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## Knowledge and Experience in Creativity Techniques in Companies Metallurgic: A Diagnosis

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### **Abstract**

*When emphasizing the division of activities longing to reach the desired objectives of the organization, emerges the increasing necessity to adopt new forms of management directed to the continuous processes of improvement of products and services. Ahead of this reality, the people who compose the enterprise will be made responsible in the taking of decisions. For the enterprise to have a sustainable growth, it is necessary that the involved individuals search through experience and knowledge, techniques based in creative capacity. The present work searched to diagnosis the level of knowledge and the level of experience of each technique of creativity in metallurgic industries, in Ponta Grossa - Paraná. In this direction the research is justified, since, the boarded topics in this work will serve of base so that other industries can stimulate the creative potential of their collaborators, creating surrounding that stimulate creativity. The methodology of field research that was used in this work estimates the diagnosis of the level of knowledge of the managers, as well as the diagnosis of the experience in the use of creativity techniques. The results of this research has perfectly shown to be possible to diagnosis how much the interviewed managers do not know, know or know well; they do not use, they use occasionally or they use creativity techniques regularly.*

**Key-word:** Creativity, Knowledge, Experience

### **1. Introduction**

The great difficulty in the diagnosis of the level of experience and knowledge on part of managers in what they say in respect to the use of creativity techniques, allies to the way to manage the creative capacity of there teams, has taken many researchers to develop studies in this area of knowledge, in the direction to search for more efficient tools that translate to competitive advantage.

More demanding and competitive markets make organizations feel directed to modernization, leading to consideration influences of social order, cultural politics and, those that not to answer to these demands could be predestinate to failure.

The great challenge that an environment in constant change brings, demand that organizations need to rethink and to adapt its organizational cultures, looking to anticipate the changes, dedicating themselves to reach objectives and proposed goals, mainly stimulating the creativity of its team through techniques, never losing the focus of quality and productivity, however using it as an advantage the potential that can be explored inside and outside of the organization.

By this way, it becomes important that organizations inform and implant to its collaborators the importance of creativity, stimulating them through techniques such as: Brainstorming; Brainwriting; 7x7; Delphi; Discontinuity; External opinion; Metaphors; Estimated Inversion; Drawings; Conscientious intuition; Mental maps; "TRIZ" Creativity Technique; Listing of Attributes; PNI Technique: Positive and Negative Interesting; Technique: Other Points of view; Questioning of suppositions and Scamper, among others, making them think in creative way.

The collaborators must feel themselves motivated to develop free and creative ideas, generating in this way results for the company in products, processes and services.

Taking account that human resources are the asset of greater importance inside of industries, the prominence of this research will happen in diagnosing the level of knowledge and the level of experience of each technique of creativity in metallurgic industries, in Ponta Grossa - Paraná.

Ahead of this:

A creative team values the individual strong points, brings to surface what people have of better, and is opened to take risks. Creativity generates chance, which generates stimulations, generating new ideas, which transform to innovations, making it possible an increase of competitiveness as where new products and services are launched in the market in a smaller time frame then of the. (Basto, 2000, p. 03)

In this context, it becomes necessary that the works in teams become part of the planning, where the allied motivation to the internal disposal in learning to learn from group experiences triggers greater and spontaneous creativity.

As commented the develop research searches to make possible the diagnosis of the experience level and knowledge of creativity techniques, with managers in the internal environment of the selected Metallurgic Industries.

In this direction, the relevance of this work was justified in the contribution in making it evident for the companies, its platform of knowledge and experience involving creativity techniques.

The present work searched to diagnosis the level of knowledge and the level of experience of each technique of creativity in metallurgic industries, in Ponta Grossa - Paraná.

Developed on the basis of an applied and qualitative research and using the technical procedure of field research in a comparative study in 19 (nineteen) companies of the metallurgic sector, where there was a return of 11 (eleven) respondent companies. The collection of data became fulfilled through semi-structuralized interview with the responsible managers in of the companies, searching for answers to the following investigation: What is the level of knowledge and experience of the managers of industries of the corresponding metallurgic sector regarding the techniques of creativity for support to the decision taking?

