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CREATIVITY MEASUREMENT AND THE 6-3-5 BRAINWRITING METHOD

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Essay

Summary

Creativity is examined from the perspective of two research community consensuses about its definition and the application of the definition. Measurement is examined from a taxonomical and heuristic perspective based on the community consensuses. Two related creativity provoking and stimulating techniques, the brainstorming and 6-3-5 brainwriting technique, are examined with evaluation of their pros and cons and the relation between them. The significance of the number 108 and how it found itself in the 6-3-5 brainwriting method is pondered upon.

Key words: creativity; new and useful; 4Ps; creativity measurement; brainstorming; brainwriting; 6-3-5; group dynamics; 108; creativity taxonomy; creativity heuristic;

1. Introduction

Creativity is a human faculty with many a definition that vary from author to author and field to field. However, in the field of creativity research which encompasses all different applications the various definitions share some important commonalities. For instance Sternberg and Lubart define creativity as "... *the ability to produce work that is both novel (i.e., original, unexpected) and appropriate (i.e., useful, adaptive concerning task constraints)*" [1]. Feist writes that "*Creative thought or behavior must be both novel-original and useful-adaptive*" [2]. Finally, Ochse presents the following definition "*Bringing something into being that is Original (new, unusual, novel, unexpected) and also Valuable (useful, good, adaptive, appropriate)*" [3]. In general there seems to be consensus that whatever is produced should be new *and* useful [4]. Moreover the definitions of creativity can be applied to a *person, process, product* as well as the environment *press* [5]. This is the so-called 4Ps approach which appears to have become another consensus in the creativity research community [6]. It might seem simple enough to provide a definition of creativity based on a specific item out of the 4Ps provided, but measuring creativity could be more complicated since it includes components of all 4Ps which can be reasonably expected to interact. Creativity measurement is discussed in the next section from a taxonomical perspective along with an accordingly based novel multicomponential heuristic framework for measuring creativity.

Following the discussion on creativity measurement a technique for generating creative ideas is discussed, namely the brainwriting 6-3-5 method and its relation to the parent technique of brainstorming.

2. Creativity measurement

A list of the various creativity tests out there should be simple enough to compile. All that is required after all is a thorough literature search which any dedicated person should be capable of. Such lists are without a doubt useful if only to keep track of available creativity measurement tools but it is arguably more important to taxonomize the existing methods thus providing structure and method to creativity measurement. As such Batey [7] builds a novel heuristic framework for creativity measurement based on the taxonomical efforts of Eysenck [8] and Amabile [9]. These efforts are related here before discussing Batey's framework.

2.1 Eysenck's creativity measurement taxonomy

Eysenck [8] proposes a dual perspective of creativity measurement based on either trait or achievement. Trait creativity measures are those that provide normally-distributed test scores. Eysenck divides trait measures into three categories,

- Cognitive variables, like intelligence, problem-solving skills, training, etc.
- Environmental variables, like culture, social economics, education, etc.
- Personality variables, like motivation, self-confidence, originality, etc.

The above variables with normal distribution scores combine to produce achievement creativity, itself with scores that follow a Poisson J-shaped distribution [10]. As for achievement creativity its measures may fit one of three criteria as indicated by Mumford and Gustafson [11],

- Overt production, such as the number of patents a person owns, number of refereed publications, etc.
- Professional recognition, such as prizes or honours received in a professional field, etc.
- Social recognition, such as peer review, expert judgment, etc.

2.2 Amabile's creativity measurement taxonomy

Amabile [9] proposes a triple perspective for creativity measurement consisting of the following techniques,

- Creativity tests, which belong to three general categories:
 - Personality tests, like the Creative Personality Scale [12].
 - Biographical inventories, like the Creative Achievement Questionnaire [13].
 - Behavioral assessments, like the Divergent Thinking tests.
- Objective analysis of products, which is rarely done since it requires the development of an objective method for evaluating the creativity of a product, a not so obvious task.
- Subjective judgments, further subdivided into the judgment of people or products.

The taxonomy of Eysenck summarized above emphasizes the complex interaction between person and environment while Amabile's taxonomy emphasizes ecologically valid measures of creativity such as social validation or usefulness. Together they cover a large extent of creativity measurement techniques and variables. Batey concatenated the two taxonomies to produce a multicomponent perspective which he uses to develop a heuristic framework for creativity measurement.

2.3 Batey's heuristic creativity measurement framework

The new heuristic creativity measurement framework is built in a 3-D matrix shown in **Fig. 1** with three axes, the *Level*, *Facet* and *Measurement Approach* axes, or in other words the *who*, *what* and *how*.

