy of corporate social responsibility [18] for the Forest Owners' Association in their magazine *Skog* [Forest].

5 DISCUSSION

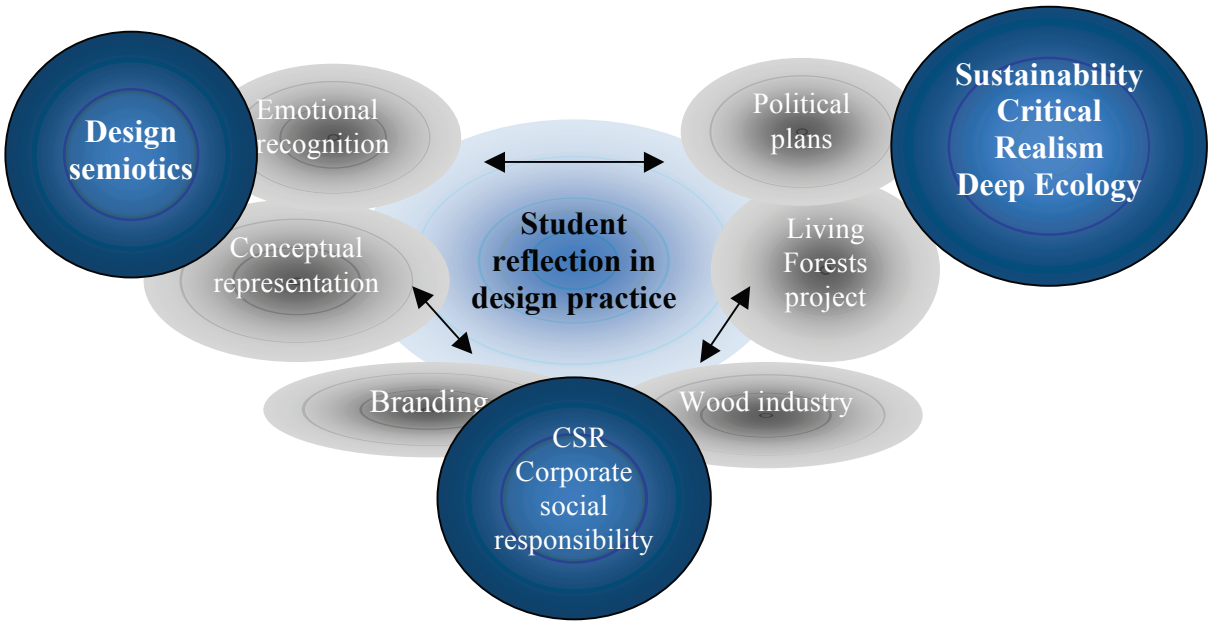

Figure 2: A pedagogical concept for sustainable thinking in design education.

The findings showed design qualities as described by Rune Monö [6]. Examples of such qualities are the semantic quality of the large-size screw, which due to its threaded body, obviously is made to turn. The screw could make the object look like a tool, but the additional elements of cable and frosted glass clearly tells the viewer it is a lamp. This makes it likely that turning the screw affects the light. The blown glass and the wooden parts give associations towards handicraft and quality. The feeling of quality is enhanced by the lamp's high finish. The lamp has strong cultural associations to old woodworking tools, but it still looks modern due to the combination of wood, glass and its high finish.
These design qualities are discussed in two philosophical views that bring together nature and technology in different ways: Critical realism by Roy Bhaskar and Petter Næss [9] and Deep Ecology by Arne Næss [3, 19]. In Deep Ecology the view of nature is that, one not only has to think about man's close relationship with nature, but that all animals and plants belong in a holistic perspective [3]. In Deep Ecology [19] everything is connected with everything through a mutual, dependent relationship in a long-term perspective. It is a symbiosis where all parties extract mutual benefits from each other through a true companionship. Deep Ecology emphasizes the importance of relational

thinking, holistic thinking, and system thinking. These are all factors of importance within a holistic design perception. In relation to the lamp *Turn,* Deep Ecology is also interesting through its striving for preservation of diverse cultures. The lamp has a strong cultural identity and roots to cultural heritage. In such an ecological and sustainable view of the world, self-realisation means that the self is widened by seeing ourselves in others and in our environment. This leads to a deepened perception of reality and our own self; a deepened realism [20]. "*In this journal [Forest], products and the ideas behind the products were portrayed in a way that had an affinity to the way I work and the ideas behind the products",* the master student said.

In critical realism, the view of nature can be associated with how Petter Næss [9] discusses the scientific rationale that urban planning should be possible and meaningful, pointing out critical realism as a prolific science and theoretical platform for urban research. Several of today's most prevalent epistemological positions are incompatible with bringing forth the knowledge base needed for urban planning to play a meaningful role. Critical realism considers interdisciplinary integration as necessary, while competing positions, e.g. positivism and post structuralism neglect and exclude important parts of reality. Critical realism recognises both actors, and structures independent, causal, impact forces and thus provides a good platform to examine the causal relationships between social, spatial structures and actors' actions like those performed by planners. Here, the product-design, master student acts as a designer within the structure of the forestry business. Critical-realism views on what kind of research-based predictions are possible fit with the product designer's qualitative impact assessment of solution options and careful context-adapted estimates of effects of the product she designed. The design master student considered the effects of handicraft traditions, cultural heritage, branding, materials, colours, new uses for forest products, and mass production as a basis for the action of designing the lamp.

5.1 Conclusion – implications in design education

The conclusion of this study is that it has possible implications in design education and design practice. Our aim has been to explore how a design theory like product semiotics [15] is good but insufficient in aiming for a sustainable design process, and that it does not capture considerations like innovation in the timber and forest industries. The study indicates that product design, based on sensitivity for material origin and cultural heritage, can contribute to holistic thinking, thus connecting design, forestry, and technology. Therefore, we may need to expand design theory with ecological theory [3], perhaps critical realism [9], or both. Further studies could contribute to an understanding of which elements of their theories could be more relevant in design practice, or whether a combination of these theories might be possible. Students can thus get an expanded view on learning outcomes, on material techniques, as well as how such techniques are an integral part of a worldview.

Such a positioning of design practice requires cross-disciplinary collaboration which may contribute to an expanded view on aesthetic experiences [21] and a deepened understanding of self-realisation from an ecological perspective [20]. Experiences that expand the product itself, its use, and its form language, where product design is intertwined in a complex way with the designer's self-identification and ethical values, reflect industry, technological innovation, and social values like cultural heritage, as demonstrated in this study.

5.2 Learning outcomes, product materiality, and sustainable environment

The learning outcomes identified [10] in the case study are relevant issues in human technology relationships in product design that concern knowledge, skills and general competence. Knowledge is to understand that the materiality and product qualities belong to a broad-based and sustainable consumption perspective. Skills are related to how the material's inherent properties through the shape and design can give signals about the origin and culture. A general competence is to see nature and design as mutually corresponding elements in a global, sustainable perspective. This case study is associated with a single product, but the phenomena identified might be of general interest and might have transfer value to other products, architecture, and system thinking from an environmental perspective [14]. However more studies are needed to explore a sustainable integration of possible connections between nature, culture and technology, and how it can be transferred into new arenas. Such arenas could possibly be found in the creative industries, the forestry and wood industry, or service-design in the field of primary industry.

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