

The Measurement of Creativity: From Definitional Consensus to the Introduction of a New Heuristic Framework

Mark Batey

Psychometrics at Work Research Group, Manchester Business School

The scientific study of creativity has proven a difficult undertaking. Researchers have employed a diversity of definitions and measurement methods. As a result, creativity research is underrepresented in the literature and the findings of different studies often prove difficult to draw into a coherent body of understanding. A heuristic framework to explicate the different methods by which creativity may be studied forms the basis of this article. Drawing upon existing conceptions of the creativity construct and previous efforts to provide structure to creativity research, the new taxonomic framework examines creativity from 3 primary perspectives in the form of a 3-dimensional matrix. The implications of the taxonomic framework for creativity research are examined. The new taxonomic framework contributes to the understanding of creativity research through the introduction of a comprehensive heuristic to guide future research and the interpretation of previous studies.

The cultural value placed upon creativity in the arts, sciences, technology, and political endeavor is immense. Creative people and their products have received adulation throughout history (Nettle, 2001), to such an extent that it has been argued that creativity constitutes humankind's ultimate resource (Toynbee, 1964). Creativity is an essential part of organizational innovation, which, in turn, drives economic prosperity (Amabile & Khaire, 2008). Yet, despite the undeniable importance of creativity, it is relatively infrequently studied in comparison to other similar constructs like intelligence or personality (Batey & Furnham, 2006; Guilford, 1950; Sternberg & Lubart, 1999).

Researchers have long been interested in the scientific analysis of creativity (Colvin, 1902; Colvin & Meyer, 1906; Dearborn, 1898). Over the years, there have been many approaches adopted in the study of creativity (Kaufman, Plucker, & Baer, 2008; Mumford, 2003; Runco, 2004). Some researchers have adopted a psychoanalytic perspective, some a psychometric approach, some cognitive, others social–psychological, and latterly neurobiological efforts to study creativity

have been instigated. At once this diversity is both encouraging, in that a wide variety of research paradigms have been investigated, and discouraging, in that creativity research has been described as a degenerating research program (Glover, Ronning, & Reynolds, 1989).

It may be argued that the primary issue to hamper creativity research centers around the lack of a clear and widely accepted definition for creativity, which, in turn, has impeded efforts to measure the construct (Batey & Furnham, 2006). Some researchers equate creativity with domain-changing, transcendent works of greatness; others find creativity in the artwork of children (Kaufman & Beghetto, 2009). Given that there is such diversity in the interpretation of the field of creativity, it is not surprising to discover that there have been a host of different ways suggested in which the construct may be studied. This diversity has made it difficult to synthesize the results of different studies and research streams. This article presents a novel heuristic framework with which to understand how creativity may be assessed. The heuristic emanates from a critique and understanding of how creativity has come to be defined. It is hoped that such a framework can allow for the integration of the diversity of approaches, as well as guide future research.

Correspondence should be sent to Mark Batey, Psychometrics at Work Research Group, Manchester Business School, Booth Street East, Manchester, UK M15 6PB. E-mail: mark.batey@mbs.ac.uk

DEFINITION

There have been recent integrative efforts to describe and delineate the field of creativity research (Batey & Furnham, 2006; Plucker, Beghetto, & Dow, 2004). With regard to definitions, many researchers have adopted the “new and useful” definition of creativity (Mumford, 2003); which suggests that a creative product is that which is deemed to be novel or original and useful or adaptive. Another area of agreement has involved the concept that creativity may refer to a person (or persons), processes, products, and also the environmental press (Rhodes, 1961/1987). However, it is important to consider how the term *creativity* has come to be understood and defined.

The historical background of the term *creativity* has a significant bearing on attempts to define the construct. The most significant issues that underpin creativity definitions concern Western versus Eastern perspectives, and creativity as divine intervention. Creativity as the original product of an individual is a predominantly Western perspective. The earliest perceptions of creativity were dominated by the story of the creation in *Genesis*. From here, the concept of creation as originality and utility arose and influenced subsequent interpretations of the properties of creative products. This contrasts with an Eastern view of creativity as the expression of personal truth or as self-growth (Lubart, 1999). The paradigmatic approach that has dominated creativity research has almost exclusively adopted this Western perspective of creativity as novelty and utility. The earliest, though predominantly Western, conceptions of creativity drew on mystical interpretations (Sternberg & Lubart, 1999). Many ancient Greeks believed that inspiration and creation resulted from divine intervention. From this perspective, creativity was “associated with mystical powers of protection and good fortune” (Albert & Runco, 1999, p. 18). The consequence for the concept of creativity was that it was considered beyond measurement and comprehension, a legacy that arguably remains today.

In time, the Greeks began to reduce the emphasis of divine intervention by the highest gods, instead considering creativity to be related to each individual’s *daimon* or guardian spirit. By the time of Aristotle, creativity was seen as a natural event that conformed to natural law, even if it did involve “an association with madness and frenzied inspiration” (Albert & Runco, 1999, p. 15). Little by little, creative acts became associated with the abilities and dispositions of the person. As creativity became associated with individuals, so researchers like Galton began investigations of *Heredity Genius* (Galton, 1869/1962) and the London school of differential movement sought to elucidate the most basic component of creative thought production; fluency

(Hargreaves, 1927). The grounding of the scientific investigation of creativity in the individual ability differences field led to the construct being considered a predominantly intellectual trait. Notable studies include the work of Terman and his associates (e.g., Terman & Oden, 1947, 1959), Guilford (e.g., 1950) and Torrance (1974). Further, the intellectual trait background of creativity research may have deflected focus from other important individual differences traits such as personality, motivation, values, and interests. A recent review has examined the relationships between creativity, intelligence, and personality (Batey & Furnham, 2006).

The development of the domain of psychology has also influenced how creativity is assessed. As intimated, the earliest psychological studies of creativity focused upon intellectual factors. Following this trend, researchers began to assess creativity from the perspective of personality, a good example being the meta-analysis of Feist (1998). Interest in cognitive psychology led to investigations of the creative problem-solving process (e.g., Finke, Ward, & Smith, 1992; Newell, Shaw, & Simon, 1964). There has also been considerable interest in the situational factors that promote or inhibit creativity (e.g., Amabile, 1996; Shalley & Gilson, 2004). Currently, studies of the neurobiology and function of creatives and creative thinking have been undertaken (e.g., Folley & Park, 2005; Jung et al., 2010; Martindale, 1999). The final frontier for creativity research lies in efforts to first evaluate and then integrate this diverse research. For this reason, confluence or syndrome approaches to creativity have been proposed (e.g., Mumford & Gustafson, 1988; Woodman & Schoenfeldt, 1989). Further, to integrate conceptually (or empirically) the diverse research on creativity, a framework needs to be devised.

