



**Anna Lipka**

Department of Organizational Management  
Faculty of Economics  
University of Economics in Katowice, Poland  
anna.lipka@ue.katowice.pl

**Alicja Winnicka-Wejs**

Department of Organizational Management  
Faculty of Economics  
University of Economics in Katowice, Poland  
a.winnicka-wejs@ue.katowice.pl

**Stanisław Waszczak**

Department of Organizational Management  
Faculty of Economics  
University of Economics in Katowice, Poland  
stanislaw.waszczak@ue.katowice.pl

**The experiment in the management  
of human capital creativity**

DOI: 10.22367/jem.2017.27.04

Accepted by Editor Ewa Ziemba | Received: February 11, 2016 | Revised: January 7, 2017;  
January 13, 2017; January 23, 2017 | Accepted: January 24, 2017.

**Abstract**

The article includes the content of sample experiments whose results may be useful in the management of human capital creativity. It presents selected experiment concepts concerning ideational fluency, flexibility and originality and their subordination to basic patterns: simple real experimental patterns, simple basic pre-experimental patterns, simple basic quasi-experimental patterns. In addition, it includes the account of the experiment on attitude shaping. Methodical, ethical and economic limits of experiment application were determined, based on the analysis of reference books related to the method of the experiment and creativity management. The way to understand the constraints is included below in the glossary of key phrases. The subject of the study was chosen on the basis of the existent research gap. As results from analyses based on the study of foreign reference books conducted by J. Samul [2015], the experiment is still a rarely used research method in the area of human capital management. It can, therefore, be concluded that the same also (and perhaps even more so) applies to experiments concerning the management of employee creativity.

**Keywords:** creativity management, human capital, experiment limits.

**JEL Classification:** M50.

## **Introduction**

Managing creativity is – apart from philosophy, ethics, history, psychology, pedagogy, sociology of creativity and the creativity law (copyright law, which may be considered not only from the legal point of view) – a sub-discipline of creatology [Basadur 1992; Magyary-Beck 1999; Davies, Scase 2000; Howkins 2001]. Management in this area is conditional on access to the theory and empirical research on the basis of which managers would find and implement appropriate solutions. However, due to the specific nature of organizational determinants – the time and space in which creative staff and teams function – it is not always possible to apply certain theories and research results. In such cases, the actions undertaken in the field of creativity management should be preceded by tests in the form of research, including those based on an experiment. The object of the study is therefore to show the content of such sample experiments, the results of which would be useful in the management of human capital creativity.

Thus, the objective of the study is to present an outline of a concept of experimental projects, their placement among the testing schemes using this method, determining the constraints entailed by their use, as well as – the presentation of the report from one of the experiments. The following research questions, corresponding to the title of the study, were developed:

- Is it possible to design experiments concerning the management of human capital creativity which fall into one of the following categories: real simple experimental schemes, basic simple pre-experimental schemes, and basic simple quasi-experimental schemes?
- Are ethical issues, as well as the effectiveness of the experiment in the above-mentioned applications, the source of constraints which cannot be removed?

The former question (the one related to methodological constraints) is important due to the fact that conditions are not always conducive to carrying out experiments in the desired way for instance, conditions for sampling other than at random. The latter question is equally important, as it is only lack of ethical obstacles and efficiency of a method which support its choice. Hypotheses verify the former question positively, whereas, the latter one negatively.

The article's structure contains: theoretical background, research methodology, research findings and discussion, conclusions and acknowledgement.

### **1. Theoretical background**

Experimental research on the cognitive substrates of creativity, personality traits of creative individuals or nature of the creative process and its products, has been conducted on the basis of psychology for a long time. Since both in the

creative and non-creative cognition particular causal mechanisms operate, it is usually necessary to use the experimental method in the research, to be able to draw conclusions on the causes and effects of the processes involved. Causation must be known to facilitate understanding of the cognitive process taking place in the mind which generates creative ideas.

Knowing the nature of the process, which produces creative ideas, it is possible to teach people more creative thinking [Smith, Shah 2006, pp. 3-4]. It must be stressed, however, that the study of the creative process is not an easy task. It concerns especially the creative work of outstanding persons – it might sound like a paradox, yet the psychology of creativity has no tools to explore the best examples of what it is interested in, that is creative work. “Tests of creativity are not suitable for testing exceptionally outstanding individuals, simply because they lack appropriate norms” [Nęcka, Sowa 2005, p. 164].

