



ULBS

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Doctoral area of study: **Engineering and Management**

DOCTORAL THESIS

**OPTIMIZATION OF THE MANAGEMENT SYSTEM AND
ERGONOMY IN ORGANIZATIONS APPROPRIATE TO
THE ENGINEER'S PERSONALITY**

- SUMMARY -

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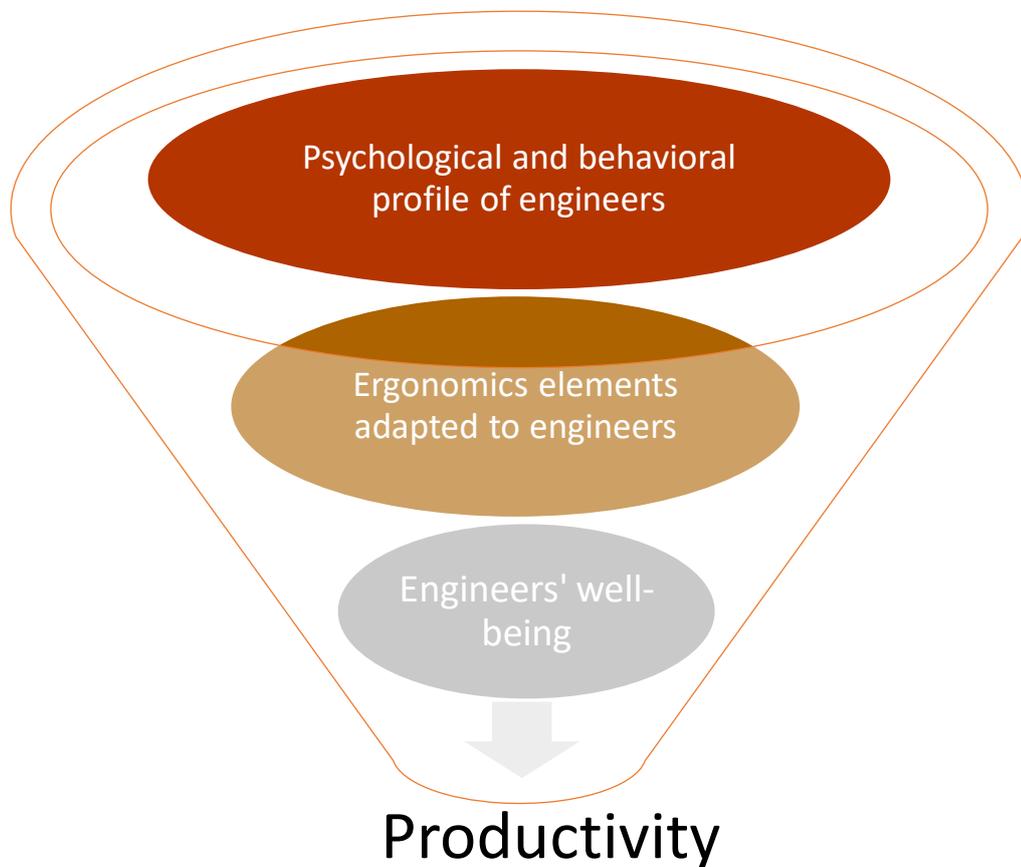
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INTRODUCTION

When you handwrite is like self-sacrifice ... Neagu Djuvara used to say. Yes, the doctoral thesis, written with his own hand, becomes a symbol of faith about one's own person, first of all. The present paper started from the analysis of the society in which we live. Social environments offer a wide range of courses for personal development as well as for entrepreneurs: how to have a successful business, how to communicate with employees. Moreover, there are recipes on how to raise your children, to love your partner, to have a family like in Hollywood. Managers chase productivity, even if they have to invest in performing machines. But the man of our days has become free of constraints, he is free to move, makes choices, is creative and, most of all, knows that he is unique. Under these circumstances, any recipes advertised to manage relationships between people tend to lead to failure. Between all socialization and online improvement we remain alone and misunderstood.