## **2. Creativity**

The word creativity, at a first moment is the manifestation of the capacity of the people to create or to be expressed in potential way.

In this context, for Sakamoto (2000), creativity is the expression of human potential of accomplishment, that if manifest through human activities that generates products in the occurrence of its process.

Creativity for Alencar (1995) is related with the thought processes that are associate with imagination, invention, intuition, inspiration, illumination and originality. Creative people are those that assimilate in an efficient and way fast, the problems that need solution, comparing them to who can not.

The concept of creativity for Wechsler (1998) is made in an ample boarding, relating that diverse types of interaction become necessary where individuals and society complete each other. It still adds, that all must be considered the possible combinations between the following elements: 1) cognitive abilities - intelligence, knowledge, special abilities techniques and talents; 2) characteristic of personality - internal motivation, confidence, none conformism, creativity-trace; and 3) environmental elements - political-religious factors, cultural factors, economic factors, educational factors.

The harmonic combination of the variable above is what self-accomplishment will allow reaching, considering not only personal, professional and superior aspects of human development.

One perceives that the authors converge to the same idea, that creativity is directly related with the way people notices the world, receiving internal influences, of the environment and personality.

In the vision of Alencar (1995) creativity is emphasized as an adjusted tool to: a) find ways to make more with less; b) to reduce costs; c) to simplify processes and systems; d) to increase profitability; e) to find new uses for old products; f) to find new market segments; g) to differentiate a resume; and h) to develop new products.

In this context, to exert creativity, it becomes necessary to stimulate the creative thought of each person, since it is inherent to each one.

For Wheller (2002), creative thought is the mental activity that uses thought abilities to establish new and useful relations or creative solutions from information that people already knew. The author strengthens that all people are creative, but in different ways, once recognized the creative potential, the same could be applied for the development of new solutions to problems.

In this context, it is necessary that people are stimulated, and why not taught, to be creative in practice through the use of techniques of stimulation of creativity, moreover, there must not exist defensive goals, due to the fact that, it will discourage creativity and the enthusiasm to create something new. In this work 17 (seventeen) of these techniques have been approached.

## **2. Brainstorming**

Brainstorming for Rodrigues (2004) is a technique to assist a team to generate/to create ideas in the lesser space of possible time.

Bateman and Snell (1998, p.103) approach Brainstorming as being an environment of free verbalization of ideas ahead of a problem delimited by the managers: "When people to end the, a long list of alternatives will have been generated. Then the group will pass to the

period of evaluation. At this point, many different ideas can be considered, they can be modified or be combined in a size for a creative solution to the problem”.

## **2.2 Brainwriting**

It is the quiet version of the Brainstorming. When removing the verbal interaction, this eliminates the possibility of the leader of the group to favor definitive more active and extrovert participants.

According to Reis (2007) in the Brainwriting, all the participants can have simultaneous ideas and are stimulated to develop ideas generated by other participants.

## **2.3 7x7 Creativity Technique**

This technique is based on a great number of ideas on one determined objective, generated in a non structuralized form and gathered on paper.

As described by Reis (2007), this technique is very useful when used in set with Brainstorming or Brainwriting.

In this technique in accordance with the author the separation of the ideas in groups can be: a) how much does it cost, b) time capacity, c) capacity of implantation or any criteria that the group considers or judges convenient.

## **2.4 Delphi Creativity Technique**

The Delphi technique is not an interactive method indicated in the development and stimulation of creativity, where it does not promote the reunion of a group it consists of:

Sending questionnaires to a group of volunteers to answer, not promoting the reunion of the participants nor knowing who they are. The answers are tabulated and returned to the participants, and these must answer again until arriving at a consensus. This technique reduces the influence of personalities in the decision. (Megginson, Mosley and Pietri, Jr 1998, p.401).

When opting to use this technique or method that stimulates creativity, the company must make an analysis of the external and internal factors that can influence the organizational climate, in order not to compromise the organization due to an improper technique.

## **2.5 Discontinuity Technique of Creativity**

The human mind tends to be blocked due to routine, however when acting in a different way of the habitual, the mind is forced to face the world of different form, stimulating individuals to be more creative.

