INTERNATIONAL CONFERENCE ON ENGINEERING AND PRODUCT DESIGN EDUCATION
8 & 9 SEPTEMBER 2011, CITY UNIVERSITY, LONDON, UK

# A CREATIVE TOOL TO BREAK HABITS: BREAKDOWN OF FUNCTIONS, DISASSOCIATIONS & COUNTER QUESTIONS (BDC)

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Abstract

Research and practice have engendered several creative tools on how to generate ground-breaking products with less environmental impact adjusted to a down-to-earth production state. However the relation between the repetitive uses of the same creative tools is a paradox in relation to habit psychology. Design educators expect creative solutions from the students although they facilitate to establish habits through arranging for repetitive performance of design and idea generating processes.
This article introduces the key terms Breakdown, Disassociations & Counter questions, (BDC), as the main facets in a creative tool, a process identified in engineering practice.
The strategy model was synthesized through building structures by literature studies. The BDC tool was also explored through analysis of external consistence and usefulness. Case studies were analyzed by disclosing structures to generate new solutions for the model.
The model was used as a tool for knowledge transfer in design education. Students adapted the method through implementation of the model in their design process. The practical results were that the tool can help design students in breaking habits established and moreover facilitate a design approach that leads to innovation within an area of constraints. This results in a new proposal of the BDC tool which include leading the thinking process into a social or emotional context and goal description.

Keywords: creative process, learning outcome, radical innovation, sustainable design

## 1. INTRODUCTION

Working processes intended to elicit creative solutions are plenty but the outcome is often reduced to drawer documentation and fun experiences. The problem related to the use of creative tools is repetitive use of the tool, the terminology and information handled in the process which is linked to or originates in, earlier behavior. Moreover the typical creative tool often release the design student from thinking within the constraints of the task as well as from own values and attitudes. The student is therefore misled towards generating wild ideas that not even the he or she believes can be transformed or materialized into products valued by the society. Habits and professional terminology becomes therefore a barrier for emancipation itself and furthermore the thinking within the limitations of the project the obstacle still to overcome.
A designer must go through a long and enduring process in order to develop innovative products. Consequently the designers trust in own ability of creative performance is vital, in order to be innovative. One interesting concept in this regard is creative self-efficacy, defined as ‘‘the belief one has the ability to produce creative outcomes’’ [1, 2]. The creative tool BDC is a proposal to enable design students to be creative and therefore build up a confidence about their own capability to create innovative products. Tools that enable students in obtaining such an attitude can be facilitated as a part of problem based learning where students are introduced to an open tool dependant on defining of premises and necessary skills to be obtained or used [3, 4].

### 1.1 Creative tools in relation to learning outcome

The act of creation as described by Arthur Koestler is: *selects, re-shuffles, combines, synthesizes already existing facts, ideas, faculties and skills* [5]. Mumford, M found that: *the ultimate concern in*

*studies of creativity is the production of novel, socially valued products* [6]. In the perspective of design education it is interesting to contextualize the definition of creativity in relation to Blooms hierarchy of cognitive domain referred to in the EUA Bologna requirements [7]. The levels; *1. Information, 2. Comprehension, 3. Application, 4. Analysis, 5. Synthesis and 6. Evaluation* constitute the hierarchy where each level depends on the student's ability to perform on the previous level or levels [8]. For example, for a student to apply knowledge (stage 3) he or she would need to have both the necessary information (stage 1) and understanding of this information (stage 2) [9, 10].
The skill of application is described as *"the ability to use knowledge in new situations, e.g. put ideas and concepts to work in solving problems"*. Accordingly we define creative act; a capability that enables the creation of solutions recognized as highly innovative socially valued product concepts. The term concept is used to embrace the possible associated system or service to a product. "Creative tool" in this context is understood as a tool that facilitates the designer to define a process that leads to a creative act and creative self efficacy.

