

# Association Memory: Prototype and evaluation of a new creativity method in the context of divergent and convergent approaches for application in business as well as a teaching concept

Lena Pieper  
University of Applied Sciences Coburg,  
Friedrich-Streib-Strasse 2  
96450 Coburg, Germany  
lena.pieper@hs-coburg.de

## ABSTRACT

### Purpose:

To showcase the concept and prototype of a creativity method developed for innovation processes in teaching as well as for business context tested in the field.

The example of ‚Association Memory‘ is intended to investigate how individual methods could be composed based on a toolbox of key ideas of design.

### Design/methodology/approach:

The concept of the method is based on key ideas from design and particularly design research. ‚Association Memory‘ should provide a simple creativity tool for ideation, which expands the solution space and gains a wide variety of ideas in a short time.

Two user case studies are conducted amongst Master students, who are mostly employed at small and medium-sized enterprises (SMEs). The experimental groups apply the method ‚Association Memory‘ to an ideation phase during Design Thinking Process for solving a task and compare the experiences and outcomes with the method to those other creativity methods. The gained experiences and results from the case studies are reviewed by a questionnaire, e.g. the perceived creativity scored according to the Torrance Test of Creative Thinking (TTCT) is questioned here.

### Findings:

This paper relates key ideas of creativity research to practice and showcases results and first experiences gathered with the new method “Association Memory”. Summarized, there is assumed a promising impact for coaching, because the method succeeded in most of the intended aspects of creativity in divergent and convergent approaches within the experimental group.

### Practical implications

A coach or teacher can gain knowledge and inspiration for creating own creativity methods applied in the innovation process.

### Originality/value

While there is a lot of research about creativity itself on the one hand and there is a multitudinous variety of creativity methods in practical usage, which exhibits similar components, in this paper key ideas of design are used analogously to a toolbox for concepting appropriate methods. First results with the new method in reliance on those tested in the field are examined to criteria of creativity and experience.

**Keywords:** *Innovation, Gamification, Creativity, Ideation, Design Methods*

**Paper type:** Research paper

**Topic:** The Human Side of Service Engineering

## 1 Introduction

Facing the increasing popularity of design methods used within non-design-based development teams, there is a need to rethink the conception of those methods with respect to the new users' prerequisites and their needs. There is also untapped potential for Participatory Design (PD), in Design Thinking processes (DTP) or Human Centred Design (HCD) in business as well as in teaching in academics for instance in higher education level. Especially for beginners it is challenging to form an overall perspective of the continually growing amount of creativity methods for practical application, to find one's bearings and finally to choose a proper method for a specific use case.

Former research found similarities to existing creativity methods which are transferred to key concepts of design there (Mose Biskjaer et al. 2017). While there is a lot of research about creativity itself on the one hand and there is a multitudinous variety of creativity methods in practical usage, which exhibits similar components, in this paper those key ideas of design are applied for concepting appropriate methods analogously to a toolbox using the example of "Association Memory".

The goal is to provide a simple threshold creativity tool for ideation, which exalts the imagination of the participant, expands the solution space and gains a wide variety of ideas in a short time by sequences of divergent and convergent elements as well. A gamification aspect aims at a high user acceptance and motivation for applying the method.

After a theoretic introduction, we present the development of the first design prototypes as well as a concept evaluation conducted using a questionnaire referring to the scales of the Torrance Test of Creative Thinking (TTCT). Based on the first assignments and qualitative questioning of the users, it is investigated to what extent the intended aspects of the concept have been received and found helpful by the users.

## 2 Theoretic Background

### 2.1 Creativity

#### 2.1.1 Criteria of Creativity

Corresponding to commonsense psychology Originality and Novelty are the most important criteria for creativity in empirical science. (Groeben 2019) According to the Torrance Test of Creative Thinking (TTCT) it is scored on the following four scales:

- Fluency (the number of ideas generated in response to the stimulus),
- Flexibility (variety of categories of responses),
- Originality (the rarity of the responses) and
- Elaboration (the level of detail in the responses (Torrance 1974)

Moreover, the combination of Novelty and Appropriateness of the new solution is sufficient and indispensable for Criteria of Creativity (Groeben 2019).

#### 2.1.2 Phases of Creativity:

The following four phases of creativity, Poincaré suggests (Poincaré 1908), are empirically tested to the present (Groeben 2019):

- Preparation
- Incubation
- Inspiration (or Illumination)

- Elaboration (or Verification).

The ideal typical modeling of linear sequences must be run through repeatedly in a typical process.

