

METHODOLOGY FOR RESEARCHING THE FACTOR IMPACT OF ANXIETY ON THE CREATIVITY AND INNOVATION OF INDIVIDUALS IN A WORKING BUSINESS ENVIRONMENT

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Abstract: *The search for arguments for the positive impact of individual anxiety on their creativity and innovation can give managers an important tool to increase the efficiency and effectiveness of their employees and engineering staff.*

There is a great interest among the representatives of the top management to prove empirically the statement that the controlled anxiety of the human resources can become a catalyst for solving problems in the work environment, creating new ideas and increasing the productivity of the work done by deploying the creative potential of employees in creating new products and services in business organizations. Significant attention has been paid to psychological, organizational and educational research on the interaction between the categories of anxiety and creativity.

The aim of the report is to present for the first time a methodology for establishing the relationships between anxiety, creativity and innovation in three aspects: at the organizational, team and personal professional level. So far, separate behavioral or biometric pairs of indicators have been studied.

The subject of the study is the behavior of human resources at different levels of anxiety and the degree of creative productivity of teams in business organizations in terms of their creativity and innovation. The object of the research is the development of a methodology for monitoring the results of employees in a real business environment in relation to the three categories described.

This will make it possible to establish control over the effective and efficient management of the innovation process in business organizations.

Keywords: *anxious, creative, innovative, human resources, innovation process management*

JEL Codes: *M12, M14, J24, J53, O35*

Introduction

Human capital is the main factor for the successful innovative policy of organizations. More and more often specialists with high qualifications and remarkably creative approach to work are being selected for personnel departments. This poses a number of challenges to management, requiring changes in the ways, methods and tools for managing human resources in an organization. The role of the manager and his/her management decisions, including human resources management labour, are

important for the success of enterprises in the industrial sector and organisations, providing production services. The dynamics and rapidly changing processes in our society present business organizations and management teams with a number of challenges. Fast and adequate measures, generating sufficiently original and good solutions for the future development of an organisation are crucial for its prosperity. For this purpose, it is extremely important for managers to possess a number of qualities, among which the power to control and manage the stress factors

from the external environment and at the work place and the pursuit of more creativity, which will help to solve the problems through non-standard methods in order to stand out from the status quo. Anxiety in an organisational environment is a common problem and is perceived as an unfavourable phenomenon, since for a large part of society it is just and only a feeling of uncertainty and dissatisfaction. In this regard, devising research methodology for the impact of anxiety on individuals and human resources groups, as well as identifying changes in their creativity and innovation by introducing controlled anxiety as a way of dealing with stress, can provide managers with an important tool for increasing the efficiency of the work of their employees, in the context of the two factors defined.

EXPOSITION

1. Arguments for the existence of a link between controlled anxiety as a way of dealing with stress, on one hand, and creativity and innovation as factors for improving the human resources in an organisational environment, on the other

According to Csikszentmihalyi, "creativity is a central source of meaning in our lives." As one of the first researchers in positive psychology, he has dedicated his life to studying experiences, which make people really happy. In his research he has found that when we are doing creative activities, we feel we are living a fuller life than in the remaining part of our existence (Yanakiev, 2016). One of the theses of the Nobel Prize laureate Nils Bohr was that if you keep the opposites together, your thought does not accelerate but stops altogether, and the mind begins to work on a new level. Pausing the thought process allows the intellect behind them to create new forms (Vasileva, 2017).

Conducted research contributes to the claim that there exists a relationship between creativity and science, and therefore, creativity requires a thought process, directed towards a specific content, some essential questions (Vasileva, 2017). Creativity suggests creating something new (Stamatov, 2015), while intelligence is the ability to acquire knowledge and use it to generate

new ideas and products. The process of creativity is part of the human intellect. Therefore, the two aspects of human intellect are closely related. Creative intelligence is the process, in which new ideas are generated to help with the solution of problems through non-standard methods in the organisation or in private life, in order to stand out from the crowd. At the same time, implementing the creative ideas in practice in the form of products or applications is considered innovation. Creative thinking helps the business organization obtain more products, which will defeat the competition and make the company dominant in the market, creative and innovative (Issa, 2010).

