A review of creativity within organizations from a psychological perspective

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Abstract
Purpose – The aim of this paper is to survey the main creativity models, mediators as well as the enhancers of organizational creativity, all from a psychological perspective. In addition, the paper seeks to identify gaps in knowledge of organizational creativity. Aspects of creativity that require closer inspection are described.

Design/methodology/approach – A review of the literature on creativity within organizations from a psychological perspective was undertaken. A large number of research papers, mainly published after 1985 covering creativity and/or innovation, were identified and critically evaluated for relevance to the paper’s purpose, and were judged on sufficient scholarship in order to create a narrative literature review.

Findings – Despite the great amount of psychological research on creativity and innovation, only a few models and theories appear to be defined. Moreover, their predictive value and incorporation of possible influencing factors is limited. In general, it can be concluded that the field of creativity requires more in-depth research as well as a synthesis of results of various studies and models in order to effectively develop, promote and predict creativity within organizations.

Research limitations/implications – The review focuses mainly on psychological aspects of creativity in organizations as published in research papers. In future studies for determining generic theories and conclusions, other aspects, e.g. sociological, cultural, economic and biological, should be taken into account.

Originality/value – A large and diverse number of studies on creativity in organizations have been conducted, but a comprehensive review paper on organizational creativity is still lacking. This paper supplies this need for survey. The findings of the current paper provide a well documented framework in addressing creativity enhancers in organizational environments. Furthermore, it articulates suggestions for further research and can be a good starting-point for newcomers in this research domain.

Keywords Creative thinking, Organizations, Psychology

Paper type General review

Introduction
Rapid change, global competition, and an increasingly demanding environment has made the ability of organizations to innovate crucial to their long-term performance. Innovation in this context is vital and a consequence of the desire to grow, keep up with competitors, and adapt to changing customer needs (Amabile and Conti, 1999; Porter, 1990; Hitt et al., 1997). Other authors suggest that innovation is also the result of people satisfying their curiosity by finding new concepts or optimizing existing ones (Hopp, 1998).

A common definition of innovation is: the successful implementation of creative ideas (Gaspersz, 2005; Wood, 2003; Woodman et al., 1993). Creativity is therefore seen as the cornerstone of innovation. So to be able to promote innovation, it is important to
understand the process of creativity and its mediators. This probably also explains why extensive research has been carried out into the concept of creativity, mainly in the last twenty years. El-Murad and West (2004) ascertained that the annual number of articles featuring the word “creativity” or “creative” in the title multiplied by five during the period 1985-1995. Much of these studies were performed from psychological perspective, primarily within the subfields social, environmental, and organizational psychology. But other psychological subfields have also investigated creativity, for example neurological, cognitive, and experimental psychology (Borghini, 2005). Creativity is therefore a subject of broad interest in the field of psychology. The determinants investigated and the models developed depend on the authors’ psychological field.

The great diversity of psychological themes and subfields mean that the published knowledge of creativity is very diverse and fragmented. The purpose of this article is:

- to survey the published psychological literature concerning: the main psychological creativity models; and the mediators as well as the enhancers of creativity; and
- identify the aspects of creativity that require closer inspection.

All these points will be discussed in relation to an organizational environment.

Before beginning this review, we require a more detailed definition of creativity. There are two main definitions of creativity. First, creativity is defined as the production of new and useful ideas or solutions (Amabile, 1983a, b; Sternberg, 1988; Gaspersz, 2005; Burleson and Selker, 2002; Woodman et al., 1993; Amabile et al., 1996). Second, it is defined as the mental process that allows people to think up new and useful ideas (Gaspersz, 2005; Mayer, 1999). The first definition refers to both the process of idea generation or problem solving and the actual idea or problem (Amabile, 1983a, b; Sternberg, 1988). The second focuses primarily on the mental process. According to Amabile(1983a) this mental process occurs in five phases: problem or task presentation, preparation, response generation, response validation, and outcome. Measuring mental processes is, however, difficult and can only be done by means of expensive laboratory experiments. In practice, creativity is measured mostly by questionnaires and assessments of the creative outcome (Smith et al., 2000). In that sense, creativity is defined as the production of new and useful ideas or solutions. Csikszentmihalyi (1996) added to this definition that creativity should change an existing domain or create a new one. All together, organizational creativity can be interpreted as the creation of a valuable, useful new product, service, idea, procedure or process by individuals working together in a complex system (Woodman et al., 1993). For the purpose of this article, creativity is viewed as the production of new and useful ideas or solutions by one or more individuals within a work environment.