In the study of creativity a variety of methods are used, most of which refer to the cognitive and personality-related characteristics of creative individuals, or less frequently, these methods relate to the creative process and the environment in which this process occurs. An overview of the methods used in the study of creativity is presented in Table 1.

**Table 1.** The methods used in the study of creativity: their strengths and weaknesses

Method	Strength(s)	Weakness(es)
Autobiographical self-reports	Highest-level creators	Lack of control over accuracy; evidence that several are untrue; limited to qualitative analysis
Biography – creative thinking	Highest-level creators; historical data accurate	Only as good as data are complete; qualitative analysis
Biography – personality or psychopathology	Highest-level creators	Qualitative analysis; retrospective assessment or diagnosis difficult; only as good as data; data not in form amenable to analysis
Case studies of innovations	Highest-level advances; historical data accurate	Qualitative analysis; only as good as data are complete; method and data may limit generality of conclusions
Historiometric analyses	Real creativity; hard data; quantitative methods	Only as good as data; may be limitations on kinds of questions that can be asked (fine-grain analysis?)
Quantitative case study	Real creativity; hard data; quantitative analysis	Lack of control; only as good as data; possibility of bias in selection of cases
In vivo (e.g., Dunbar) – thinking	Real situations	Lack of control; quality of data; highest level?
In vivo – personality	Real creators	Correlational study; highest level?
In vitro (e.g., Dunbar) – discovery	Control; approaches real situation	Artificiality; is situation too structured by experimenter?
In vitro – personality (undergraduates tested)	Control	Assessment of creativity depends on validity of test; correlational study
Laboratory experiment – problem solving	Control and analysis of phenomena	Artificial situation; is it real creativity?

Source: Weisberg [2006, p. 79].

The examples of experimental studies on the phenomenon of creativity are as follows:

- the role of insight into solving a problem [Köhler 1917],
- functional stability, persistence – regular, daily use of the object constitutes an obstacle to use it in a new way [Duncker 1945],
- fixation in solving the problem (design-related) – prior presentation of the example with the features which should be avoided results in these features being incorporated into the project by more than 50% of those polled [Jansson, Smith 1991],
- distorting effect of prior experience on solving a problem [Frensch, Sternberg 1989; Ward 1995],
- the impact of artificially induced mood on creative thinking [Isen 1999],
- laboratory studies of incubation and illumination [Wallas 1926],
- research on the stages of creative thinking [Patrick 1935, 1937],
- laboratory studies of incubation [Olton, Johnson 1976],
- research on the role of the socio-environmental factors in creativity [Amabile 1983, 1996].
- prestige effect – assessment of art works in respect of the artist (fame, recognition) or circumstances (exhibition, museum) [Farnsworth, Beaumont 1932; Crozier, Chapman 1981].

The experiments refer to various sub-processes of creativity management, inclusive of its planning and organization, as well as evaluation.

It was assumed in own research that the rare use of experimental studies, in particular-those relating to creativity may be connected not only with their ethics, but also with their economy/profitability.

## **2. Research methodology**

### **2.1. Explanation of key concepts**

Key concepts of the study are as follows: creativity, creativity management, experiment in the creativity management, simple experimental research patterns, the methodological limits of the experiment, the ethical limits of the experiment, the economic limits of the experiment.

Creativity is the most important feature of human capital, which does not mean the same as intelligence. These characteristics are diagnosed differently. The following tools are used for the diagnosis of creativity [Amabile 1982, pp. 997-1013; Kubicka 2005, pp. 125-153]:

- tests (e.g. of divergent thinking, Torrance's *Test of Creative Thinking (TTCT)*, *Anagram Test*, *Consequences Test*, *Titles Test*, *Stories Test*, Torrance's *Creativity Tests*; *TCT-DP*, *TCT-V Creativity Tests*, Wallach-Kogan's *Creativity Test (WKCT)*, Mednick's *Remote Associates Test (RAT)*, Nećka's and Rychlicka's *Test of Creative Thinking*;
- questionnaires of attitudes, interests, motivation, creativity styles (e.g. Popek's *Creative Behavior Questionnaire – KANH*);
- personality questionnaires (e.g. Gough's and Heilbrun's *Adjectives Test*);
- interviews, observation of behaviors or activities (e.g. Amabile's *The working environment questionnaire*) as well as
- product and environment analysis (e.g. Amabile's *The Consensual Analysis Technique*, Richards's *The Life Works Scale*).