Stereotypes, entrenched bad habits, convergent thinking, fear of being different, neophobia and social conformism can be identified as the largest limitations for creativity. Due to this fact, the allegation has been made that creative personalities are a counterweight of the status quo (Vasileva, 2017). A number of publications of prof. Mihalyi Csikszentmihalyi and his followers in the field of psychology show that the process of discovery has emerged as one of the most attractive activities, engaging people's attention and efforts. The professor's observations contribute to the understanding that creative personalities differ from the others in that they like the activities they are engaged in, whether or not the result of their efforts will bring them fame and money (Yanakiev, 2016). According to J. Petrova (2015), creativity is the emanation of personal development and an expression of cultivated positive energy. It is not characterized by the element of "unification", as it specifies the individual features of the subjects, as well as contributes to overcoming the doubts about one's own qualities and leads to self-respect and self-improvement (Petrova, 2015).

In his research works, I. Bozhkov justifies the conclusions he has reached with the generalizations of Arthur Kropliy, distinguishing several main fields, in which research on creativity and the concept of creativity, respectively, has been conducted. These are, namely, the relations creativity - intelligence; creativity - madness; creativity - problem

solving; creativity – creative personalities; creativity as a social phenomenon and the necessity of social validation (Bozhkov, 2016).

Our contemporary world faces a number of global challenges of financial, social and environmental nature, which provokes the topic of professional stress and its consequences to become extremely relevant worldwide and to be increasingly put on the agenda of human resource management.

Researchers Rashid and Archer characterise stress as “the impact or tension that a particular situation, event or relationship has on a person, specific situation or events and relationships”. (Rashid & Archer, 1983). From the point of view of business organizations, stressful situations for the manager can be expressed in failure in planned sales, deterioration of relations between individuals and groups of human resources, as well as misunderstandings between workers - manager, or difficulties in overcoming problematic situations of various kinds. The problems that managers may encounter are different and innumerable, and in the specialized literature they are called “stressors”. Many researchers have been trying to prove that these influences can be both positive and negative. According to Selye, stress is inevitable in our daily routine or in the organisation’s activities, and it is not always negative – it can also have a “mobilising effect” (Selye, 1982), but only if it is within the limits tolerated by the individual, add (Ruskova and Ruseva, 2019), i. e. stress and its manifestations represent the energy that makes people take the necessary actions to fulfil their goals and. From the point of view of management, when the manager has a sense of control over the situation, the stress may be a motivating rather than threatening factor and it can become a stimulator for making creative decisions, which would be exceptionally successful for the organisations from the industrial and tertiary economic sectors.

A number of psychologists and researchers define stress as a synonym of anxiety. For the purpose of research, it is important to clarify that we distinguish between the two concepts and do not consider them the same. We accept and

share Rolo May’s claims that anxiety is the way stress is perceived and interpreted. Stress is “the intermediate station on the way to anxiety”, therefore, anxiety is the way we cope with stress. The stress factors from the environment reflect largely on the activities and productivity of the organisation through the projection of “anxiety” (Tsvetanova, 2010). The research interest in this phenomenon is related to the American psychologist Rolo May. According to him, “anxiety” can be used as a stimulus for enhancing our own awareness, vigilance and desire for life (May, 2018). May claims that normal anxiety can be seen as the body’s ability to respond to various threats. (May, 2018). Whereas E. Born (2021) anxiety is perceived as a natural reaction to an alleged or real threat. K. Ganey defines anxiety as adaptive (normal). In his view, in its non-pathological versions, the manifestation of anxiety can perform an important adaptive function for individuals. Adaptive, or normal anxiety is characterised by several features: (1) one tolerates it relatively easily; (2) it does not have a serious presence in one’s daily life; (3) its intensity can be controlled; (4) there are few bodily signs of anxiety. (Ganey, 2006). Significant attention has been paid to psychological, organizational and educational research on the interaction between the categories of anxiety and creativity. Among the researchers of the relationship between stress (including anxiety) and creativity are Byron, K., Nazarian and D., Khazanchi (2010). They conduct meta analysis of 76 experimental studies (including 82 independent samples). Its purpose is to clarify this relationship and to identify the factors, which can explain the differences (Byron, Nazarian, Khazanchi, 2010).

