Structured use of Constraints in Ideation

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"Constraints facilitate creativity" is a widely spread idea in creative work. In an attempt to verify this statement, the effect of constraints on the outcome of ideations have been tested. Subjects were exposed to open-ended questions, some without constraints, some with constraints and some with structured constraint. To measure the creativity of the output parts of Guilford model for creative ability was applied. Results showed that working with constraints in a structured manner produced more ideas (when extreme results was eliminated) than when no structure or unstructured constraints were present. These results show that constraints play a part of creativity and that understanding how to apply them in a creative task might be useful.

Keywords: creativity; constraint; ideation; triz; design fixation;

Constraints and creative work

"Design Fixation" is a well know problem in creative work. Existing ideas or solutions blocks the creation of new ideas, and only modifications of existing ideas or solutions are generated (Youmans 2010).

"The Blank Page" effect is also a common problem in creative work. The possibilities of a blank page and the unlimited scope of decisions that needs to be made to fill it can be overwhelming and the creator is paralyzed not able to start. To get around "The Blank Page" effect it is common to introduce constraints (Joyce 2009).

TRIZ is a problem solving method that uses information about a problem to find similar problems. This is done so the solutions of similar problems can be studied in the hopes of finding a relevant solution. TRIZ consists of a set of design principles that can be used when a feature of the design results in unwanted factors, such as making the object heavier when trying to improve its strength (Altshuller 1999).

Constraints are restrictions that limits the number of solutions for solving a problem. Constraints can be rules, goals, norms, and scarcity (Joyce 2009). Constraints are said to limit creativity, but it is also said to foster it. Creativity-friendly constraints include a clear problem with clear goals. Like writing a 6 word story or the Iron Chef "secret ingredient" challenges (Haught-Tromp 2016).

Creativity is an infrequently studied construct and a clear widely accepted definition of creativity has been lacking. To measure creativity as a personality trait, Guilford's creative ability model can be used (Batey 2012). Guilford model consists of four axis; *fluency*: number of ideas, *flexibility*: the differences between the ideas, *originality*: how unusual the ideas are compared to other participants, *elaboration*: detail of the ideas (Guilford 1950).

Structured use of constraints means identifying constraints and their options before in a systematic manner applying each option on each constraint. This approach may become ineffective with many constraints. Main constraints could be considered and 1-3 constraints could be isolated and tested systematically to save time.

Use of constraints in creative work

In the NTNU course called "Making is Thinking" the students had an ideation workshops were the students worked in teams. During this ideation sessions the teams were encouraged to focus on fluency and flexibility rather than originality or elaboration. The students were provided post-it notes to write down ideas. During the workshop some open concepts were posted on the board for the students to draw inspiration from. Words like water, concrete, summer.

Some time into the workshop one of the lecturers started saying new concepts to draw inspiration from. This became frantic as the students could not write down more than one or two ideas connected to each concept before a new concept were introduced. This resulted in that the work was to some degree disrupted as there was a mismatch between the speed of the student and the lecturer. The set of options for constraints did however provide inspiration making it possible for the students to generate ideas with fluency and flexibility.

This situation does indicate that semi-structured use of constraints are a common part of a creative process among professionals in creative occupations. In this situation the students would have been left with a blank page had it not been for the concepts written on the board. Many options for the constraints was provided and the students worked well when the options was written down, but when the session got unstructured by the lecturer listing options faster than the students could work, the process was to some degree disrupted.

Using a list of options and iterating over them draws similarities to TRIZ. When stuck on a problem where all ideas creates unwanted features TRIZ gives a methodical way to work with methods on the problem and can help create the ideas needed to solve the problem. Those TRIZ can be said to in some cases to be a counter for design fixation. What prevents a solution of the problem from being found is that the team working the problem is fixated on a set of possible solutions. Introducing the methods TRIZ provide results in a bigger sets of solutions being tried out. TRIZ removes some constraints, it makes the team less constrained of their earlier experience and knowledge of methods. TRIZ does however introduce constraints, if the solutions the team looked at before consulting TRIZ not described in TRIZ the solution might be abandoned or forgotten. The constraint in this case is what method to apply to the problem to generate a solution. Each of the methods provided in TRIZ is an option to the constraint. It is therefore possible to argue that TRIZ is a framework for applying options to a constraint in a structured manner.