How creativity is defined is crucial to how the construct is studied, yet “what creativity is, and what it is not, hangs as the mythical albatross around the neck of scientific research on creativity” (Prentky, 2000–2001, p. 97). As a psychological concept, creativity has resisted unequivocal definition or clear operationalization (Parkhurst, 1999; Plucker et al., 2004; Runco, 2004). Most researchers agree that creativity may be defined with regard to the terms *new* and *useful* (Mumford, 2003). Table 1 lists some examples of the new and useful approach to defining creativity. However, recent research has indicated that, in many cases, peer-reviewed creativity studies do not provide a definition of the construct (Plucker et al., 2004).

Alongside the growing consensus behind the new and useful definition of creativity, there is also concurrence regarding the areas to which definitions have been attributed. Rhodes (1961/1987) suggested that definitions relate to four areas: the *person(s)* who creates, the cognitive *processes* involved in the creation of ideas,

TABLE 1
Selected Definitions of Creativity

Plucker, Beghetto, and Dow (2004, p. 90)	“Creativity is the interaction among <i>aptitude, process and environment</i> by which an individual or group produces a <i>perceptible product</i> that is both <i>novel and useful</i> as defined within a <i>social context</i> .”
Mumford (2003, p. 110)	“Over the course of the last decade, however, we seem to have reached a general agreement that creativity involves the production of novel, useful products”
Sternberg and Lubart (1999, p. 3)	“Creativity is the ability to produce work that is both novel (i.e., original, unexpected) and appropriate (i.e., useful, adaptive concerning task constraints)”
Simonton (1999, pp. 5–6)	“... creativity must entail the following two separate components. First a creative idea or product must be original... However, to provide a meaningful criterion, originality must be defined with respect to a particular sociocultural group. What may be original with respect to one culture may be old news to the members of some other culture... Second, the original idea or product must prove adaptive in some sense. The exact nature of this criterion depends on the type of creativity being displayed”
Feist (1998, p. 290)	“ <i>Creative thought or behaviour</i> must be both novel-original and useful-adaptive”
Ochse (1990, p. 2)	<i>Bringing something into being</i> that is <i>Original</i> (new, unusual, novel, unexpected) and also <i>Valuable</i> (useful, good, adaptive, appropriate).
Barron (1955, p. 553)	“... if a response is to be called original... it must be to some extent adaptive to reality”

the *press* or environmental influences, and lastly the *product* that results from creative activity. This *4Ps* approach appears to have gained relatively wide consensus (Runco, 2004). How researchers interpret the *new and useful* definition of creativity will determine how they assess the construct. For example, if usefulness is taken to mean utility for society as a whole, then how creativity is measured and what populations may be sampled is very different from the researcher who sees usefulness as relating only to the experiment or study at hand. Those researchers who emphasize the importance of social appraisal or *ecologically valid* appraisals of the novelty and utility of a creative person or product will be inclined to measure the construct using raters or judges.

Those who emphasize a person-centered view of creativity will probably assess creativity with reference to trait attributes, like intelligence or personality (e.g., Eysenck, 1993; Guilford, 1950). Those who emphasize a process-centered view will probably assess creativity with reference to problem-solving (e.g., Finke et al., 1992; Mednick, 1962). Those who emphasize the role of the environment will focus on the climate for creativity (Amabile, 1996; Dul & Ceylan, 2011). However, the dominant definition of the moment is the *new and useful* product-oriented approach: “Over the course of the last decade, however, we seem to have reached a general agreement that creativity involves the production of novel, useful products” (Mumford, 2003, p. 107).¹ This indicates that advocates of this approach will look to define creativity in terms of the outputs or products of an individual. Then, by proxy, the person who produced the novel and useful product will be deemed creative.

¹Unfortunately, many of the tests or assessments of creativity do not assess creative potential using novelty and utility as criteria (e.g., Remote Associates Test; Mednick & Mednick, 1967; and the Barron-Welsh Art Scale; Welsh & Barron, 1963).

In addition, the *4Ps* approach indicates that assessments of creativity may be broad; incorporating not only an assessment of product, but also the characteristics of the person, the *press* and the processes required for creativity. Therefore, it may be hypothesised that these different approaches have led to multicomponential models and thus measures of creativity, whereby the person, process, product, and *press* are considered in addition to the importance of social appraisal.

In summary, it has been suggested that the conception of creativity as *new and useful* and the *4Ps* approach already influences how researchers define and measure the construct. It may be argued that it is now time for these concepts to be drawn together into a systematic model.

PREVIOUS APPROACHES TO THE ASSESSMENT OF CREATIVITY

In the same way that it may be contended that the historical background to the understanding of creativity impacts upon the way it is measured, so too may the research background. In addition, a number of different creativity researchers have attempted to taxonomize the ways in which creativity may be assessed. Therefore, a few early monumental creativity research efforts are briefly introduced here, before a consideration of different taxonomies of creativity measurement.

Galton, Terman, and Hargreaves

Francis Galton conducted early historiometric analyses of eminence, genius, and “productive creators.” In his book *Hereditary Genius* (1869/1962), Galton sought to examine the extent to which eminence or genius could be “passed down” through the generations. Genius was assessed with reference to rated social achievement

based upon surveys of biographical dictionaries. The significant legacy of Galton's research was the use of ratings of creativity from archival sources. Another important research stream was the *Genetic Studies of Genius* conducted by Lewis Terman and associates at Stanford University (e.g., Terman & Oden, 1959). In a study initiated in the 1920s, some 1,600 high-IQ schoolchildren taken from a sample of a quarter of a million were followed to examine the relationship between intellect and real-world achievement. The legacy of the approach taken by the Terman group is that objective measures of traits can be applied to rated achievement. Although the investigations of Galton and Terman and colleagues had operationalized creativity in terms of ratings of social achievements, other researchers have approached the problem of creativity measurement through the use of objective tests. Following on from the work of Spearman (1904), Hargreaves (1927) in his studies of *The Faculty of Imagination* was able to isolate a factor of intelligence that corresponded with fluent ideational production, but was independent of *g*, or general intelligence. The tests used to identify this *f*, or fluency factor, called for multiple responses to objects seen in an inkblot, completions to an incomplete picture, or the production of long lists of words. The legacy of this experimental work has resulted in a number of different tests of divergent thinking (e.g., Guilford, 1967; Torrance, 1974; Wallach & Kogan, 1965). These early monumental studies have significantly shaped the way in which creativity is assessed. There would appear to have been two primary approaches; creativity derived from ratings or judgements and creativity as a normally distributed trait derived from scores on a test.