The representatives of the top management are really interested in proving empirically the claim that the controlled anxiety when managing human resources can become a catalyst for solving problems in the work environment. In this respect, creating methods for studying the influence of anxiety on the individuals and groups of human resources and identifying the changes in their creativity and innovativeness with the introduction of controlled anxiety as a way of dealing with stress can provide the managers with a key tool for enhancing

the the efficiency of the work of their employees in the organization, in the context of the two factors defined .

2. Methods for studying the influence of anxiety on the individuals and groups of human resources and identifying the changes in their creativity and innovativeness with the introduction of controlled anxiety as a way of dealing with stress.

In the scientific literature, considerable attention is paid to psychological, organizational and educational research on the interaction between the categories of anxiety and creativity. The search for arguments and evidence of the impact on the productivity and efficiency of human resources, groups and individuals through the inclusion of controlled anxiety as a tool to deal with stress at work in the industrial enterprises and organizations in the field of industrial services operating in industrial and tertiary economic sectors is an unexplored problem. For the first time, an attempt is made to analyze the relationship between the parameters of controlled anxiety as a way to deal with stress in the workplace, on one hand, and the creativity and innovation of individuals and groups, on the other, in order to provide a tool for the top management of the industrial enterprise and / or organization in the field of production services for managing social innovation with importance for increasing the productivity and efficiency of human resources.

2.1. Restrictive conditions of the study

- The studied set of focus groups and individuals is located on the territory of Bulgaria;
- Of the tertiary economic sector, we consider only the industries - education, science, and communications.
- The participants belong to the following groups: students participating in the acquisition of specialized training in the second stage of high school and obtaining high quality knowledge and skills in the field of information technology, STEM and entrepreneurship; students in business and technical specialties at the bachelor's

level; PhD students in higher education in social, economic and legal sciences; technical and ICT professional fields; full-time teachers in technical and non-technical faculties of universities and various professional fields of higher education; information and telecommunication production services and creative industries (television).

- The representatives of the industrial economic sector are assemblers from the automotive industry;
- The social experiment is conducted in a limited temporal plan - the last day of the working week for the given focus group and within 3 hours - 1st phase 45 minutes and 2nd phase - shortening the work process of filling out the questionnaires by ½ from the initial time as a stress factor;
- The focus group consists of 15 participants - at the upper limit of the recommended sizes;
- The anonymity of the participants and their organizations is preserved; the respondents participate with a number written on the bracelet of the watch with the biometric indicators;
- The surveyed organizations are typical representatives of the field in which they operate and have had a long-term presence in it;
- The business representatives have a staff of 50 to 249 and over 250 people, which according to this criterion classifies them as medium and large enterprises;
- There are no representatives of trade and commercial organisations;
- The interest of the managers of the organizations voluntarily participating in the experiment to provide expert assessments after processing the statistical results and the description of the hypotheses was stated;
- When conducting a social experiment, we limit ourselves to examining "controlled anxiety" only in the workplace;
- In the current development, "controlled anxiety" will be perceived as a way to deal with stress / the magnitude of a stressor.

2.2. Methodological framework of the research

The interaction and correlations between the factors anxiety, creativity and innovation are analyzed at the organizational, team and personal professional level. The research is implemented in two stages – pilot and real. After the pilot study the final version of a four-step questionnaire, based on the Mensa tests, has been formulated

The survey, which is based on the tests for: anxiety, creativity, intelligence and creative intelligence of Mensa, developed by the team of Prof. Robert Alan, is a social

experiment to establish the basic level of innovation and creativity in a normal work environment and subsequent repetition of the test in a stressor environment.

