Creativity Research Journal
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t775653635

An Examination of Individual Factors and Employees' Creativity: The Case of Spain

María F. Muñoz-Doyague [a]; Nuria González-Álvarez [a]; Mariano Nieto [a]
[a] University of León, Spain

Online Publication Date: 01 January 2008
To cite this Article: Muñoz-Doyague, María F., González-Álvarez, Nuria and Nieto, Mariano (2008) 'An Examination of Individual Factors and Employees' Creativity: The Case of Spain', Creativity Research Journal, 20:1, 21 - 33
To link to this article: DOI: 10.1080/10400410701841716
URL: http://dx.doi.org/10.1080/10400410701841716

CREATIVITY RESEARCH JOURNAL, *20*(1), 21–33, 2008

ISSN: 1040-0419 print/1532-6934 online
DOI: 10.1080/10400410701841716

Routledge
Taylor & Francis Group

An Examination of Individual Factors and Employees' Creativity: The Case of Spain

María F. Muñoz-Doyague, Nuria González-Álvarez, and Mariano Nieto
University of León, Spain

The objective of this investigation was to identify and analyze the individual attributes responsible for creative performance among employees of a Spanish firm. Drawing from the existing literature on intrinsic motivation, expertise, cognitive style, and individual creativity, research was conducted to test a creativity model of employee characteristics in Spain. Results confirmed that innovative style and intrinsic motivation were related to employee creativity, as measured by self-ratings. Moreover, results suggested that the accumulation of individual attributes that were hypothesized to have a positive relationship with creativity had a greater effect in creativity than when considering separately. A cluster analysis was carried out in order to procure a taxonomy of employees depending on their individual characteristics. Three groups were defined. Their behavior differed significantly in terms of their creativity performance. Recommendations for enhancing creativity in work settings are proposed.

There is a consensus that creativity is a key aspect in the success of the innovation process. Furthermore, it appears that, rather than innovation, creativity is the real source of competitive advantage for organizations, as it is the basis of their innovative potential (Amabile, 1983, 1988, 1996; Amabile, Conti, Coon, Lazenby, & Herron, 1996; Ford, 1996; Cummings & Oldham, 1997; Woodman, Sawyer, & Griffin, 1993).

Given the lack of academic research about this topic in Spain and the role of employees' creative contributions, the objective of this investigation was to analyze which individual attributes enhance the generation of creative ideas, focusing on the Spanish firm. In addition, this study tested the idea that creativity is more affected by an accumulation of these attributes, rather than their individual contributions. This belief served as the basis for an employee classification and a subsequent empirical verification. The ultimate objective was to identify what type of human resource strategies can stimulate creativity.

This research was funded by a grant from the Executive Agency of Education and Culture of the Castilla and León Autonomous Region Board.

Correspondence should be addressed to María F. Muñoz-Doyague, Faculty of Economics and Business Management, Business Management Department, Campus de Vegazana, s/n, 24071 León, Spain. E-mail: ddefmd@unileon.es

CREATIVITY DEFINED

Creativity is a complex concept that has been defined in various ways (Mumford & Gustafson, 1988; Shalley, 1995). It can be identified with the tangible characteristics of products (e.g., Amabile, 1982; Shalley, 1991; Woodman et al., 1993; Oldham & Cummings, 1996; Zaltman, Duncan, & Holbeck, 1973), persons (e.g., Guilford, 1950; McKinnon, 1962; Torrance, 1974), thought processes (e.g., Koestler, 1964; Newell, Shaw, & Simon, 1962; M. I. Stein, 1974; Wallas, 1926; Weisberg, 1986, 1993; Wertheimer, 1945), or the situation in which it takes place (e.g., Csikszentmihalyi, 1988, 1990; Gruber, 1988). There is consensus that creativity refers to something that is novel and useful (Ford, 1995). The inception of a strategy or creative solution will vary according to the area of activity or related task, but in some way all creative behavior implies the identification of original formats and improvements in attaining some goal (Shalley, 1995).

Most of the research in organizations has defined creativity in terms of the product or engendered idea.

Amabile (1988) defined creativity as the "production of novel and useful ideas" (p. 126). This definition has been cited in later conceptual models (Ford, 1996; Woodman et al., 1993) and in various recent studies (Amabile et al., 1996; Oldham & Cummings, 1996; Taggar, 2002; Tierney, Farmer, & Graen, 1999).

To be consistent with the literature, creativity in the present research was defined as the generation of novel and useful ideas for the organization. An idea or product is considered novel if it implies either a significant recombination of existing materials or the introduction of completely new materials (Oldham & Cummings, 1996). In addition, this contribution must offer something original and unique relative to what is already available in the current repertoire of products or company procedures (Cummings & Oldham, 1997). An idea or product is useful when it can solve a problem, meet the requirements of a given situation, or reach a recognized target (MacKinnon, 1978). This implies that it must be directly relevant to the organization's goals and be something from which, in the short or long term, some value could be obtained (Cummings & Oldham, 1997).

Individual Characteristics and Creativity

Amabile (1983, 1996), Woodman et al. (1993), and Ford (1996) showed that four individual attributes determine level of creativity: personality, intrinsic motivation, expertise, and cognitive style. In reference to personality, it is evident that whether a person is more or less creative will be determined by his or her idiosyncrasies. In fact, traditionally, it was thought that for a person to be creative, the personality characteristics were fundamental (Guilford, 1950; Nicholls, 1972; Torrance, 1974). Oldham and Cummings (1996) demonstrated empirically that an individual is likely to have a high creative output if he or she has the personality traits of a creative person. Nevertheless, personality characteristics are not sufficient. Individuals with normal aptitudes are at least capable of producing moderately creative work and the social environment can cause creative behavior both in degree and frequency (Amabile, 1997; West & Farr, 1990), which, of course, would leave personality as the principal deciding factor.

Because personality is a given and incontrollable variable, only the other three mentioned factors and their relation with the creative individual will be considered in the present research. All of these interact with personality but they can be stimulated if adequate policies are put into practice by the management.

Intrinsic Motivation and Creativity

When individuals look for pleasure, interest, satisfaction of curiosity, self-expression, or personal challenges at work, they are said to be intrinsically motivated (Amabile, 1993, 1997). If creative work is desired, this is one of the most important components that must be present, up to the point that a high degree of motivation can compensate for the deficiency in abilities (Amabile, 1993).

In effect, although abilities determine what a person is capable of doing in his or her work, intrinsic motivation is the cause of what he or she really does. It determines the degree in which an individual commits abilities and expertise to achieve a creative result (Dweck, 1986). This is due to the fact that intrinsic motivation affects the employee's decision to start and maintain the effort needed to be creative through the course of time (Tierney et al., 1999). With respect to this, Csikszentmihalyi (1988) noted that "it doesn't matter how original one is, if one gets bored in their work, it will be difficult that one will become sufficiently interested in it to make a creative contribution" (p. 337).

Certainly, creative efforts are sometimes extrinsically motivated (Rubenson & Runco, 1992, 1995), and there is empirical research that demonstrates how certain kind of extrinsic factor could inhibit creative thinking (Amabile, 1993). However, intrinsic motivation is considered as a core characteristic of creative persons (Runco, 2004), and it does make sense that creative persons tend to follow intrinsic interests, and that tasks that are intrinsically motivated tend to be free from the extrinsic factors that can constrain creativity.

