THIS IS HOW WE ROLL; A PLAY ON CREATIVE THOUGHT AND THE GENERATION OF NOVELTY

A play on creative thought and the generation of novelty

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Abstract

This paper examines generation of novelty and creative dynamics in design teams that aim at arriving at something truly novel. Looking at the works by Schumpeter, Campbell and March in explorations for solutions that go beyond what could be easily foreseeable and the works of Smith, Lindsey, Cardoso among others, in the field of design fixation, this paper explores an approach taken to introduce elements of randomness in design exercises to prevent fixation and facilitate aimless and unguided explorations. The dynamic explained in this paper presents the utilization of a game-based dynamic in design teams that facilitates the generation of novel ideas.

Introduction

To arrive at something truly novel and creative is a common desire for design teams. Following Schumpeter (1934), such an outcome often relies on a re-combination of already existing concepts and materials that successfully deviates from established knowledge. Generating new combinations that deviate from what is established as the standard, requires exploration that goes beyond what could be easily foreseeable. In order to arrive in an unforeseeable solution space, we need what Campbell (1960) refers to as a blind variation. That is, an expansion of knowledge that is somewhat random, aimless and unguided. The design teams need to explore ideas seemingly unrelated to the problem space and connect distant knowledge domains since "… new provinces… can only be brought about by accidental circumstances." (Mach, 1896). Such an expansion of knowledge is however risky. History tells us that most new combinations are bad ones and that "only a small, unpredictable fraction of novel initiatives will turn out to be successful" (March, 2010). In order to arrive at something truly novel, a design team will therefore need to generate many deviating solutions. Research has shown however, that it is very difficult to let go of design solutions and start developing completely new ones. Existing solutions easily turn into design fixations.

As exemplified in the editorial by Cardoso & Badke-Schaub (2011), to imagine an alternative use of a well-known object, such as a pair of pliers, in an ideation session is challenging since previous knowledge constrains our thoughts and may make us fixed on the well-known function ('functional fixedness'). Another type of fixation is 'mechanized thought' where the same previously successful thought process will tend to become used by default and lead to the same familiar solutions. In addition, "when an example of an existing solution is presented to designers during idea generation,

they often copy features and principles from such examples, ultimately reusing the example in suboptimal ways".

This is what we noticed in our student design team who were part of a nine-month design project. They had been presented with the challenge to 'find a new use and market for drones', and after careful benchmarking they struggled to get beyond conventional uses. To help them, we introduced a game that would force random elements to be added in their ideation sessions and we did so based on picture dice (Story Cubes). In what follows we first describe the game as it was used. In a next section we will then analyze the game from a fixation perspective to see how it may help design teams overcome fixation and facilitate the generation of novel ideas.

The Dice Game

Image 1: Story cubes used during the idea generation process by the participants

The dice we used are Story Cubes and originally part of a social game where participants roll a set of dice with pictures. The goal is to tell a story that includes all the rolled pictures. The original dice set includes both activities and things but can be expanded with themed extra dice sets ranging from "activities" and "medical" to "fairy tales" and "Batman". The pictures on the dice are simple line drawings and offer multiple options for interpretation. A magnifying glass can for example represent a magnifying glass, but also a detective, search, or investigation. The dice can be arranged in any order in the telling of the story.

A Design Thinking Challenge

As already mentioned, our students' challenge was to develop an alternative use and market for drones and the project was referred to as 'UAV Taxi'. What the drone was supposed to transport and in what context was part of the challenge. The aim of the project was for the

students to learn to practice Design Thinking. Design Thinking is a structured, hypothesis-driven, human-centered, innovation method inspired by designers' ways of working. It is based