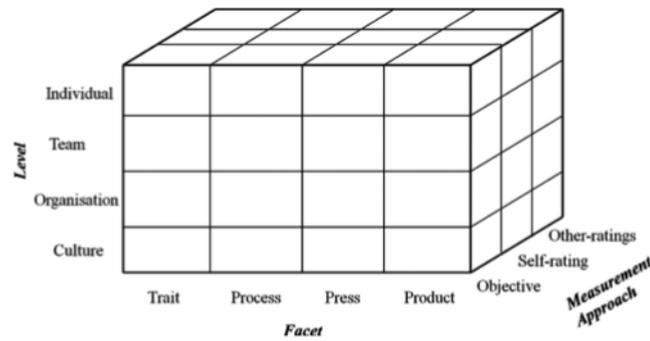


Fig. 1 3-D matrix representation of the new heuristic framework for measuring creativity (adapted from [7]).

The vertical axis is the *Level* at which creativity may be measured, or *who* is to be analysed, the individual, team, organization or culture, with individuals being usually the main focus of creativity. It should be noted that although one can examine creativity within a certain *level* it is not possible to use the label *creative* without reference to other aspects. For example rating individuals or teams as creative would likely require examination of their product, process or trait. Rating an organization or culture would likely require examination of their environment press. Therefore creativity measurement within a *Level* must be made in reference to a *Facet* using a *Measurement Approach*. This highlights the multicomponential nature of creativity measurement.

The horizontal axis is the *Facet* or *what* is to be analyzed, the trait, process, press or product. This is derived from the 4Ps approach since trait attributes correspond to person attributes. The trait approach examines the characteristics of the subject analyzed, be it a person, team, organization or culture. In other words are they intelligent, thorough, dedicated, accessible, etc. This is the most commonly used approach by creativity researchers. The process approach examines the means used to be creative, such as team interaction, knowledge sharing, problem analysis stages, etc. It has often been used to figure out whether Creative thinking processes can be taught or improved. The press approach examines the operational environment of the subject, in other words the surrounding conditions for producing creativity. The environment may be seen as a source of stimulation or evaluation and may be evaluated from the sociocultural perspective, or the immediate working environment perspective, or the perspective of impacting characteristics of figures of authority within the environment. The product approach examines the output of the subject and is easily the most objective approach. It focuses on product ratings, production criteria like awards and publications, suggestions for improvement, etc. At the most basic level products can be creative by accepting and extending existing paradigms, rejecting them and trying to replace them, or synthesizing them [14]. Although the different facets are provided separately they are closely intertwined. For example a person (trait) cannot be considered creative without reference to a product, which is the result of processes that took place within an environment. Again this is another highlight of the multicomponential nature of creativity measurement.

The third and oblique axis is the *Measurement Approach* or *how* creativity is to be analyzed. Three options are provided, namely objective rating, self-rating and other-ratings.

Objective rating can be done for individuals, preferably by third parties, based on the number of innovative patents or publications or even by providing a number of ideas to a stimulus question. A corresponding aggregate of individual achievements can be used for teams or organizations, and similarly for entire cultures. However, for entire cultures the matter is usually best addressed by external cultural experts and that makes it effectively an other-ratings technique discussed further below. When done by the subject of the analysis the measurement approach becomes a subjective self-rating. Such measurements can be done by individual self-rating scores of creativity, or by team creativity questionnaires and aggregates of individual perceptions of team creativity. Also subjective, other-ratings measurements can be made by external parties such as experts and people familiar with the creative product and/or the creator. For individuals these may be teachers, directors or supervisors for teams and organizations, and anthropologists and historians for cultures. A notable deficiency of other-ratings is that people familiar with the creator may be biased, and experts in the subject matter (reviewers, referees, etc.) may not allow a highly creative but possibly controversial idea to be allowed in a field by virtue of their gate keeping function. As a result some of the most creative individuals of all times remained unrecognized in their lifetime (e.g. Van Gogh for post-impressionist influence in the 20th century) or achieved recognition later after the passing of the gatekeeper (e.g. Euler's fluid dynamics equations vs. those of his mentor Bernoulli).