Many theories describe how intrinsic motivation benefits creativity (Amabile, 1996; Ford, 1996; Gardner, 1993, Gruber & Davis, 1988; Mainemelis, 2001; Mumford, 2000; Runco, 2004; Sternberg & Lubart, 1991, 1996; Woodman et al., 1993; Woodman & Schoenfeldt, 1990). Additionally, empirical work that relates intrinsic motivation with individual creativity in organizational environments supports these theoretical propositions (Amabile, 1988; Amabile, Hill, Hennessey, & Tighe, 1994; Ford, 1999; Ruscio, Whitney, & Amabile, 1998; Taggar, 2002; Tierney et al., 1999). On the other hand, it seems that creativity is supported by the recognition and rewards that accredit the individual's ability or the actual job's value, and through rewards that permit one to pursue an intrinsically interesting job (Amabile et al., 1996; Amabile & Gryskiewicz, 1989).

In order to test how intrinsic motivation relates to creativity specifically in a Spanish firm, this hypothesis was tested:

H1: The degree to with an individual is intrinsically motivated is positively related to his or her creativity.

Expertise and Creativity

Everything people know and do in their work amounts to expertise. In a word, expertise is knowledge: technical, procedural, and intellectual. To carry out one's work, an individual includes his or her factual knowledge, technical abilities, and special aptitudes (Amabile, 1988).

Expertise is the foundation of creative work. Thus, for a creative output, a person's prior knowledge of his function is critical (Amabile, 1988, 1997) and is a prerequisite for creative action (Amabile, 1988; Ford, 1996; Simon, 1986; Sternberg & Lubart, 1991, 1996; Weisberg, 1999; Woodman et al., 1993; Woodman & Schoendfeldt, 1990).

Expertise can be viewed as a set of cognitive pathways that can be followed by an individual in order to resolve a problem or carry out a given task (Amabile, 1988), what Newell and Simon (1972) described as a problem solvers' network of possible digressions. The bigger the set, the greater will be the number of available alternatives to produce something new, to develop a new combination of steps in carrying out a job or in problem solving (Amabile, 1988, 1996, 1997); in other words, there will be a greater probability that individual be creative.

Cohen and Levinthal (1990) described how an individual's prior knowledge increases his or her capacity to acquire more knowledge and use it in a creative sense, thus allowing types of associations and links that may have never been considered before. It is difficult to imagine any creative behavior that is free of previous expertise (B. S. Stein, 1989). Creative individuals do not produce new ideas from a vacuum, ''but rather those ideas must arise from a large set of well-developed skills and a rich body of domain-relevant knowledge'' (Simonton, 2000, p. 152), so it is not surprising that expertise influences the problem solving process (Mumford, 2000). Various works (Baer, 1998; Kulkarni & Simon, 1990; Weisberg, 1986) show that a person's ability to generate viable and original solutions to problems is influenced by expertise, or the knowledge obtained through expertise.

After an exhaustive review of the works that relate knowledge with creativity, Weisberg (1999) reached the conclusion that there exists empirical consistency about creative individuals needing, from their initial exposure to the field in which they are going to develop their work until the production of their first significant creative work, the passing of a considerable amount of time. This supports the importance of expertise in the generation of creative work. Nevertheless, it should be pointed out that most of the works carried out in this sense are case-studies of eminent creators (e.g., Gardner, 1993; Weisberg, 1986, 1993, 1995) who have excelled in various fields of endeavor such as music, painting, or poetry. Although the influence of expertise in creativity as a study variable in a theoretical context has been shown to be an important factor in the creative output (Amabile, 1983, 1988, 1996, 1997; Ford, 1996; Runco & Chand, 1995; Woodman et al., 1993; Woodman & Schoendfeldt, 1990), empirical studies that analyze the relationship between expertise and creativity an organizational setting are scarce.

On the other hand, although it was not carried out in the heart of a company, an empirical study was found that uncovered a positive and significant correlation between expertise and creativity (Taggar, 2002). This supports the premise that it is necessary to have experience in a function to generate creative work, at least when dealing with heuristic tasks.

Tierney and Farmer (2000) found that the length of service in a job position negatively contributes to the employees' belief of creative efficiency, yet in the case of blue-collar workers, education level did the opposite. Nevertheless, evidence that shows that these two elements influence the beliefs of creative efficiency of the white-collar workers seems to be unavailable. Tierney and Farmer argued that, given that knowledge is a stable characteristic that makes up the value of efficiency itself and creative output, it is reasonable to expect an association between work related knowledge and creative self-efficiency.

Although it is generally recognized that if novelty is to be found in a field, one must be knowledgeable in it (Amabile, 1983, 1988; Bailin, 1988; Hayes, 1989; Weisberg, 1986, 1995), there are those that consider that too much expertise could cause the individual to fall into monotonous habits (Frensch & Sternberg, 1989; Lunchins & Lunchins, 1959), given that familiarity with a task could induce it to be carried out in a routine manner (Ford, 1996). In general, it is assumed that the relation between expertise and creativity is in the form of an inverted U (Simonton, 1984), in that very high levels of expertise could possibly have a negative effect on creativity. As Runco (1996) argued, individuals may lose their abilities to generate creative ideas if they rely completely on their past experience as, with too much expertise, actions become rigid and automatized.

Thus, although expertise, by bringing about the attainment of knowledge faster (Chi, Glaser, & Farr, 1989), can have a series of positive effects on problem resolution, equally it could provoke the use of systematic solutions in opposition to the use of trial and error in problem solving (Kaizer & Shore, 1995), which could decrease an individual's creativity.

In this research, it is assumed that expertise in the field of activity is fundamental in order to generate some kind of new response opposed to what already exists, given

that one cannot develop new ideas without prior knowledge of the field of activity. As Woodman et al. (1993) remarked, although expertise in a given field could lead to "functional fixedness" (p. 301), preventing individuals to generate creative solutions, it is difficult to imagine any creative behavior that is, in any sense, "knowledge free." That is, to a certain extent, creativity demands a comparable level of systematic training and practice (Simonton, 2000). On this basis, the following hypothesis is presented to be verified in the analytical model:

H2: The degree to which an individual has expertise in his or her domain is positively related to his or her creativity.

Cognitive Style and Creativity

Cognitive style refers to how people address problems and their solutions, and their capacity in bringing together existing ideas and forming new combinations (Kirton, 1989). It determines the degree of flexibility and imagination that people have to face up to their problems.

Following Kirton (1976), this natural orientation, or an individual's preferred forms of problem resolution, can stem from the skill of doing things better to the skill of doing things in a different way, being two extreme opposites of the same continuum, which Kirton called, respectively, *adaptor* and *innovator*. Thus, an adaptor (someone with an adaptive cognitive style) will tend to use data within a consolidated domain, will accept problems as they have been defined and will generate ideas consistent with the accepted norm. On the contrary, an innovator (someone with an innovative cognitive style) will search for and integrate diverse information, redefine the problems presented, and generate ideas, possibly digressing from the norm.

In essence, the cognitive style most conducive to creativity is characterized by the facility to understand complex problems and the ability to break away from mental schemes while resolving a problem (Amabile, 1988; Ford, 1996; Woodman et al., 1993). Assuming that an individual has some incentive to carry out an activity, the performance will be good or adequate or acceptable, technically, if, as previously noted, the required expertise is present. Nevertheless, despite having a good deal of expertise, without creative abilities, an individual will not produce creative work. These creative abilities include a cognitive style that favors the adoption of new perspectives when resolving problems, thanks to the deductive capacity in the search for new cognitive paths (Amabile, 1983, 1988, 1996).