**Method**

This review involved studying a great number of articles and some books concerning creativity and/or innovation. Information was retrieved from the (online) library of the University of Amsterdam and the multi-media library at the Open University of The Netherlands in Heerlen. Some additional relevant information was retrieved on the internet. Articles written in Dutch, English, German or French were considered, with the focus being on publication dates after 1985. Every article was judged on its relevancy and sufficient scholarship.
The reviewed articles often consisted of model descriptions or previous reviews which had not been verified by underlying data. If they had been verified, the methods used were so diverse that the findings were non-comparable. A meta-analysis was not possible for this reason, and a narrative review was therefore preferred (Eagly, 2005).

Results

Creativity models

The different moderators and mediators of creativity have been investigated in-depth. The factors that are examined and how they should be translated within their context depend mainly on the researchers’ interests and theoretical (psychological) background. In order to correctly interpret and understand the determinants found, some knowledge is required of the current main theoretical frameworks related to organizational creativity. It is remarkable in this respect that although there has been a lot of research into the determinants for creativity, few attempts have been made to theorizes and link all these aspects together. Creativity research, therefore, often seems ad hoc in nature (James et al., 2004).

Most surveys concerning organizational creativity have been conducted by social psychologists. It is also social psychology that has produced most of the theories and models of how creativity can be affected, although such theories and models are still rare. There are, for instance, multiple theories that relate emotional change as a consequence of social change to creativity. These models assume that positive affect leads to cognitive variation which stimulates creativity (Isen et al., 1985). Amabile et al. (2005) have theorized that diverse influences can, at any point, start a dynamic pattern of increasingly or decreasingly positive affect on creativity. These influences may consist of activities provoked by the organization, a change in emotional status, changes in the social environment, and the effects of the creative outcome itself. Not only are the direct consequences of affect on creativity and vice versa taken into account, but also processes in which affect functions as a concomitant or direct/indirect effect of creative thinking. The theory is known as the organizational affect-creativity cycle (Figure 1).

An earlier and probably better-known model by Amabile (1983b) is the componential theory of creativity. It states that three components are relevant in creative processes. First, the domain relevant skills. They consist of knowledge, technical skills, and talent in the specific domain. The domain relevant skills are mainly developed through education and work experience. Second, the creativity relevant skills, such as cognitive thinking styles, working styles, and personality characteristics. Intrinsic task motivation is also mentioned as a mediating factor in the creative process. Intrinsic task motivation represents the attitude regarding a task and the perception of one’s own motivation. Finally, Amabile mentions that intrinsic motivation interacts with a fourth element: the external social environment in which an individual operates. In addition to this componential theory, Ford (1996) proposed an interaction model. He theorized that the knowledge and abilities as mentioned by Amabile multiplied by motivational and sense making factors predict the extent of individual creative action taken (Figure 2).

In short, Amabile has tried to conceptualize the creative process which is used by Ford to predict the actual actions taken that are considered to be creative. Another causal model of creative action developed within social psychology was proposed by Ramamoorth et al. (2005). This model suggests that innovative behavior is based on
psychological contract, job design, and organizational justice. They hypothesized that meritocracy, procedural justice perceptions, job autonomy, pay, and met expectations will, either directly or indirectly, positively influence the perceived obligation to innovate that results in innovative work behavior. Tests of this model have led to the conclusion that a sixth indirect determinant for innovative work behavior could be added: equity appeared to positively influence met expectations.

A relatively recent model that can be classified within both social and organizational psychology is the circular model regarding the effects of multicultural organizations on creativity (Figure 3). Borghini (2005) stated that cultural integration positively influences the shared mental models and core competences of employees, enhancing creativity and subsequently boosting proposals of creative solutions, also referred to as “variety”. These solutions bring about movement within an organization and promote cultural integration. On the other hand, cultural integration also encourages the codification of knowledge. The codification process involves the translation of tacit or contextual knowledge into forms that are subject to communication and transmission. Codified knowledge is often formalized in programs, procedures, software, patents, instructions etcetera. These formalized structures can, however, lead to core or organizational rigidities, meaning the inability to abandon rules and consolidated knowledge that have proved to be effective in the past. These rigidities can, in its turn, limit creativity.