The Taxonomy of Creativity Research Methods

Several researchers have attempted to taxonomize the various means by which creativity may be assessed. At the most basic level, lists of the available measures have been produced. However, some efforts have been made to provide a framework for creativity measures. Hocevar and Bachelor (1989) and Lubart (1994) presented taxonomies of the available measures at the time, which consisted of eight categories: divergent thinking (DT) tests; attitudes and interest inventories; personality inventories; biographical inventories; ratings by peers, teachers, and supervisors; judgments of products; ratings of eminence; and self-reported creative activities. These lists of available creativity measures are helpful, insofar as they provide an indication of how creativity has been and might be assessed. However, arguably more useful are those efforts to provide some structure to the way creativity measurement may be approached.

Eysenck (1996) proposed that the study of creativity may either be viewed from the trait or achievement per-

spective. Trait measures of creativity are those for which the distribution of scores conforms to the normal distribution. Therefore, DT tests, intelligence tests, personality inventories, and creativity-specific self-report measures would be included on the basis that, when administered to a cohort, the scores obtained tend to follow a normal distribution. He further subdivided trait creativity measures into cognitive variables (e.g., intelligence, knowledge, technical skills, etc.), environmental variables (e.g., cultural factors, socioeconomic factors, educational factors, etc.) and, last, personality variables (internal motivation, confidence, non-conformity, etc.). Each of these normally distributed trait measures are postulated to synergistically interact to produce achievement creativity, which is not normally distributed. Rather, achievement creativity has been demonstrated to follow a Poissonian, J-shaped distribution (e.g., Lotka, 1926; Moles, 1958/1968; Price, 1963). Mumford and Gustafson (1988) indicated that achievement measures may be based upon three different criteria: first, overt production criteria such as number of patents awarded; second, professional recognition criteria such as prizes awarded for achievement in a domain; last, social recognition criteria that would normally involve judgements or ratings with regards to creativity awarded by peers or experts.

Amabile (1996) suggested that there are three assessment techniques for creativity measurement: first, creativity tests; second, objective analysis of products; and last, subjective judgements. Creativity tests were considered to fall into three broad categories: personality tests (e.g., Creative Personality Scale; Gough, 1979), biographical inventories (e.g., the Creative Achievement Questionnaire; Carson, Peterson, & Higgins, 2005), and behavioral assessments (e.g., DT tests). Objective analyses of products are rarely attempted and involve an objective method for identifying the creativity or originality of a product. An example of this is the analysis of the relationship between the fame of a melody and the level of originality of the opening six notes of each melody (Simonton, 1980). The last category of creativity measurement suggested by Amabile was subjective judgements. The subjective judgment of creativity was further subdivided into the judgment of people or products. Judgments of people are common (e.g., Cox, 1926; Galton, 1869/1962), as is the product judgment paradigm (e.g., Amabile, 1982; Getzels & Csikszentmihalyi, 1976).

The taxonomic efforts of Eysenck (1996) and Amabile (1996) together provide a relatively broad coverage of the creativity construct. Eysenck noted the importance of a complex interaction between person and environment. Amabile highlighted the importance of ecologically valid measures of creativity. It may be postulated that the next stage for the taxonomy of

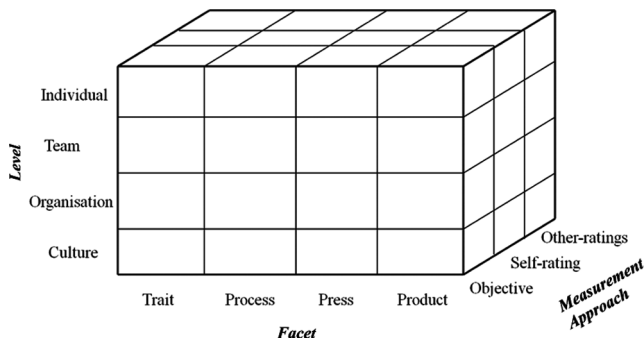


FIGURE 1 A graphical representation of the new heuristic framework for creativity measurement.

creativity measurement involves the concatenation of these two approaches. Future efforts to explain how creativity may be measured need to take account of multicomponent perspectives, as well as the role of social appraisal.

A NEW HEURISTIC FRAMEWORK FOR CREATIVITY MEASUREMENT

The remainder of this article is concerned with the provision of a brief introduction of a new heuristic framework for creativity measurement and some succinct examples of how the framework can be applied. The framework, which is presented in Figure 1,² draws upon and synthesises some of the previous efforts to taxonomize available measures of creativity. Last, the implications of this taxonomic framework for the study of creativity are presented.

The taxonomic framework for measuring creativity to be presented here takes the form of a three-dimensional matrix. Upon one axis lies the *level* at which creativity may be measured. Upon another axis lies the *facet* of creativity that may be assessed. The last axis concerns the *measurement approach*. The similarity of the new heuristic framework for creativity measurement to the Guilfordian (1967) representation of intelligence is clear. However, the similarity between the two models lies only at the visual level.

Level

The level of creativity to be assessed is concerned with who is to be the focal point of analysis. This is broken down into four categories: the individual, the team, the organization, and the culture. In practice, the indi-

vidual has proven to be the primary focus for study. However, the creativity of teams may be examined (Nijstad & Stroebe, 2006; Thompson & Choi, 2006) as can the creativity of organizations (Nayak, 2008). This last point is, perhaps, a little moot. The creativity of an organization is often seen to be the aggregate of individual creativity scores. An extension of organizational creativity studies would involve comparison and contrast of the aggregated creativity scores of individuals in different divisions or companies within the same global corporation. The greatest level of abstraction from the individual involves the analysis of cultural differences in approaches toward creativity (Williams & McGuire, 2010). It is important to note that, although the creativity of an individual or team might be examined, the label *creative* could only be applied with reference to some other information. For example, an individual (or team) could be rated as to whether they are perceived to be creative, or more likely their output or products would be examined. Therefore, to undertake an assessment of the creativity within a level (person, team, etc.), reference must be made to the facet of creativity referred to (process utilised, product generated, etc.), as well as the measurement approach adopted (ratings, objective test, etc.).