Therefore, for creative production, it is necessary that an individual has a cognitive style oriented towards the achievement of "new cognitive paths" (Amabile, 1988, p. 131), or divergent thinking (Ford, 1996; Guilford, 1950; Runco, 1991; Woodman et al., 1993). This orientation is consistent with Kirton's (1976) definition of the innovative cognitive style, and illustrates what Amabile (1983, 1988) qualified as creativity-relevant skills.

Some specific aspects of this way of thinking include "(i) break from perception schemes, (ii) break cognitive schemes or explore new cognitive paths, (iii) for as much time as is necessary, keep the response options open, (iv) delay judgement, (v) when storing information use many categories, (vi) log with precision, and (vii) escape from performance scripts" (Amabile, 1988, p. 131). Equally, Ford (1996) noted that diverse thinking skills "help an individual to generate many alternative solutions to a problem" (p. 1125), being a requisite that enables creative action. Also, recent work illustrated the influence of models of divergent thinking on studies of creativity (Runco et al., 2000).

In this sense, the qualities that Rogers (1954) attributed to a creative person relate more to the innovator than the adaptor. According to Rogers, the creative person is characterized by having little respect for traditional knowledge or practice, compulsively plays with ideas, and needs a high level of social recognition for his ideas.

If the conceptual work that proposes the relationship between cognitive style and creativity is in abundance (e.g., Amabile, 1983, 1996; Basadur, Graen, & Green, 1982; Ford, 1996; Woodman et al., 1993), the studies that demonstrate empirically this relation are relatively scarce (Baer, 1994; Buttner, Gryskiewicz, & Hidore, 1999; Cummings & Oldham, 1997; Ettlie & O'Keefe, 1982; Payne, Lane, & Jabri, 1990; Scott & Bruce, 1994; Taggar, 2002; Tierney et al., 1999). All of them support the premise that those individuals having a cognitive style described as innovator or intuitive show high levels of creativity, and those that show a more adaptor style are less creative. Scott and Bruce's work shows an exception in that, although a systematic cognitive style negatively affects creativity, in order to develop an innovative behavior it is not necessary to be a highly intuitive problem solver, thus partially supporting this last hypothesis.

Given that, in general, those individuals who have an innovative cognitive style will have a superior creative performance than those with an adaptor style, so that the former will be nurturing for creativity whereas the latter will have the opposite effect, the following hypotheses were considered:

H3: The degree to with an individual's cognitive style is innovative is positively related to his or her creativity.

H4: The degree to with an individual's cognitive style is adaptive is positively related to his or her creativity.

Effect of the Accumulation of the Individual Factors Considered in Creativity

Having analyzed the three individual factors that influence creativity, it is necessary to point out that there are those who consider that these elements by themselves are not sufficient, so that an individual works in a creative manner (e.g. Amabile, 1988, 1996; Ford, 1996; Woodman et al., 1993), but that the integral effect of all the components will lead to a greater creativity than if they are taken separately. In other words, each component is necessary but none sufficient alone, such that, in order to achieve creativity in the work place, all of them must be present.

In this sense, Amabile's (1983, 1996) componential theory suggested that creativity has a greater chance to occur when people's creative abilities and expertise overlap with their strongest intrinsic interests and that the greater the level of each one of the components the greater will be the creativity. This is called the ''creativity intersection'' (Amabile, 1988, p. 156), so that an individual possessing the three components will have a higher probability for being creative. Besides, the levels of each one of his joint components determine the final level of creativity reached by an individual. For example, a person can have a great deal of experience in his chosen ield, but if his cognitive style is inappropriate, his performance will be ''technically good, or adequate or acceptable'' (Amabile, 1988, p. 131), but he or she will not produce work that can be classified as creative. In addition, if this person has both these requisites but lacks the appropriate motivation, the possible effect on creativity will not be so notable. These ideas give rise to the formulation of the following hypothesis that brings together the above-mentioned effects:

H5: The accumulation of intrinsic motivation, expertise, and innovative cognitive style in an individual is positively related to his or her creativity, that is, the more of this attributes the individual possess, the more will be his/her creativity.

METHOD

Sample

The study was carried out among 110 employees of a company in the automotive sector whose principal activity consists of the manufacture of two-wheeled vehicles. To this end, in the pursuit of excellence, the company employs the just-in-time production philosophy, in which the generation of creative ideas for continual improvement is fundamental.

Workers from the administration, production, and sales divisions formed the population under study; the members of the strategic apex and the assembly line operatives were excluded. A questionnaire was sent to all these participants in which a series of questions were posed with the objective to measure and verify the model's variables. In order to increase the number of replies, the questionnaire was sent out twice: the first with the March 2003 payslips, and the second in the following month. A total of 53 valid questionnaires were received, which implied a 48.1% return, with even representation from all the analyzed divisions and their corresponding departments.

The sample is essentially composed of employees with a fairly high average length of service in the company and an average educational level corresponding to secondary school, high school education, or technical school, which indicates that the employees have a good expertise level based on an apprenticeship in their activities during a long period of time.

Measures

Formed from 11 items obtained from Ettlie and O'Keefe (1982), Oldham and Cummings (1996), and Zhou and George (2001), a 7-point scale was made in order to measure creativity. The scale measured the concept's two fundamental aspects, namely novelty and utility. The items were averaged out and a high score represented an employee with a highly creative value.

Intrinsic motivation was measured by averaging out five items extracted from Amabile et al. (1994) and Tierney et al. (1999). A seven-point scale posed questions on the degree of interest, passion, and enjoyment felt by the employee in his work place. A high score implied that the employee was highly intrinsically motivated.

The expertise variable was measured by averaging out the replies provided to a 7-point Likert-type scale made up of four items made from Amabile (1988), Amabile and Gryskiewicz (1989), and Szulanski (1996). The items made reference to the degree of knowledge that the employee had and used to carry out his job, where scores of around 1 indicated no knowledge or previous expertise, and scores of 7 suggested a high level of professional expertise.

The cognitive style was measured using a measurement derived from Kirton's (1976) Adaptation–Innovation Inventory, but reducing the tool's original 32 items to 17. To make the variable operative, a factorial analysis was carried out using the principal components

TABLE 1
Factor Structure of Cognitive Style Measure

	Factor Loadings		
	Factor 1	*Factor 2*	
CS1	−.119	**.851**	.738
CS2	−6.340E–02	**.840**	.709
CS3	5.898E–02	**.776**	.606
CS4	1.444E–02	**.880**	.774
CS5	−.113	**.790**	.637
CS6	−.242	**.768**	.648
CS7	−.277	**.690**	.552
CS8	**.797**	−.146	.656
CS9	**.816**	−.110	.678
CS10	**.703**	.122	.509
CS11	**.784**	−.112	.627
CS12	**.819**	.174	.702
CS13	**.831**	−7.662E–02	.696
CS14	**.902**	−.165	.840
CS15	**.694**	−.312	.579
CS16	**.770**	−.220	.641
CS17	**.664**	−.367	.575
% Variance accum.	36.876	65.697	
Eigenvalues	7.206	3.962	

Note. Boldface indicates loadings over .50. Associated items were retained in the subscales of the cognitive style measure. Extraction: Principal Components. Rotation Method: Varimax Normalized. CS = cognitive style.

method. Because it was desired to synthesise the two extreme styles included in the model, the priority criteria was used to obtain these two factors.