Intelligence, however, is tested almost exclusively by testing. The most commonly used intelligence tests include: Wechsler's scales (*WPPSI-R*, *WISC-IV*, *WAIS-IV*), Raven's *Matrices Test*, Kaufman's *Intelligence Tests (KAIT)*, *Woodcock-Johnson III*, *CAS (Cognitive Assessment System)*.

Creativity and intelligence are intertwined, as indicated by the threshold hypothesis formulated by E.P. Torrance. It claims that up to a certain level of intelligence (about 120 points in the scale of intelligence quotient) a positive, linear relationship between creativity and intelligence can be observed, while above this threshold, the relationship is weaker or absent [Karwowski, Grajewski 2012].

The difference between creativity and creative output is indicated in the reference books. The following aspects are mentioned [Sokół 2015, p. 42]:

- reference to people, their predispositions (creativity), as well as the creative process and products (creative output),
- connection with everyday activity (creative output) or science/art (creativity),
- equation with lack of brilliance (creativity) or brilliance (creative output).

Employees' actions may, but do not have to, lead to outstanding products. They may relate not only to the area of science/art, but also other areas which are difficult to depreciate, even more so that they can penetrate into the domain of science or art. Therefore, at least two of the differentiating criteria are poorly suited for use during the analysis. As a result it appears advisable to treat these concepts as synonymous. It is also recommended to accept that the management of creativity (creative output) means its short-, medium- and long-term planning, as well as organizing, motivating and monitoring related not only to people but also to processes and products. The management is especially important for example in the case of the culture of adhocracy and personnel strategies of the

following types: attacking, quality, development and involvement, as well as general strategies based on product differentiation or ‘opening’ a market niche.

An experiment in the management of creativity can be understood as a method to study the links between specific ways to manage creativity and ideational fluency, flexibility and originality of the products of creative activity (see definitions below), as well as its place among the cherished values and attitudes to it and the progress in the development of creative skills. This kind of experiment would consist in research and implementation.

The application of simple research patterns means the examination of the impact of only one specific independent variable (e.g. a specific way to motivate to work) on one of the dependent variables indicated in the above definition (e.g. modification of attitudes towards creativity). It refers to the, so-called, one difference canon [Rószkiewicz 2002, pp. 40, 96]. These patterns can be implemented as the following patterns [Cook, Campell 1979; Aakar, Day 1990; Creswell 1994; Rószkiewicz 2002, pp. 102-117; Harrison, List 2004; Croson 2005; Davies 2007; Ross, Morrison 2007; Parjanen 2012]:

- real patterns (then there is a possibility of full manipulation of the independent variable and random allocation of research units to either the test group or the control group takes place),
- pre-experimental patterns (if the range of manipulation of the independent variable is limited and the allocation of research units to the aforementioned groups is different from being random),
- quasi-experimental patterns (if there is a lack of random allocation of research units to the specific groups, while there is full possibility to manipulate the independent variable).

Schemes are diversified by the following aspects:

- the range of manipulation with the independent variable,
- the way of being assigned to a particular group,
- the type and number of measurements.

The methodological limits of the application of these patterns are drawn by the ‘incompatibility’ of research and implementation issues within a specific pattern, e.g. in the case of restrictions related to the manipulation of the independent variable, or of the gradation of motivation intensity with regard to creativity. The ethical limits of the experiment are drawn by its negative impact on the researchers (e.g. the burden of the obligation to provide information concerning specific results of the experiment) as well as the subjects (e.g. lowering of self-esteem after the experiment). The economic limits of the experiment are drawn by its unprofitability, i.e. the outlays on the research being higher as compared to the effects of the implementation of its results.

Points 3-5 below present experimental projects related to three criteria of creativity evaluation, thus referring to the existent theory. They were drawn up according to the following methodological steps:

- the definition of the research subject,
- the meaning of the experiment for creativity management,
- identification of the experiment scheme,
- determining the type of outlays and effects of the experiment,
- assessment of the ethical aspect of the experiment.