Facet

The facet of creativity to be assessed is concerned with *what* is to be analysed. This is broken down into four categories approximately corresponding to the 4Ps approach; trait (person), process, press, and product.

The trait approach involves the analysis of the characteristics of the focus for study (e.g., what are the characteristics of the person or team being investigated? Is/are they intelligent, extraverted, aggressive, conscientious? etc.). The process approach involves the analysis of the means by which creativity is produced (e.g., how does the team interact and share knowledge? How much time does the team spend on different aspects of decision-making? etc.). The press approach involves the analysis of the environment in which the focal point of analysis operates (e.g., what is the climate in the organization like for team creativity?). Last, the product approach involves an analysis of the product to emanate from the efforts of the focus of the study (e.g., how creative is the product/idea created by the team?).

The trait approach to creativity measurement (especially of the individual) has been the dominant paradigm adopted by most creativity researchers. This is understandable, given that in pragmatic terms the aim of creativity studies has often been to identify the most creative people or teams to improve society's lot (Albert & Runco, 1999; Guilford, 1950; Toynebee,

²It is important to note that the framework presented is a heuristic, rather than an exact representation of how creativity can be assessed.

1964). Typically, researchers have examined intellectual or personality traits (Batey, Chamorro-Premuzic, & Furnham, 2009, 2010; Batey, Furnham, & Safiullina, 2010; Furnham, Crump, Batey, & Chamorro-Premuzic, 2009) with more recent attention paid to subclinical psychopathologies such as schizotypy (Batey & Furnham, 2008) and hypomania (Furnham, Batey, Anand, & Manfield, 2008).

The process approach to creativity measurement (again predominantly within individuals, but also popular in team creativity research) has been investigated to elucidate the processes by which creative products are produced (Finke et al., 1992). In pragmatic terms, such research has often been undertaken to ascertain whether creative thinking processes may be taught or encouraged.

The product approach to creativity assessment has traditionally focussed on ratings or assessment of products (Amabile, 1996), production criteria like professional recognition awards or publications (Dewett & Denisi, 2004), or suggestions made to improvement schemes (Oldham & Cummings, 1996). Sternberg, Kaufman, and Pretz (2002) developed a taxonomic model that examined how different creative products impact upon domains. At the broadest level, products or creative contributions can accept existing paradigms and extend them, reject paradigms and attempt to replace them, or synthesize paradigms.

All creative people, processes, or products must be both created within and evaluated by the prevailing environment. The environment may be assessed in terms of the sociocultural milieu (e.g., the Dark Ages vs. the Renaissance), the immediate working/impacting environment (usually the classroom, laboratory or organization) or the characteristics of certain individuals within the environment (e.g., foreman, leader, teacher, etc.). Additionally, the environment may be perceived as a source of stimulation (Dodds, Smith, & Ward, 2002; Moss, 2002) and also evaluation (Csikszentmihalyi, 1999). In reality, the analysis of trait, process, or product needs to also consider who is being assessed, by whom, and using what methodology.

The configuration of the facets of creativity seems to indicate that each of these four categories or facets is independent. This approach is beneficial with regard to measurement. However, the four facets are highly inter-related. It may be contended that processes occur within a person or persons to produce a product. This whole process unfolds within the creative press such that it may be suggested that: $\text{Person} \times \text{Process} \times \text{Press} = \text{Product}$.

This conceptualization of creativity as the synergy of the 4Ps indicates that, although a single facet of creativity may be investigated (e.g., process), no single facet exists without relation to other facets of creativity. A product cannot be created without reference to a person who utilizes cognitive processes within an environment.

Further, a person cannot be considered creative without reference to some product, which, in turn, has resulted from cognitive processes that unfolded within a specific environment. If this contention is taken to be true, it indicates that any comprehensive analysis of creativity must be multi-componential.

Measurement Approach

The measurement approach with regards to creativity concerns how creativity is to be assessed. Measurement may be made objectively (e.g., hard data).³ Within the context of the investigation of an individual, this might take the form of an analysis of the number of patents awarded to an individual for innovative products or the number of gallery showings for an artist. A subjective measure may be taken from the focal point of analysis (e.g., an individual, team, etc.). In the context of the investigation of an individual, this would involve scores on a self-rating of creativity. For a team, this might be measured using a team creativity questionnaire or aggregated ratings of the perceived creativity of the team provided by individual team members. Last, measurement may be made subjectively and externally to the focal point of analysis (e.g., subject matter experts, judges, etc.). In the context of the analysis of the creativity of an individual, this might take the form of ratings of the creativity of the individual provided by a teacher. With regard to culture, the creativity of a sociocultural group such as the Aztecs could be rated by subject matter experts.

The most common forms of assessment have usually involved objective measures of creativity, such as asking an individual to produce a number of ideas to a stimulus question and self-reported measures of creativity, such as providing a list of achievements. The alternative to the creator or creators providing an assessment of their creativity is to gather perceptions from those outside the creation process. Some commentators have argued that this is the only viable form of creativity assessment given the social nature of creativity (e.g., Amabile, 1996, Csikszentmihalyi, 1999). If creativity involves the social recognition of a novel and valuable idea or product, then society must be asked its opinion of the creation. Typically, the assessment of others takes the form of person or persons who are conversant with the creative product and/or the creator (peers, team members, teachers,

³The types of data considered to be objective are likely to be open to considerable debate. In particular, it may be argued that personality inventory data are objective, in that a personality inventory is "independent of the subjective judgment of the particular examiner" (Anastasi & Urbina, 1997, p. 7). However, the data are still based on self-report.

