Are we there yet? A Review of Creativity Methodologies

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Abstract

Over the years, researchers and educators defined creativity as a step out of the ordinary. However, the definition of creativity has suffered from the lack of consistency, just as creativity measuring methodologies have also suffered from subjective analysis. The aim of this paper is to analyze various creativity measuring methodologies and the underlying theme of creativity with the attempt to determine a common attribute of creativity measuring methodologies using various case studies. This paper seeks to evaluate the methodologies from the broad aspect of the creativity process, product, press and person; the paper will also explore an appropriate methodology for assessing creativity.

Introduction

There have been inconsistencies concerning the definition of creativity. For example, the definitions of creativity used by different researchers such as Torrance, Hadamard, Snow, Rothenberg, Sternberg, Kaufman and Pretz, show the inconsistencies in the definition of creativity.

- Hadamard defined *creativity as an "invention or discovery, be it in mathematics or anywhere else, takes place by combining ideas"* [12].
- Sternberg et al. defined creativity as the "ability to produce work that that is novel (i.e., original, unexpected), high in quality, and appropriate (i.e.,useful, meets task constraints)" [30].
- Snow defined *"Creativity is not a light bulb in the mind, as most cartoons depict it. It is an accomplishment born of intensive study, long reflection, persistence, and interest"* [27].
- Rothenberg defined *"creativity as the production of something that is both new and truly valuable"* [24].
- Torrance defined creativity as "*the process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficult; searching for solutions, making guesses, or formulating hypotheses and possibly modifying them and retesting them; and finally communicating the results*" [35].

Scoping and analyzing all the above definitions on creativity can be challenging, which makes a unifying definition for creativity a daunting if not impossible, because it as been argued by various researchers that creativity is domain specific [3,4,7,8,9,32,39]. However, Rhodes (1961) did an extensive search to find a unifying definition of creativity and found out that the definitions are not mutually exclusive (i.e., creativity definitions overlap and intertwine). He claims that the content of the definitions form four strands and each strand has a unique identity. From further research, Rhodes concluded that creativity definitions existed in 4P (PERSON—identification of the characteristics of the creative person, PROCESS—the components of creativity, PRODUCT—The outcome of creativity and PRESS—the qualities of the environment that nurture creativity) [21,23].

In a similar view, Torrance (1976) commented that some researchers find his prior definition of creativity too loosely constrained, while others find that same definition to be narrowly oriented to scientific process with the exclusion of artistic endeavors. Having spent a number of years studying

creativity, Torrance observed that creativity has usually been defined in terms of process, product and at times personality or environment. He redefined creativity to accommodate scientists and lay people alike as,"*a successful step into the unknown, getting away from the main track, breaking out of the mold, being open to experience and permitting one thing to lead to another, recombining ideas or seeing new relationships among ideas*"[34].

Through Torrance's extensive research in creativity, Raina and Tan-Willman have referred to him as the creativity man, creativity giant, ultimate beyonder and so on. All these names make many researchers accept Torrance's definition of creativity to a higher degree[22,31].

Analysis Creativity Methodologies

Similar to the existence of inconsistencies in the definition of creativity there are also inconsistencies in the methodologies used to measure it. Inconsistencies in *what to measure?, how to measure?* and also *subjective analysis of creativity* are just a few.

There are a number of methodologies that are used to measure creativity. In research studies, while some researchers such as Hocevar divided these methodologies into ten categories (such as, divergent test, attitude and interest inventories, biographical inventories, personal inventories, teacher nomination, peer nomination, supervisor ratings, judgments of products, eminence, and self-reported creative activities and achievements), other researchers have no categories for these methodologies. This results in chaos. The following list contains some examples of tests used to analyze creativity:[2,5,11,18]

- The Figure Preference Test
- The Idea-generation Test
- The Story-telling Test
- Supra-rational Test
- The Ingenuity Test
- The Water Jar Test
- The Sex Role Identity Test
- The Remote Associates Test
- The Two-Sting Test
- The Purdue Test
- The Use for a Brick Test (similar to Purdue Test)
- Battery of creativity tests
- Computerized Axial Tomography (CAT-scan)

The above tests are dependent on the basic concepts of the methodologies stated below:

- Structure of Intellect (SI) Model—This model was extended from Thurstone's theory, which is based on the premise that abilities are organized in a rectangular solid form, and Sternberg and Grigorenko claimed that a researcher needs to understand Guilford's model of intelligence before comprehending Guilford's model of creativity because Guilford viewed creativity as a part of intelligence[10,29,33].

  Guilford expanded the 7 mental abilities (verbal comprehension, verbal fluency, number, spatial visualization, memory, perpetual speed, and reasoning) of Thurstone's model to 120 and eventually to 180. Guilford categorized his model into three areas which are, operation,

content and product[10].

The test is structured in "...which participants are presented with pairs of numbers or letters that are identical or different in minor details"[29]. Sternberg and Grigorenko stated that participants have to mark each pair as either same or different.