## **2.2. The design of an experiment on ideational fluency**

Ideational fluency means the fluency of thought, that is, the ease of producing ideas, measured by the number of ideas generated.

The experiment could prove the impact of training on the ideational fluency. Experiments of this kind are well known, they may be used in research studies on the predictors of entrepreneurship (e.g. the ability to ‘find’ problems and ways of solving them [see Hernandez, Redien-Collot 2013, pp. 93-114].

The advisability of the experiment design, however, involves checking the above impact for specific organizational conditions and particular category of workers. It is assumed that full manipulation with the controlled factor is possible (the duration of training sessions, their number and type), and the possibility to measure ideational fluency before training sessions for deliberately selected (test group) group of employees (the primary measurement), and then after them (the final measurement). The measurements: both the primary and the final one would also be made for a control group. The above experiment design corresponds to the characteristics of the non-equivalent control pattern, which is one of the basic simple quasi-experimental patterns (just like a numerical series pattern, an equivalent chronological samples pattern, an original and final pattern performed on separated samples, and an original and final pattern performed on separated samples, with control groups).

Participation in the above experiment is associated with benefits for the subjects (improving certain skills and developing abilities as necessary conditions for creativity [Amabile 1996] rather than ethical violations, apart from the question of making an effort to participate in the study. Potential threats may include lower self-esteem for those individuals from the research group, who do not increase their ideational fluency as a result of inventive training, and violation of confidentiality in that respect.

The outlays connected with the organization of the experiment include:

- development and carrying out inventive sessions,
- division of participants into targeted groups,
- carrying out four measurements.

Effects are associated with the growth of human capital value of employees as a result of an increase in the quality of their human capital. When the quality becomes the organization's competitive advantage, the organization strengthens its competitive potential. Taking this into consideration, it is possible to conclude that there is a surplus of effects over outlays, i.e. economy/profitability of experimental research. This will occur, of course, when the actual results will not differ from the expected ones.

### **2.3. The design of an experiment on ideational flexibility**

Flexibility of thought is reflected in the ease with which it changes direction. It is measured by the number of categories, to which the generated ideas may belong. It can be examined by using tests that measure the fluency and flexibility of thought (for example, a brick uses test [Guilford 1978, pp. 287-288]).

One option would be to examine the impact of change to academic staff assessment criteria on their ideational flexibility. This flexibility would involve, for example, combining expertise from different scientific disciplines in their publications. The experimental assumption would be that the introduction of the criterion of assessing for interdisciplinarity and giving the criterion the highest possible value (as compared to other assessment criteria) will result in an increase in the percentage of employees with publications of this type. Therefore, the test group would be defined in an intentional way. The controlled factor would assume only one value, and the possibility of manipulating with it would have a limited scope. At the same time there would be a single measurement of the value of the dependent variable for all employees. The increase in the percentage of employees with publications of an interdisciplinary nature would imply the effectiveness of the motivational impact of the change in the criteria of assessing employees. If the test group were employees of a specific organizational unit, then demonstrating the aforementioned effectiveness could be followed by the implementation of the above assessment principles to the whole organization.

The result of the above experiment would therefore be an increase in the value of the produced research papers due to their interdisciplinarity. The outlays on the experiment would be connected with the development of new assessment principles

drawn up according to the concept of ‘output’ (for qualitative and/or quantitative results). A further type of outlays would be connected with the following:

- the designation of the group in an intentional way,
- the selection of the manipulated factor value/category,
- the manipulation of the controlled factor,
- the measurement of the value of the dependent variable (the percentage of publications which meet the requirement)

or with the operations related to the implementation of the simple basic pre-experimental pattern, and to be exact – one-group pattern with the final measurement.

Ethical risks, as in the previous case, concern self-esteem and the eventuality that the confidentiality of results may be breached, and moreover – that personnel decisions may be negative for an employee as a result of the negative assessment of their published work.