TABLE 2
Potential Objective, Self-Rated and Other-Rated Measures of Individual Creativity

Level	Facet	Measurement Approach	Potential Measure
Individual	Trait	Objective	Divergent thinking test scored for fluency ^a
Individual	Process	Objective	Time spent considering the solution to a problem
Individual	Press	Objective	Level of noise in room during creation
Individual	Product	Objective	Number of patents awarded
Individual	Trait	Self-rated	Self-rating of perceived personal creativity
Individual	Process	Self-rated	Self-rating of the extent to which the individual perceives they combine diverse ideas
Individual	Press	Self-rated	Self-rating of perceived threat of evaluation in the environment
Individual	Product	Self-rated	Self-rating of the creativity of a product
Individual	Trait	Other-rated	Expert rating of the creativity of an individual
Individual	Process	Other-rated	Expert rating of the amount of time the individual spends problem-solving
Individual	Press	Other-rated	Expert rating of the suitability of an environment for creativity
Individual	Product	Other-rated	Expert rating of the creativity of a product produced by an individual

^aA fluency score is calculated by counting the number of responses provided to an open-ended question. An example being the questions posed by Hargreaves (1927).

tutors, managers, etc.). An alternative is to ask for subject matter expert opinion (e.g., MacKinnon, 1965). However, there are serious considerations in these social recognition criteria. If assessment is to be made by peers or those familiar with the person or product, then judgments may be open to significant biases. In addition, often, the great creativity of individuals remains unrecognized in their lifetime (e.g., Van Gogh) and subject matter experts can often be wrong. Similarly, within the creativity research tradition, Csikszentmihalyi (1999) argued that gatekeepers may not allow creative ideas to be registered within a domain, with the result that an idea may be highly creative but not yet recognized by the relevant community.

In summary, a new heuristic model has been presented that takes into account the who or level of analysis (individual, team, organization, or culture), the what or facet (trait, process, press, or product) and also the how or measurement approach (objective, self-rated, or other-rated).

Using the New Heuristic Framework for Creativity Measurement to Examine Measures of Individual Creativity

To illustrate how the new heuristic framework for creativity measurement can be adopted, some of the potential measurement methods for examining the creativity of an individual are presented. Table 2 lists examples of the measures that could be used to assess individual creativity using objective, self-ratings, and other-ratings. The examples in Table 2 are subsequently related to Figures 2, 3, and 4. In each case, only one example is provided, as there is insufficient space here to examine possible permutations of the heuristic framework.

Objective measures. Figure 2 illustrates the areas of the framework that relate to objectively measured creativity with regards to an individual.

Within the confines of considering objective individual trait measures, researchers have examined intellect,

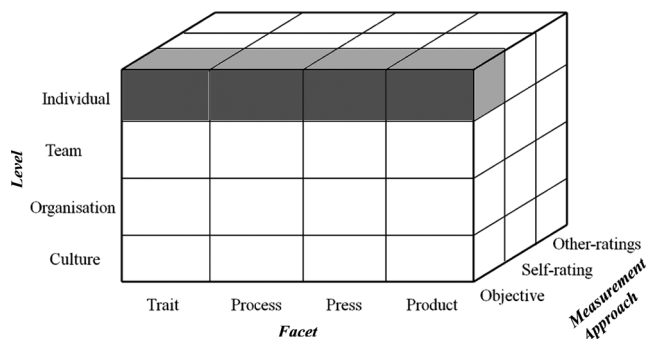


FIGURE 2 The new heuristic framework for creativity measurement: Objective measures of individual creativity.

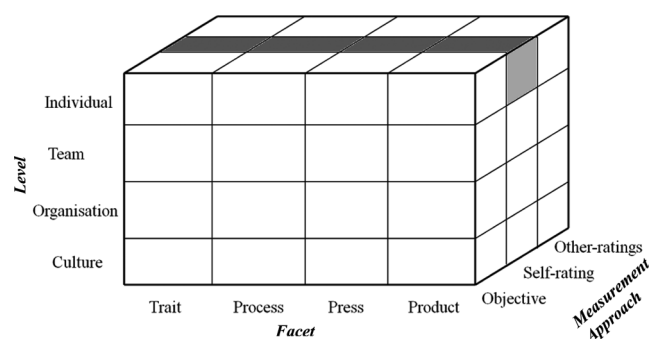


FIGURE 3 The new heuristic framework for creativity measurement: Self-rated measures of individual creativity.

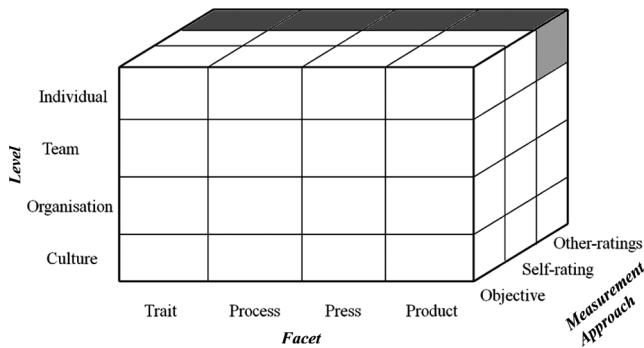


FIGURE 4 The new heuristic framework for creativity measurement: Other-rated measures of individual creativity.

personality, and motivation (cf. Batey & Furnham, 2006 for a review) in addition to other proposed measures of creativity like the Remote Associates Test (Mednick & Mednick, 1967) or the Barron-Welsh Art Scale (Welsh & Barron, 1963). Latterly, researchers have begun to examine biological trait measures (e.g., Reuter et al., 2005).

Self-rated measures. Figure 3 illustrates the areas of the framework that relate to self-rated measures of creativity with regards to an individual.

In practice, the use of self-ratings of creativity has been popular (Furnham et al., 2008), as have measures that assess perceived environmental characteristics (Amabile & Grysiewicz, 1989). In a recent study, Silvia (2008) examined the extent to which people could recognize creativity in their own ideas.

Other-rated measures. Figure 4 illustrates the areas of the framework that relate to other-rated measures of creativity with regards to an individual.

The *other-ratings* paradigm has been popular in creativity research. The provision of expert ratings of an individual has been common (e.g., Cox, 1922; Mackinnon, 1965). Researchers have provided ratings of the creative process (Getzels & Csikszentmihalyi, 1976) and the use of expert ratings of a product is the basis of most creativity product assessment tools like the Consensual Assessment Technique (Amabile, 1982).

SUMMARY, LIMITATIONS, AND IMPLICATIONS OF THE HEURISTIC FRAMEWORK FOR CREATIVITY MEASUREMENT

Although creativity has been viewed as essential for the progress of society and deemed to be an important area for scientific study, commentators have argued that research in the area is highly fragmented (Glover et al.,

1989) and underrepresented in the academic literature (Guilford, 1950; Sternberg & Lubart, 1999). It may be argued that although there is a necessary and encouraging diversity of research approaches, the lack of a consensual definition of creativity has led to a multitude of measurement approaches, which, in turn, has hampered synthesis of the findings of creativity research. In this article, it has been posited that there is now definitional consensus, in the form of an acceptance of the new and useful and 4Ps approaches (Mumford, 2003; Runco, 2004). Taking this consensus in addition to the taxonomic approaches of Eysenck (1996), who proposed a distinction between trait and achievement measures of creativity, and Amabile (1996), who preferred a distinction based upon creativity tests, objective product analyses and subjective analyses, a new heuristic framework for creativity measurement has been presented.