The confluence model of creativity by Sternberg and Lubart (1996) is a theorization within personality psychology. It suggests that creative individuals show a variety of
Figure 2. Creativity model as proposed by Ford

Key
FC – Facilitates creativity, CC – Constrains creativity, FH – Facilitates habits, CH – Constrains habits
characteristics. These characteristics largely represent decisions that people take rather than innate abilities. According to this model people decide to be creative. A further claim within this context is that self-leadership is necessary to perform effectively in the workplace (Neck and Manz, 1996). Self-leadership can be described as a self-influencing process that helps individuals to develop self-direction and self-motivation. Embroidering on self-leadership, another model was developed that can be placed within the context of personality, social, and organizational psychology. It suggests that individuals with strong self-leadership consider themselves to have more innovative and creativity potential than individuals who have weak self-leadership. It is also suggested that individuals are more likely to practice innovation and creativity when they perceive strong support from their work group, supervisor, and organization than individuals who perceive weak support from their work environment. This implies that individuals with strong self-leadership who perceive suitable support from their work environment will be most likely to exhibit creative behavior (DiLiello and Houghton, 2006).

Another interactionist model combining knowledge from multiple psychological fields was proposed by Woodman and Schoenfeldt (1989). This model suggests that creativity is the complex product of a person's behavior in a given situation. A situation is characterized by contextual and social influences that either facilitate or inhibit creative accomplishment. These influences provoke both cognitive and non-cognitive traits and predispositions within an individual that can lead to creative actions. This model combines elements of personality, cognitive, and social psychology and focuses on the individual level of creativity. Woodman et al. (1993) have added extra components to this model to express organizational creativity (Figure 4). They state that individual creative behavior is input for group creative behavior. Individual creative behavior is a function of antecedent conditions, creativity, personality, knowledge, intrinsic motivation, cognitive styles and abilities, social influences and contextual influences. Group creative behavior is, in turn, dependent on individual
Figure 4. Theory of organizational creativity

INDIVIDUAL CREATIVITY:
\[ C_I = f(A, CS, P, K, IM, SI, CI) \]

GROUP CREATIVITY:
\[ C_G = f(C_I, G_{COMP}, G_{CHAR}, G_{PROC}, CI) \]

ORGANIZATIONAL CREATIVITY:
\[ C_O = f(C_O, CI) \]

Key:
A = Antecedent Conditions
B = Creative Behavior
CS = Cognitive Style
P = Personality
K = Knowledge
IM = Intrinsic Motivation
SI = Social Influences
CI = Contextual influences
G_{COMP} = Group Composition
G_{CHAR} = Group Characteristics
G_{PROC} = Group Processes

Source: Woodman et al. (1989)
creative behavior, group composition, group characteristics, group processes, and contextual influences. Group creative behavior is input for organizational creative behavior and together with contextual influences, such as organizational culture, reward systems, resource constraints, etcetera, it eventually leads to creative outcome. This model combines creativity aspects from different organizational levels (individual, group, and organization) on the one hand with various determinants of creativity from different psychological subfields (social, cognitive, personality, and organizational) on the other, and is therefore probably the most extensive organizational creativity theory today.

In short, most of the theories regarding organizational creativity are derived from social psychology. Only a few models combine knowledge derived from different subfields. Little is known about the validity and predictive value of these models. While discussing the various moderators and mediators of creativity investigated, this article will use the three levels of creativity (individual, group, and organization) as proposed by Woodman and Schoenfeldt (1989).

Determinants of creativity

Individual creativity. Individual creativity has been investigated by a great number of psychological subfields. Initially, the purpose of these studies was to understand and describe the distinctive characteristics and traits of people thought to be creative (Barron, 1955; MacKinnon, 1965). As traits are still an important subject of study in relation to creativity, there have been many studies of this subject and these have produced many traits associated with creativity. Barron and Harrington (1981) list a large number of them: sensitivity to problems, high valuation of aesthetic qualities, broad interests, attraction to complexity, high energy, independence of judgment, autonomy, intuition, self-confidence, playfulness, a creative self-sense, and the ability to accommodate apparently opposite or conflicting traits in one's self-concept. Others added curiosity, persistence, causal reasoning, intellectual honesty (as cited in Rice, 2006), self-direction, stimulation, achievement (Rice, 2006), devotion to work (Hayes, 1989), and an internal locus of control (Woodman and Schoenfeldt, 1989). These aspects are all positively related to creativity. On the other hand, conformity and power are negatively associated with creativity (Rice, 2006). However, there is no clear evidence that the traits mentioned above also have a predictive value for creativity within organizations (Woodman et al. 1993; Hayes, 1989). Research has also stated that creative personalities have various personality traits. Some traits may be present in one creative individual but not in others (Tardiff and Sternberg, 1988). Employers who select employees for creative behavior based on perceived personality traits have not had much success. More effective in this regard may be selection based on self-evaluated creativity. Gardner and Pierce (1998) hypothesized that people with higher levels of self-evaluated creativity tend to implement innovative ideas more frequently. A study investigating which factors influence self-perceived creativity found that the amount of experience in management and the life cycle phase of the business venture moderate the perception of one's own creativity. Perceived creativity was highest with three to five years of management experience in mature/declining business ventures (Pretorius et al., 2005). Other factors investigated were gender and business venture size, but they did not influence the perception of creativity.
Besides the number of years of management experience, for example, it has also been suggested that age is related to creativity. Major creative contributions are, apparently, most likely to occur in young adulthood, whereas minor contributions and net productivity are most likely to peak in middle age. The curve for major creative contributions falls sharply at the end of young adulthood, while the curve for minor ones is relatively flat and decreases slowly after individuals reach their mid-sixties (Lehman, 1966; Mumford and Gustafson, 1988).