The final solution, once rotated, explained 66% of the total variance. The 10 items of the scale that corresponded to the innovative cognitive style explained the first factor. As shown in Table 1, the seven remaining items that characterized the adaptor cognitive style gave rise to significant and high factor loadings in the second component. The scores of all the employees in these components were saved for subsequent use using the regression method.

RESULTS

Cronbach's alphas for all the measures were higher than .80. Removal of any item or set of items in any measure did not appreciably improve estimates of internal consistency. So all the measures used in this research were internally consistent.

Individual Effect

A stepwise linear regression analysis was used to analyze the relationship of the individual factors on creativity. The null hypothesis of the parameters was rejected, according to the F-test ($p < .01$) Thus, the model fits the data.

On the other hand, in the final model, as shown by the value of the determination coefficient ($R^2 = 0.66$), the adjustment integrity is good, which means that 66% of the behavior of the dependant variable was explained through the predictor variables. In addition, the relevance of the variables finally chosen in the equation was demonstrated by the evolution experienced by the adjustment of the determination coefficient while adding new variables to the regression analysis. Table 2 reports the regression coefficients associated with each of the independent variables considered in the final regression equation.

Observing the results, given that on applying Student's t contrast, the results of the associated β coefficients are significant and with the adequate sign, it can be said that the innovative cognitive style ($\alpha = 0.93$) and intrinsic motivation exerted a positive and important influence on an individual's creativity. Hypotheses H1 and H3 were confirmed respectively by this fact.

The same did not occur with the adaptor cognitive style ($\alpha = 0.93$) and expertise ($\alpha = 0.89$) variables. In both cases, the regression coefficients results, although were in the right direction, were not significant, so both variables were finally excluded from the model. For this reason, the H4 and H2 hypothesis could not be confirmed.

Accumulative Effect of Individual Factors on Creativity

Having studied the effect of each individual factor on creativity, with the objective to test the hypothesis H5, the combined effect was then considered.

In order to carry out the analysis, a new variable that adopted four possible values, based on each employee's number of individual characteristics, was created. In order to distinguish whether a worker displayed a particular characteristic or not, a criterion was established that compared the points awarded for that characteristic to the average points of the same corresponding to the 53 employees of the sample population. The intended purpose was to test a positive relationship between this

TABLE 2
Summary of Regression Analysis for Variables Predicting Creativity

Predictive Variables	*B*	*SE B*	*ß*
Step 1			
Innovative CS	0.874	.102	.768**
Step 2			
Innovative CS	0.534	.141	.469**
Motivation	0.425	.132	.399**

Note. $R^2 = .77$ for Step 1; $\Delta R^2 = .044$ for Step 2 (ps $< .05$). Expertise and Adaptor Style were excluded from the regression equation.
**$p < .01$.

new variable and creativity in order to be able to test the proposed hypothesis.

The variable as defined, which measures the accumulation of the individual characteristics in the employees, establishes in function of the number of characteristics they have, a total of four employee categories. Starting from these four groups, it will be necessary to check among them the existence of homogeneity or heterogeneity with respect to the creativity variable. To do this, a 1-way ANOVA was carried out, having first checked that the necessary requirements for its application were in compliance, where creativity was the dependant variable and the variable defined to measure the accumulation of the individual characteristics in the employees was the factor of analysis.

The results displayed in Table 3 show that the average between groups quadratic is well above the same within groups value that, in fact, is a very small value. Consequently, a high F value was obtained ($p < .01$), thus rejecting the null hypothesis. Therefore, it can be confirmed that creativity differs from one individual to another in function of their individual characteristics.

On the other hand, the model was well adjusted ($\eta^2 = 1.179$). In other words, the amount of increase of creativity is due to the fact that an individual has the greatest possible number of characteristics that positively influence his creative performance.

Having confirmed that there exists a relationship between the individual characteristics of all the people and the resulting creativity, its significance was analyzed. Agreeing with the presumption of the H5 hypothesis, those individuals that have the three characteristics will be more creative than those with only one or two or none of them. Therefore, creativity should increase as the value of the variable that accumulates these attributes increases. Using Spearman's rho contrast, and given the categories nominal order, a bivariate partial correlation test was undertaken to make a check. Spearman Correlation Coefficient was positive and significant, $\rho = .659$ ($p < .01$), which confirmed the idea that, in line with the possession of individual characteristics that have been deemed necessary for creativity, an individual's creativity increases.

TABLE 3
Analysis of Variance for Creativity

	SS	*df*	*MS*	*F*
Between groups	36.435	3	12.145	19.270**
Within groups	30.883	49	0.630	
Total	67.318	52		

Note. Creativity in groups of individuals defined on the basis of the accumulation of individual attributes.

**$p < 0.01$.

TABLE 4
Centers and Sizes of Nonhierarchical Clusters for Individual Attributes

Variable	*Cluster 1*	*Cluster 2*	*Cluster 3*
Motivation	− 0.14	0.61	− 2.28
Innovative CS	− 0.26	0.68	− 2.04
Adaptor CS	− 0.63	0.32	0.85
Expertise	− 0.49	0.85	− 1.55
Number of individuals	24	24	5

That is, and in confirming the H5 hypothesis, those individuals that are intrinsically motivated, have an innovative cognitive style, and also have sufficient experience to carry out their work, were more creative than those that do not simultaneously have these characteristics.

Confirmatory Analysis

Additionally, it was considered timely and interesting to check for the existence of homogeneous groups of individuals in function of their individual characteristics, with the aim to analyze if their behavior, in a creative sense, follows what has been said before.

To do this, using the four individual characteristics as classification elements, a cluster analysis was applied to the employee sample. In the first place, the existence of three conglomerates was found by carrying out a hierarchy conglomerates analysis following Ward's method and the squared Euclidean distance between individuals. This hierarchical procedure produced the mean values of each one of the variables in each identified group, which were used as an initial seed center in an analysis of k-median conglomerates, in which it was specified that the identified groups were exactly three. Table 4 reports the final number of individuals that belonged to each group and the mean values adopted by each one of the variables in each group.

Next, in function of the individual characteristics, a significance contrast of the differences between the conglomerates centers was carried out. For this, a variance

TABLE 5
Significance Test of the Differences between Nonhierarchical Cluster Centers in Relation to the Variables Used in Their Formation

	Cluster		*Error*		
	MS	*df*	*MS*	*Df*	
Motivation	17.660	2	.334	50	52.943**
Innovative CS	16.798	2	.368	50	45.635**
Adaptor CS	9.132	2	.675	50	13.535**
Expertise	17.904	2	.324	50	55.285**

Note. **$p < .01$.

TABLE 6
Tests of Equality of Group Means

Variable	Λ	*F*	*df1*	*df2*
Expertise	.311	55.285**	2	50
Motivation	.321	52.943**	2	50
Adaptor CS	.649	13.535**	2	50
Innovative CS	.354	45.635**	2	50

Note. $^{**}p < .01$.

analysis was made, which allowed an examination of the variability between the different clusters and within each one of them. As can be seen (see Table 5) all the F values were significant ($p < 0.1$), which suggests that the conglomerates obtained variables differed significantly in the three groups under consideration.