An intensive Preparation is required for the processing depth, which is essential to a new solution. One challenge here is to learn about implicit thought pattern without losing flexibility of thinking. That is, why conscious search of solution is paused during the phase of Incubation – to keep flexibility and gain some space for associative thinking, which is needed to restructure the problem area. The cognitive restructuring becomes conscious during the phase of Inspiration immediately and creates a feeling of Illumination– a so called „Eureka-Moment“.

The solution’s feasibility and viability must be proven and elaborated afterwards in an Evaluation. While Incubation and Inspiration are based on divergent thinking, Elaboration depends on convergent thinking (Groeben 2019).

## **2.2. Divergence**

Divergent thinking as a key strategy in creative processes has been established by Guilford (Guilford 1967). It “allows one to explore in different directions from the initial problem state, in order to discover many possible ideas and idea combinations that may serve as solutions” (Finke et al. 1992: 183).

Mose Biskjaer et al. define divergence as “the process of expanding the design space in order to enable and identify new options and alternatives beyond the immediate design space” (Mose Biskjaer et al. 2017). Avoiding criticism and evaluation is decisive during divergent thinking phases in design processes, because it allows a maximal range of ideas and may lead therefore to the most unconventional the most original ideas. While Divergent thinking may further originality, it does not necessarily work for creativity in the sense of being both original (novel) and effective (useful) (Runco/Jaeger 2012).

## **2.3. Convergence**

In design, convergent thinking is productive to evaluate the ideas and in terms of usefulness and effectiveness in context: “One goes from an initial problem state through a series of prescribed operations in order to converge upon a single correct solution” (Finke et al. 1992: 183).

By zooming in on salient aspects of the design process, the spectrum of potential creative options is reduced to relevant solutions (Löwgren/ Stolterman 2004). A phase of convergence (also called selection, reduction, elimination, evaluation, etc.) is analytical by decimating alternatives to a few or just one and is according to Mose Biskjaer et al. – regardless of denotation—integral to all models of creative processes (Mose Biskjaer et al. 2017). For this certain model used, the following phases of design process involve convergent thinking mainly: Preparation and Elaboration. As the polar opposite of divergence, in summary can be said, that convergence is the process of contracting the design space in the form of fusing and/or discarding ideas in order to create a more focused understanding of the immediate design problem.

## **2.4 Design Space**

A design space is a mental construct formed by a designer based on his/her knowledge and experience and in response to external conditions. By realizing the aspects and options, which as creativity constraints constitute the design space, a designer can define, develop, and delimit his/her design space to make it auspicious for creative performance—neither too wide (underconstrained), nor too narrow (overconstrained) (Stacey/ Eckert. 2010).

Subscribing to the definition of a design space as: “a conceptual space, which encompasses the creativity constraints that govern what the outcome of the design process might (and might not) be” (Finke et al. 1992: 456) a design space schema can help mapping critical

aspects and their underlying options, which constitute a design space in total at any time. Constraints in a creative process are often manipulable (Mose Biskjaer/ Halskov 2014) which enables the designer (to some extent) to shape, explore, define, and delimit his/her particular design space. This is vital in a creativity method's ideation part. During the inspiration phase the designer explores the creative problem and feels the effects from its creativity constraints.

Here, we look closely on the creative latitude of a creativity method. Creative latitude is determined by the extent to which a creativity method lets the designer explore, define, and delimit his/her design space to optimize its potential for creative performance (Mose Biskjaer et al. 2017)

## **2.5 Framing**

Concerning the Design Space is a mental construct contouring the solution space in the creative process, the framing of a single creativity method within the process, the kind it is embedded, is as important as the method itself. For instance many creativity methods seek to create a special mindset or disrupt participants' preconceptions of their design space in order to foster creativity (Sanders et al. 2010: 196]. The disruption of participants' preconceptions is sometimes helpful to overcome Design fixation (Jansson/ Smith 1991). Design fixation is defined as becoming so fixated upon a specific way of seeing a problem or solution that it stops progress and the emergence of new solutions in the design process. It can be very challenging for designers to deal with that. Creativity methods which are developed for avoiding and overcoming fixation often use operations which support divergent thinking (Mose Biskjaer et al. 2017). Therefore, they are placed preferably in phases within the process where ways to address a design problem are explored and developed (Löwgren/ Stolterman 2004).

Another crucial framing aspect in design is according to Schön the naming and therefore the framing of the problem itself before even starting the process of solving it (Schön 1983). In summary it can be said, therefore, that Divergence, Convergence and finally Framing as three key design space aspects set up creative latitude.