The doctoral Thesis *The optimization of management system and ergonomics in organizations, appropriate to engineers' personality*, proposes a reflexive inductive exercise to increase the productivity of employees in the organization. Starting from the psychological and behavioral profile of engineers, the ergonomic features of the organization's work environment are specified: physical environment - elements of interior design and psychosocial environment - organizational management. Following the modeling of the working environment according to the defining features of the engineers, as well as the socio-professional category, the employees' well-being improves because the ergonomic space created corresponds to the inner needs. Well-being will be reflected directly in employee outcomes and will increase organizational productivity. The proposed approach in the thesis, to build the physical work environment and to choose the management strategy according to the needs and expectations of the employees, is antagonistic to the Procrustean model, which requires the employee to adapt to a fixed working environment and managerial approach imposed by the structure and the specifics of the organization. Large amounts are being spent by large organizations to tailor employees to their specificity, structure and internal managerial style. The employee is either elongated, by trying to develop habits, skills that he or she has latent or lacking at all, or contracted, by wanting to mold what he or she already has, to fit him/her nicely into the Procrustian bed.

The approach of the paper: the psychological characteristics of the engineers - ergonomics - well-being - productivity is presented in the figure below.



Following the entire argumentation of the paper, as well as the data obtained from the bibliographic research, it can be stated that **the necessity, the topicality, the usefulness and the importance** of approaching this field derives from:

- The current orientation of society towards the human psyche, in order to discover its limits, but especially its infinite possibilities;
- The use of psychology at the level of man - machine - working environment;
- Insufficient studies in the field of engineers' psychology;
- Lack of correlations, at country level, between the psychological characteristics of engineers, their state of well-being and productivity;
- Organizations' desire to achieve European standards that require employee orientation;

- The need to find solutions to increase employee outcomes by motivating them to work;
- Providing practical solutions, which can be applied at minimal costs, in order to increase the well-being of the employees.

The theme proposed for research is therefore useful to the society and topical, falling within the research direction of the PhD adviser, in the field of Engineering and Management, Prof. Eng. Lucian-Ionel Cioca, PhD.

The thesis aims at optimizing management strategies and ergonomics in organizations, starting with the study of the psychological and behavioral profile of engineers, in order to increase the employees' well-being and productivity.

The general objectives of the thesis are:

- Analysis of the current state of scientific knowledge in the field of engineers' psychology, management strategies and ergonomics specific to the organizations in which engineers work;
- Studying the psychological and behavioral profile of engineers in four directions: preferred ergonomic structures, style of communication, style of management, personal values;
- Comparing the psychological and behavioral profile of engineers with those of other socio-professional categories;
- The mathematical modeling of the behavior of employees at the work place, following the experimental application of the results regarding the psychological and behavioral profile of the engineers at the organizational level in order to increase the well-being and their productivity.

Taking into account the psychological and behavioral characteristics of engineers to build their work environment ergonomically to increase well-being and productivity, research is based on the following hypotheses:

1. If we introduce the ergonomics and management elements adapted to the psychological and behavioral profile of the engineers in the work environment, then they will increase the employees' well-being.
2. If employee' well-being increases, then their productivity increases.

The research methodology used in the paper includes: analysis of products and activity documents, social investigation, observation and experiment.

The analysis of the products and documents of the activity is based on the principle of dialectical unity between the documents elaborated at the organizational level and the strategy and the managerial style used. It is used to study the managerial style adopted in organizations where the engineers work, based on the organizational chart, the job description, the aptitude sheet, and the job evaluation sheet. The techniques of realization of the method are: documents specific to the managerial system of the organizations in the county; studies, reports, synthesis on human resource management and ergonomics; studies, publications, official statistics on the psychological characteristics of employees.

The sociological survey is the most widely used research method. It is a complex method, with the tools and techniques it uses. The survey is a way of knowing scientifically the opinions, attitudes, aspirations of people being also a means of influence. It achieves quantifiable results on human behaviors or other psychosocial studied characteristics (Cauc, 2007). The survey is intensive and collective, conducted on a small number of people, from organizations interested in collaborating for research and focuses on the study of the attributes and characteristics of the target group. The techniques for carrying out the social survey are: the questionnaire (used in the pretesting, testing and experimental stages) and the interview.