Following on, in order to check the reliability of the results obtained with the two conglomerate analyses, a discriminate analysis was carried out using the stepwise method, in which the cluster membership was used as the dependent variable and the individual characteristics as the independent variables. In Table 6 are shown the results of the equality tests of group means. Looking at the data, the results obtained are confirmed with the cluster analysis; i.e., there exist significant differences in the averages of the different groups for each independent variable. Therefore, it's heterogeneous groups dealing with each other.

Table 7 shows the eigenvalues and the canonical correlation obtained for the discriminant functions. As can be seen, the first characteristic root is the larger and more important in explanatory power than the second one. This indicates the relative discriminant power of the discriminant functions. Also, Rc value means that nearly all the variance in the discriminant scores can be attributed to group differences. So we can affirm that the three groups come from a population in which the individual characteristics show different values depending to which group each individual belongs, which really means that the discriminate functions are well separated between each group.

Last, from the comparison of the classification derived from the cluster analysis and that obtained from the discriminate function, we could verify that all of the cases originally grouped together were classified correctly, which showed that there was internal homogeneity and heterogeneity within the groups.

TABLE 7
Eigenvalues and Canonical Correlation for Discriminating Canonical Functions

Function	*Eigenvalue*	% *Variance*	*Rc*
1	4.786	83.8	.909
2	0.926	16.2	.693

Note. Λ = .090 for Function test 1 through 2; = .519 for Function Test 2 ($p < .01$).

The next stage proceeds with the interpretation of the groups. For this, the mean values of the independent variables in each of the conglomerates were examined (see Table 4), extracting the following conclusions in relative terms on the cluster characterization:

1. Cluster number 1 is made up of individuals who show below mean values in the four variables. Specifically, the average values of intrinsic motivation and innovative cognitive style are slightly below the sample mean, and that of expertise is a little less and that of cognitive style severely more. For this reason, and given the characteristics shown, we consider that these are employees who possibly could show some creativity but not at a high level. This group is defined as *apprentices*. These are employees with a high potential for improvement in their creative performance. In this sense, it could be convenient to especially introduce policies that increase their motivation to suggest new ideas, from improving their job post, awarding them more autonomy and a greater degree of responsibility in such a way that the job becomes more interesting, to setting up mechanisms to recognize and reward creativity. In addition, it would be convenient to provide adequate training to improve their creative abilities, stimulating their potential innovative cognitive style, and increase their degree of knowledge so that they orientate them to generate new and useful ideas for the organization.
2. The second group unites individuals characterized by a high degree of intrinsic motivation, a clearly innovative cognitive style and a high degree of professional skill, given that these three variables are well above the sample average. Equally, they show a slight disposition towards systematic thinking, given that the adaptor cognitive style yields an average value slightly above the average. In accordance with this, it could be thought that they are workers with a high creativity level, because it is reasonable to speculate that they would put their expertise to this end, given the high level of intrinsic motivation shown, reinforced by their innovative style in exposing and solving problems. For this reason, this group is defined as *innovators*. These employees are a basic resource for the organization, for which one must try to maintain their level of intrinsic motivation, continually giving them challenging tasks, such that they do not lose the interest that they have for their work, and put into practice their abilities and expertise using their innovative style to resolve problems.

3. Finally, individuals whose qualities are not the most appropriate to be creative make up the third conglomerate. Being employees with an above average adaptor cognitive style gives reason for this conclusion, a situation that is further aggravated by the fact that, given that the values of these two variables are slightly below that of the sample, they show a total lack of intrinsic motivation nor the slightest sign of intuitive thought. Thus, the possibilities of contributing new ideas are practically nil, if not maybe an idea of improvement inspired by learning through practice, reasons enough to define this group as *conformists*. It's advisable that this type of group is assigned the more mechanical and systematic tasks in which they could reach an efficient level of output, without expecting that they contribute novel ideas in their work that they could only achieve outside of their routine.

At this point, it would be interesting to introduce the creative variable with the purpose to determine the existence of significant differences between the groups obtained in relation to this variable. The objective is none other than to check the adequacy of the interpretation of the clusters, in other words, that the most creative group is the innovators, followed by the apprentices, and in last places the conformists.

To do this, and having checked the compliance of the necessary requirements, a 1-way ANOVA was carried out, where creativity was the dependant variable and the obtained community mix was the factor of analysis.

The results of the analysis appear in Table 8. As can be seen, besides being a very small value, the average intergroup quadratic is much higher than the average intragroup quadratic. Consequently, a high F value is obtained, significant to a level of 0.05, thus rejecting the nullity hypothesis. This indicates that creativity differs, in function of the individual characteristics shown, from some individuals to others.

In addition, the coefficient 2 is very close to 1 (1.036), which is indicative of a well-adjusted model, for which it can be concluded that the factor explains the totality or an important part of the total variance. This means that the fact that an individual has certain individual characteristics that are more or less in evidence will determine whether he is more or less creative.

TABLE 8
ANOVA. Creativity in Groups of Individuals Defined on the Basis of their Individual Attributes

	SS	*df*	*MS*	*F*
Between groups	34.266	2	17.133	25.919**
Within groups	33.052	50	0.661	
Total	67.318	52		

Note. $^{**}p < .01$.

Using Spearman's rho contrast, and given the categories nominal order, a bivariate partial correlation test was undertaken to make a check. Spearman Correlation Coefficient was positive and significant, $\rho = .659$ ($p < .01$), which confirms the idea that, in line with the possession of individual characteristics that have been deemed necessary for creativity, an individual's creativity increases.

Once the existence of a relationship between the community group and creativity is confirmed, the next step is to analyze its sense. To do this, using Spearman's rho contrast, a bivariated correlation test was undertaken. Spearman Correlation Coefficient was positive and significant, $\rho = .619$ ($p < .01$), which confirms what was predicted, that the most creative group of employees are the innovators, followed by the apprentices, with the least creative being the conformists.

DISCUSSION

That the individual factors are clearly related to the individual creativity is effectively shown by the results obtained. On the other hand, the obtained coefficient of determination indicates that 66% of the dependant variable is explained by the variables included within these factors, which implies that there could be other factors, not contemplated in this study, which equally have a bearing on an individual's creativity. Nevertheless, it has already been mentioned that personality was considered as a determinant aspect of creativity, but was not included in the model, given that it was deemed a noncontrollable variable by the company except in the recruitment and selection processes, in which case it is assumed that the those candidates whose personality characteristics that met the requirements of the post to be filled would be selected. Therefore, it's not considered an attribute that can be improved or influenced by any management practice applied to the organization's members.

Among the individual factors considered, it can be concluded that the innovative cognitive style and intrinsic motivation, in this order of importance, positively and significantly influence the individual's creativity. In this way, this new empirical evidence has contributed to supporting the relevance of the influence of both characteristics on individual creativity. This is an outstanding conclusion for the Spanish case, as there are no empirical researches that address this topic in the Spanish academic literature.

In truth, these two relationships are those that have been most studied in the literature and of which most empirical corroboration found, thus the results of this

study confirm or support those obtained from research undertaken up to today. So we can extend them to the Spanish case.