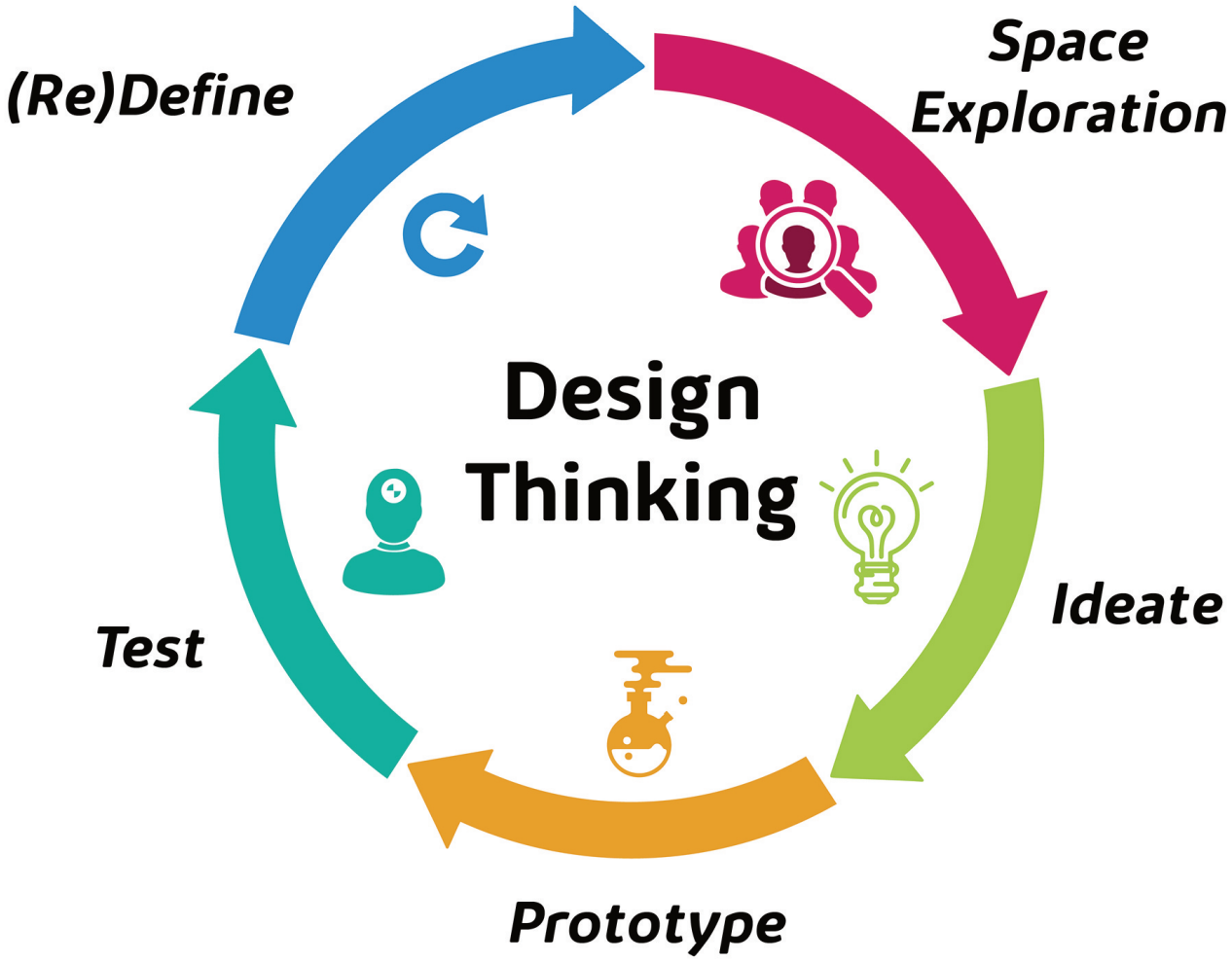

Image 2: Iterative design thinking process

on an iterative cycle of problem definition, space exploration, ideation, prototyping and testing that leads to new insights into the user's needs. It aims to simultaneously addresses technical feasibility, financial viability and the user's desire for the solution, but takes desirability and the user as the starting point. It is collaborative and interdisciplinary and aims at learning fast through rapid, simple and cheap prototyping and testing with real users. Our eight students were part of an interdisciplinary team and had backgrounds in product design, visual design, mechanical engineering, and strategy. It

was an international team collaboration, with students from two different universities, so the students were culturally mixed with four Brazilians, one Finish, one Estonian and two Swedish students.