The observation is the finding of a fact with the appropriate investigative means (Chelcea, 1995). In the final stage of the research, the post-test phase, we will validate the data obtained by experimental realization of a managerial and ergonomic model that will be put into practice in an organization in Sibiu. After applying the results, the behavior of engineers at work will be noticed. The observation technique is the Observation Grid for Engineer Behavior.

Experimental empirical research follows an inductive-deductive-inductive approach: from the theories present in the literature, regarding the causal link between the well-being of employees and productivity (inductive approach), verifiable assumptions (deductive approach) are derived, that will be put in correspondence with other data collected during the research (inductive approach) (David, 2006).

The logical thread of the thesis, the finalities and the strategy approached for their achievement in the paper are presented schematically in the following figure:

PART I. ACTUAL STAGE OF SCIENTIFIC KNOWLEDGE IN THE FIELD OF ENGINEERS' PSYCHOLOGY, MANAGEMENT AND ERGONOMICS

Chapter 1. Psychic processes and engineers' personality traits
Chapter 2. Leadership
Chapter 3. Ergonomy of engineering organizations

O1 - Analysis of the current state of scientific knowledge in the field of engineers' psychology, management strategies and ergonomics specific to organizations in which engineers work
Strategy: analysis of products and activity documents - studies, documents, reports, publications.

PART II. STUDIES ON THE PSYCHOLOGICAL AND BEHAVIORAL PROFILE OF ENGINEERS.

Chapter 4. Study on the psychological and behavioral profile of engineers. Research methodology
Chapter 5. Questionnaire research on the ergonomic modeling of the engineer's working space, according to the individual sensory sensitivity
Chapter 6. Physical and social working and emotional interaction of engineers with the physical and social working environment, in order to increase the sense of well-being of employees
Chapter 7. Analysis of the managerial style adopted by engineers, according to the Blake-Mouton scale
Chapter 8. Analysis of engineers' communication styles
Chapter 9. The inventory of personal values of engineers
Chapter 10. The general framework of the psychological and behavioral profile of engineers
Chapter 11. Comparative evaluation of the psychological and behavioral profile of engineers, teachers and doctors

O2 - Studying the psychological and behavioral profile of engineers in four directions: preferred ergonomic structures, style of communication, style of management, personal values.
O3 - Comparison of the psychological and behavioral profile of engineers with that of other socio-professional categories.
Strategy: Social survey - questionnaire and interview.

PART III. PART III. EXPERIMENTAL APPLICATION OF THE RESEARCH RESULTS IN ORDER TO EXPAND THE PRODUCTIVITY OF EMPLOYEES

Chapter 12. Experiment on the correlation between ergonomics, well-being and productivity of employees
Chapter 13. Modeling human behavior through game theory

O4 - The mathematical modeling of employee behavior in the workplace, following experimental application of results on the psychological and behavioral profile of engineers at the organization level in order to increase their well-being and productivity.
Strategy: observation and experiment.

PART IV. FINAL CONCLUSIONS, OWN CONTRIBUTIONS, FUTURE RESEARCH DIRECTIONS

Chapter 14. Final conclusions of the research and recommendations
Chapter 15. Summary of own contributions and future research directions

O5 - Identification of own contributions and subsequent research directions.
Strategy: analysis of products and activity documents.

From a structural point of view, the paper is composed of four parts, which sum up 15 chapters. The logics of the work, like a funnel, seeks to abstract information, process it, make the results out of focus, and finally, the droplet flowing from the chiming of previous processes - productivity.

Returning to the original quote, *When handwriting is like self-sacrifice ...* (Neagu Djuvara), the doctoral thesis is also the author's symbol of faith. Initially, the most intellectually stimulating and challenging part was the analysis of the psychological and behavioral profile of engineers. Then, an exciting imagination exercise became the ergonomic modeling of the working environment. But the productivity of employees remains essential for the organization. So, the question arises: which is still the core? Logically, but also intuitively, the binder of the elements of the work, the well-being of the employees, was discovered. Probably, the doctoral thesis has as its core, the desire for well-being and **balance** of the human being - the state of well-being according to its own personality - the psychological and behavioral profile, in order to build an environment in which to reflect the self - ergonomics, but to also resonate with the wishes of others - productivity.