So, in the case of intrinsic motivation, and independent of the sample group being company managers (Ford, 1999), employees of various departments (Amabile, 1998; Tierney et al., 1999) or postgraduate students (Ruscio et al., 1998; Taggar, 2002), the positive influence of this variable on creativity is supported by all the researches.

Equally, and also independent of the sample group being managers (Buttner et al., 1999), departmental employees (Payne et al., 1990; Tierney et al., 1999) or students (Baer, 1994; Ettlie & O'Keefe, 1982; Taggar, 2002), the works that analyzed the relationship between the innovative cognitive style with creativity coincide in the positive influence of this variable. Only the work carried out by Scott and Bruce (1994) in a research and development department of an industrial corporation showed that for individuals to develop an innovative behavior, it was not necessary for them to have a high innovative cognitive style. Nevertheless, these authors used innovative behavior as an independent variable, which covered not just creativity but all the phases of the innovative process.

On the other hand, the effects that expertise and adaptor cognitive style could have on creativity were not demonstrated for the case of a Spanish firm. A negative relationship, but with significant results, between adaptor cognitive style and innovative behavior was also found by Scott and Bruce (1994). Cummings and Oldham (1997) also found low scores in creativity obtained by employees with an adaptor cognitive style. This indicates the need to investigate further this relationship, one that is hardly tested in the academic literature. Also, it is necessary to comment on the lack of this result to find an explanation.

In the first place, the innovative and adaptive cognitive styles were treated separately, as suggested in the literature (Jabri, 1991; Kirton, 1976), and as mentioned, finding a positive and significant relationship between the former and creativity. In this sense, the studies found in the literature that relate the innovative versus the adaptive cognitive style with creativity do show the opposing influence that they cause on an individual's creativity. Equally, the positive association of the innovative cognitive style in relation to creativity has been supported by the studies that only analyzed this case. Nevertheless, in this investigation, a definite conclusion cannot be reached, because the result of the relationship of the adaptor cognitive style with creativity was negative, but not significantly so.

Along these lines, it can be thought that individuals can indistinctly use one or another style, depending on the situation they are in and the task to be undertaken, because it is possible that a person with an extreme innovative style, at any point in their life, although only for necessity, could show a more systematic way of thinking.

Thus, in the first stages of the innovative process, in which the generation of novel and useful ideas is fundamental for its subsequent success, the possession of an innovative cognitive style seems important in order to carry out the task satisfactorily. In fact, it's precisely this individual attribute that is shown to be the most significant of all those analyzed, based on this study's results. On the other hand, it is shown that the development of creativity is not influenced in any sense by the fact that an individual has or develops a certain cognitive style with a more adaptive character.

As Scott and Bruce (1994) noted, it could be that those who are capable of using a style appropriate to the stage of the innovative cycle in which they are involved are the true innovators. It is certain, that in their research, these authors reached the conclusion that individuals, in order to develop an innovative behavior—both those that carry out routine tasks as well as those involved in more complex tasks—do not need to be highly intuitive problem solvers (innovators), and a systematic problem solver style (adaptors) significantly inhibits the display of high levels of innovative behaviour. Nevertheless, the measure used for the innovative behavior included activities of a more general nature related with the complete innovative process and not just exclusively with creativity as is in this research work. All this suggests the need to analyze this relationship in greater depth.

With reference to expertise, the regression coefficient obtained, although positive, was not a significant result. The sample characteristics could be the reason for this lack of importance, which showed an average length of service of 18 years and an average to low education level, which point toward employees having a high level of expertise thanks to the continued and prolonged practice of their work. This fact could result in the employees becoming very familiar with their tasks, causing them to fall into routine procedures while carrying them out. Thus, it's possible that they find themselves at the point in Simonton's (2000) inverted *U* where creativity has reached a stalemate as a consequence of this long-acquired expertise and stereotyped behavior taking place. One can look also for an explanation basing on Rubenson and Runco's (1992) psycoeconomic approach to creativity, according to which "major contributions are more likely to be made by younger creators, and older creators are more likely to extend existing principles with minor contributions" (p. 141). The psychoeconomic justification lies on the individual's knowledge in some area, and on the implicit risks derived from speculating with a creative idea. From Rubenson and Runco assertions, we can state that those employees

with tenure and greater length of service will, in general, possess more domain-relevant knowledge, so that they will produce minor contributions because of "a major contribution is likely to reduce the value of much existing knowledge, imposing a large cost on those with substantial investments in that knowledge" (p. 141). So employees with less expertise will be more ready to gamble on a major contribution; experienced ones will not. However, as has been mentioned, the relationship between expertise and creativity, despite provoking interest, has hardly been tested empirically in organizational settings, which makes it appropriate to carry out new studies using diverse type of employees from different fields, and with different education and length of service levels, which confirm or deny this proposition. Also, it will be interesting to determine the optimal level of expertise that an employee needs in order to maximize his or her creative potential.

In addition, the accumulation of individual characteristics that positively affect creativity has an even greater effect on this. Therefore, it can be concluded that those individuals that do not have any of these characteristics show a minimum level of creativity, which is to be expected because anybody with normal characteristics could produce at least a modest amount of creative work if the environmental conditions are favorable (Amabile, 1996; Shalley, 1955). At the moment that those individuals have one of the necessary characteristics for creativity, their level of creativity considerably increases and will keep on increasing as they continue to acquire them. This means that to develop an optimum creative behavior, it is not sufficient to have the necessary conditions of sufficient expertise or innovative cognitive style or be intrinsically motivated. Besides this, it is necessary that they are jointly present in an individual such that he can maximize the development of his creative potential.

Equally, the cluster analysis carried out also confirms this idea, given the obtained classification of the employees. Important conclusions for management can be derived based on the interpretation of the three given mixes. In this manner, companies should take into account the type of employees they are dealing with in order to achieve, in the case of the apprentices, the maximum stimulation of their potential creative output, the minimum time that the creative level of the innovators can be maintained and, to assign to the conformists those tasks that do not require the use of creative thought abilities.

PRACTICAL IMPLICATIONS

Given the lack of academic studies in Spain that analyze the aspects considered here, it's particularly relevant that the conclusions from this investigation make a contribution of empirical evidence in the case of a company located in that country.

In addition, the importance is highlighted of having an adequate human resource management in order to achieve the maximum creative performance and, consequently, obtain a greater supply of novel and useful ideas for their subsequent development or introduction for any company.

In the first place, the relevance of the recruitment and selection processes to contract workers who have adequate attributes in order to generate the greatest number of creative ideas is observed. They must be individuals with special abilities for creative thinking, as well as ones who have a high internal motivation.

Once inside the company, it is necessary to make an emphasis on their training, with the objective to increase their employees' knowledge base, as well as to teach them to think in an innovative way.

Also, a key element to keep up the intrinsic motivation, very important for creativity, is the provision of challenging tasks in which the employee has to put into practice his capabilities and skills.

In this sense, it is important that the different types of employees that are counted on are identified in function of their individual characteristics, with the aim of maximizing the use of their creative potential. In this way, those workers characterized by high levels of intrinsic motivation and expertise and having an innovative cognitive style, are essential to the company, given their demonstrated high level of creativity. On the other hand, those employees that show these attributes in a lesser form have a high creative potential that must be stimulated using policies that increase their motivation to suggest new ideas, or recognize those ideas when they are contributed. Equally, it's necessary to recognize those employees without these characteristics, in order to assign them tasks of a more systematic nature that they could carry out very efficiently, avoiding the demand of results that are not appropriate to their way of being and working, with the consequent intrinsic sanctions, that usually accompany this, such as the sensation of incompetence or failure.