## **2.6. Combination**

Welling mentions Combination as one of four mental operations, which account for creative cognition, derived from existing theories of creativity (Welling 2007). Combination is defined "as bringing two or more concepts together to create a novel concept" (Costello/ Keane 2000). This operation is central to many aspects of creative processes: Koestler highlighted, that combination is a key pattern in creativity, combining two or more previously unrelated ideas to achieve a new one (Koestler 1964].

He argues, that creativity is to be located in "the perceiving of a situation or idea [...] in two self-consistent but habitually incompatible frames of reference" and calls this "bisociation" (Koestler 1964: 33). Moreover, he contrasts bisociation with association: Association concerns to previously existing connections among ideas, while establishing entirely new connections is characteristic for Bisociation. He holds unconscious processes like in intuition, coincidence and in dreams responsible to get there. According to Koestler, bisociation only occurs when the person has been thoroughly involved in the problem or situation for a long time which might be difficult to put into practice during day-to-day business.

## **2.7 Method**

The paper uses the definition of a method as: "[a] well-specified repeatable procedure for doing something: an ordered sequence of goal-directed operations" (Bunge 2003). on a general domain level, providing "a recipe for action... based on a specific purpose and specific values, and it translates them into an actable procedure." The conceptual aspects of

creativity methods pertain to how ideas and concepts emerge and transform (Ward et al. 1997).

## **2.8 Gamification**

To create an enhanced user experience, game-type elements are applied to non-game contexts with the goal of increasing user motivation. This method, described as Gamification (Deterding et al. 2011), attracts much attention since several years especially because of its positive effects on user motivation and efficiency (Zagel et al. 2019). Previous studies prove a positive influence of gamification towards motivation and engagement in everyday processes (Neeli 2012). Zagel et al. regard the application of this concept promising to aim for more productivity while simultaneously improving user motivation (Zagel et al. 2019; Gonzales-Schaller 2013).

## **3 Case of Application**

In the specific scenario, the project group consisting of nine Master students got stuck in process finding new concepts for writing instruments, they didn't come over this by Brainstorming and complained about a lack of Originality and Novelty. Their coach described them as very censorious in group discussion. Since avoiding criticism and evaluation is decisive during divergent thinking phases in design processes, because it allows a maximal range of ideas and may lead therefore to the most unconventional the most original ideas, this is an important aspect of group dynamics, which might be considered during conceptualization of an individual creativity method for this context. The working methods the students were used to because of their professions were in opposite also very analytical and not synthetical or creative.

The goal is to provide a simple threshold creativity method for early ideation phases of design process. The use case, which is described here, is a tailored concept for the particular situation of a project work within an interdisciplinary team in higher education (spec. geared to the needs of Masterclass ZukunftsDesign, which is an extra-occupational Master program for Innovation). The method should meet the following requirements: It should exalt the imagination of the participant, expand the solution space and gain a wide variety of ideas in a short time. The main challenge identified is to incorporate the heterogenic backgrounds of discipline, working experience, age and finally design-based vs. non-design-based users.

Facing the increasing popularity of design methods used within non-design-based development teams, there is a need to rethink the conception of those methods with respect to the new users' prerequisites and their needs. The previously discussed background research serves as a basis for the development of the cards and the gaming structure.

## **4 Association Memory Prototype**

### **4.1 Association Memory Gaming Structure**

We came up with a method consisting of the following steps, which are intended to represent Poincare's four phases of creativity in an ideal typical modeling of linear sequences.

1. For introduction, a short creativity workshop was announced to the participants and they were introduced briefly to the concepts convergent and divergent thinking to gain a consciousness and openness for the following game.

2. In the first step of the game, one card per attendee is drawn from a stockpile (covered) and turned over. During the next 5 minutes, any participant is asked to write down anything, what comes in mind associated with the picture on his card (without any relation to the actual problem). We chose to let them do this as individual work to avoid criticism one the one hand and reach a wider variety of inspirational impulses for the next steps. Decoupling the associations from the actual task should enable to achieve connections to a “new frame of reference” (Koestler 1964: 33, 50) later, to get from Association to Bisociation and finally to transform the Design Space.
3. In a second step, the written associations are combined with the actual task by each participant himself drawing and writing at least ten ideas during the next ten minutes. The former transformed Design Space and new Framing are transferred to the new generated ideas
4. Third the players are advised to choose their favorite idea and bring this into prototypes (30 minutes).
5. Finally for Elaboration of the ideas the group comes together and discusses their ideas and prototypes referring to criteria, which were set before the game during convergent phases of the design process. Afterwards the group selects the best prototypes and decides, which they want to elaborate together (15 minutes).