Intelligence was related to creativity as far back as the 1920s (Spearman, 1923). At that time, it was also noted that intelligence is a necessary but not a sufficient factor for creativity (Terman, 1926). Sternberg and O’Hara (2000) concluded from a review study of intelligence and creativity that creativity is only weakly related to academic intelligence. This correlation only counts for IQ levels up to 120 or even lower. Higher IQ levels were not associated with a higher level of creativity, so there seems to be a threshold to the effect of IQ on creativity. Intelligence is often also related to divergent thinking, a cognitive process in which a person generates many unique, creative responses to a single question or problem. In contrast, convergent thinking concerns a systematic approach to finding a single, correct answer to a problem (Psychology glossary, n.d.). Divergent thinking has been studied extensively and is often associated with the process of creative problem solving. It has, however, also been concluded that the most appropriate heuristic depends on the type of question or problem to be solved. Most effective problem solvers, it seems, apply both thinking styles (Brophy, 2001). Other cognitive abilities associated with creativity and determinants for cognitive thinking heuristics are fluency, originality, flexibility, imagination, field independence, and knowledge of heuristics to generate novel ideas (as cited in Woodman et al., 1993). Besides the aforementioned cognitive abilities, domain specific knowledge, and expertise are also related to creativity (Woodman et al., 1993; Simonton, 1988; Ericsson and Charness, 1994; Redmond et al., 1993). Stein (1989) identified both positive and negative effects of domain knowledge on creativity. Domain specific knowledge is necessary to produce creative solutions; on the other hand, knowledge can lead to functional fixation, which prevents creativity.

The creativity displayed in the past decade has also been the subject of research in social psychology. One of the determinants for creativity from a social perspective appears to be affect. Affect refers to both emotion and mood. Several studies found a positive relationship between positive affect and creativity (Isen et al., 1985; Hirt et al., 1996; Vosburg, 1998). Amabile et al. (2005) also detected this relationship in work environments. Some researchers concluded that there may be a negative link between affect and creativity, but their results are less consistent (Martin et al., 1993; George and Zhou, 2002). Others suggest a curvilinear relationship between affect and creativity, or found indirect support for a U-shaped relationship, or proposed an inverted U-shaped function (as cited in James et al., 2004). We may conclude that the relationship between affect and creativity is not entirely clear, nor is the duration of affect, although some scholars point out an incubation period for up to two days (Amabile et al. 2005).

Another main research topic is the effect of motivation on a person’s creativity. Intrinsic motivation is regarded as conducive to creativity, while extrinsic motivation is almost always detrimental (Amabile, 1983a). Some studies suggest that reward has a negative effect on intrinsic motivation and therefore negatively influences creativity (Hennessey, 2000). This conclusion is, however, contested by others (Amabile et al.,
They state that reward can sometimes even have a positive effect. Other factors associated with motivation and (indirectly) with creativity are control of attention, task restraints, and goal-setting. In the latter case, it seems that the higher the amount of self-regulation, the greater the intrinsic motivation and creativity (Simon, 1967; Kanfer and Ackerman, 1989; Amabile, 1983a, b).