REFERENCES

Amabile, T. M. (1982). Social psychology of creativity: A consensual assessment technique. *Journal of Personality and Social Psychology*, *43*, 997–1013.

Amabile, T. M. (1983). *The social psychology of creativity*. New York: Springer-Verlag.

Amabile, T. M. (1988). A model of creativity and innovation in organizations. *Research in Organizational Behavior*, *10*, 23–167.

Amabile, T. M. (1993). Motivational synergy: Toward new conceptualizations of intrinsic and extrinsic motivation in the workplace. *Human Resource Management Review*, *3*, 185–201.

Amabile, T. M. (1996). *Creativity in context*. Boulder, CO: Westview.

Amabile, T. M. (1997) Motivating creativity in organizations: On doing what you love and loving what you do. *California Management Review*, *40*, 39–58.

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal*, *39*, 1154–1184.

Amabile, T. M., & Gryskiewicz, N. (1989). The creative environment scales: The work environment inventory. *Creative Research Journal*, *2*, 231–254.

Amabile, T. M., Hill, K. G., Hennessey, B. A., & Tighe, E. (1994). The work preference inventory: Assessing intrinsic and extrinsic motivational orientations. *Journal of Personality and Social Psychology*, *66*, 950–967.

Baer, J. (1994). Divergent thinking is not a general trait: A multidomain training experiment. *Creativity Research Journal*, *7*, 35–46.

Baer, J. (1998). The case for domain specificity of creativity. *Creativity Research Journal*, *11*, 173–178.

Bailin, S. (1988). *Achieving extraordinary ends: An essay on creativity*. Dordrecht, The Netherlands: Kluwer Academic.

Basadur, M., Graen, G. B., & Green, S. G. (1982). Training in creative problem solving: Effects on ideation and problem finding in an applied research organization. *Organizational Behavior and Human Performance*, *30*, 41–70.

Bower, G. H., & Hilgard, E. (1981). *Theories of learning* (5th ed.). Englewood Cliffs, NJ: Prentice-Hall.

Buttner, E. H., Gryskiewicz, N., & Hidore, S. C. (1999). The relationship between styles of creativity and managerial skills assessment. *British Journal of Management*, *10*, 228–238.

Chi, M., Glaser, R., & Farr, M. (Eds.) (1989). *The nature of expertise*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, *35*, 128–152.

Csikszentmihalyi, M. (1988). Society, culture, and person: A systems view of creativity. In R. J. Sternberg (Ed.), *The nature of creativity* (pp. 325–339). New York: Cambridge University Press.

Csikszentmihalyi, M. (1990). The domain of creativity. In M. A. Runco & R. S. Albert (Eds.), *Theories of creativity* (pp. 190–212). Newbury Park, CA: Sage.

Cummings, A., & Oldham, G. R. (1997). Enhancing creativity: Managing work contexts for the high potential employee. *California Management Review*, *40*, 23–38.

Dweck, C. E. (1986). Motivational processes affecting learning. *American Psychologist*, *41*, 1040–1048.

Ettlie, J. E., & O'Keefe, R. D. (1982). Innovative attitudes, values, and intentions in organizations. *Journal of Management Studies*, *19*, 163–182.

Ford, C. M. (1995). Creativity is a mystery: Clues from the investigators' notebooks. In C. M. Ford & D. A. Gioia (Eds.), *Creative action in organizations: Ivory tower visions and real world voices* (pp. 12–49). Newbury Park, CA: Sage.

Ford, C. M. (1996). A theory of individual creative action in multiple social domains. *Academy of Management Review*, *21*, 1112–1142.

Ford, C. M. (1999). Interpretive style, motivation, ability and context as predictor of executives' performance. *Creativity and Innovation Management*, *8*, 188–196.

Frensch, P. A., & Sternberg, R. J. (1989). Expertise and intelligent thinking: When is it worse to know better? In R. J. Sternberg (Ed.), *Advances in the psychology of human intelligence* (pp. 157–188). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Gardner, H. (1993). *Creating minds: An anatomy of creativity seen through the lives of Freud, Einstein, Picasso, Stravinsky, Eliot, Graham, Gandhi*. New York: Wiley.

Gruber, H. E. (1988). The evolving systems approach to creative work. *Creativity Research Journal*, *1*, 27–51.

Gruber, H. E., & Davis, S. N. (1988). Inching our way up Mount Olympus: The evolving-systems approach to creative thinking. In R. J. Sternberg (Ed.), *The nature of creativity* (pp. 143–169). New York: Cambridge University Press.

Guilford, J. P. (1950). Creativity. *American Psychologist*, *5*, 444–454.

Hayes, J. R. (1989). Cognitive processes in creativity. In J. A. Glover, R. R. Ronning, & C. R. Reynolds (Eds.), *Handbook of creativity* (pp. 135–145). New York: Plenum Press.

Jabri, M. (1991). The development of conceptually independent subscales in the measurement of modes of problem solving. *Educational and Psychological Measurement*, *54*, 975–983.

Kaizer, C., & Shore, B. M. (1995). Strategy flexibility in more and less competent students on mathematical norm problems. *Creativity Research Journal*, *8*, 77–82.

Kirton, M. J. (1976). Adaptors and innovators: A description and measure. *Journal of Applied Psychology*, *61*, 622–629.

Kirton, M. J. (1989). Adaptors and innovators at work. In M. J. Kirton (Ed.), *Adaptors and innovators: Styles of creativity, and problem solving* (pp. 1–36). New York: Routledge.

Koestler, A. (1964). *The act of creation*. London: Hutchinson.

Kulkarni, D., & Simon, H. (1990). The process of scientific discovery: The strategy of experimentation. *Cognitive Science*, *12*, 129–175.

Lindsay, P. H., & Norman, D. A. (1977). *Human information processing* (2nd ed.). New York: Academic Press.

Lunchins, A. S., & Lunchins, E. H. (1959). *Rigidity of behaviour*. Eugene: University of Oregon Press.

Mainemelis, C. (2001). When the muse takes it all: A model for the experience of timelessness in organizations. *Academy of Management Review*, *26*, 548–565.

MacKinnon, D. W. (1962). The nature and nurture of creativity talent. *American Psychologist*, *17*, 484–495.

MacKinnon, D. W. (1978). *In search of human effectiveness: identifying and developing creativity*. Buffalo, NY: Creative Education Foundation.

Mumford, M. D. (2000). Managing creative people: Strategies and tactics for innovation. *Human Resource Management Review*, *10*, 313–351.

Mumford, M. D., & Gustafson, S. B. (1988). Creativity syndrome: Integration, application and innovation. *Psychological Bulletin*, *103*, 27–43.

Newell, A., Shaw, J., & Simon, H. A. (1962). The processes of creative thinking. In H. Gruber, G. Terrell, & M. Wertheimer (Eds.), *Contemporary approaches to creative thinking* (pp. 63–119). New York: Atherton Press.

Newell, A., & Simon, H. A. (1972). *Human information processing*. Englewood Cliffs, NJ: Prentice Hall.

Nicholls, J. G. (1972). Creativity in the person who never produce anything original and useful: The concept of creativity as a normal distributed trait. *American Psychologist*, *27*, 717–727.