The new heuristic framework for creativity measurement assumes the form of a $4 \times 4 \times 3$ matrix. Creativity may be assessed with reference to level (individual, team, organization, and culture), facet (trait, process, press, and product) and measurement approach (objective, self-ratings, and other-ratings). Effectively, this suggests at least 48 different means of assessing the creativity construct. For example, the trait creativity of an individual may be measured objectively using a DT test scored for fluency; the processes of team creativity may be assessed by self-ratings (provided by the team members); the environmental press impinging upon organisational creativity might be evaluated by judges; similarly, the creative products or artifacts created by an entire culture (e.g., the Romans) might also be judged by subject matter experts.

Defining and elucidating the methods by which creativity may be studied scientifically has proven problematic (Batey & Furnham, 2006; Plucker et al., 2004; Runco, 2004). Therefore, any new model that attempts to do this will also be susceptible to limitations. There are a number of limitations of the new heuristic model. First, it may be argued that although researchers have begun to converge on a consensus definition (Mumford, 2003; Plucker et al., 2004), there is yet to be universal agreement. Second, there are issues around the orthogonality of the categories within the levels (person, team, etc.), facets (trait, process, press and product) and measurement approaches (objective, self-rated and other rated). When, for example, does a large work team end and an organizational unit start? Equally, as previously mentioned, no product exists without a person or persons utilizing a process within an environment. Within the same theme, it is difficult to ascertain whether a personality inventory is an objective measure (as it is standardized) or whether it is a self-report measure. However, the issue of objectivity versus subjectivity besets all of the behavioral sciences and not just the field of creativity. Fourth, there remains an issue as to the

extent to which every box within the model can be examined or whether such an exercise would be desirable. For example, it might prove difficult to provide an objective measure of the processes involved in the creativity of an ancient culture. This issue is mitigated to a degree in that the model presented here is heuristic, rather than exact.

Perhaps the biggest potential limitation or criticism of the new heuristic model is that creativity cannot be located in the model *per se*. Rather, creativity may be inferred by the intersection of the relevant parts of the matrix. For example, a rating of the product of an individual by a subject matter expert is not creativity. Similarly, a high score on a test of divergent thinking or a large number of awarded patents is not creativity. At first glance, this issue might seem to provide a serious challenge to the utility of the new heuristic framework. However, within the literature, it is not uncommon to find researchers who argue that creativity resides in the juncture between different factors (Csikszentmihalyi, 1999). Csikszentmihalyi suggested that creativity can be found in the interplay between an individual, the field, and the domain. Within this heuristic model, the methods of assessment that might be employed within each box are effectively predictors or proxy measures of creativity. Indeed, it may be argued that because creativity involves the confluence of the 4Ps that results in a product that is perceived to be new and useful by some external group, that there can never be a single measure of creativity. Rather, researchers examine proximal constructs that have been found to relate to creativity from traits (e.g., intelligence, personality, etc.), processes (e.g., incubation, time spent considering an object, etc.), the environmental press (e.g., the behaviour of others, organizational culture, etc.) to the product deemed creative itself (e.g., experimentally induced products like pictures and poems to rated works of a domain-changing nature like the theory of evolution by natural selection). This very diversity of potential methods of measurement, it may be contended, has given rise to difficulty in assimilating and condensing the results of the multitude of creativity studies. However, for the same reason, it indicates why the field requires a parsimonious model with which to make sense of the body of research.

There are also a number of implications and benefits that arise from the new heuristic model. Researchers have called for comprehensive definitions and measurement taxonomies (Batey & Furnham, 2006; Plucker et al., 2004) so that the field may advance. The new heuristic framework provides evidence that a consensual definition can be drawn from the literature and related to common methods of understanding how creativity may be measured (e.g., Amabile, 1996; Eysenck, 1996; Rhodes 1961/1987). Further, the model is effectively the synthesis of existing research, which, as a result, should ensure that the concepts introduced will fit neatly

with the existing practices and knowledge of creativity researchers. In fact, it may be contended that researchers need not change how they conduct research, but they now have a comprehensive taxonomic framework within which to locate their investigations. Given that the dominant models for explaining creativity are multicomponential (e.g., Amabile, 1996; Eysenck, 1993; Mumford & Gustafson, 1988; Sternberg & Lubart, 1999; Woodman & Schoenfeldt, 1989), the new heuristic framework for creativity measurement provides a structure for understanding these multicomponent approaches and perhaps the opportunity to synthesise these various models. In time, by providing a heuristic that enables diverse strands of research to be organized and understood, this new framework can have a significant impact upon the understanding of previous research efforts, and also form a template from which meta-analyses and structural equation models can be derived.

The use of the heuristic framework might prove valuable in that it can illustrate areas of research that relate to creativity that have yet to be explored. In doing so, it may help promulgate new research, but within the auspices of a heuristic that helps make sense of the new research findings. This last point is particularly important. This article has presented evidence that the construct of creativity is extremely broad, ranging from individuals to cultures, from traits to products and with measurement methods that range from objective to subjective. This range is necessary and also encouraging, but the very diversity of potential methods of measurement, it may be contended, has given rise to difficulty in assimilating and condensing the results of the multitude of creativity studies. The heuristic framework for creativity measurement could provide a structure to follow to conduct these analyses.

Creativity is of undeniable importance, yet has lagged behind similar research streams like intelligence (Stenberg & Lubart, 1999). If the lack of definitional consensus and clarity of measurement methods has obfuscated and hampered creativity research, it may be that the new heuristic framework for creativity measurement can help structure this important field of research.

REFERENCES

- Albert, R. S., & Runco, M. A. (1999). A history of research on creativity. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 16–34). Cambridge, UK: Cambridge University Press.
- Amabile, T. M. (1982). Social psychology of creativity: A consensual assessment technique. *Journal of Personality and Social Psychology*, 43, 997–1013.
- Amabile, T. M. (1996). *Creativity in context*. New York, NY: Westview.
- Amabile, T. M., & Gryskiewicz, N. (1989). The creative environment scales: The work environment inventory. *Creativity Research Journal*, 2, 231–254.