Finally, research within more biologically oriented clusters, like neurological and clinical studies, indicates that there may be a link between testosterone and creativity (Reuter et al., 2005). Eysenck (1993) speculated that there is a genetic basis for creativity based on differences in neurotransmitters and enzymes that are eventually linked to the DNA chains. Other neurological studies used EEG measures as determinants for creativity (Bekhtereva et al., 2001; Mølle et al., 1996). These studies assign a crucial role to the frontal lobes, especially in the right hemisphere. Little is known, however, about which determinants influence individual creativity in this context. Furthermore, clinical studies are mainly performed with clinical patients and are usually not representative for healthy individuals.

Regarding individual determinants for creativity, many different factors have been investigated, mainly focusing on personality, traits, affect and cognitive heuristics. Some other fields remain relatively unexplored, such as biological factors.

**Group creativity.** Regarding group creativity, several potentially influential factors have been studied. Choi and Thompson (2005), for instance, investigated the impact of membership change on group creativity. It appeared that open groups with rotating group subsets were more creative than closed groups; the open groups produced more ideas and of a greater variety of idea types than did the closed groups. The newcomers had a positive effect on the total group and seemed even to increase the productivity of the “old-timers”. It should be mentioned, however, that the change in membership was relatively permanent in nature. In addition, the new members were already acquainted with the organization and had the same amount of task experience as the other group members. It was suggested that the effectiveness of group changes on creativity depends on factors such as timing, task experience of newcomers, group expectations, social fit, frequency of change, and the ability to collaborate and adjust.

There have been many studies of the effects of “informal” contacts on the creative functioning of organizations or teams. According to Kratzer et al. (2005), past studies have found contradicting results. They reviewed several studies regarding the effects of friendly versus friendship ties within innovation teams. Friendship ties represent contacts that also take place outside the work environment, while friendly ties are bound to work settings. They concluded that friendly ties have a U-shaped relationship to innovative team performance, while friendship ties only have positive effects on team performance. These findings imply that managers should attempt to foster formal as well as informal contacts between their employees that preferably develop into friendships. Others, however, suggested that strong group cohesiveness suppresses creativity, whereas weak ties facilitate it (Woodman et al., 1993; Perry-Smith, 2006).

In addition to the relationships between different group members, another factor is the climate for creating favorable relationships. The climate model for creativity and innovation that has been studied most is the model presented by West (as cited in Mathisen et al., 2004). He suggests that four climate factors are essential for teams to be creative. First, there must be a clearly defined and shared vision that provides focus and direction to the team members’ energy. Second, participation in decision making seems
important to increase the team’s commitment and the likelihood that its members will invest in the outcomes of decisions. Furthermore, the environment must be perceived as safe, so that team members feel they can present new ideas without fearing criticism and ridicule. Finally, there must be articulated and enacted support for attempts to introduce new and improved ways of doing things. The latter factor also interacts with the preferred type of leadership. Leadership support and creative and collaborative leadership appear to have a positive influence on creative work (Woodman et al., 1993).

Wilkins and London (2006) defined the generally favorable climate for creative outcome as one that includes learning orientation, psychological safety, and self-disclosure. Furthermore, many researchers emphasize the necessity of reducing conflict and criticism in order to promote a creative environment (as cited in Nemeth et al., 2004). Nemeth et al. (2004), however, found evidence that groups encouraged to debate and even criticize did not impede idea generation in brainstorming sessions. Permission to criticize even led to significantly more ideas than did brainstorming sessions where members did not debate and criticize opposed ideas. Various other studies also found support for this thesis in giving and seeking feedback. Even conflict appeared to be associated with creative outcomes (Wilkins and London, 2006; James, 1995).

Besides factors specific to group climate, Woodman et al. (1993) concluded from a literature study that creative outcome may be highest when the group structure is organic and when it is composed of individuals drawn from diverse fields or functional backgrounds. These researchers add resource availability, group size, communication patterns, norms, roles, problem solving strategies, and social information process to the list of group moderators for creativity. Paulus (2000) concluded from his literature review study that there are a number of factors that lower creativity in groups. He divided these factors in two groups, namely: social inhibitors and cognitive interferers. Social inhibitors are social anxiety, social loafing, illusion of productivity, matching and downward comparison; cognitive interferers include production blocking, task-irrelevant behaviors, and cognitive load. Paulus also identified factors that lead to high creativity in groups, grouped into social and cognitive stimulators. Cognitive stimulators included novel associations, priming, attention, conflicts, heterogeneity and complementarities of group members, divergent thinking style, and incubation of ideas. Social stimulators were competition, accountability, upward comparison, and goals. According to Farmer et al. (2003), positively perceived creativity expectations by fellow employees and self-sense of creativity also promotes group creativity.