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1. PART I. ACTUAL STAGE OF SCIENTIFIC KNOWLEDGE IN THE FIELD OF ENGINEERS' PSYCHOLOGY, MANAGEMENT AND ERGONOMICS

1.1. OBJECTIVES

O1 - Analysis of the current state of scientific knowledge in the field of engineers' psychology, management strategies and ergonomics specific to organizations in which engineers work.

O2 - Defining the terms, concepts underpinning the doctoral thesis.

O3 - Study of documents, articles, national and international publications dealing with the concepts and causal relationships between them.

O4 - Identification of insufficiently studied elements and establishment of the research niche.

1.2. STRUCTURE

The first part of the thesis contains the most important recent results in areas of interest for the research objectives and is structured in three chapters (18% of the total content pages):

- Chapter 1. Psychic processes and personality traits of engineers (4 sections);
- Chapter 2. Leadership (7 sections);
- Chapter 3. Ergonomics of engineering organizations (4 sections).

1.3. CONTENT ELEMENTS

In the first chapter, “**Psychic processes and personality traits of engineers**”, following the bibliographic research, the terminology approached in the thesis was defined. The psychological profile of engineers has been studied from various sources at national and international level. Currently, the psychological and behavioral profile of engineers is related to the Asperger genre and disorder. The psychic and behavioral features studied at the level of the group of engineers are: agreeability, logical thinking, meticulousness, emotional stability, extraversion, assertiveness, customer orientation, optimism and work unity, neuroticism, workplace performance, professional satisfaction, career satisfaction, financial success. Using tools for personality assessment, the group of engineers has been characterized, by comparison with other socio-professional categories, as having the following features: aggressiveness, coldness, egocentrism, impersonalism, impulsiveness, antisocial behavior, empathy, creativity, stubbornness, aesthetic orientation, ambition, trust, deviance, dominance, expressiveness, flexibility, intelligence, openness to new experiences. The notion of management and ergonomics has been defined, and sources have been searched that have directly studied the relationship with the engineers’ personality structure.

The second chapter, “**Leadership**”, includes a picture of the leadership concept needed to determine which features of employees are defining to address a particular managerial style. The notion of leadership and management has been defined, and levels of analysis and management and leadership types have been studied.

The third chapter, “**Ergonomics of engineering organizations**”, deals with ergonomics from the point of view of senses, so that specific concepts can be operationalized to include them in the sociological research. Rudolf Steiner is the one who offered a broad perspective on human senses. Thus, he brings to the forefront 12 senses, which outline the working space from the perspective of: visual, auditory, tactile, verbal, thought, self, life, balance and movement.

1.4. PERSPECTIVES

As a result of the bibliographic research, there was a lack of studies on the personality structure of engineers and the ergonomics of the workplace. The psychic processes of engineers already studied can provide general information on how to communicate, but one can not shape a particular management style tailored to the needs of this socio-professional category.

Two ways of adapting the individual to the workplace have been identified to increase his/her well-being and productivity: aloplastic adaptation (ergonomic composition of the work environment) and autoplasic adaptation (of the individual to the organization, by customizing the management style).

Classical literature on ergonomics (Rangu, 1984) addresses both the work environment and the management style used in an organization. In a broad sense, ergonomics relates both to the organization of the physical working environment and to the organization of the psychosocial environment, that is to say the character and the style of leadership, adapted to the needs of the employee.

Approaching the ergonomics from the point of view of the theory of senses of pedagogue Rudolf Steiner, the direct and measurable way of compiling a questionnaire that treats the workplace from a psychological perspective materializes.

2. PART II. STUDIES ON THE PSYCHOLOGICAL AND BEHAVIORAL PROFILE OF ENGINEERS.

2.1. OBJECTIVES

O1 - Studying the psychological and behavioral profile of engineers in four directions: preferred ergonomic structures, style of communication, style of management, personal values.

O2 - Comparison of the psychological and behavioral profile of engineers with that of other socio-professional categories.