Playing the Game

To try to help the students get unstuck, we initially divided the design team of eight into sub-teams of two and set them up with a starter set of five dice of different kinds.

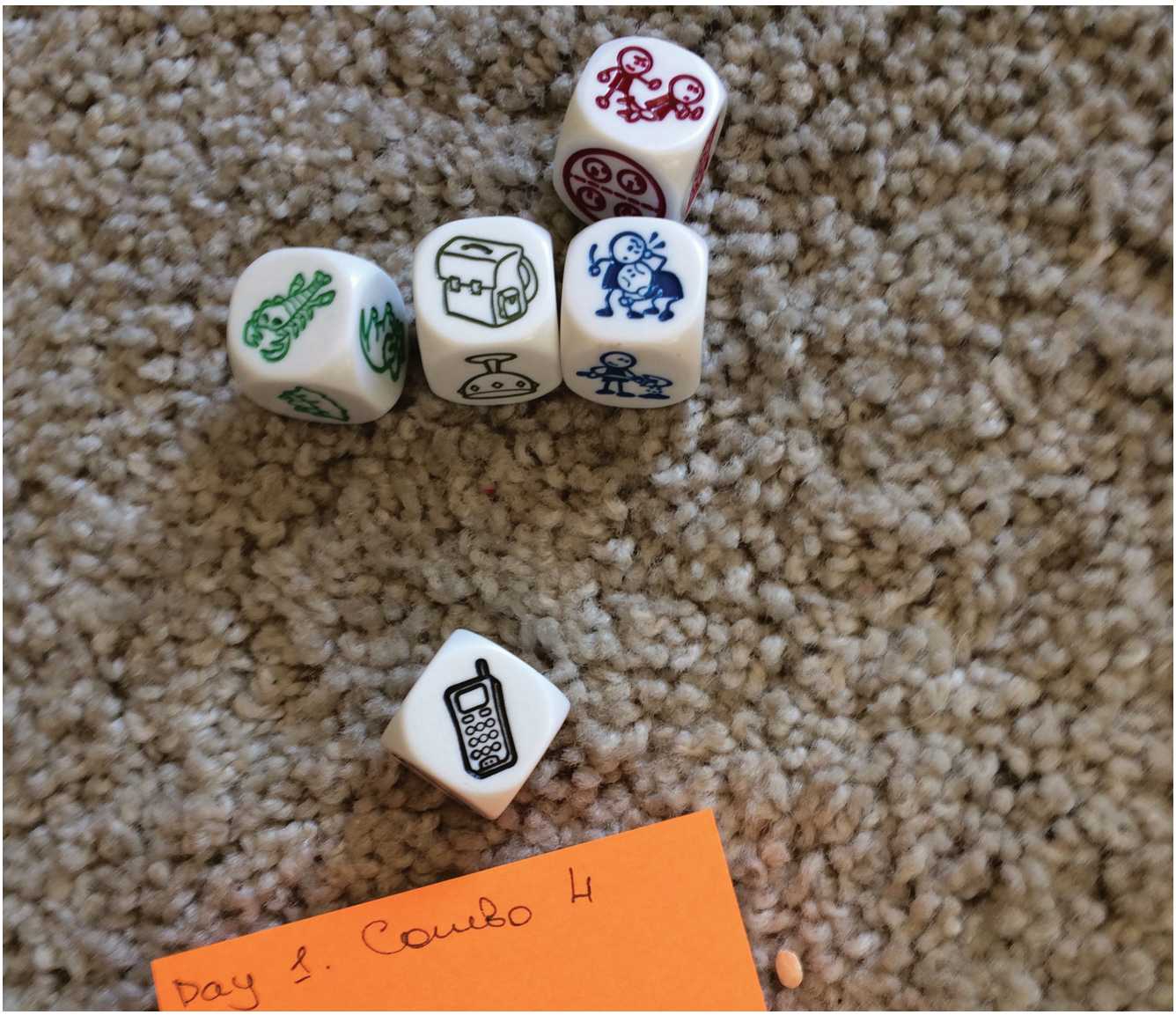

Image 3: Example of a roll used by students to generate stories

Telling Stories

The students' task was to spontaneously tell a story based on the dice they had rolled. In addition to the dice pictures, every story had to include a drone. They were handed post-its and asked to take a photo of the dice they had rolled and to write a short summary of each story they created. In the initial rounds, each participant was expected to tell their own story based on the dice to make sure that everyone felt expected to contribute and lost their inhibitions when it comes to telling silly stories. Once everyone was active and engaged, they could also create the story together with their partner.