Determinants of creativity in groups appear to be influenced mainly by group factors related to composition and processes. 

Organizational creativity. Although Hemlin (2006) concludes that team leadership is more important for creativity than organizational support, several case studies have been performed to determine factors that influence creativity on organizational level. Most common are cultural influences, resources availability, reward policies, organizational mission and strategy, structure and technology. Although the effects are difficult to measure, the extent of their presence are all positively related to creativity in organizations (as cited in Woodman et al., 1993; Burkhardt and Brass, 1990; Paulus, 2000).

A case study of a relatively small enterprise (up to 30 employees) showed that creativity and innovation were promoted by avoiding hierarchy, building flexible work places, and emphasizing on cross-fertilization (Tekla, 1995). In addition, Paulus (2000)
concludes that innovation will be inhibited when organizations are highly centralized or formalized, and when groups or individuals tend consciously or unconsciously to resist the innovative process. Goncalo and Staw (2006) discuss the effects of individualistic versus collectivistic cultures on creativity. Harmony, group conformity, and interdependency are promoted within collectivistic cultures, while in individualistic cultures uniqueness and group independence are valued. Study results have indicated that individualistic values contribute more to creativity. If creativity is an organizational goal, an individualistic culture seems preferable. Reiter-Palmon and Illies (2004) concluded from a review study that organizations that focus on planning ahead and identifying potentially significant problems at an early stage, give their employees sufficient information and encourage problem solving activities result in more creative outcomes. Others added allocating time and resources for experimentation, providing competence-building opportunities, the presence of intrinsic reward systems, cohesion, some discretion in job activities, clear vision and goals, recognition of innovative efforts, and providing an atmosphere in which it is safe to share novel ideas as relevant organizational factors for creativity (Ramus, 2001; Paulus, 2000). Sundgren et al. (2005) determined that the perceived creative organizational climate depends mainly on the factors information sharing, learning culture, and intrinsic and extrinsic motivation. They postulated it as a path model (Figure 5).

Oldham and Cummings (1996) conclude that in addition to attempting to promote organizational creativity, management should consider both personal and contextual factors to increase creativity. Highly creative employees perform best in complex and challenging jobs that are managed in a supportive, non-controlling way. Employees with less creative personalities get stressed and irritated under such circumstances, leading to lower creative output. With respect to the determinants for organizational creativity identified, the organizations’ challenge is to design a context and strategy to maximize creative achievement at work while taking individual differences into account.

![Path model for drivers of organizational creativity](image_url)

**Source:** Sundgren et al. (2005)
Promoting creativity

Although extensive research has been carried out concerning the determinants for creativity and the widely accepted importance of innovation and creativity, little is known about whether creativity is trainable. In business training, the topics creativity and innovation are often avoided because they are more subjective (Carrier, 1999; Van Vuuren, 1997). Most research on how to develop creativity has involved creative thinking techniques, for example brainstorming, attribute listing, and morphological analysis (Riquelme, 2000). These techniques are helpful in generating a large number of ideas in a short period of time, so that the chance of finding the golden idea increases (Gaspersz, 2005). Riquelme (2000), however, believes that these techniques are only effective when the problem is clearly defined. Basadur et al. (1986) demonstrate that training organizational members in creative thinking brings about an improvement in attitudes toward divergent thinking. Although it is widely believed that utilizing this creative technique enhances creative outcome (Riquelme, 2000; Wood, 2003), this association was not present here.

Another frequently used technique to generate a large number of ideas in a short time is brainstorming. Mullen et al. (1991), however, found that groups using the brainstorming rules generate substantially fewer ideas than when the same number of individuals brainstorm in isolation. This productivity loss in groups can be explained by social loafing, production blocking, and evaluation apprehension. Paulus and Yang (2000) suggested that under the right conditions, idea exchange processes in groups may enhance creativity. Their suggestion was based on a study where writing down ideas and subsequently sharing them led to more ideas than individual brainstorming did. Furthermore, the degree of attention paid by group members while sharing ideas appeared to be an important factor in generating more ideas after an incubation period of a few days.