In parallel with the main study, a study of biometric parameters is conducted in the experimental part is. It is carried out using fifteen Huawei Band 6 bracelets (Fig. 1), which have a rich set of sensors, including these for measuring blood pressure, heart rate, position in space, etc.



Fig. 1. Huawei Band 6 smart bracelets in their two main color variants - Sakura Pink (left) and Graphite Black (right)

For the implementation of each of the experimental studies an algorithm has

been developed and followed, which consists of six individual phases (Fig. 2)

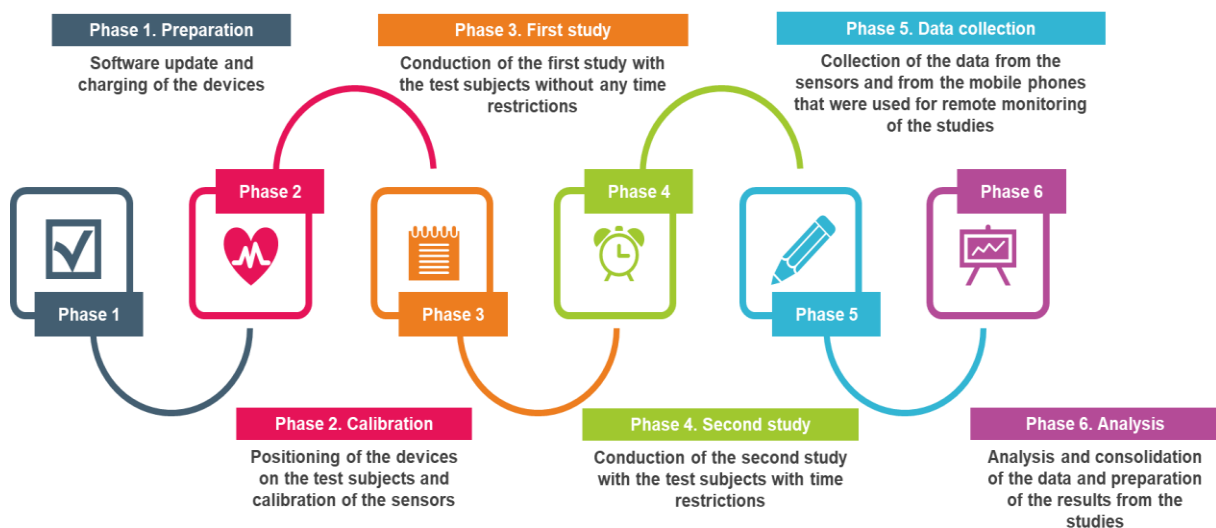


Fig. 2. Algorithm for conducting a biometric study

The social experiment is conducted in a limited temporal plan - the last day of the working week for the given focus group and within 3 hours in two stages: first stage - 45 minutes for filling in the survey and second stage - cutting the work process of filling in the surveys by 1/2 of the initial time as a stressor. The survey is conducted in two different work situations - in a normal working environment (situation A) and in an environment with a stressor (situation B). The initial completion of the questionnaires is set for 45 minutes, and during the second stage, the test is retaken, but this time with a time constraint. This constraint equals half the time for conducting the initial survey. In this way, participants are put in a stressor environment and the behaviour of human resources at various levels of anxiety, as well as the degree of creative productivity of the teams and individuals in the business organisations in terms of their creativity and innovativeness are studied. Before the participants start filling in the questionnaire, the devices need to be calibrated. After the successful placement and calibration of the device for each participant, we can move on to the next two phases, which represent the essence of the experimental study. In Phase 3 of the biometric survey, all participants are given the opportunity to complete the questionnaires in a normal work environment. For each of the subjects, the time indices for starting and passing the test are recorded. During the completion of the test, three manual measurements of the stress level are performed, as well as regular automatic measurements, which the device performs autonomously at a time interval of 30 minutes. After the completion of the initial examination, the test subjects are

required to retake the test, but already with a time limit, ie. in a stressful environment.