From Stories to Scenarios

Once the teams of two had reached the goal of some twenty different stories they were asked to reflect on the stories they had created and see what drone uses they might indicate. The stories created varied from possible solutions to potential obstacles that can be found in the

Image 4: Example of stories generated by students during a session

challenge. One story for example featured a pirate, something that could be abstracted to the more general scenario of "Criminal", which led to discussions of how criminals might desire having illegal things drone-delivered over prison walls. Each new use scenario was noted without judgment of appropriateness or chance of success. Some stories were of course complete nonsense and would not lead to a second level abstraction. The sub-teams would then share the scenarios they had found with their other teammates. Once done, the teams would exchange partners, pick up a new mix of dice, and get going again. Our students initiated multiple game sessions spread out over the course of a week.

From Scenarios to Categories

After some 250 stories were created and scenarios abstracted, the team would synthesize and form connections between what had been produced. The participants sorted the scenarios and rearranged them seeking connections. The connections were based on criteria established by the team with the intention of finding paths that could be taken in the later design stages. Our students organized their scenarios into categories of drone use such as 'healthcare' (ranging from drone delivery of tools during surgery to nano-drones operating inside the body), 'rescue operations', and 'entertainment'.

This way interesting scenarios and categories were identified and used as starting points for further space exploration and need-finding.

Thoughts and Theories Behind the Game

Following March's (2010) separation of novelty as "deviation from established procedure or knowledge" and creativity as "novelty that is subsequently judged successful" the game was used in the initial steps of a design process where novel areas for problem search were identified. Among the scenarios and categories generated there were many novel ones, whereof only few were selected to be developed into potentially creative solutions. Our aim with the game was to provide the students with a tool to overcome some of the counterproductive effects of fixation and facilitate novelty generation.

The sources of fixation (why do we become fixated?)

Following research in the area, fixation is something that "blocks successful completion of various types of cognitive operations" and a result of "the inappropriate and counterproductive implicit use of knowledge" (Smith & Linsey, 2011, p. 85), meaning that people tacitly bring knowledge of solutions that have worked before into new problem areas and fails to see past it. There are numerous examples of experiments where students have been exposed to solutions, even flawed ones, and thereafter have incorporated them into their own solutions (see e.g. Jansson & Smith, 1991; Purcell & Gero, 1996). Fixation is not only bad though. More often than not, being able to see connections and effortlessly transfer knowledge between problem situations is a good thing, and part of what is considered skill and to be skillful (Polanyi, 1952). Experienced designers may that way however, also become attached to what they have already created and try to improve upon it instead of generating alternatives. Fixation has hence been referred to as "negative transfer of knowledge between problem situations" (Chryisikou & Weisberg, 2005 referred to in Cardoso and Badke-Schaub 2011).

Overcoming fixation

Much research has been devoted to how we may get around the negative effects of fixation. On top of very general suggestions, such as 'incubation' (letting the problem rest for a while) and exposing oneself to environments that are rich in cues and clues that may help trigger insight, Smith and Linsey (2011) sums up strategies in three main categories:

Forgetting fixation by putting it out of mind: This they suggest can be done by 'Inhibition' (identifying the fixating knowledge and intentionally putting it aside), 'Interference' (replacing a fixating response with another one), or 'Changing Context' (understanding the problem in a new context). The first two require that the fixating knowledge first can be identified, which may be difficult.

Redefining the problem: This can be done by thinking about the problem in an atypical work situation.

Using analogy: Finding other areas with an analogue relationship to the problem area. A waiter's hand carrying a tray can for example serve as an analogy to the construction of a highway overpass.