Raynolds (1972) investigated whether creativity training enhanced free thinking processes. The training consisted of a week-end at a mountain retreat devoted to non-verbal and verbal exercises, stretching exercises, cognitive modeling, and information overloading. Students who participated in the creativity training perceived themselves to be more process orientated than students from the control group did. Pretorius et al. (2005) indicate in a more recent study that creativity education should include: techniques for facilitating creativity, removing barriers to being creative, developing critical and creative thinking, personal attributes, actions that facilitate creativity, improving intuitive creativity, creative problem solving and opportunity finding, including opportunity delineation and the generation of ideas, and evaluating and prioritizing ideas. Besides a knowledge of creativity techniques, Smith et al. (2000) consider two other categories of knowledge that promote creativity:

1. knowledge of the domain in which one intends to create; and
2. knowledge of other domains, which can be useful for creating analogies.

This implies that domain specific skills can promote creativity, which, in turn, confirms part of the componential theory by Amabile (1983b) referred to previously. In this study, creativity relevant skills, intrinsic motivation, and the social environment are also taken into account.

Gaspersz (2005) indicates a number of steps that can be taken by management to promote a creativity stimulating climate. Some of them were already mentioned as determinants for group or organizational creativity: promote open communication,
include everybody in the innovation process to suggest new ideas, share knowledge, bring people from different disciplines together, create a climate with tolerance for failure, set challenging targets, create time for creativity, and allow in-house entrepreneurship. Others have added giving rewards (Weiss, 2001), setting clear visions and goals (Shalley, 1995; Weiss, 2001), providing information and helpful feedback (Zhou, 2003), giving encouragement (Deci and Ryan, 1987), stimulating a risk taking environment (Woodman et al., 1993; Mumford and Gustafson, 1988), evaluating progress in terms of work and not in terms of outcomes (Mumford, 2000; Shalley, 1995), restricting constraints (Nohria and Gulati, 1997; Drazin et al., 1999), structural measuring of creativity and making it part of process reviews, regular planning of brainstorming sessions, and making sure that team members have an equal status (Weiss, 2001). Finally, it has been suggested that creativity can be promoted by creating an open, fun, trusting, and caring environment where new understanding is valued (Rice, 2006; McAllister, 1995; Mumford and Gustafson, 1988).

From an environmental perspective, creativity appears to be enhanced when the workplace is borderless, as this facilitates interactions and free chatting among team members (Haner, 2005; Hong et al., 2003). Besides free chatting, formal forums appear to be necessary to effectively share knowledge and also promote creativity. Ehlers et al. (2004) postulate that an office needs to look attractive in order to contribute to the perceived well-being of employees. Consistent with these findings, Amabile et al. (1996) stated that physical environments can enhance creativity. Furthermore, computerized creative support systems can be helpful in facilitating the creative process, although much research still has to be done to optimize these systems (Kletke et al., 2001). Creativity support tools could be useful in:

1. collecting information through searching and browsing facilities and visualizing data and the process;
2. relating information;
3. creating by thinking through free associations, exploring solutions, composing artifacts and performances, and reviewing histories; and
4. disseminating results to relevant parties (Shneiderman, 2002).

In the foregoing we have mentioned several aspects of promoting creativity at individual, group, and organizational level. These aspects focus mainly on training to improve knowledge and cognitive heuristics and on taking away barriers for creativity. Bharadwaj and Menon (2000) conclude from their study of 634 organizations that promoting individual creativity mechanisms as well as group and organizational creativity mechanisms leads to the best results when it comes to improving organizational creative outcomes.

Comments and suggestions
Creativity is regarded as a common good, a free resource waiting to be explored and exploited (Styhre, 2006). Some determinants of creativity, for example divergent thinking abilities, have been investigated extensively, whereas much less is known about others such as convergent thinking and biological markers (Brophy, 2001). This pattern – extensive investigation in one subfield of creativity and almost a lack of information in another – is present in the theoretical frameworks of creativity that...
have been published as well. Multiple models have been developed from the social and organizational psychology perspective, while creativity is still relatively unexplored in the field of biopsychology. Moreover, many of the existing theoretical frameworks lack solid foundations in experimental figures (for example the circular model for multicultural organizations by Borghini (2005)) or their tests produce contradicting results (such as the effects of domain specific knowledge on creativity in the componential model of Amabile (1983b)). Extensive models that integrate creativity knowledge from multiple fields are also still lacking.

Regarding the moderators and mediators for organizational creativity that are currently being investigated, we must question to what extent they can be examined in diverse situations, as the results are often based on laboratory experiments. In other surveys, they are often subjective and situational, as the assessment of creativity is performed mainly by means of questionnaires. On the other hand, measuring creativity solely in terms of output can overlook products that are not regarded as creative (Smith et al., 2000). What is regarded as creative in one environment may not be identified as such elsewhere. It has been suggested that the perception of creativity depends on the content of the group norm (Adarves-Yorno et al., 2006). We can therefore conclude that there is a methodological obstacle to objectively measuring creativity.