Oldham, A., & Cummings, G. R. (1996). Employee creativity: Personal and contextual factors at work. *Academy of Management Review*, *39*, 607–634.

Payne, R. (1990). The effectiveness of research teams: A review. In M. A. West & J. L Farr (Eds.), *Innovation and creativity at work* (pp. 101–122). Chichester, UK: Wiley.

Payne, R., Lane, D., & Jabri, M. (1990). A two dimensional person–environment fit analysis of the performance, effort, and satisfaction of research scientists. *British Journal of Management*, *1*, 45–57.

Pelz, D. C., & Andrews, F. M (1966). Autonomy, coordination, and stimulation in relation to scientific achievement. *Behavioral Science*, *11*, 89–97.

Rhodes, M. (1987). An analysis of creativity. In S. C. Isaksen (Ed.), *Frontiers of creativity research* (pp. 216–222). Buffalo: Bearly Ltd.

Rogers, C. (1954). Toward a theory of creativity. *Review of General Semantics*, *11*, 249–260.

Rubenson, D. L., & Runco, M. A. (1992). The psychoeconomic approach to creativity. *New ideas in Psychology*, *10*, 131–147.

Rubenson, D. L., & Runco, M. A. (1995). The psychoeconomic view of creative work in groups and organizations. *Creativity and Innovation Management*, *4*, 232–241.

Runco, M. A. (1991): *Divergent thinking*. Norwood, NJ: Ablex.

Runco, M. A. (1996). Personal creativity: Definitions and developmental issues. *Developmental Review*, *12*, 233–264.

Runco, M. A. (2004): Creativity. *Annual Review of Psychology*, *55*, 657–687.

Runco, M. A., & Chand, I. (1995). Cognition and creativity. *Educational Psychology Review*. *7*, 243–267.

Runco, M. A., Dow, G., & Smith, W. (2006). Information, experience, and divergent thinking: An empirical test. *Creativity Research Journal*, *18*, 269–277.

Ruscio, J., Whitney, D. M., & Amabile, T. M. (1998). The fishbowl of creativity. *Creativity Research Journal*, *11*, 243–263.

Scott, S. G., & Bruce, R. A. (1994). Determinants of innovative behaviour: A path model of individual innovation in the work place. *Academy of Management Journal*, *37*, 580–607.

Shalley, C. E. (1991). Effects of productivity goals, creativity goals, and personal discretion on individual creativity. *Journal of Applied Psychology*, *76*, 179–185.

Shalley, C. E. (1995). Effects of coaction, expected evaluation, and goal setting on creativity and productivity. *Academy of Management Journal*, *38*, 483–503.

Simonton, D. K. (1984). Generational time-series analysis: A paradigm for studying sociocultural influences. In K. Gergen & M. Gergen (Eds.), *Historical social psychology*, (pp. 141–155). Hillsdale, NJ: Erlbaum.

Simon, H. A. (1985). What we know about the creative process. In R. L. Kuhn, (Eds.), *Frontiers in creative and innovative management* (pp. 3–20). Cambridge, MA: Ballinger.

Staw, B. M. (1990). An evolutionary approach to creativity and innovation. In M. A. West & J. L. Farr (Eds.), *Innovation and creativity at work* (pp. 287–306). Chichester, UK: Wiley.

Stein, B. S. (1989). Memory and creativity. In J. A. Glover, R. R. Ronning, & C. R. Reynolds (Eds.), *Handbook of creativity* (pp. 163–176). New York: Plenum Press.

Stein, M. I. (1974). *Stimulating creativity, Vol. 1*. New York: Academic Press.

Sternberg, R. J., & Lubart, T. I. (1991). An investment theory of creativity, and its development. *Human Development*, *34*, 1–31.

Sternberg, R. J., & Lubart, T. I. (1996). Investing in creativity. *American Psychologist*, *51*, 677–688.

Szulanski, G. (1996). Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal*, *17*, 27–43.

Taggar, S. (2002). Individual creativity and group ability to utilize individual creative resources: A multi-level model. *Academy of Management Journal*, *45*, 315–321.

Tierney, P., & Farmer, S. M. (2002). Creative self-efficacy: Potential antecedents and relationship to creative performance. *Academy of Management Journal*, *45*, 1137–1148.

Tierney, P., Farmer, S. M., & Graen, G. B. (1999). An examination of leadership and employee creativity: The relevance of traits and relationships. *Personnel Psychology*, *52*, 591–620.

Torrance, E. P. (1974). *Torrance Test of Creative Thinking: Norms-technical manual*. Lexington, MA: Ginn.

Wallas, G. (1926). *The art of thought*. New York: Harcourt Brace Jovanovich.

Weisberg, R. W. (1986). *Creativity, genius and other myths*. New York: Freeman.

Weisberg, R. W. (1992). Metacognition, and insight during problem-solving. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *18*, 426–431.

Weisberg, R. W. (1993). *Creativity: Beyond the myth of genius*. New York: Freeman.

Weisberg, R. W. (1995). Case studies of creative thinking: Reproduction versus restructuring in the real world. In S. M. Smith, T. B. Ward, & R. A. Finke (Eds.), *The creative cognition approach* (pp. 53–72). Cambridge, MA: MIT Press.

Weisberg, R. W. (1999). Creativity and knowledge: A challenge to theories. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 226–250). Cambridge, UK: Cambridge University Press.

Wertheimer, M. (1945). *Productive thinking*. New York: Harper.

West, M. A., & Farr, J. L. (1990). Innovation at work. In M. A. West, & J. L. Farr (Eds.), *Innovation and creativity at work* (pp. 1–13). Chichester, England: Wiley.

Woodman, R. W., Sawyer, J. E., & Griffin, R. W. (1993). Toward a theory of organizational creativity. *Academy of Management Review*, *18*, 293–321.

Woodman, R. W., & Schoenfeldt, L. F. (1990). An interactionist model of creative behaviour. *Journal of Creative Behavior*, *24*, 279–290.

Zaltman, G., Duncan, R., & Holbeck, J. (1973). *Innovations and organizations*. London: Wiley.

Zhou, J., & George, J. M. (2001). When job dissatisfaction leads to creativity: Encouraging the expression of voice. *Academy of Management Journal*, *44*, 682–697.

APPENDIX

Creativity Measure (Self-Report)

1. Among my colleagues and co-workers, I will be the first or nearly the first to try our a new idea or method.[a]
2. I solve problems which has caused others great difficulty.[a]
3. I investigate and secure funds needed to implement new ideas.[b]
4. I usually find new uses for existing methods or existing equipment.[a]
5. I develop adequate plans and schedules for the implementation of new ideas.[b]
6. I suggest new and better ways to achieve goal or objectives.[d]
7. I usually search out new technologies, processes, techniques and/or product ideas.[b]
8. I use existing information or materials to develop ideas, methods, or products that are useful to the organization.[c]
9. I develop ideas, methods, processes, or products that are both original and especially useful to the organization.[c]
10. Quite frequently, the ideas I develop are implemented by the organization.
11. On the whole, the ideas I generate are relevant for organizational success.

[a]Adapted from Ettlie and O'Keefe (1982). [b]Adapted from Scott and Bruce (1994). [c]Adapted from Oldham and Cummings (1997). [d]Adapted from Zhou and George (2001).