#### **2.4. The design of an experiment on originality**

Originality is the third and last – beside the ideational fluency and flexibility – criterion of the assessment and management of creativity. It means the ability to produce rare and/or unusual ideas. It can be measured by applying frequency indicators or using the assessment provided by competent evaluators. The experiment may relate to the assessment of the impact of ‘cutting-off’ employees of *public relations* teams from the Internet on the originality of the effects of their work. It is assumed that the ‘cut’ would increase their originality. The test group (experimental) would consist of employees without or with limited access to the Internet (possibility of full experimental manipulation), whereas the control group – would consist of employees (in the same number and with comparable characteristics, in particular those concerning motivation, as well as knowledge and experience in the field of public relations) – having such access (limited – a pre-test, or full – a post-test).

The experiment would be carried out according to the pattern with the primary measurement and a control group, which is one of the simple basic real experimental patterns (beside: the pattern with a control group without the primary measurement, a single group pattern with the final measurement, the pattern with the primary and final measurement, implemented in different groups, and Solomon pattern [Łobocki 2011, p. 117]. In the test group – unlike the control group – there would be no pre-test. It would be specified whether the difference between the results of the post-test in the test group and pre-test in the con-

trol group is statistically significant. The originality of the products would be assessed by the same commission of experts.

Outlays on experimental study should be connected with the creation of experimental conditions ('being cut off from the Internet', group isolation), verification of the equivalence of the groups, preparation of a task in the field of public relations for the groups, and then the assessments of their implementation, as well as a comparison of both group results (between the final measurements, as well as the final measurement of the test group and the pre-test for the control group) in order to determine whether there is a statistically significant difference between them. The experiment results could involve the implementation of the way teams for public relations work, which would lead to a higher originality of their work. This is important as it would imply economy/profitability of the research.

When it comes to the ethical side of the above tests, it is possible to take into account possible negative feelings of individuals accustomed to the use of the Internet and – as in the cases described above – the eventuality of their lower self-esteem and a breach of confidentiality.

### **3. Research findings and discussion**

The three experimental projects presented above, in contrast to the one shown below, would require non-student sampling. Nowadays, a certain number of students are simultaneously employees. In addition, they represent generation Z, claimed to use the Internet in an extensive manner, which may imply the type of attitudes which are investigated in the study, such as resignation from creativity in return for imitative activities, which requires less effort. The experiment was to specify the chances to influence these attitudes as ones affecting human behaviour. And therefore the selection of the experiment to conduct was partly determined by the significance of the study (treatment of creativity as the most important characteristic of human capital shaped during the educational process), and partly – by the opportunity to use easily accessible samples. In relation to the last point it could be added that: "It would be nice to be able to demonstrate external accuracy [...], yet what is much more important is internal accuracy [...], which you can increase by means of 2<sup>nd</sup> degree randomising of easily accessible samples" [Wieczorkowska-Wierzbńska, Wierzbński, Król 2015, p. 180].

As for the methodology of the research, the experiment was carried out according to the pattern with the control group without the primary measure, which is one of the simple basic real experimental patterns. The assignment to the test and control groups was performed on a random basis. Members of both groups

were students and the study was conducted in November 2015 during a lecture in the subject of ‘Human Capital Management’, when the research group heard a lecture on creativity capital management, while the control group heard a lecture on another topic. The groups had no contact with each other. Then individuals from both groups were asked the following question: “How can you induce a behavior change of the ‘copy-paste’ type in school and at work to creative behavior?”. It was assumed after the reference books [Nowak 1995, p. 53] that attitudes have a cognitive, affective and behavioral component and the last one was made the subject of research. The difference [Rószkiewicz 2002, pp. 308-311] in the attitudes of individuals who listened to the lecture and those who did not was specified, that is, the difference: Bk-Kk. In order to test statistical significance, a test for independent measurements was applied: a U test for two means, using the test statistics for large samples ( $n > 30$ ) in the following form:

$$U = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

where:

$\bar{x}_1$  and  $\bar{x}_2$  – the arithmetic mean of a variable,

$S_1^2$  oraz  $S_2^2$  – variance of a variable,

$n_1$  oraz  $n_2$  – sample size.

The results of the analysis of the content of student work are presented in Tables 2-5.

**Table 2.** Kinds of individual determinants

Kinds of determinants	Test group – number of responses	Control group – number of responses
Domain	2	1
Intelligence	4	3
Intrinsic motivation	5	0
Educational environment	6	0

Note: Students may have listed more determinants. The difference is statistically significant: the test result exceeds the critical value  $13 > 1.9$  (the average number of responses in the test group differs significantly from the average number of responses in the control group).