What the dice do

"As an instrument for selecting at random, I have found nothing superior to dice.

Galton (1890), p. 13

As mentioned in the introduction, novel solutions are re-combinations of known concepts and materials and rest on a somewhat unguided and random expansion of knowledge that is difficult to plan. Our students' main problem was to ignite this expansion and get beyond conventional use. One reason for this was inhibitions when it comes to exposing potentially stupid ideas and therefore over-thinking and judging before sharing. Another reason was the lack of outside stimuli. Dice have a long history of being used as tools for randomness. The randomness induced by Story Cubes is limited to the illustrations on each side of a die, but then as the pictures are open to multiple interpretations the number of possible outcomes increases. A combination of random elements from the dice and the problem domain-oriented knowledge that the students already had made the students stretch their imagination into areas they had not previously thought of, but still kept them grounded in their challenge.

Multiple interpretations.

The introduction of the Story Cube dice, which contained several different pictures, allowed our students to create several scenarios even if the same pictured appeared in multiple occasions. This was possible due to the multiple interpretations that each student gave to a particular image. One such example of different interpretations was one of a picture depicting a magnifying glass. For one student the picture was related to search while another interpreted as a detective, which allowed for two completely different outcomes.

Randomness.

Novelty cannot be conceived by only searching in the vicinity of what it's known to us, they require an element of random combination or chance that allows for new outcomes to appear. Introducing such element of randomness was the task attributed to the dice during the game. As previously proposed by Galton, the outcome of a roll of a number of dice cannot be predicted and by combining a number of dice with different faces, the number of possible combinations increased.

A change of context

The game itself forced our students out of their normal work environment but also transferred their challenge to a different context. Since the fixating knowledge was difficult to identify in our case, playing the game put their challenge in contexts that otherwise would not have been part of their creative dynamic by subjecting it to random scenarios.

The telling of stories provided opportunity to transfer and combine 'inside domain knowledge' with 'outside domain knowledge' on a first level of abstraction, capturing analogies. Reflecting on the stories and trying to find the higher-level categories was then similar to Linsey et al.'s (2008, referred to in Smith and Linsey 2011) use of word trees.

References

Campbell, D. T. (1960). Blind Variation and Selective retention in creative thought as in other knowledge processes. *Psychological Review*, vol. 67, p. 380-40

Cardoso, C. Badke-Schaub, P. (2011) Fixation or inspiration: Creative problem solving in design. *Journal of Creative Behavior.* vol. 45, p. 77-82

Chrysikou, E. G., Weisberg, R. W. (2005). Following the wrong footsteps: fixation effects of pictorial examples in a design problem-solving task. *Journal of Experimental Psychology, Learning, Memory and Cognition* Vol.31 (5), pp. 1134-1148.

Galton, F. (1890) Dice for statistical experiments. *Nature.* Vol. 42, 13–14

Jansson, D., and Smith, S. (1991). Design fixation. *Design Studies* Vol.12 (1), pp. 3-11.

Linsey, J., Wood, K., Markman, A. (2008). Increasing Innovation: Presentation and Evaluation of the Word Tree Design-by-Analogy Method. *ASME IDETC Design Theory and Methodology Conference*, New York, NY.

Mach, E. (1896) On the part played by accident in invention and discovery. *Monist*, 6, 161-175.

March, J. G. (2010) Generating Novelty. *The Ambiguities of Experience*. Ithaca and London: Cornell University Press 2010. 75-98. Print.

Polanyi, M. (1952) The Stability of Beliefs. *The British Journal for the Philosophy of Science*, Vol. 3, pp. 217-232

Purcell, A. T., Gero, J. S., (1996). Design and other types of fixation. *Design Studies* Vol.17 (4), pp. 363-383.

Smith, S. M. Linsey, J. (2011) A Three-Pronged Approach for Overcoming Design Fixation solving in design. *Journal of Creative Behavior*. vol. 45, p. 83-91

Schumpeter, J. A. (1934) The Theory of Economic Development. New Brunswick and London: Transaction Publishers 2004. Print