An example cited by Reis (2007), is where a discontinuity in the habitual behavior can be to arrive earlier to, to go through another route, or to go by public transport instead of going of car. When discontinuing oneself in his form of thinking, or to acting, is stimulating to the mind to follow new lines of reasoning.

## **2.6 External Opinion Creativity Technique**

This is a technique where people who are not involved in the problems tend to think more clearly, emitting opinions without influences of any order.

Probably, one of the most creative and simple technique to generate ideas. As a classic example of this technique Reis (2007) quotes that a Panasonic salesman loaned video cameras for the children in at his sons' birthday. He asked for the opinion of the children, one of them

said that it did not have camcorders for left-handed people. Due to this fact, Panasonic was the first manufacturer to have adjustable video cameras for dexterous and left-handed people.

## **2.7 Metaphors Creativity Technique**

This technique consists of centering the problem and establishing a comparison with something that has similarities.

The example cited by Reis (2007) is of a company who decided to produce potatoes chips that were packed and that the package did not occupy much space in the shelves. However, if the air of the interior of the packages was removed, the potatoes would be damaged.

The solution was found in an analogy: the company imagined that the potatoes were trees leaves, which cannot be compressed when they are dry, because they break. However, it is possible to make it while still they have some humidity.

It was then that the producer had the idea to moist the fried potatoes with a little humidity and compresses them with the intended forms. The obtained result: the famous Pringles.

## **2.8 Inversion of Estimates**

This method consists of having an inverted image of the basic estimate and in this way to meet new a boarding for the problems. Although not being a technique that gives a definitive reply, it helps to arrive to one.

To exemplify the technique of inversion of estimates, Reis (2007) considers that one imagines that one does not want to supply a good service to the customers, this fact is an inversion of the estimate that is basic, to supply useful and good services. What will happen? Certainly one will have the necessity to use a so qualified staff, will have lesser costs in the formation of human resources, and will not have concern with directed marketing. Through the reduction of the costs, the customers also will demand much low prices.

It becomes necessary to observe that depending on the inversion of estimate, the result may not be the desired one.

## **2.9 Drawing Technique**

The drawing technique consists of scribbles on paper while one sits at the telephone or when one wants to explain something. This method for Reis (2007) are a form to try to explain to oneself exactly what is wanted to be said and to organize the ideas.

Ahead of this boarding it is suggested to sit down and to draw the interpretation of the problem - where to place the office furniture or to diminish the delays in the deliveries (drawing the distribution routes, for example) - it will help to find the ideal solution.

## **2.10 Conscientious Intuition**

The subconscious mind is a creative and powerful instrument. It does not follow the standards of logical and rational thought, that is used conscientiously, and therefore, more it is opened to creative thought. One of the strongest forms of use of the subconscious mind is intuition; there are people who trust it totally to make decisions, but it is risky to do so in relation to important subjects.

## **2.11 Mental maps Technique**

Mental map (Mind Map) is used diagram to represent words, ideas, tasks or other items to a central concept that are marked around of this concept. It is a diagram that

represents connections between portions of information on a subject or task. The elements are arranged intuitivamente in accordance with the importance of the concepts. They are organized in groups, ramifications or areas. (Siqueira 2007, P. 1).

Mental Maps explore the fact that the brain does not work of linear form, but it jumps from an idea for another one, in a random form, following the associations that it goes discovering; it processes better, it memorizes and remembers easily information that combine words, numbers, order and sequence with colors, images, dimensions, symbols and visual rhythms.

## **2.12 "TRIZ" Creativity Technique**

Siqueira (2007, p.13) says that TRIZ is a systematic methodology, guided to the human being, based in knowledge, for the solution inventive of problems. The TRIZ is based on knowledge because it is especially efficient in the conceptual solution of problems, on which - at least with the current technology - computer does not obtain to compete with the human brain.

It can be observed that the basic concepts of the TRIZ (idealidade, contradiction and resources) as MPI is relatively old, based in the formularization of Altshuller (1969), however of practical application as cited by Siqueira (2007).

Siqueira (2007, p.13) says that TRIZ is a systematic methodology, based in knowledge, for the solution inventive of problems. TRIZ is based on knowledge because it is especially efficient in the conceptual solution of problems, on which - at least with the current technology - computer do not compete with the human brain.