**Table 3.** Kinds of determinants related to work management

Kinds of determinants	Test group – number of responses	Control group – number of responses
Incentive system triggering the creativity of employees	21	18
Training taking into account creative behavior	10	6
Using in practice methods of creative problem solving (e.g. brainstorming)	8	3
Engaging creative managers	5	5
Caring for shaping spatial working conditions conducive to creativity,	5	3
A wide range of freedom for staff (autonomy)	5	5
Change in the mindset of the employees	2	0
Selection of employees for their creativity	2	0
Organizational culture conducive to creativity	1	0
Organizational culture supportive to creativity	1	0

Note: Students may have listed more determinants. The difference is statistically significant: the test result exceeds the critical value  $1.987 > 1.9$  (the average number of responses in the test group differs significantly from the average number of responses in the control group).

**Table 4.** Kinds of determinants related to the shaping of human capital in school systems

Kinds of determinants	Test group – number of responses	Control group – number of responses
Training teachers in the methods directed at student creativity	2	1
Change of attitudes of the teaching staff (more tolerance for the plurality of views)	4	0
Recruitment of creative teachers/lecturers	6	1
Teaching methods directed at student creativity	36	31
Rewarding system during classes (rewarding creative behavior)	20	10
Change of assessment systems at particular stages of education	6	8
Using an anti-plagiarism program	5	6
Training for students on using information resources	2	0
Organizational culture supportive to student creativity	1	0

Note: Students may have listed more determinants. The difference is statistically insignificant: the test result does not exceed the critical value  $1.479 < 1.9$  (the average number of responses in the test group does not differ significantly from the average number of responses in the control group).

**Table 5.** Kinds of determinants related to the environment of the organization

Kinds of determinants	Test group – number of responses	Control group – number of responses
Cultural conditions of the country	5	1
Changes in law protecting artists (legal and penal, copyright)	3	4
Changes in the Internet access, including social media (e.g. method of blocking copying from internet websites; charges for copying)	3	2
Social campaigns (e.g. popularizing copyright)	1	3

Note: Students may have listed more determinants. The difference is statistically significant: the test result exceeds the critical value  $2.13 > 1.9$  (the average number of responses in the test group differs significantly from the average number of responses in the control group).

The following general comments can be made about the experiment:

- There are visible differences in the content of the responses. The test group applies the concepts heard in the course of the lecture (e.g., intrinsic motivation, domain, stimulators and inhibitors of creativity, brainstorming, creativity culture, creative economy). In the control group the concept of intrinsic motivation was not cited, and the techniques of creative thinking were listed only by three students.
- Differences also appear in the length of the record. In the test group works are extensive, full of content (a lot of cited categories), while in the control group, they are short, with verbless clauses (fewer ideas).
- Only the test group identified intrinsic motivation and educational environment as kinds of individual determinants.
- In both groups incentive and training systems were considered the most important. Among the determinants related to work management, the use of methods of solving problems in a creative way (brainstorming) was listed third in the test group.
- In terms of categories of determinants relating to the formation of human capital in the school systems, in both groups attention is drawn to the teaching methods, yet the test group mentioned the rewarding system at school twice as often as the control group. The test group also notices an important role of engaging creative teachers/lecturers in changing the behavior of the ‘copy-paste’ type.
- In terms of determinants in the organization environment – in the test group the majority of responses referred to the cultural determinants of a given country, while in the control group – to legal conditions.

The performed experiment involved outlays in the form of conducting the content analysis of the students' work and their presentation (preceded by categorization of responses), as well as determining whether the difference between the final measurement in the test and control groups is statistically significant (this occurred in the case of individual determinants, those related to work management, as well as to the organization environment). The outlays also include the preparation of the question the students in both groups were asked as well as drawing up and implementation of the conditions in which the experiment was conducted, which was preceded by acquiring knowledge of experimenting patterns. The experiment results are: the application of didactic and economic knowledge about the limits of creativity. The knowledge of what limits are perceived by the students influences the ethical judgement of the experiment.