#### 4.2. Association Memory Design of the cards:

Specifically, a playing card deck– with specifically selected inspirational motives depicted– has been developed for visual stimulation of “Association Memory” during the early ideation phase in academic teaching as well as for conducting innovation workshops in business. The motives shown on the cards are selected for the following criteria: They ought to be rich of association referring to e.g. function, setting, analogy, metaphor, aesthetical/formal, sound and supplement.

The playing card format is inspired by the popular card game “Pairs” (German: “Memory”) designed by William Hurter in 1964. The cards therefore are square shaped.



Figure No. 1: Playing Card, Design Example

## 5 Prototype Evaluation

### 5.1 Evaluation method

Two user case studies are conducted amongst Master students as well as in a business environment of Franconian small and medium-sized enterprises (SMEs). The experimental groups apply the method ‘Association Memory’ during an ideation phase during Design Thinking Process for solving a task. The gained experiences and results from the case studies are reviewed: The method’s User Experience is examined by questionnaire. The outcome (of ideas) of both groups (experimental and control group) is examined for creativity. According to the Torrance Test of Creative Thinking (TTCT) it is scored on the

following four scales: Fluency (the number of ideas generated in response to the stimulus), Flexibility (variety of categories of responses), Originality (the rarity of the responses) and Elaboration (the level of detail in the responses), and compared to each other.

The trial participants were 23 students of the Masterclass ZukunftsDesign in 1st, 3rd and 5th semester, mostly with professional experiences in various disciplines.

## 5.2 Questionnaire

To receive structured information, an open questionnaire for capturing the topics of Fluency, Originality, Flexibility and User Experience was filled out by the students. The questionnaire consisted of 13 items and collected information about the participants' experience with creativity methods in general, more specifically about the output during a creative process with the method „Association Memory“ in comparison to other methods e.g. Brainstorming concerning Fluency, Originality, Flexibility and Innovative Capability. We surveyed, if the participants could imagine to use the method again generally, for which purpose they would use it, where applicable, and which limitations they see.

**Short Survey: Association Memory**

Name	(optional)	Kurs	ITT/ Projektarbeit
Dozent	Lena Pieper	Zeitraum	SoSe 2019

*Bitte beantworte jede Frage in ca. 1-2Sätzen*

1. Wieviel Erfahrung in Kreativmethoden hast du schon? Welche?
2. Welche Kreativmethoden setzt du bislang (regelmäßig) ein?
3. Wie beurteilst du deinen Output mit der Methode in Hinblick auf Originalität (im Vergleich zum klassischen Brainstorming, soweit bekannt)?
4. Wie beurteilst du deinen Output mit der Methode in Hinblick auf Innovationsfähigkeit (im Vergleich zum klassischen Brainstorming, soweit bekannt)?
5. Wie beurteilst du deinen Output mit der Methode in Hinblick auf Vielfalt (im Vergleich zum klassischen Brainstorming, soweit bekannt)?
6. Hat dir der Workshop Spaß gemacht?
7. Was hat dir gut gefallen?
8. Was würdest du verbessern?
9. Kannst du dir vorstellen, die Methode in Zukunft einzusetzen?
10. Wenn ja, in welchem Bereich kannst du dir vorstellen, die Methode in Zukunft einzusetzen?
11. Mit welchem Ziel würdest du die Methode ggf. einsetzen?
12. Wo würdest du die Methode nicht einsetzen?
13. Warum würdest du die Methode nicht einsetzen?

Figure No. 2: Questionnaire

## 6 Findings

How do you transfer key ideas of design into new methods for example for coaching a design-team in a co-creation-context instead of using a bundle of existing creativity methods? Does the team benefit from such an individually designed method? This paper relates key ideas of creativity research to practice and showcases results and first experiences gathered with the new method "Association Memory".

### 6.1 Evaluation results

Finally, the analysis questionnaire responses revealed that the participants benefited from using the method during their creative process regardless of their former experience with creativity methods in general. The level of experience ranged from non-conversant, less conversant through medium to advanced and well advanced equally-distributed. Nevertheless, it can be observed, that some students considered the creative potential to be more valuable, others were more focusing on the fun aspect of the game and of the prototyping— regardless of their semester being high or low.