2.3. Purpose and subject of the research

The purpose of the experimental research is to study the influence of anxiety on the individuals and groups of human resources and to identify their creativity and innovativeness when controlled anxiety has been introduced as a way of dealing with stress.

The subject of the research is the behaviour of human resources at different levels of anxiety and the degree of creative productivity of the teams and individuals in the business organisations in terms of their creativity and innovativeness. Fig. 3 presents a conceptual framework of the social experiment.

2.4. Determining the general population and the sample size

The experimental study included seven focus groups, each of which consisted of 15 respondents who had voluntarily agreed to participate in the study. The data that will be entered and analyzed are for a total of 105 respondents.

Representatives of organizations from the secondary (automotive) and tertiary economic sectors (including education, science, and communications) in their work environment take part in the experiment.: High school students (U); University students (S); PhD students (D); Academic staff (AS); Creative industries group (CI); Robotic Systems group (RS); Mashine-building group (M).

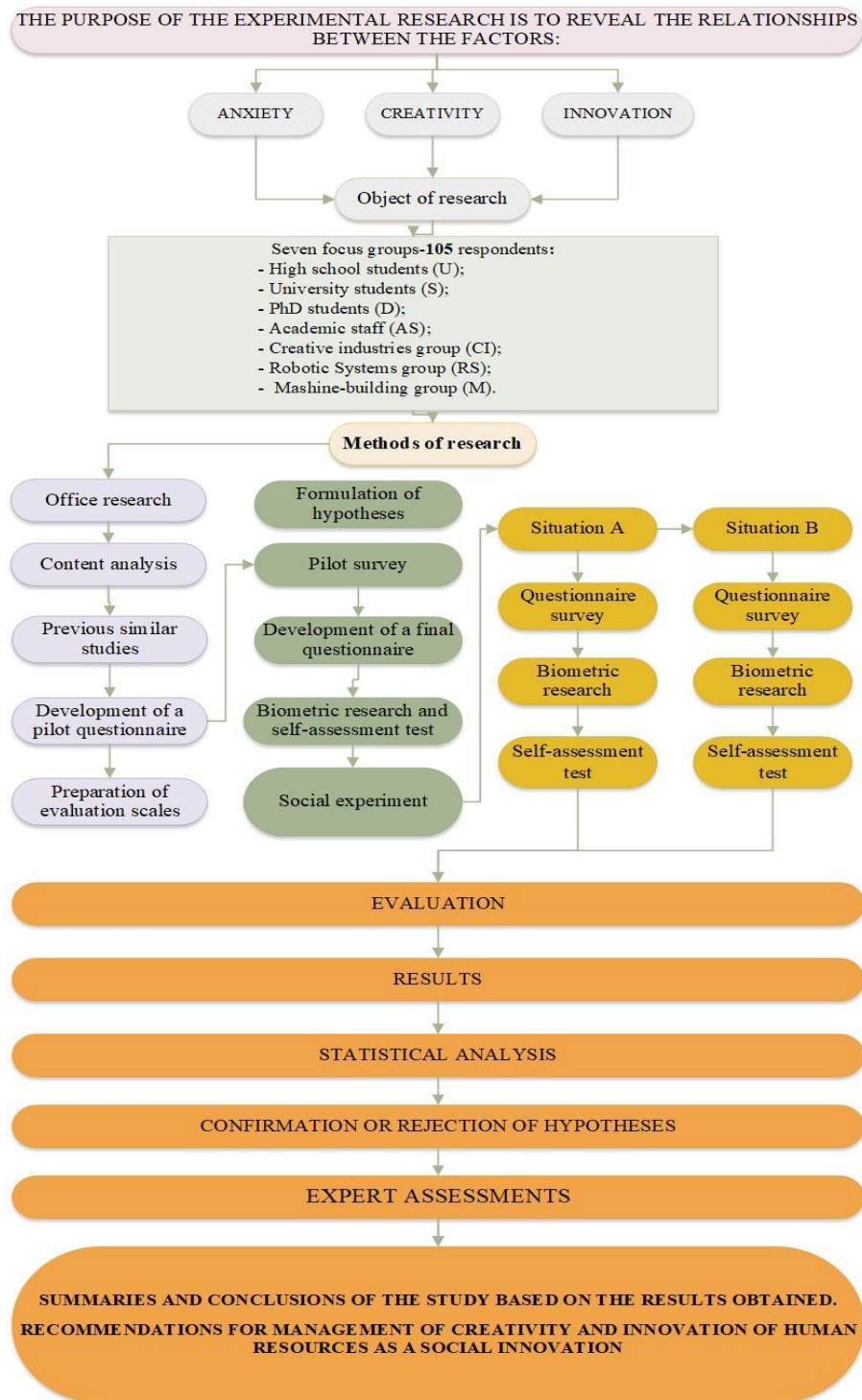


Fig. 3 A conceptual framework of the social experiment

2.5. Methods of research used

A combination of qualitative and quantitative research methods has been applied during the implementation.

Qualitative research methods

- **Office research:** analysis of scientific applied literature and of previous studies in the field.

- **A survey** through which the participants report their states on the respective scales. The questionnaire consists of four tests: for anxiety, creativity and intelligence of Mensa, developed by prof. Tobert Allen’s team (Allen, R., E. Fulton, H. Gale, K. Scat, 2017). Parallel to the main survey through tests a biometric test is implemented with the help of 15 Smart bracelets (Huawei Band 6) supporting the

application *Health* for measuring the factors *Stress* and *Pulse* according to the source technology certified by the Institute of Psychology at the Chinese Academy of Sciences.

The anxiety test includes 25 closed questions, aiming to show the level of anxiety of the participant at that moment, according to his/her self-evaluation. The maximum number of points to be achieved on the test is 75. It contains questions, asking how we manage to control stressful situations in our daily lives, whether at work or in the family – for example:

- „You are facing numerous problems at work. What would you do?“;
- „You are on your way to a business meeting but you get stuck in traffic. What would you do?“;