- Amabile, T. M., & Khaire, M. (2008). Creativity and the role of the leader. *Harvard Business Review*, *86*, 100–109.
- Anastasi, A., & Urbina, S. (1997). *Psychological testing*. Upper Saddle River, NJ: Prentice-Hall International.
- Batey, M., Chamorro-Premuzic, T., & Furnham, A. (2010). Individual differences in ideational behavior: Can the Big Five and psychometric intelligence predict creativity scores? *Creativity Research Journal*, *22*, 90–97.
- Batey, M., Chamorro-Premuzic, T., & Furnham, A. (2009). Intelligence and personality as predictors of divergent thinking: The role of general, fluid and crystallised intelligence. *Thinking Skills and Creativity*, *4*, 60–69.
- Batey, M., & Furnham, A. (2006). Creativity, intelligence and personality: A critical review of the scattered literature. *Genetic, Social, and General Psychology Monographs*, *132*, 355–429.
- Batey, M., & Furnham, A. (2008). The relationship between measures of creativity and schizotypy. *Personality and Individual Differences*, *45*, 816–821.
- Batey, M., Furnham, A. F., & Safiullina, X. (2010). Intelligence, general knowledge and personality as predictors of creativity. *Learning and Individual Differences*, *20*, 532–535.
- Barron, F. X. (1955). The disposition toward originality. *Journal of Abnormal Social Psychology*, *51*, 478–485.
- Carson, S. H., Peterson, J. B., & Higgins, D. M. (2005). Reliability, validity, and factor structure of the creative achievement questionnaire. *Creativity Research Journal*, *17*, 37–50.
- Colvin, S. S. (1902). Invention versus form in English composition. *Pedagogical Seminar*, *9*, 393–421.
- Colvin, S. S., & Meyer, I. F. (1906). Imaginative elements in the written work of schoolchildren. *Pedagogical Seminar*, *13*, 91.
- Cox, C. M. (1926). *Genetic studies of genius II: The early mental traits of three hundred geniuses*. Stanford, CA: Stanford University Press.
- Csikszentmihalyi, M. (1999). Implications of a systems perspective for the study of creativity. In R. J. Sternberg (Ed.), *Creativity research handbook* (pp. 313–325). Cambridge, UK: Cambridge University Press.
- Dearborn, G. V. (1898). A study of imagination. *American Journal of Psychology*, *5*, 183–190.
- Dewett, T., & Denisi, A. S. (2004). Exploring scholarly reputation: It's more than just productivity. *Scientometrics*, *60*, 249–272.
- Dodds, R. A., Smith, S. M., & Ward, T. B. (2002). The use of environmental clues during incubation. *Creativity Research Journal*, *14*, 287–304.
- Dul, J., & Ceylan, C. (2011). Work environment for employee creativity. *Ergonomics*, *54*, 12–20.
- Eysenck, H. J. (1993). Creativity and personality: Suggestions for a theory. *Psychological Inquiry*, *4*, 147–178.
- Eysenck, H. J. (1996). The measurement of creativity. In M. A. Boden (Ed.), *Dimensions of creativity* (pp. 199–242). Cambridge, MA: MIT Press.
- Feist, G. J. (1998). A meta-analysis of the impact of personality on scientific and artistic creativity. *Personality and Social Psychological Review*, *2*, 290–309.
- Finke, R. A., Ward, T. B., & Smith, S. M. (1992). *Creative cognition: Theory, research and applications*. Cambridge, MA: MIT Press.
- Folley, B. S., & Park, S. (2005). Schizophrenia, schizotypy and creativity in relation to laterality: A behavioral and near-infrared optical imaging study. *Schizophrenia Research*, *80*(2/3), 271–282.
- Furnham, A., Crump, J., Batey, M., & Chamorro-Premuzic, T. (2009). Personality and ability predictors of the consequences test of divergent thinking in a large non-student sample. *Personality and Individual Differences*, *46*, 536–540.
- Furnham, A., Batey, M., Anand, K., & Manfield, J. (2008). Personality, hypomania, intelligence and creativity. *Personality and Individual Differences*, *44*, 1060–1069.
- Galton, F. (1962). *Hereditary genius: An inquiry into its laws and consequences*. London, UK: Macmillan/Fontana. (Original work published 1869)
- Getzels, J. W., & Csikszentmihalyi, M. (1976). *The creative vision: A longitudinal study of problem-finding in art*. New York, NY: Wiley.
- Glover, J. A., Ronning, R. R., & Reynolds, C. R. (1989). *Handbook of creativity: Perspectives on individual differences*. New York, NY: Plenum.
- Gough, H. G. (1979). A creative personality scale for the adjective check list. *Journal of Personality and Social Psychology*, *37*, 1398–1405.
- Guilford, J. P. (1950). Creativity. *American Psychologist*, *5*, 444–454.
- Guilford, J. P. (1967). *The nature of human intelligence*. New York, NY: McGraw-Hill.
- Hargreaves, H. L. (1927). The 'faculty' of imagination: An enquiry concerning the existence of a general 'faculty,' or group factor, of imagination. *British Journal of Psychology Monograph Supplement*, *3*, 10.
- Hocevar, D., & Bachelor, P. (1989). A taxonomy and critique of measurements used in the study of creativity. In J. A. Glover, R. R. Ronning, & C. R. Reynolds (Eds.), *Handbook of creativity. Perspectives on individual differences* (pp. 53–75). New York, NY: Plenum.
- Jung, R. E., Segall, J. M., Bockholt, H. J., Flores, R. A., Smith, S. M., Chavez, R. S., & Haier, R. J. (2010). Neuroanatomy of creativity. *Human Brain Mapping*, *31*, 398–409.
- Kaufman, J. C., & Beghetto, R. A. (2009). Beyond big and little: The four C model of creativity. *Review of General Psychology*, *13*, 1–12.
- Kaufman, J. C., Plucker, J. A., & Baer, J. (2008). *Essential of creativity assessment*. New York: John Wiley & Sons.
- Lotka, A. J. (1926). The frequency distribution of scientific productivity. *Journal of the Washington Academy of Sciences*, *16*, 317–323.
- Lubart, T. I. (1994). Creativity. In R. J. Sternberg (Ed.), *Thinking and problem solving. Handbook of perception and cognition* (2nd ed.), (pp. 289–332). San Diego, CA: Academic Press.
- MacKinnon, D. W. (1965). Personality and the realization of creative potential. *American Psychologist*, *20*, 273–281.
- Martindale, C. (1999). Biological bases of creativity. In R. J. Sternberg (Ed.), *Creativity Research Handbook* (pp. 137–152). Cambridge, UK: Cambridge University Press.
- Mednick, S. A. (1962). The associative basis of the creative process. *Psychological Review*, *3*, 220–232.
- Mednick, S. A., & Mednick, M. T. (1967). *Examiner's manual: Remote Associates Test*. Boston, MA: Houghton Mifflin.
- Moles, A. (1968). *Information theory and esthetic perception* (J. E. Cohen, Trans.). Urbana, IL: University of Illinois Press. (Original work published 1958)
- Moss, S. A. (2002). The impact of environmental clues in problem solving and incubation: The moderating effect of ability. *Creativity Research Journal*, *14*, 207–211.
- Mumford, M. D. (2003). Taking stock in taking stock. *Creativity Research Journal*, *15*, 147–151.
- Mumford, M. D., & Gustafson, S. B. (1988). Creativity syndrome: Integration, application, and innovation. *Psychological Bulletin*, *103*, 27–43.
- Nayak, A. (2008). Experiencing creativity in organizations: A practice approach. *Long Range Planning*, *41*, 420–439.
- Nettle, D. (2001). *Strong imagination: Madness, creativity and human nature*. Oxford, UK: Oxford University Press.
- Newell, A., Shaw, J. C., & Simon, H. A. (1964). The process of creative thinking. In H. Gruber, G. Terrell, & M. Wertheimer (Eds.), *Contemporary approaches to creative thinking* (pp. 63–119). New York, NY: Atherton.