### 1.2 Habits

Creative tools can help designers break behavioral habit patterns coupled to creation processes. Habits are described by Kurt Lewin as behavior performed without considering the relations to own attitudes [11]. K. Lewin called such behavior *frozen*; additionally he describes the change of habits as *unfreezing* and finally the settling of a new behavior as *freezing*.
Grankvist found that the frequency of past behavior reflects the degree of habits strengths [12, 13] and that regular experience of rewarding consequences are important for a habit to develop [13]. Furthermore he found that; "a critical factor for a habit to develop is stability of the context of performance. In a stable context habits are more likely to develop and to exert an influence on behavior".
Dahlstrand & Biel has proposed 7 sub-steps to Lewins 3 steps of behavioral change [14]. Their research on the three first stages out of the seven explains a method on how to unfreeze habits namely; 1. *Activation* 2. *Attending present behavior* and 3.*Consider alternative solution*. The stage of activation or *priming* describes the need to inform about values related to the forthcoming experience [14, 15]. Research on behavior in the purchase of eco-labeled products show that priming customers just by asking of a person's attitude towards eco-labeled products leads to more sales of eco-labeled products [13]. The activation has to be linked to the coming experience where the person is expected to *attend present behavior,* e.g. easily spotted eco labeled products at point of purchase; otherwise the person will behave according to his or her habit. In order to finally *consider alternative solutions* , a person needs to know how or what to do in order to plan the new behavior e.g. knowledge of what type of labeling that in fact is favorable to purchase in relation to the environment; or that a person has to know where batteries can be returned not only that they can be returned before considering present behavior and planning new behavior [13].
Based on this background we identified the research question of how a creative tool that enables the breaking of habitual behavior can be identified to facilitate highly innovative product solutions.

## 2.0 METHOD

The method to study the conceptual phase in a product development process was done by studies of habit psychology, interview and a case study approach. Interview analysis was done by concept mapping to disclose creative processes in practice [16, 17]. Three key elements of habit breaking elements were identified in the analysis namely "breakdown of functions, disassociation" and "counter questions". The understandings of these three concepts are explored through the case studies [18] and discussed in relation to product design education. Similarities and differences were disclosed through concept mapping in diverse contexts in order to construct an approach that can be used in new situations [17].

## 3.0 BREAKDOWN OF FUNCTIONS, COUNTER QUESTIONS & DISASSOCIATIONS (BDC)

### 3.1: Interview: Old Olsen

C.H.G. Olsen (Figure 1) (1835 – 1921) was a Norwegian inventor. He owned and managed the mechanical workshop C.H.G. *Olsen & co, Værksted for Videnskabelige Instrumenter,* which was

established in 1861, and invented several apparatuses. In 1878 at the World Exposition he received the gold price for a telegraph (Figure 1) invention in competition with Thomas Edison i.a. The essence of the creative tool C.H.G. Olsen used while inventing was to turn a problem on its head in order to see it from different angles. He would perform the process also on working solutions in search for even better solutions. C.A. Ljungmann started working for C.H.G. Olsen in 1888 and passed on the ideas of C.H.G. Olsen to his grandchild Øystein Ljungmann whom we have interviewed. Ø. Ljungmann partly grants the Old Olsen for the numerous inventions and patents he has developed throughout his career running the small company Instrumec as. along with his son, constructing and manufacturing medical instruments. Instrumec has had great success and has sold medical instruments all over the world until they were merged with the Danish company Dako Denmark as, presently selling Instrumecs former products. Ø. Ljungmann use the "Old Olsen method" as a brainstorming tool and states that engendered solutions are often based on a combination of several "wild "ideas but emphasize that using Old Olsen is hard work.