2.2. STRUCTURE

The second part of the paper includes an extensive study on the psychological and behavioral profile of engineers. The strategy used was the social survey - questionnaire and interview. The eight chapters represent 56% of the total content pages:

- Chapter 4. Study on the psychological and behavioral profile of engineers. Methodology of research (9 sections);
- Chapter 5. Research based on a questionnaire on the ergonomic modeling of the workspace of engineers, depending on individual sensorial sensitivity (5 sections);
- Chapter 6. Physical and emotional interaction of engineers with the physical and social work environment, in order to increase the well-being of the employees (5 sections);
- Chapter 7. Analysis of managerial style adopted by engineers, according to the Blake-mouton grid (one section);
- Chapter 8. Analysis of the communication style of engineers (2 sections);
- Chapter 9. Inventory of personal values of engineers (2 sections);
- Chapter 10. General overview of the psychological and behavioral profile of engineers (one section);
- Chapter 11. Comparative evaluation of the psychological and behavioral profile of engineers, teachers and doctors (3 sections).

2.3. CONTENT ELEMENTS

The second part of the thesis is the most extensive, because it provides information based on a questionnaire consisting of 235 items.

Chapter four, “**Study on the Psychological and Behavioral Profile of Engineers. Methodology of Research**”, follows two directions:

1. Determining the engineer workspace characteristics, by studying the behavioral profile, following the application of the self-evaluation questionnaire;

2. Determining the psychological characteristics that allow shaping of a preferred management type by applying self-evaluation questionnaires.

The purpose of the study is to optimize the human resources management methods at the organizational level and the ergonomics elements appropriate to the psychological and behavioral profile of the engineers in order to increase the employees' well-being and improve the organization's results (increase productivity).

The working hypotheses that come out of the established objectives are:

1. Enhancement of the workspace by the employer increases the intellectual and physical comfort of the employees and increases the productivity of the engineers.

2. The use of positive emotion-based management strategies increases the efficiency of the engineers' workplace and improves the performance of the organization.

200 questionnaires were filled in by engineers, teachers and doctors. All the people employed in a given place, which have manifested both availability and willingness to collaborate has been chosen.

The analysis of the workspace of the engineers is based on two main coordinates: the determination of the physical and psychological workspace, as described by the ergonomics of the organization.

The evaluation of the behavioral profile of the engineers, in view of optimizing the work space, was done by developing a tool that directly targets the characteristics of the environment.

The psychosocial environment of work is directly influenced by the character and style of leadership.

The notion of management implies, first of all, communication. Communication is a process and a set of behaviors that serve to produce, transmit and receive information through socially shared and socially symbolic systems (Ardeleanu, 2006). From a social point of view, communication is the set of individual and collective behaviors that allow the production, transmission and reception of information (Ardeleanu, 2006). Communication makes use of symbols, motivations, and cognitions. In order to identify the managerial style appropriate to the engineers, both from the employee perspective and from the manager perspective, a

communication style questionnaire was used, focused on four dimensions: assertive, non-assertive, passive and aggressive communication.

Along with the communication component, managerial relationships have the purpose of generating behavior. Individual or group behavior is the effect of individual faith on what is desirable or useful, what is prescribed or outlawed. This belief, the principle of life, materializes in individual and group values. Values have the status of principle according to which people choose and evaluate behaviors, events and states. In conclusion, people communicate according to the values they have, evaluate the manager's behavior according to their personal values. For this reason, the questionnaire also includes a questionnaire on personal values.

Managerial relationships are assessed by employees and depending on what the employee will do in the manager's situation. Thus, a questionnaire on the preferred managerial style, task-oriented or relationship oriented was also introduced.

In conclusion, the applied questionnaire has four parts:

1. Ergonomic organization of the workspace: The present test is non-standardized; it does not have standardization samples. It is an objective test, with structured questions with a nominal scale. The measured dimension is sensory sensitivity. It consists of 18 statements, which contain 85 items.
2. Managerial style: Managerial style questionnaire aims to define own managerial style and personal trends, according to how more importance is given to the task (productivity, efficiency, achievement of goals) or relationship (group satisfaction).
3. Communication style: assertive, non-assertive, aggressive, manipulator.
4. Personal Values: S.P.V. is a questionnaire consisting of 30 series of 3 statements (triads). The 6 values measured by S.P.V. are the following: the practical spirit (P), the self-realization (A), the variety (V), the decisional spirit (D), the organizational spirit (G).