The creativity test includes 10 questions. As with the anxiety test, participants have the right to mark one of three possible answers, the one that best suits their nature, and to determine what their creative ability is. The maximum total on the evaluation scale is 20 points. The high results show significant levels of creative and original thinking, inherent in talented people. These qualities imply an increased ability to make creative decisions, which would be extremely successful for the future development of the organisation, with the management of social innovations. The test contains questions of the type:

- „ During any daily routine - whether preparing a dish, following a recipe or making an object, how does the lack of one of the materials affect you?“
- „ An idea comes to mind that makes you wonder how it is possible that no one has ever thought about it. What would you do?“

The intelligence test comprises 30 mathematical and logical questions. The questions included allow the participants to discover which their strengths and weaknesses are, whether they have better numerical than linguistic skills, or that their ability to work with shapes (visual-spatial intelligence) is their strongest trait.

The test on creative intelligence is one open question – a bucket test. In this experiment all good, useful and original answers are evaluated. The usefulness of the answers given can tell us whether the participant's unique thought processes are the result of rational or irrational thinking. The maximum number of points on the evaluation scale is 50. It determines whether the tested individual possesses high, good, fair or low creative intelligence.

- **The neuroeconomic test – practical testing and distributed practice** – biometric study of the parameters *Stress* and *Pulse*, using 15 Smart bracelets (Huawei Band 6) supporting the application *Health* for measuring the factors *Stress* and *Pulse* according to the source technology certified by the Institute of Psychology at the Chinese Academy of Sciences.

- **Social experiment** – conducted with 7 focus groups of representatives of industry and service organisations.

- **Expert evaluation method:** as an additional condition for final confirmation or rejection of the formulated hypotheses and sub-hypotheses after processing of the statistical results the method of expert assessments is used.

Quantitative research method

- The method involves the implementation of Statistical Program for the Social Sciences SPSS¹ for statistical analysis and reliable processing of the data collected. The data from the pilot and the real research are entered by the PhD student, conducting the research and are analysed with the help of an application for statistical analysis of data SPSS v19. The following analyses are applied: variation analysis; graphic analysis; comparative analysis; correlation analysis and regression analysis.