The judgement is also connected with devoting part of the classes to obtaining opinions from students and the possibility of specific impact (a rather positive change) on the subjects. In the case of information flow between the groups after the experiment, there may be a feeling of injustice. Students may also fear negative assessments by the researchers, who are at the same time, their academic teachers.

The experimental study confirmed that it is feasible to use lectures not only to broaden the knowledge about creativity, but also shape the attitude towards behavior of 'copy and paste' nature. Lack of access to similar studies prevents the comparison of findings attained by other researchers. The repetition of the experiment, however, is possible, yet with different groups, which may be perceived as imposing a kind of constraint on the study.

## **Conclusions**

The given examples have confirmed the possibility of designing experiments relating to the management of creativity, according to the three patterns listed at the outset. For four experiments (one executed and three designed) the types of outlays and effects have been identified, noting that they are determined by the type of the experimentation pattern and detailed research issues. It was estimated that the ratio of the results to outlays – mainly due to the significance of the results – indicates the economy / profitability of the experiments, although the evaluation of the economy is not easy, and it would be difficult to express its result quantitatively. The ethical boundaries of these experiments were also indicated and it was proved that they are partly similar (e.g. fears before the disclosure of the experiment results, the impact on the subjects).

The above examples refer both to the creative process (with and without the use of the Internet; with the change in the principles of creative workers assessment; with the introduction of or resignation from inventive training), people's attitudes (influencing them by the transmission of specific content), as well as the results of creativity (ideational fluency, flexibility, originality) and thus to different aspects of creativity management. This proves the universality of the experiment applications to its objectives.

The application of the experiment enhances the appropriateness of personel-focused activities orientated on improving the creativity of individuals and teams. The examples given above do not exhaust the list of all the possible experiments on the topic. Due to the existent demographic conditions, it would be worthwhile to conduct it with reference to various generation cohorts.

## References

- Aakar D.A., Day G.S. (1990): *Marketing Research*. John Wiley and Sons, Toronto.
- Amabile T.M. (1982): *Social Psychology of Creativity: A Consensual Assessment Technique*. "Journal of Personality and Social Psychology", Vol. 43, No. 5, pp. 997-1013.
- Amabile T.M. (1983): *The Social Psychology of Creativity*. Springer Verlag, New York.
- Amabile T.M. (1996): *Creativity in Context: Update to the Social Psychology of Creativity*. Westview Press, Boulder.
- Basadur M.S. (1992): *Managing Creativity: A Japanese Model*. "Academy of Management Executive", No. 6, pp. 29-42.
- Cook T., Campbell D.T. (1979): *Quasi-Experimentation: Design and Analysis Issues for Field Setting*. Rand McNally College Publishing, Skokie, IL.
- Creswell J.W. (1994): *Research Design: Qualitative and Quantitative Approaches*. Sage, Thousand Oaks.
- Croson R. (2005): *The Method of Experimental Economics*. "International Negotiation" 2005, Vol. 10, No. 1, pp. 131-148.
- Crozier W.R., Chapman A. (1981): *Aesthetic Preferences: Prestige and Social Class*. In: D. O'Hare (ed.). *Psychology and the Arts*. Humanities Press, New Jersey.
- Davies M.B. (2007): *Doing a Successful Research Project. Using Qualitative or Quantitative Methods*. Palgrave, Macmillan, Basingstoke.
- Davies H., Scase R. (2000): *Managing Creativity*. Open University Press, Milton Keynes.
- Duncker K. (1945): *Zur Psychologie des produktiven Denkens*. Springer, Berlin.
- Farnsworth P.R., Beaumont H. (1929): *Suggestion in Pictures*. "Journal of General Psychology", Vol. 2, pp. 362-366.