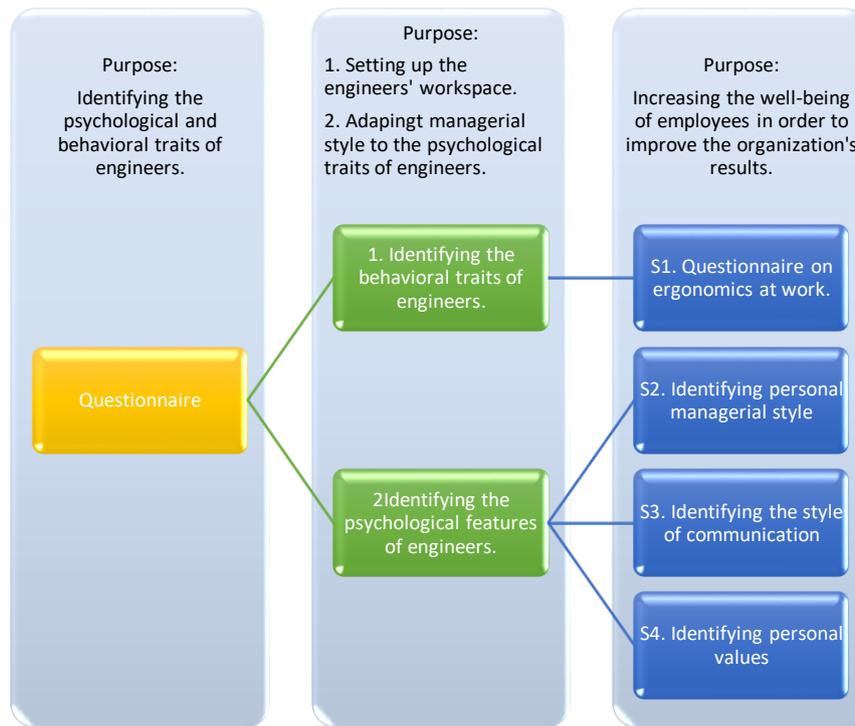


Figure 1. Structure of the questionnaire.

Chapter Five, “**Research based on a questionnaire on the ergonomic modeling of the workspace of engineers, based on individual sensory sensitivity**”, includes an analysis of the engineers’ preferred work environment, based on individual sensitivity to tactile, visual, spatial and auditory stimuli.

The items on tactile sensitivity aim to discover the engineers’ favorite texture of furniture, objects in the surrounding area, and the favorite material for a service uniform.

The visual stimuli analyzed relate to the color of the work room, the color of the office, the clothing, and the sensitivity to the visual elements in the environment.

The spatial stimuli analyzed in the questionnaire are:

- Geometry of the workspace;
- Perception of others in the workspace;
- Workspace dimensioning;
- Choosing relaxation spaces during the break.

Testing sensitivity to auditory stimuli tracks the composition of the workspace with / without auditory stimuli. The preference for listening to music during work and break, as well as the type of music preferred is identified.

Chapter six, “**Physical and emotional interaction of engineers with the physical and social work environment, in order to increase the well-being of the employees**” brings a new type of approach to the workspace, starting from a multidimensional model of the psychological well-being. Two directions are simultaneously pursued:

1. Analyzing the interaction of employees with the working environment. Environmental control.

2. Analysis of employee interaction with the social environment at work. Positive relationships with others.

Employee control over the working environment, related to the improvement of the state of well-being, is analyzed in the questionnaire by 7 items. The purpose of the questions is to establish the overall coordinates of the individual’s interaction with the environment, to build an attractive workspace that increases the well-being of employees.

Increasing the well-being of employees at the workplace is also influenced by positive relationships with other employees as well as hierarchical superiors. In this respect, the possibility of having satisfactory and good quality relationships with other people at the workplace was analyzed.

Chapter seven, “**Analysis of the managerial style adopted by engineers, according to the Blake-Mouton scale**”, captures the preferred managerial style of engineers, task-oriented or relationship-oriented. 81.9% of the engineers are positioned in the E-scale (moderate orientation towards task and relationship) and 12.1% are positioned in the C-scale (strong orientation towards task and relationship). The A scale (minimum orientation to task and relationship) and B (strong orientation towards task and minimal orientation towards relationship) hold equal percentages, 2.6%, while only 0.9% opted for D (strong orientation towards relationship and minimum towards task).