3. The brainwriting 6-3-5 method

The previous discussion on the definition of creativity and its measurement led to the conclusion that creativity is most conveniently defined and measured by the novelty and usefulness of what it produces. Accordingly the techniques of provoking and stimulating creativity discussed in this section consist mainly of trying to produce as many ideas as possible in a given time frame and then sifting through the results to identify the most creative ideas. The discussion is about the brainwriting 6-3-5 method, which is closely related to the earlier brainstorming method discussed first in giving a logical introduction to the brainwriting technique.

3.1 Brainstorming

Brainstorming is a group technique for provoking and stimulating creativity originally developed in the early 1950s by Alex Osborn to find solutions for a problem [15]. Osborn claims that the technique's ideative efficacy is based on deferred judgment and the sheer quantity of ideas produced [15] (1963 edition). The brainstorming technique follows four basic rules:

- Focus on quantity not quality;
- Withhold criticism or evaluation;
- Welcome unusual ideas;
- Build on the ideas of others and possibly combine them.

Amongst Osborn's brainstorming guidelines it is also advised to work within a set time frame and have a facilitator who does not contribute ideas to record them publicly [15] (1957 edition). The typical procedure of a brainstorming session is the following:

1. Introduce a question, problem, or topic both orally and in writing on chart paper;
2. Invite participants to respond with as many ideas or suggestions as possible, ideally in single words or short phrases. Encourage everyone to participate but do not proceed in any set order;

3. Explain that until the brainstorm is complete, no one may repeat or comment on any response;
4. Record every response on chart paper. Often, the most creative or outrageous suggestions are the most useful and interesting;
5. Afterward, prioritize, analyze, or use the list to generate discussion or problem solving.

Brainstorming has been found to be the most widely used method for provoking and stimulating creativity within organisations [16]. Unfortunately the social interaction and group dynamics that contribute to the method's success also contribute to its weaknesses. Osborn [15] (1957 edition) observed that when a group of people share ideas there is inevitably a common tendency to instantaneously evaluate them, which probably discourages group members from sharing ideas they worry may not be well received by their colleagues. Brainstorming sessions also result in verbal traffic jams that can lead to people forgetting ideas [17]. VanGundy [18] argues that people might also withhold an idea if they worry they might upstage a group member with a superior social or professional status, and that group members taking more time than individually allocated could disrupt the session. He also stresses that brainstorming requires an experienced facilitator to make sure the general guidelines are followed. An additional deficiency of brainstorming is that the individual mental resources that could be devoted to producing more ideas are largely drained by trying to remember an idea until it can be shared, listening to others carefully enough and trying to follow the guidelines at the same time [19]. Other psychological factors can reduce the productivity of brainstorming sessions. Among such factors is social loafing which is people feeling they are not personally accountable or not needed by the group, resulting in a low level contribution [20]. Another psychological factor with a negative impact on brainstorming is downward comparison which consists of people matching their performance in terms of rate and type of ideas generated with that of the lowest performers of the group [21]. Finally people may exhibit illusions of productivity that find the group's performance superior to individual ones [22], or the individual performances of other group members superior to their own [23].

3.2 The brainwriting 6-3-5 method

The brainwriting 6-3-5 method is another group technique for provoking and stimulating creativity originally developed in the late 1960s by Bernd Rohrbach [24]. It is considered as brainstorming through the medium of graphics [25] and has been further developed over the years to address the issues of brainstorming [18]. Similarly to brainstorming the focus is placed on the quantity of ideas and not their quality. The original implementation of the brainwriting 6-3-5 method requires six participants and proceeds as follows [26]:

1. The session topic is formulated as a problem statement which is announced and written on top of the 6 idea forms. Each form is a worksheet handed out to each participant with 3 columns for each idea and rows identifying the name of the contributing participant.
2. Each participant is given 5 minutes to write down 3 ideas on their respective row of their respective form.
3. The supervisor signals the end of the five-minute period and the forms are passed along to the right. The process is repeated and participants are free to draw inspiration from each other's ideas or think up new ones. Similarly to

brainstorming participants can also contribute to other's ideas and combine them.

4. The process continues for 6 rounds until the worksheets are filled up within 30 minutes and the 6 participants have contributed a total of 108 ideas.

The 6-3-5 brainwriting technique is very straightforward, easy to learn and very efficient since it allows producing 108 ideas in 30 minutes with no particular experience required by the supervisor. Moreover, nobody is in charge of recording ideas since it is done on the fly by the participants with the obvious advantage of being able to track ownership of each idea during and after the session. This technique eliminates the previously noted brainstorming issues of verbal traffic jams, monopoly of a session by certain members, and draining of mental faculties and should reduce concerns about the opinion of other group members. Introverts are also more encouraged to contribute since no direct interaction with the other group members is required. MacNaught [27] notes that this method has disadvantages of its own where for instance the time constraints might prove severe for some participants so a bit of training could be required. MacNaught also notes that without the verbal communication of brainstorming and people providing suggestions ideas might not develop as far. A notable deficiency of brainwriting is the complete lack of group dynamics.