- 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*. Erlbaum, Hillsdale, Vol. 5, pp. 157-188.
- Guilford J.P. (1978): *Natura inteligencji człowieka*. PWN, Warszawa.
- Harrison G., List J. (2004): *Field Experiments*. "Journal of Economic Literature", No. 42(4), pp. 1009-1055.
- Hernandez E.M., Redien-Collot R. (2013): *Méthodes de créativité et amélioration des projets entrepreneuriaux: présentation d'une expérimentation dans un contexte académique*. "Revue Gestion 2000", Vol. 30, No. 5, pp. 93-114.
- Howkins J. (2001): *The Creative Economy. How People Make Money from Ideas*. The Penguin Press, London.
- Isen A. (1990): *On the Relationship between Affect and Creative Problem Solving*. In: S. Russ (ed.). *Affect, Creative Experience and Psychological Adjustment*. Taylor & Francis, Philadelphia, pp. 3-17.
- Jansson D.G., Smith S.M. (1991): *Design Fixation*. "Design Studies", No. 12, pp. 3-11.
- Karwowski M., Gralewski J. (2012): *Threshold Hypothesis: Fact or Artifact?* <http://dx.doi.org/10.1016/j.tsc.2012.05.003> (access: 12.11.2015).
- Kubicka D. (2005): *Strategie i techniki badania twórczości*. In: A. Tokarz (ed.). *W poszukiwaniu zastosowań psychologii twórczości*. Wydawnictwo Uniwersytetu Jagiellońskiego, Kraków, pp. 125-153.
- Köhler W. (1917): *Intelligenzprüfungen an Menschenaffen*. Springer, Berlin.
- Łobocki M. (2011): *Metody i techniki badań pedagogicznych*. Impuls, Kraków.
- Magyary-Beck I. (1999): *Creatology*. In: M.A. Runco, S.R. Pritzker (eds.). *Encyclopedia of Creativity*. Academic Press, San Diego.
- Nęcka E., Sowa J. (2005): *Człowiek – umysł – maszyna. Rozmowy o twórczości i inteligencji*. Znak, Kraków.
- Nowak L. (1995): *Pozaekonomiczne determinanty zachowań nabywców*. Wydawnictwo Akademii Ekonomicznej, Poznań.
- Olton R.M., Johnson D.M. (1976): *Mechanism of Incubation: Searching for the Elusive*. "Journal of Creative Behavior", No. 13, pp. 9-22.
- Parjanen S. (2012): *Experiencing Creativity in the Organization: From Individual Creativity to Collective Creativity*. "Interdisciplinary Journal of Information, Knowledge and Management", No. 7, pp. 109-128.
- Patrick (1937): *Creative Thought in Artists*. "The Journal of Psychology", No. 4, pp. 35-73.
- Ross S.M., Morrison G.R. (2007): *Experimental Research Methods*. In: D.H. Jonassen (ed.). *Handbook of Research for Educational Communications and Technology*. AECT, Bloomington.
- Rószkiewicz M. (2002): *Metody ilościowe w badaniach marketingowych*. Wydawnictwo Naukowe PWN, Warszawa.

- Samul J. (2015): *Przegląd metod badawczych zarządzania zasobami ludzkimi w literaturze zagranicznej*, referat, sesja 1 „Badania w obszarze ZZL – rodzaje metod, ich etyka, skuteczność i wartość poznawcza”, VIII Zjazd Katedr ZZL „Zarządzanie Ludźmi w Sektorze Publicznym i Non Profit”, Uniwersytet Ekonomiczny w Poznaniu, Poznań, 21-22 września.
- Smith S.M., Shah J.J. (2006): *Empirical Studies of Creative Cognition in Idea Generation*. In: L. Thompson, H.S. Choi (eds.). *Creativity and Innovations in Organizational Teams*. Lawrence Erlbaum Associates Publishers, London – Mahwah – New Jersey, pp. 3-4.
- Sokół A. (2015): *Zarządzanie twórczością w organizacji. Koncepcja, metody i narzędzia*. CeDeWu, Warszawa.
- Wallas G. (1926): *The Art of Thought*. Harcourt, New York.
- Ward T. (1995): *What's Old about New Ideas?* In: S.M. Smith, T.B. Ward, R.A. Finke (eds.). *The Creative Cognition Approach*. MIT Press, Cambridge, MA, pp. 157-178.
- Weisberg R.W. (2006): *Creativity. Understanding Innovation in Problem Solving, Science, Invention, and the Arts*. John Wiley & Sons, New Jersey.
- Wieczorkowska-Wierzbińska G., Wierzbiński J., Król G. (2015): *Metody ilościowe*. In: M. Kostera (ed.). *Metody badawcze w zarządzaniu humanistycznym*. Wydawnictwo Akademickie Sedno, Warszawa.

## **Acknowledgement**

Statistical calculations were made by Justyna Dudek, MEng (see Tables 2-5).