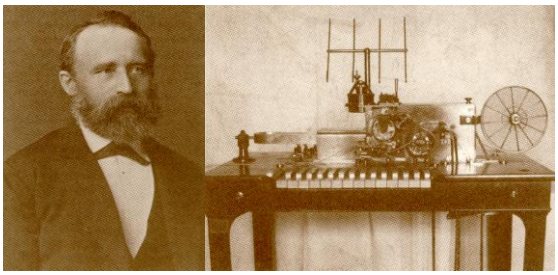

*Figure 1. Old Olsen and his telegraph invention*

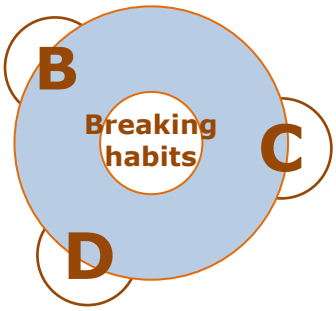


*Figure 2. BDC creative tool*

### 3.2: The BDC tool

Three key elements were identified through analysis of the inventive engineering practice "Old Olsen method": breakdown of functions, disassociation and counter-question (figure 2).
Example of analysis from Instrumecs practice Case Coverstainer:
A product to prepare and stain histology test tissue on glass slides for microscope analysis. A problem during development was that the magazine holding the glass slides carried too much chemicals from one bath over to another. The break down process directed the thinking away from magazine, towards the necessity to lower only the tissue into the stains (B). Counter questions were prompted such as (C): *what is a magazine? Does the magazine have to be lowered into the baths?* The counter questions and breakdown of functions was made achievable through the rephrasing of the word magazine to an objective description such as: *system that facilitates the glass slides to be lowered into a bath*. The final solution was a holder in which one end of the glass slides could snap on to. This disclosed the possibility to only lower parts of the glass slide alone into the different baths and the "carry over "was minimized.
**Breakdown of functions (B)**: defined by a thinking process that involves splitting up concepts into entities and entity into functions. Thus a product is looked upon a product synthesized by functions
**Disassociation (D)**: a ceased conception related to a term or product.
**Counter questions (C)**: questionings of the engendered findings in the process of disassociating and breakdown.
Functions in this article are understood as something more than technical features, but as something that utilize users in a physical or affective way, passive or active. These are exemplified in two cases.

#### *3.3 Case 1: BDC in Packaging for "Triomega"*

The BDC tool was studied in a context of a creative process of developing a packaging solution for Triomega (figure 3) - a nutritional supplement based on fish oil. The breakdown (B) of functions was related to the goal to reduce environmental impact through changed behavior in relation to preserving the content of the package, this because the fish oil capsules make the major part of the products environmental impact. Counter questions (C) were prompted to disclose understanding of functions e.g.: *what makes people close a package? Why do people not close packages firmly? What is a lid?*

The questions helped to disassociate (D) from the traditional conception of a function understood as a cap with additional information about the necessity to close the package.
The concluding design proposal was based on the assumption that the users do not like the package to fall over with the possibility of capsules falling out. Consequently the packaging solution was literary turned upside down; a hinged lid made the bottom of the package. Accordingly a new use situation was created where the user has to empty the package from the perceived bottom of the product. This was done in order for people to freeze a behavior of always closing the lid because they would feel that the box would not stand firmly without closing it.

### 3.4 Case 2: BDC in "Public art in a chapel of rest"

The BDC tool was studied in a context of public art namely a creative process for a chapel of rest [19]. The relevance to product development was to involve stakeholders in order to reach a common solution for a specific situation. The process was documented through a participatory design approach. Breakdowns (B) of functions were related to the main function that family members could mourn and be together beside the coffin with the deceased in an atmosphere of spiritual guiding. The problem of function was that even though the room was a part of the church, it had an atmosphere of a logistic function more than spiritual guiding: an empty, white space with some chairs, big grey doors for transportation of the coffin in and out of the room, a door to a cold storage room and a door to a kitchen. To break down the function (B) concept the stakeholders were asked the following counter questions (C): *What is a wake? What situation are you aiming for? Which of these material surfaces refer to what we have talked about?* Through disassociating (D) new functions were disclosed such as to create therapeutic steps in a mourning process as well as to make children dare to come into the room. Another new function was to bring teenagers into the room when there was no coffin there, to talk about death. When finished; the church community decided that the chapel of rest could be used as a silent room as well.

### 3.5. The BDC tool

The relation between the key terms (BDC) in different contexts showed that the processes could be found in both cases, and that they were adapted to the specific situations. In the chapel of rest the BDC terms were closely related to human values and social factors in a collective creation. In the Triomega packaging project the BDC terms were related to change of behavior in a sustainable context, elicited through the product semantics. Accordingly social and emotional contexts were synthesized into the creative tool (Figure 4)[16, 17].