The most popular creativity method already used was Brainstorming. Other methods named were "Kopfstandmethode", "Crazy 8", "Brainjogging" (Herwig-Lempp), "SPOT-Analysis", "Walt-Disney-Strategy", "Narren, Richter, Weise", Thinking Hats, Thinking out of the Box, Six Hands, Mindmap, Brainwriting, Image Cards and Design Thinking.

The self-assessed Originality/Novelty of output with the method "Association Memory" compared to Brainstorming was mainly positively evaluated by the participants, just 3 of 23 voted negatively. Reasons given here for a negative personal conclusion were "Oldschoolness" or former insecurity because of the open objective in the beginning. On the other hand, the clear objective was also largely positively regarded besides the open-ended outcome and "the head starting to associate". It was emphasized, that unconventional and free thinking was granted by the method.

The perceived Innovative Capability with the method "Association Memory" per self-assessment ranged from low through medium to high, but tended to be high. One of the reasons indicated most frequently for a lower perceived capability are doubts, that the generated ideas can be utilized in the following steps of the design process, which was not an integrated part of the game. Another point of criticism mentioned, was the limitation to the own memories and associations. One student wrote, the process seemed to be very creative, but the output was similar to other methods.

The students described the Variety of their output with the method "Association Memory" as predominantly good, only 2 of them considered the Variety to be low. But a greater number of students were confused by the question or by the term "Variety". Two mentioned, it was difficult for them to write down many associations, most highlighted the variety of associative chains, which they had with the method.

The Fun aspect was significantly highly rated by nearly all the students, only one of 23 participants didn't enjoy the workshop according to our questioning. One person especially liked the prototyping, one was appealed by the variety and originality of the ideas generated by the whole group.

All things considered, the test persons enjoyed the creative atmosphere during the workshop, the free and unconventional thinking, and they also liked, that they didn't knew the final product in the beginning. Two persons especially liked the pictures on the cards. Proposals for improvement pertained to the introduction, to rise the share of teamwork and to the time-limit. About 82% of the participants would use the method again for their projects and work. The suggested fields of application according to the questioning were mainly Ideation, getting unstuck in creative processes, marketing, promotion, product development and consultancy workshops. The participants indicated the creative ideas, variety of ideas, and creating an open mind during a workshop as reasons for using the method again. First impulses, a first framing of the design and finding new application areas for existing technologies were additional areas of use, which were suggested.

Limitations of the method were seen using it while working with blinds, because there is a need for the ability to see. The participants also wouldn't use the method during later phases of the design process or if they would be pressed of time or limitations for example.

Summarized our findings suggest, that the theoretic concept transferred to the method succeeded in most of the intended aspects of creativity in divergent and convergent approaches within the experimental group. Moreover, the process and the outcome were perceived as much more creative than with the classical Brainstorming.

## 6 Conclusions

While there is a lot of research about creativity itself on the one hand, there is a multitudinous variety of creativity methods in practical usage on the other hand, which exhibits similar components. In this paper key ideas of design are used analogously to a toolbox for concepting appropriate methods. It could be shown, that the concepts of Divergent Thinking and Convergent Thinking, Phases of Creativity, Design Space, Framing and Combination were translated into single actions and those were combined to a playful creativity method. First results with the new method in reliance on those tested in the field are examined to criteria of creativity and experience with positive results in Fluency, Flexibility and Originality, which indicates an improved creative outcome compared to the existing creativity method Brainstorming. It became clear, that the individually created method "Association Memory" is particularly suitable for divergent phases of the design process and for getting unstuck.

A coach or teacher can gain knowledge and inspiration from this case study for creating own creativity methods practically applicated in the innovation process.

While this paper focuses on the conception and performance of the method, its outlook describes how future research will deal with the refinement and utilization of the ideas in the further process, addressing the more convergent phases of Evaluation and Elaboration during creativity process primarily.