## **2.13 Technique of Listing of Attributes**

The listing of attributes compels the people to analyze aspects that normally pass unobserved.

According to Siqueira (2007, p.1) the Listing of Attributes is a technique that: it catches an entity, that can be an object, system or project; it identifies and characterizes its diverse attributes; it identifies the varied values that these attributes can assume; an then combines these attributes to find new forms for the object, system or project.

## **2.14 Positive, Negative and Interesting PNI Technique:**

PNI is a tool that has as objective to explore an idea for the analysis of its strong, weak and interesting points. The name of this tool comes of the three initials: **Positive**: the good things, what you like in the idea; **Negative**: the bad things, what you do not like; **Interesting**: what you find interesting and that deserves reflection.

In accordance with Siqueira (2007) instead of saying simply that one likes or it does not like an idea, one can use PNI to explore its diverse aspects better, before making a judgment.

Ahead of this boarding the intention of the technique appears: To see the two sides of an argument; To see things in a different perspectives; To extend the vision on a subject; To explore ideas before making the judgment; To base decisions better.

## **2.15 Other Points of opinion Technique:**

As to Siqueira (2007), this technique consists of looking at the situation adopting the perspective of another totally different involved person. For example: if you are a supervisor of an assembly line, and are facing many errors in the identification of the parts, try think

about the situation if it would be seen and analyzed by a doctor, a supermarket manager, a real estate broker, etc.

## **2.16 Questioning of Assumptions Technique**

This technique is a process to question the validity of rules, procedures, situations, information or assumed behaviors as true and undisputed. People are surrounded by assumptions regarding why certain things exist and of how they function. One gets used to accept it and not to question these assumptions. In truth, there is a great difficulty of see an to recognizing these assumptions. Quite frequently, these assumptions are invoked as reasons and justifications so that the things are kept as they are. Siqueira (2007, P. 3).

## **2.17 Scamper Creativity Technique:**

The Scamper Creativity Technique is a set of seven operators (manipulating verbs) that make possible the exploration in different ways to transform an object, system or process. The name of this tool comes of the initials of the seven operators: **S**ubstitute, **C**ombine, **A**dapt, **M**odify, **P**ut to Other Uses, **E**liminate and **R**earrange.

SCAMPER must be used as to Siqueira (2007) to carry through improvements or to recreate objects, systems or processes from already the existing ones, since it combines the boarding of psychological stimulations with the guided of creative thought; imagination is canalized through the operators in order to explore definite ways.

In this way, it becomes necessary the construction of a creative organization that is motivates practical management that stimulates, spreads and extends the creativity techniques, developing the creative potential in individuals or a collective way, preventing to restrain creativity.

## **3. Methodology**

The technical procedure of field research is exploratory, for Lakatos & Marconi (2007, p.190) it is an empirical inquire with the objective for the formularization of questions or a problem to describe an intervention in the real context where the fact occurs.

Regarding to the problem, the research is qualitative and quantitative; in relation to the objectives it is descriptive and to the nature it is an applied research, involving the generation of knowledge that have practical applications, directed to the solution of specific problems (SILVA; MENEZES, 2005, p.20).

In relation to the method of data collection, through questionnaires sent to the managers of the 19 (nineteen) companies, however there was a return from 11 (eleven) companies, which were analyzed.

The companies, object of this study are of the metallurgic sector, being 01 (one) micro company; 07 (seven) of small size and 03 (three) of medium size. All the researched companies are situated in the city of Ponta Grossa - Parana.

After the questionnaires were answered the transcriptions of the data was done, the analysis of the data was accomplished question by question, in the boarding that involved the research, that was the use of creativity techniques, it was effected as to follow, and compiled in the analysis of the results and final considerations.

## **4. Results and Analyses: The case of the companies of the metallurgic sector**

For the accomplishment of the study, a structuralized questionnaire was applied approaching 17 (seventeen) questions relative to creativity techniques.