Testing structured use of constraints

Taking a step back looking at the workshop and TRIZ one of the similarities that appears is structured use of constraints. Exploring the concept further and using Guilford's method to measure creativity derives the hypothesis "Does structured use of constraint result in higher fluency of ideas in ideation than the use of unstructured constraints or no constraint?".

To test the hypothesis an experiment was designed. Three scenarios was created where all scenarios asked the participants to provide ideas for new transportation methods. The difference between the scenarios the constraints provided, in one there was no constraints, in the other scenarios a list of constraints was provided, in one they were just listed in the other each constraint option got a separate input field so that the participant had to finnish generating ideas for each option before starting with the next option.

Questionnaire was chosen as data generation method. Ideally the experiment would the experiment have been carried out physically but due to time constraint a digital form was used. To divide participants to the three different questionnaires a webpage[1] was created with the function of working as the experiment landing page. The page randomly gave the participants a link to one of the questionnaire.

Guilford's method provides four axis and gives the ground for a qualitative analysis of the generated data from the questionnaire, but due to the scope of this article a quantitative analysis approach meaning only one of the four axis was used to analyse the data, the fluency or quantity of ideas generated.

Result and discussion

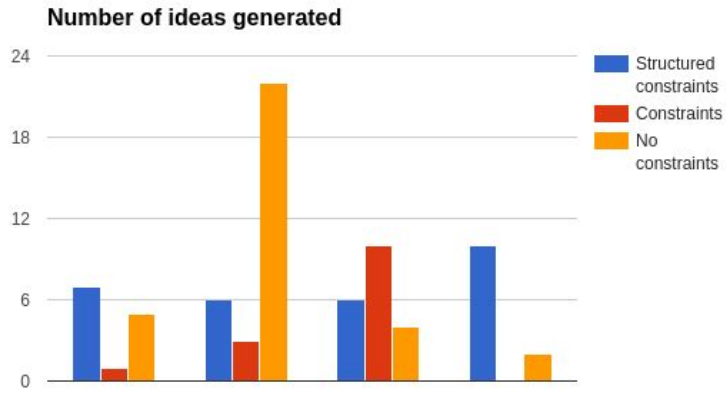

Figure 1. Number of ideas generated per participant, 11 in total.

The experiment generated 11 responses[2] in total divided between the different questionnaires. The responses are shown in Figure 1. The results indicate that structured use of constraints gives a more even fluency between the participants than the use of unstructured or the use no constraints. Looking at the common fluency the structured constraints scores higher if the anomalies are removed.

The sample size of this experiment was not sufficient to draw any conclusions. The participants was from different backgrounds with different experience working creative problems. The experiment would have benefitted from being done physically with a set time to prevent distractions and ensure the participant worked the problem for the set time. This suggested based on the effect observed where the participant answered less and less on each option in the task. Based on feedback from the questionnaire, a better explanation of the task could have been beneficial. The explanation of the task was kept short, as online questionnaires instructions tend to not be read thoroughly.

Conclusion

The results from this experiment indicates that structured use of constraints can provide fluency in ideation. Due to few participants it is not possible to conclude, but this experiment provides grounds for further experimentation.

The fluency in responses on the structured constraint task was more even than the fluency on the task with constraint and the task without constraints. The responses on the no constraint task surprisingly did better than the responses on the unstructured constraint task.

Notes

1. The experiment can be viewed at https://dagfro.de/projects/fuzzy/paper/

2. The results can be viewed at https://dagfro.de/projects/fuzzy/paper/results.php

References:

Altshuller. 1999. TRIZ bok Al′tshuller, G., Shulyak, L. and Rodman, S., 1999. *The innovation algorithm*. 1st ed. Worcester, MA: Technical Innovation Center, Inc.

Batey, Mark . 2012. *The Measurement of Creativity: From Definitional Consensus to the Introduction of a New Heuristic Framework*

Guilford, J. P. 1950 *Creativity*, American Psychologist, Volume 5, Issue 9, p444-454.

Haught-Tromp, Catrinel. 2016. *The Green Eggs and Ham hypothesis: How constraints facilitate creativity.* Psychology of Aesthetics, Creativity, and the Arts, Vol 11(1), Feb 2017, 10-17.

Joyce , Caneel K. 2009. *The Blank Page: Effects of Constraint on Creativity*

Youmans, Robert J. 2010. *The effects of physical prototyping and group work on the reduction of design fixation*