Recent implementation of this method have featured 4, 5 or even 7 participants with the number of ideas generated being 72, 90 or 126 respectively [28]. However the number 108 in the original implementations has received no attention whatsoever and warrants a brief discussion. Some interesting facts that can be noted about the number 108 are:

- $108 = 0^0 \times 1^1 \times 2^2 \times 3^3$, forming a rather curious and rigorous progression of self-powers of the first 4 integers;
- 108 is also an *abundant* number, meaning that the sum of its proper divisors exceeds it;
- The interior angle of a pentagon measures 108° whereby a pentagon is the external envelope connecting the corners of a pentagram, a symbol central to Wikkan practices;
- The golden ratio ϕ , a number that continues to fascinate thinkers from all times [29] is the ratio of the straight distance between two points on a circle 108° apart to the radius of that circle;
- The distance between the Earth and the Sun is 108 times the Sun's diameter;
- The distance between the Earth and the Moon is 108 times the Moon's diameter;
- The diameter of the Sun is 108 times the diameter of the Earth;
- The radius of the Moon is 108 miles;
- There are 108 divinities in the Hindu pantheon of Gods, 54 beneficent and 54 maleficent;
- Buddhist and Hindu Mantras are recited 108 times, also the number of beads in Buddhist and Hindu rosaries and considered an auspicious number;
- There are supposedly 108 energy channels connected to the heart chakra;
- Astrologically 108 is the product of the 12 houses of the Zodiac with the 9 planets (including the Moon) that visit them, giving 108 possible astrological influences.

A comprehensive listing of all the possible associations of the number 108 is not really necessary as it is already clear from the aforementioned associations that 108 is a special

number with supposedly expansive properties and divine associations. Some religions like Hinduism and Buddhism attribute spiritual consciousness properties to the number 108. It is then not entirely surprising that it has found its way into a technique for provoking and stimulating creativity, itself with early spiritual roots. One may wonder why Bernd Rohrbach opted for 108 in the first place. It could have been pure coincidence, a choice based on religious belief or even mathematical elegance related to the golden ratio just like ancient Greek sculptors did. To answer this question one needs to undertake a careful study of the life and beliefs of Bernd Rohrbach, which is beyond the scope of this essay.

4. Conclusions

There are two main consensuses in the creativity research community that creativity involves producing something new and useful, and that creativity can be applied to four basic facets: the person, process, product and environment press. These are the so-called 4Ps of creativity. Measuring creativity requires a multicomponential perspective with three main components: the *who* level of measurement, the *what* facet of measurement, and the *how* measurement approach. The four levels are the individual, team, organisation and culture. The four facets are the trait, process, environment press and product and are equivalent to the 4Ps. The three measurement approaches are objective, self-rating and other-ratings. The different components are inter-related in that one cannot evaluate creativity at any level without considering one or many facets and using one or many measurement approaches. The heuristic multicomponential approach derived by Batey [7] and illustrated in **Fig. 1** can be used to develop customized creativity measurements.

The brainstorming and brainwriting 6-3-5 techniques of provoking and stimulating creativity discussed here consist of producing as many new ideas as possible in a group setting within time frame. The earlier brainstorming parent technique emphasizes group dynamics by allowing verbal communication and building on each other's ideas with possible negative consequences on the performance of introverts. The latter 6-3-5 child technique emphasizes efficacy in terms of producing 108 ideas in 30 minutes with little direct group interaction and eliminates verbal communication altogether as well as many of the group dynamics problems, but ideas might not develop as far without direct interaction. The choice of 108 ideas in the 6-3-5 method has received little or no attention in the literature although the number 108 recurs regularly in the spiritual fields where it is considered auspicious and possessing special consciousness characteristics. The number 108 occurs also in mathematics where it has a curious progression representation and an association with the famous golden ratio. The number 108 occurs also in astronomy in relation to the distance between the Earth and the Sun and the Earth and the Moon, as well as the radius of the Moon. These curiosities are few among many regarding the number 108 and are simply noted here without advancing any association theory. In that regard it is desirable to take a closer look at the life and beliefs of the creator of the 6-3-5 method, Bernd Rohrbach.

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