Chapter Eight, “**Analysis of engineers’ communication styles**”, seeks to identify the style of communication used by engineers. Based on the S.C. communication style questionnaire, the personal communication style is grouped into four categories:

- Assertive communication - AS;
- Non-aggressive communication - NAS;
- Aggressive communication - AG;
- Manipulating communication - M.

Organizational communication has a technical, style component, characterized in the paper by the Style of Communication questionnaire. Another component of communication relates to its content, namely to what everybody thinks it is important to communicate. The importance of the topics we approach is given by each person's values. Chapter nine, "**The inventory of personal values of engineers**", identifies the personal values of engineers. The S.P.V. aims to identify the percentage in which the six personal scales or values are manifested: the practical spirit, the self-realization, the variety, the decision-making spirit, the organizational spirit and the goal orientation.

Chapter 10, "**The general framework of the psychological and behavioral profile of engineers**", presents the correlations between the results of the four questionnaires, which will outline the psychological and behavioral profile of the engineers. Correlations were made between 140 items. For the questionnaires targeting personality (style of communication, style of leadership and values) only the final answers were correlated, as the questions were already correlated with the final interpretation grid.

Chapter 11, "**Comparative evaluation of the psychological and behavioral profile of engineers, teachers and doctors**", includes a comparative analysis of the psychological and behavioral profile of engineers, teachers and physicians, based on the previously described questionnaire. The choice of the two professional categories was made following the analysis of job description diagrams of several categories of employees. The three types of jobs were analyzed according to: logical, analytical, algorithmic, critical thinking; social relations; type of communication; necessary skills; occupational interests; values and needs attached to work; specific knowledge. The three types of jobs have common elements in a proportion of 33%, combined differently, depending on the category being analyzed.

1.4. RESULTS

Axis 1 - Ergonomic organization of workspace

In conclusion, if 10 engineers work in an office, then:

- Description of the individual features of the 10 engineers:
 - 5 engineers would be women, 5 men.
 - 4 people would wear uniform, 6 conform to the organization's clothing code.
 - 1 person would be dressed carelessly.
 - 2 do sports and wear synthetic materials.
 - 5 would wear blue cotton clothes, 3 black cotton clothes, 1 blue cloth, and one white cloth.
 - 8 listen to music on headphones while working.
 - when they leave work, 9 listen to music.
- Dimensioning of the room and location:
 - 10 engineers would work in 2 rooms. The first office includes 4 people, and the second office, 6, of which 2 would have individual speakers.
 - Each room is wide, airy. Space 1 would have 28m² and space 2 would have 42m². The dimensioning is done according to the normative instructions that each employee has a working space that varies between 2/3 m² and 15/18 m² (Puiu, 2010). An average value of 7 m² per person was chosen.
 - In each space, 3 employees face the window. In space 2, those working in separate lodges face the door. There are three women and three men seated facing the window.
 - The perspective of the building, if we consider it to be included in a circle, would be: 360° mountains, hills, plain field and 83° view on the city.
- Arrangement of the office:
 - The offices would be white and the hallway orange. In a forest division, all the walls would be green. It is recommended to try painting the offices in the blue color.
 - 7 spaces stimulate the power of concentration.