- Nijstad, B. A., & Stroebe, W. (2006). How the group affects the mind: A cognitive model of idea generation in groups. *Personality and Social Psychology Review, 10*, 186–213.
- Ochse, R. (1990). *Before the gates of excellence*. Cambridge, UK: Cambridge University Press.
- Oldham, G. R., & Cummings, A. (1996). Employee creativity: Personal and contextual factors at work. *Academy of Management Journal, 39*, 607–634.
- Parkhurst, H. B. (1999). Confusion, lack of consensus, and the definition of creativity as a construct. *Journal of Creative Behavior, 33*, 1–21.
- Plucker, J. A., Beghetto, R. A., & Dow, G. T. (2004). Why isn't creativity more important to educational psychologists? Potentials, pitfalls, and future directions in creativity research. *Educational Psychologist, 39*, 83–96.
- Prentky, R. A. (2000–2001). Mental illness and roots of genius. *Creativity Research Journal, 13*, 95–104.
- Price, D. (1963). *Little science, big science*. New York, NY: Columbia University Press.
- Reuter, M., Panksepp, J., Schnabel, N., Kellerhoff, N., Kempel, P., & Hennig, J. (2005). Personality and biological markers of creativity. *European Journal of Personality, 19*, 83–95.
- Rhodes, M. (1987). An analysis of creativity. In S. G. Isaksen (Ed.), *Frontiers of creativity research: Beyond the basics* (pp. 216–222). Buffalo, NY: Bearly. (Original work published 1961)
- Rogers, C. R. (1954). Toward a theory of creativity. *ETC: A Review of General Semantics, 11*, 249–260.
- Runco, M. A. (2004). Creativity. *Annual Review of Psychology, 55*, 657–687.
- Shalley, C. E., & Gilson, L. L. (2004). What leaders need to know: A review of social and contextual factors that can foster or hinder creativity. *Leadership Quarterly, 15*, 33–53.
- Silvia, P. J. (2008). Discernment and creativity: How well can people identify their most creative ideas? *Psychology of Aesthetics, Creativity, and the Arts, 2*, 139–146.
- Simonton, D. K. (1980). Thematic fame, melodic originality, and musical zeitgeist: A biographical and transhistorical content analysis. *Journal of Personality and Social Psychology, 38*, 972–983.
- Simonton, D. K. (1999). *Origins of genius*. New York, NY: Oxford University Press.
- Spearman, C. (1904). General intelligence, objectively determined and measured. *American Journal of Psychology, 15*, 201–293.
- Sternberg, R. J., Kaufman, J. C., & Pretz, J. E. (2002). *The creativity conundrum: A propulsion model of kinds of creative contributions*. New York, NY: Psychology Press.
- Sternberg, R. J., & Lubart, T. I. (1999). The concept of creativity: Prospects and paradigms. In R. J. Sternberg (Ed.), *Creativity research handbook* (pp. 3–15). New York: Cambridge University Press.
- Terman, L. M., & Oden, M. H. (1947). *Genetic studies of genius. Vol. IV. The gifted child grows up*. Stanford, CA: Stanford University Press.
- Terman, L. M., & Oden, M. H. (1959). *Genetic studies of genius. Vol. V. The gifted group at mid-life*. Stanford, CA: Stanford University Press.
- Thompson, L. L., & Choi, H. S. (Eds.) (2006). *Creativity and innovation in organizational teams*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Torrance, E. P. (1974). *Torrance tests of creative thinking: Norms—Technical Manual Research Edition—Verbal Tests, Forms A and B; Figural Tests, Forms A and B*. Princeton, NJ: Personnel Press.
- Toynbee, A. (1964). Is America neglecting her creative minority? In C. W. Taylor (Ed.), *Widening horizons in creativity: The proceedings of the fifth Utah Creativity Research Conference* (pp. 3–9). New York, NY: Wiley.
- Wallach, M. A., & Kogan, N. (1965). *Modes of thinking in young children*. New York, NY: Holt, Rinehart & Winston.
- Welsh, G. S., & Barron, F. (1963). *Barron-Welsh Art Scale*. Palo Alto, CA: Consulting.
- Williams, L. K., & McGuire, S. J. (2010). Economic creativity and innovation implementation: The entrepreneurial drivers of growth? Evidence from 63 countries. *Small Business Economics, 34*, 391–412.
- Woodman, R. W., & Schoenfeldt, L. F. (1989). Individual differences in creativity: An interactionist perspective. In J. A. Glover, R. R. Ronning & C.-R. Reynolds (Eds.), *Handbook of creativity. Perspectives on individual differences* (pp. 3–32). New York, NY: Plenum.