Several tests have been proposed in the past for generating valid creative measurements. However, psychometric tests such as Torrence’s ‘Test of creative thinking’ are widely used but lack predictive validity (El-Murad and West, 2004) and expert evaluations of creative products are highly subjective (Amabile, 1982). Other types of measurements are the biometric tests that include the measuring of the glucose metabolism in the brain during creative activity. These tests can, however, only be performed in laboratory conditions and have major time and cost implications (El-Murad and West, 2004). Amabile et al. (1996) developed a tool for assessing perceived stimulants and obstacles in organizational work environments. In order to determine the climate for creativity, a number of perceptions of the work environment are measured: organizational and supervisory encouragement, work group support, freedom, sufficient resources, challenging work, workload pressure, and organizational impediments. This tool is one of the few to measure creativity climate, but it requires further validation. Tests that include all the relevant factors for creativity and are furthermore objective are yet to be developed.

According to Kabanoff and Rossiter (1994), the majority of creativity training programs include:

- training and practice with creativity-enhancing techniques; and
- attempts to change negative attitudes and problem solving styles in the direction of greater flexibility, openness, and humor.

Little is known, however, about the effectiveness of such creativity training programs. Various tests have also produced contradictory results for the effectiveness of frequently used enhancing techniques such as brainstorming. Research aimed at promoting factors for creativity mainly focus on removing barriers to free thinking.

On the one hand, creativity is often described as the key to organizational effectiveness and a necessity for long-term success (Amabile and Conti, 1999; Porter, 1990; Hitt et al., 1997). On the other hand, organizations are streamlining and standardizing work to contribute to efficiency, performance, and customer satisfaction.
(Feldman and Pentland, 2003). In this perspective creativity and standardization appear contradictory. Nonetheless, creativity is generally seen as a desirable process within organizations. We must question, however, whether this is always the case, because creativity can negatively affect the efficiency of existing processes (Gilson et al., 2005). Besides possibly negative effects on organizational efficiency, creativity outcomes might lead to evil, born out of negative emotions and/or negative goals (James et al., 1999). Little is known about these possibly negative aspects of creativity, a subject that requires investigation and theorization.

Because information in various domains about theories, determinants and enhancers of creativity is either lacking or inconsistent, many basic questions – for example which factors influence organizational creativity, whether creativity is innate or can be acquired, and in which theoretical framework all this information fits – still remain unanswered. What should be explored and tested in greater depth is a solid and valid method for measuring creative outcome and creative processes. In addition, more research is needed in various relatively unexplored fields of creativity, for example biopsychological factors. We also need more theorization and testing of hypotheses of creativity processes covering multiple psychological perspectives in order to acquire a better understanding of the global concept of organizational creativity. With regard to our diverse knowledge about methods to promote creativity, it would be advisable to investigate whether the current traditional creativity training programs should be adjusted and what the effects on organizational performance will be.

**Conclusion**

Regarding this article, it should be mentioned that the literature review was limited to the psychological aspects of creativity. Creativity is, however, also an object of study for other scholars, among others in the fields of sociology and organizational science (Gilmartin, 1999). These aspects have not, or not entirely, been taken into account, but will surely supply other relevant information and theories about organizational creativity.

As shown by this review, much has already been investigated with respect to organizational creativity, but more still remains to be explored. Sharing information across the boundaries of different fields of study can be a first step towards developing more extensive theories regarding the determinants and promoters of creativity. Reliable and predictive creativity theories obtained in this way could become a realistic tool for recruiters to select employees with creative potential. Another research suggestion to boost creativity research and (indirectly) improve innovative effectiveness is to develop a valid instrument to determine creative outcomes, one that will also be helpful in determining the effects of creativity training programs. A final necessary step is to move from creativity toward innovation, because creativity alone is not enough to produce an innovative organization. Research on how to transform creative ideas into innovative outcomes efficiently is vital for organizations that hope to keep up with their rapidly changing environment.

In general it can be concluded that there has already been done a great deal of research into organizational creativity from the psychological perspective. This however has until now not resulted in valid and reliable models and corresponding theories in order to effectively boost creativity within organizational environments. In addition, more in depth and comparable research is still required as well as combining research results from other scientific areas.
References


**Further reading**


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