## 4.0 DISCUSSION & FINAL REMARKS

### *4.1 BDC in design education*

An explorative study with the BDC tool was done as a student project in packaging. The study showed that the BDC tool to a little degree was useful in defining problems and goals. The prompting of counter questions felt unnatural for some students possibly due to the lack of goal as a driver for the questioning. Thus context relation analysis seemed to be necessary to make the concept work in a social setting. Goals and emotional & social dimensions can be built into the tool to strengthen external consistence (figure 4) through contextualizing the creative process. To enable even more diverse processes one can include analytic tools such as function analysis, human task analysis [20], principle function analysis, agronomical analysis as part of using the BDC tool.
In an industrial environment a goal description or a brief is often suggested by the client. The goal is often anchored in habits even though the intention with the brief is to facilitate emancipation and innovation. Using the BDC tool might help in order to rephrase a goal description or brief from the description of a total and often existing solution or product towards solitary functions. Accordingly the goal might then help to prevent the designer and the developing team away from a habitual superficial comprehension of a product or as a student put it "*merely shape or aesthetics"*.

### *4.1 The BDC tool and habits*

Design students approaching a new project have when framed within the normal context of performance a propensity to find solutions that originate in earlier behavior. Still the teachers often

give the very same process for the students to follow, with the unrealistic expectance of innovative results. Consequently such a learning environment might break down the students' belief of being able to be creative rather that to strengthen it.
Peoples repetitive use of terms connected to creative processes elicit associations related to earlier behavior and will therefore influence brain storm sessions or analysis sequences [14]. Innovative solutions demand creative tools that liberate the designer from associations linked to combinations of functions and ideas that are known in existing products. Describing a product by objective function descriptions rather than terminology that give associations to existing products can activate the value of thinking disassociated from the conventional product. The act of disassociating from the traditional comprehension of a product can work as an activation towards awareness of own attitudes, a situation that makes it more likely for designers to consider a change of own behavior while performing a creative process.


*Figure 3. Triomega by 2025 design*

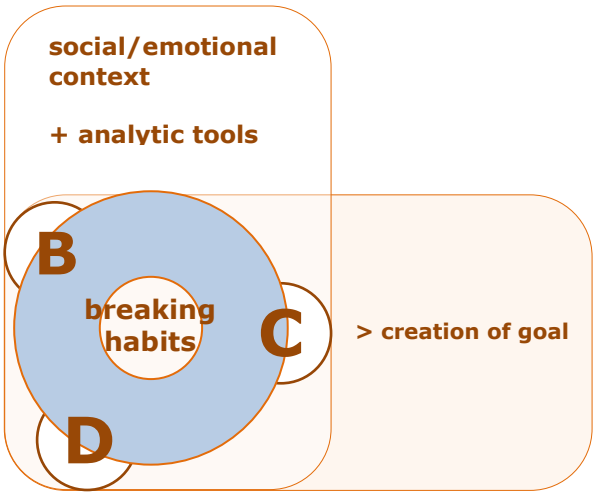


*Figure 4. 2nd generation model of the BDC tool*

Although designing with the BDC demands a certain responsive attitude and therefore might change the frozen habits related to one's own design process, establishing new habits through a repetitive use of the BDC tool might of course embody a problem. Therefore alternative design strategies and theories should constantly be explored related to the specific aims of each project to provoke and question how the BDC is synthesized with contexts and analytic tools. Hence the factor of freezing in regards to using the BDC can be minimized.
Changes of teaching space can serve as an activating factor and therefore enhance the propensity to change student behavior. The means of changing the context for performing design work can be both physical and cognitive. The tool involves therefore partly physicality through the dimension of perception of objects produced in the design process.
By the use of breakdown of functions, disassociations and counter questions frozen habitual patterns can be broken. Thus the designer's creative process is emancipated. Accordingly highly innovative products as well as improved product properties linked to commercial and sustainable issues can be possible outcomes.

### *4.1 The BDC tool and learning outcome*

The designer has to decide on what dimensions and analytic tools that is most suitable for the use of the BDC tool for each specific project. This process will activate thinking and performance on all levels of Blooms taxonomy.
Creative tools are especially useful in order to meet the demands in EU-criteria of learning outcomes in design education, because they contribute to make the learning process explicit and transparent. Research based documentation linked to use and development of creative processes is rare. A strategy to develop the design education and practice is to continue the disclosure of different creative practices in professions such as engineering as well as art and design, enhancing the transfer of knowledge to new areas within and across professions.

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