The approbation of the methods through conducting a scientific experiment in the form of social innovation could provide managers with a key tool for enhancing the productivity and efficiency of human resources labour, groups and individuals at their workplace in specific enterprises from the industrial and the tertiary

¹SPSS, Version 19, лицензирана версия на РУ „Ангел Кънчев“.

economic sectors in the context of the two factors defined. The scientific hypotheses of the research are based on the interrelation between these factors, and we formulate eight main research claims, which have seven sub-hypotheses each, for the seven target groups studied.

Hypothesis H1: Controlled anxiety as a way to deal with stress affects the creativity of human resources in the organizations studied, measured by biometrics in a normal work environment.

Hypothesis H2: Controlled anxiety as a way to deal with stress affects the creativity of human resources in the organizations studied, established through self-esteem in a normal work environment.

Hypothesis H3: Controlled anxiety as a way to deal with stress affects the creativity of human resources in the organizations studied, measured by biometrics in a stressor environment.

Hypothesis H4: Controlled anxiety as a way to deal with stress affects the creativity of human resources in the organizations studied, measured by self-evaluation in a stressor environment.

Hypothesis H5: Controlled anxiety as a way to deal with stress affects the innovation of human resources in the organizations studied, measured by biometrics in a normal work environment.

Hypothesis H6: Controlled anxiety as a way to deal with stress affects the innovation of human resources in the organizations studied, measured by self-evaluation in a normal work environment.

Hypothesis H7: Controlled anxiety as a way to deal with stress affects the innovation of human resources in the organizations studied, measured by biometrics in a stressor environment.

Hypothesis H8: Controlled anxiety as a way to deal with stress affects the innovation of human resources in the organizations studied, measured by self-evaluation in a stressor environment.

CONCLUSIONS

The information presented in the exposition of this study gives grounds to

draw the following main summaries and conclusions:

The development and implementation of a comprehensive three-part self-assessment checklist and a parallel biometric study to objectively assess controlled anxiety and its impact on enhancing managerial creativity and organizational innovation will enrich our understanding of whether this factor influences creativity and organizational innovation and whether it can expand the areas of its practical applicability in the development of industrial business organizations;

The analysis of the correlations between the independent variable *controlled anxiety* as a way to deal with stress in the workplace, on one hand, and the dependent variables *creativity and innovation* of individuals and groups, on the other, allows the development of a methodology to detect movement at the levels of the dependent variables studied in a positive / negative direction and hence, the determination of the productivity and efficiency of the employees in a given organization from the production sphere or that of the services.

By using the methodology, stressors can be applied to increase the productivity of staff, especially in the field of creative industries and services. Implementing the methodology of controlled anxiety by the top management of the organizations studied leads to successful management of social innovation with importance for increasing the productivity and efficiency of human resources in terms of their creativity and innovation.

The implementation of a social experiment with 105 respondents in 7 focus groups tested in a normal work environment and in a stressful environment is a way to test a variety of hypotheses and evaluate options with different extended sets of roles, through which they legitimize the beneficiaries of innovative projects to function not only as users of project support for industrial growth and innovation, but also as project actors and resources to increase organizational innovation and competitiveness.

The scientific hypotheses of the research are based on the interrelation between the

studied factors: controlled anxiety, creativity and innovation. Affirming or rejecting the impact of controlled anxiety as a way to deal with stress on the creativity and innovativeness of human resources in the work environment, will increase the subjective readiness of the managers of the industrial organizations for multifaceted cooperation with the specialists in R&D projects and will predetermine their higher individual motivation and that of the project team members for active participation, and hence for better results.

The social experiment will provide arguments in favor of the preliminary research expectation that determining the fruitful cooperation between managers, members of their research teams and other specialists involved in project activities is the subjective readiness of each party for multilevel cooperation in the context of development and implementation activity of business organizations, considered in the perspective of training and retraining of human resources.

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