## References

1. Mose Biskjaer, M., Dalsgaard, P., Halskov, K., 2017. Understanding Creativity Methods in Design, in: Proceedings of the 2017 Conference on Designing Interactive Systems - DIS '17. Presented at the the 2017 Conference, ACM Press, Edinburgh, United Kingdom, pp. 839–851.
2. Mose Biskjaer, M., Dalsgaard, P., Halskov, K., 2014. A constraint-based understanding of design spaces. In Proceedings of the 2014 Conference on Designing Interactive Systems (DIS 2014). ACM, New York, 453-462.
3. Mose Biskjaer, M., Halskov, K., 2014. Decisive constraints as a creative resource in interaction design. *Digital Creativity* 25, 1: 27-61.
4. Bunge M., 2003. Philosophical dictionary. Prometheus Book, Amherst, New York.
5. Costello, F.J., Keane, M.T., 2000. Efficient creativity: Constraint-guided conceptual combination. *Cognitive Science* 24, 2: 299-349.
6. Deterding, S., Sicart, M., Nacke, L., O'Hara, K., Dixon, D.: Gamification: using gamedesign elements in non-game contexts. In: CHI '11 Extended Abstracts on Human Factors in Computing Systems, pp. 2425-2428. ACM New York (2011)
7. Finke, R. A., Ward, T.B., Smith, S. M., 1992. Creative cognition: Theory, research, and applications. Bradford Books/MIT Press, Cambridge, MA.
8. Gonzales-Schaller, P.: Trendthema Gamification: Was steckt hinter diesem Begriff? In: Diercks, J., Kupka, K. (eds.) *Recrutainment*, pp. 33-51. Springer, Wiesbaden (2013)

9. Groeben, N. (2019). Kreativität. In M. A. Wirtz (Hrsg.), Dorsch – Lexikon der Psychologie. <https://portal-hogrefe-com.ub-proxy.fernuni-hagen.de/dorsch/kreativitaet/>[accessed Jan 2019].
10. Guilford, J.P., 1967. The nature of human intelligence. McGraw-Hill, New York.
11. Hoffmann, M., Loeffl, J., Luo, X., Thar, W., Valeva, M., Zagel, C.: zukunftsdesign - offen.innovativ.machen, In: Krahl, J., Loeffl, J. (eds.) Zwischen den Welten 11, Cuvillier Verlag Göttingen (2017)
12. Jansson, D.G., Smith, S.M., 1991. Design fixation. Design Studies 12, 1: 3-11.
13. Koestler, A., 1964. The act of creation. Hutchinson, London.
14. Löwgren, J., Stolterman, E., 2004. Thoughtful interaction design: A design perspective on information technology. MIT Press, Cambridge, MA.
15. Rips, L.J., Smith, E.E., Medin, D.L., 2012. Concepts and categories: Memory, meaning, and metaphysics. In The Oxford handbook of thinking and reasoning, Holyoak, K.J., Morrison, R.G. (eds.), Oxford University Press, New York, 456-474.
16. Neeli, B.K.: A Method to Engage Employees using Gamification in BPO Industry. In: Services in Emerging Markets (ICSEM), Third International Conference on Services in Emerging Markets, IEEE, pp. 142-146 (2012)
17. Poincaré, H. (1908). Science et méthode. Paris: Flammarion.
18. Runco, M. A., Jaeger, G.J., 2012. The standard definition of creativity. Creativity Research Journal 24, 1: 92-96.
19. Sanders, E. B., Brandt, E. Binder, T., 2010. A framework for organizing the tools and techniques of participatory design. In Proceedings of the 11th Participatory Design Conference (PDC 2010). ACM, New York, 195-198.
20. Schön, D.A., 1983. The reflective practitioner. Basic Books, New York.
21. Stacey, M., Eckert, C., 2010. Reshaping the box: Creative designing as constraint management. International Journal of Product Development 11, 3: 241-255.
22. Torrance, E. P. (1974). The Torrance Tests of Creative Thinking: Norms-Technical Manual. Princeton, NJ: Personal Press.
23. Ward, T.B., Smith, S.M., Vaid, J., 1997. Conceptual structures and processes in creative thought. In Creative thought: An investigation of conceptual structures and processes, Ward, T.B., Smith, S.M., Vaid, J., (eds.), APA, Washington, D.C., 1-27.
24. Welling, H., 2007. Four mental operations in creative cognition: The importance of abstraction. Creativity Research Journal 19, 2-3: 163-177.
25. Sanders, E., William, C., (2002). Harnessing People, Aôs Creativity: Ideation and Expression through Visual Communication. 10.1201/9780203302743.ch10. [https://www.researchgate.net/publication/265498443\\_Harnessing\\_PeopleAos\\_Creativity\\_Ideation\\_and\\_Expression\\_through\\_Visual\\_Communication](https://www.researchgate.net/publication/265498443_Harnessing_PeopleAos_Creativity_Ideation_and_Expression_through_Visual_Communication) [accessed Apr 19 2019].
26. Zagel, C., Grimm, L., Luo, X. (2019). Method Cards – A New Concept for Teaching in Academia and to Innovate in SMEs. 10.1007/978-3-319-94229-2\_22.