The punctuation scoring possesses was in 03 (three) levels of evaluation for the diagnosis of the level of knowledge and 03 (three) levels of evaluation for the diagnosis of experience, in the order is presented: for level of knowledge “1” - I do not know, “2” - I know and “3” - I know Well; for experience level “1” - We do not use, “2” - Occasional Use and “3” - Regular Use. The related questionnaire was accomplished by the managers of the companies. Veracity of the information was requested; therefore the research will only have value if the answers reflect the true practical and the performance obtained in the company.

In relation to the level of general knowledge in Techniques of Creativity, the result can be visualized in table 2:

**Table 2: Tabulation of the Level of general knowledge on Techniques of Creativity.  
GENERAL DIAGNOSIS OF THE LEVEL OF KNOWLEDGE OF THE  
MANAGERS**

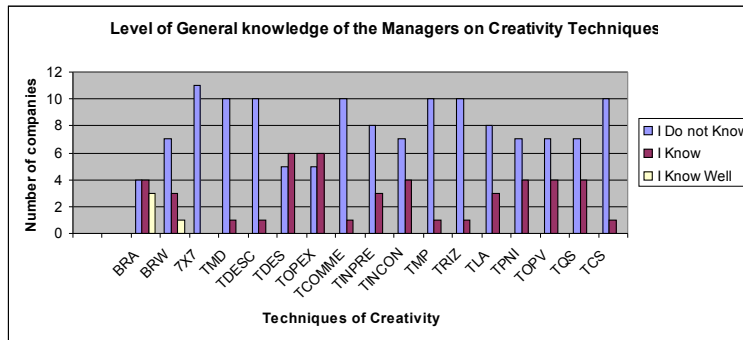
LATED ITEMS	Items	I Do not Know	I Know	I Know Well
BRAINSTORMING	BRA	4	4	3
BRAINWRITING	BRW	7	3	1
TECHNIQUE 7X7	7X7	11		
TECHNIQUE OR DELPHI METHODOLOGY	TMD	10	1	
DISCONTINUITY TECHNIQUE	TDESC	10	1	
DRAWINGS TECHNIQUE	TDES	5	6	
EXTERNAL OPINIONS TECHNIQUE	TOPEX	5	6	
COMPARISONS AND METAPHORS TECHNIQUE	TCOMPME	10	1	
TECHNIQUE OF ESTIMATED INVERSION	TINPRE	8	3	
TECHNIQUE OF CONSCIENTIOUS INTUITION	TINCON	7	4	
TECHNIQUE OF MENTAL MAPS	TMP	10	1	
"TRIZ" CREATIVITY TECHNIQUE	TRIZ	10	1	
TECHNIQUE OF LISTING OF ATTRIBUTES	TLA	8	3	
TECHNIQUE PNI: POSITIVE, NEGATIVE AND INTERESTING	TPNI	7	4	
TECHNIQUE OTHER POINTS OF VIEW	TOPV	7	4	
TECHNIQUE QUESTIONING OF ASSUMPTIONS	TQS	7	4	
SCAMPER CREATIVITY TECHNIQUE	TCS	10	1	

Source: The author

In table 2, a diagnosis between the 11 (eleven) researched companies is made, on the level of general knowledge that each manager has in relation to the techniques of Creativity.

In graphic 1 the value in % is demonstrated how much the researched companies, do not know, they know or they know well the techniques creativity.





**Graph 1: Level of General knowledge of the Managers on Creativity Techniques.**  
Source: The author

It can be observed in graph 1, that of the managers of the 11 (eleven) researched companies, with regard to the level of common knowledge of the techniques of Creativity: 72.73% do not know the techniques, 25.13% know and 2.14% know well.

One perceives that the percentage of managers who do not know creativity techniques overcomes the number of managers who know, in a sufficiently significant difference, and that the number of managers who know well is sufficiently small. In relation to the level of general experience in Techniques of Creativity, the result can be visualized in table 3:

**Table 3: Tabulation of the Level of General Experience on Techniques of Creativity.**

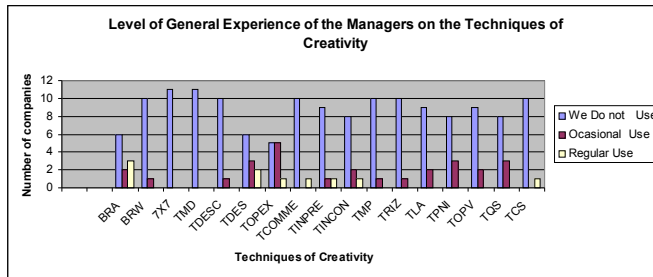
**GENERAL DIAGNOSIS OF THE LEVEL OF EXPERIENCE OF THE MANAGERS**

RELATED ITEMS	Items	We Do not Use	Ocasional Use	Regular Use
BRAINSTORMING	BRA	6	2	3
BRAINWRITING	BRW	10	1	
TECHNIQUE 7X7	7X7	11		
TECHNIQUE OR DELPHI METHODOLOGY	TMD	11		
DISCONTINUITY TECHNIQUE	TDESC	10	1	
DRAWINGS TECHNIQUE	TDES	6	3	2
EXTERNAL OPINIONS TECHNIQUE	TOPEX	5	5	1
COMPARISONS AND METAPHORS TECHNIQUE	TCOMPME	10		1
TECHNIQUE OF ESTIMATED INVERSION	TINPRE	9	1	1
TECHNIQUE OF CONSCIENTIOUS INTUITION	TINCON	8	2	1
TECHNIQUE OF MENTAL MAPS	TMP	10	1	
"TRIZ" CREATIVITY TECHNIQUE	TRIZ	10	1	
TECHNIQUE OF LISTING OF ATTRIBUTES	TLA	9	2	
TECHNIQUE PNI: POSITIVE, NEGATIVE AND INTERESTING	TPNI	8	3	
TECHNIQUE OTHER POINTS OF VIEW	TOPV	9	2	
TECHNIQUE QUESTIONING OF ASSUMPTIONS	TQS	8	3	
SCAMPER CREATIVITY TECHNIQUE	TCS	10		1

Source: The author

In table 3, a diagnosis between the 11 (eleven) researched companies is made, on the level of general experience that each manager has in relation to techniques of creativity.

In graph 3 the value in % is demonstrated of how much to the researched companies, do not use, use occasionally or use regularly the presented techniques of creativity.



**Graph 3: Level of General Experience of the Managers on the Techniques of Creativity**

Source: The author

It can be observed in graph 3, that the managers of the 11 (eleven) researched companies, with regard to the level of general experience of techniques of Creativity is: 80.21% do not use the techniques; 14.44% use it occasionally and 5.35% use it regularly.

One perceives that the percentage of managers who do not use creativity techniques is greater than the number of managers who use it occasionally and in a sufficiently significant difference, and that the number of managers who use it regularly is sufficiently small.

## 5. Final considerations

The intention of this research was to diagnosis the level of knowledge and the level of experience of each technique of creativity in the metallurgic industries, in Ponta Grossa - Paraná. This general idea guided several other questionings that had served as support and aiming to the construction of this study, amongst them are:

1) To rescue the techniques to increase team creativity, to reach this considered objective, a detailed bibliographical revision study, at a first moment presenting concepts of creativity under the optics of some authors, describing the characteristics of the creative individual and the way the creative process occurs. It finishes the proposal approaching techniques to increase team creativity such as: Brainstorming; Brainwriting; 7x7; Delphi; Discontinuity; External opinion; Metaphors; Inversion of Estimated; Drawings; Conscientious intuition; Mental maps; "TRIZ" Creativity Technique; Listing of Attributes; PNI Technique: Positive, Interesting and Negative Technique; Other Points of view; Questioning of Suppositions and Scamper. It was verified that in Brazil the majority of the existing studies on creativity is directed to the area of the education, with some studies directed to the organizational environment, however in a generic form.

2) The Diagnosis of the level of knowledge and the level of experience (abilities) of the managers who work in the Metallurgic Companies of Ponta Grossa, relative to the creativity techniques, effecting analysis through tables and graphs.

3) The conclusions presented in this work estimate that the responsible manager for answers has clarity regarding the concepts presented on each creativity technique.

Regarding the Research Problem, the concluded analysis presents, however, three principal restraints. The first one is that the results are limited the researched companies; second is that the correlation between creativity and competitiveness is not investigated and third proposals for the use of the techniques are not made.

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