However, Sternberg and Grigorenko noted that the SI model is limited in a number of ways despite its contributions. One such limitation is subjectivity, for example " a test of divergent production ...requires examinees to name things quickly that are white and edible"[29]. Another limitation noted by Ochse is low correlational ratings of creativity tests and role of motivation, which he noted as being of major importance to creative achievement[29], and finally the tedium required to measure the above tasks.

- The Remote Associates Test (RAT)—This test suggested that creative solution can be achieved through serendipity, similarity or mediation. Mednick, the founder of this process, emphasized the importance of time away from a particular problem on creativity, he claims that original ideas are remote, which are segregated from the original problem or initial idea. This remoteness requires time for a set of ideas to be formed, which is normally referred to as a "remote associate". These remote associations are due to similarity among elements of experience, or stimuli that evoke them[18].

  The test uses every image and object, which are a visualizer and verbalizer respectively or concept. These are associated with other images, objects or concepts, which are arranged in a particular list. At the top of this list, associate ideas are stronger and are closely linked together, moving down the list, the strength becomes weaker and ideas come to mind less quickly[5]. Mednick stated that creative people go farther down the list by coming up with higher-quality associations to solve their problems, which invariably yield creative products. For example, these three words can be presented 'telephone' 'high' 'electric' and 'up' 'knife' 'bandaid' the related words to these three will be 'wire' and 'cut' respectively.

  A major limitation is that the questions on the RAT test do not conform to the theory of the RAT test itself. For example, A participant expects that answers to the test question will be subjective instead of yes or no answers[20].
  Another limitation is the consideration of bias. A participant needs to be familiar with the items mentioned on the test.

- Torrance Test of Creative Thinking (TTCT)—Also known as Minnesota Tests of Creative Thinking measures the essence of creativity[19].

  The TTCT test is composed of verbal and figural tests composition.

  The Verbal test—composed of six word–based–designed exercises that measure three mental characteristics namely fluency, flexibility and originality. This measures curiosity; cause–and–effect relationships; the ability to play with ideas and consequences; freeing of the mind from rigid, set thinking; and the ability to fantasize[19,36].

  The figural test—As two parallel forms, A and B, comprises of three activities designed to measure seventeen mental characteristics (fluency, originality, abstractness of titles, resistance to premature closure and elaboration, plus thirteen creative strengths). This measures: the ability to impose meaning on a situation or stimulus where none exists;

to structure, integrate, and present an object, scene, or situation; and the ability to perceive similar stimuli in different ways[19,36].

One of the limitations of the TTCT is that the test is based on "best guesses" or approximations of what creativity may actually be[19]. Another limitation is the use of a paper and pencil test, which some researchers such as Sternberg find to be insufficient to measure creativity.

- Consensual Assessment Technique (CAT)—Amabile proposed that creativity can be measured by using experts' subjective assessment for determining creative products, through "consensual assessment technique" (CAT). The technique requires expert judges to rate the creativity of a product on a scale of 1 to 5 using a subjective definition instead of a given criterion or checklist. "If appropriate judges independently agree that a given product is highly creative, then it can and must be accepted as such"[2]. The drawback to this technique was noted by Hickey. He stated that in order to rate the creativity of products, there is the need to rate the expertise of an appropriate judge.

All the creativity measurement methodologies discussed in this paper have not truly measured creativity. To support this view, Wallach noted that, researchers often concluded that when they increased creativity some manipulation had merely increased performance on the creativity test. In addition, Wallach stated that if creativity tests measured creativity then the tests would be appropriate[37,38], however, the creativity tests did not exactly measure creativity, which makes the tests inappropriate. In addition, Mansfield and Busse asserted that most of the creativity tests (e.g., divergent thinking and numerous cognitive tests) do not show any correlations with measures of real–life creativity[17].

From the analysis of the above creativity methods, a number of issues arise. For example, there exists no standardization of methods, hence, the issue is subjective. In addition, these creativity measurement methods are for various categories of creativity (i.e., product, person, press, process, etc), which introduces chaos thereby causing a lack of systems approach.

Research shows many different perspectives and a large number of applications of experimental findings in creativity, however, investigations of correlations of creativity do not bring researchers any closer to understanding the actual mechanisms that underlie creative capacities[25,26].

Conclusion

For more than a century, researchers have been investigating the concepts of creativity and how to measure and analyze it. Through research various issues have been encountered regarding the assessment and analysis of the creativity measuring methodologies. Some of the issues are reliability, subjectivity and bias. Exploring new system tools that reduce the issues of subjectivity, bias and reliability are important.

However, coming up with a creative idea is like an epiphany. Such epiphanies are commonly subjective. In order to deal with subjectivity, this research leads to future direction in using systems tools such as Fuzzy Logic[16], Neural Network[6,13], or hybridized methods[1] (i.e., Adaptive Neuro–Fuzzy Inference System (ANFIS)). One reason for believing so is that fuzzy and neural methods attempt to emulate key elements of the human thinking process, particularly when seeking solutions to complex problems.

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Acknowledgement

The authors thank the support of Clifford D. Clark Fellowship that enabled them to complete this project. They also appreciate the support of the Alliance for Graduate Education and the Professoriate (AGEP) funded by National Science Foundation (NSF).

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