- 7 offices / workspaces would be made of wood and 3 of modern materials (plastic combination with other structures).
- The office / workspace would be light, cheerful.
- 6 workspaces will be predictable, will not change often, and all IT will want to work in them. 4 spaces will be unpredictable, meaning they will often change their set-up.
- 6 spaces will be symmetrical, geometric, and 4 will be asymmetric (two of the asymmetric would be occupied by IT).
- 5 spaces will have lines and straight shapes with fixed furniture. 5 spaces will have curved lines, round shapes and modular, mobile furniture.
- 8 prefer a relaxed, comfortable position. 6 prefer to sit. 2 prefer nonconformist and comfortable furniture, of which 1 is IT engineer. In conclusion, the IT specialist and one other employee sit in cushion chairs. 6 have very comfortable chairs and pillows.
- There will be symmetrical / asymmetric 6 plants, 3 in each office. Of the 6 plants, 3 would be in the vicinity of the women's workspace.
- 10 offices are neat, but on 3 of them one can sometimes see papers that are not put in place.
- 4 have familiar objects on the desk (cups, personalized pad, personalized pen holder etc.), of which at least one woman and one man.
- Their behavior during the meal break (30 minutes to 8 hours of work):
 - 9 socialize with colleagues during the break, including the two working alone.
 - 8 go out and walk, one of whom walks alone. Four outdoor sports equipment can be fitted outside, of metal and plastic, and a wooden circuit and climbing ropes can also be used, which can also be used by women dressed in skirts.
 - 5 talk to each other standing.
 - 4 engineers would sit in the dining room and watch monitors with:
 - 12 minutes - music, of which 4 minutes pop, then radio;
 - 3 minutes - news;
 - 12 minutes - news in the field;
 - 3 minutes - meditation by wise men.
 - 2 would sit for coffee.
 - 2 would stay in the office (excluding those who sit alone).

- 2 would go smoking.
- In pause, employees are thinking about:
 - 5 - family (2 males and 3 females);
 - 6 at what they have to do at home;
 - 5 - friends.

Increasing the well-being of employees by setting up a workspace according to individual needs:

- Changing **the attitude** of employees towards work, colleagues and tasks;
- Increasing employee motivation;
- Makes collectivity fun;
- Changing employee attitudes - is optimistic;
- Increases the level of energy concentration;
- Increases employee performance;
- Develops positive emotions in relation to work;
- Reduces passive-aggressive behavior of employees (quitting and staying);
- Decreases tensions and negative emotions.

The only threat to this perfect mechanism of engaging employees in solving tasks is the phenomenon of hedonic adaptation, that is, the habit of employees with that state and environment. For this reason, it is recommended to change the working environment to about 2 years.

Axis 2 - Analysis of managerial style adopted by engineers, according to the Blake-Mouton scale

Engineers prefer a balanced manager behavior, oriented both to staff and production. By practicing compromise management, the manager has a moderate-oscillating behavior that ensures a balance between the importance of the task and the importance given to people. It is an efficient management that ensures both performance in production and active involvement of staff.

However, the questionnaire raises two issues:

1. The grid is self-evaluation, so it represents people's perception of their own person.

2. The grid was filled in by people who did not have a leading position, so they reflected their opinion on how they would like it to be. It is normal for every man to strive for balance and harmony, at least in theory.

Axis 3 - Analysis of the communication style of engineers

81% of engineers adopt the assertive style of communication, characterized by the ability to directly express their views, desires, without harming the rights of the interlocutor, without making them suffer. The second place of the engineers' preferences for different types of communication is occupied by the aggressive style (34%), then the manipulating style (29%) and the nonassertive style (25%).

One third of the respondents have the secondary style of communication aggressive, which can be explained by the fact that the dominant assertive style can be tedious, stressful, as it involves the management of one's own emotions, and when this gets out of control, the person becomes verbally aggressive. An assertive style acquired through linguistic exercise, without an emotional management exercise, becomes an aggressive style very easily.

There is a poor positive correlation between those who have chosen to be defined by the assertive style and the manipulator style option. It seems that the assertive communication style, with the characteristic of adapting to the needs of the interlocutor and that of not hurting, even protecting the person in front, has a manipulative component. Some of the people who have chosen the assertive style as their preferred style have the second choice the manipulating style. The Pearson correlation coefficient between the number of choices made and the manipulator style is strongly positive for a significance level $p < 0,001$, which means that the more well-defined the dominant manipulator style, the more styles of communication it uses, depending on the situation and personal needs.

Axis 4 - Inventory of personal values of engineers

The engineers particularly show their practical spirit (38%), organizational spirit (33%) and orientation towards a goal (15%). The spirit of self-realization (5%), variety (3%) and decision-making spirit (6%) have minimum values. The organizational spirit of the individual increases with the conclusion of the act of marriage, but the decisional spirit decreases.

The results of the S.P.V. applied to engineers outline their psychological profile as follows: engineers show a practical, materialism-oriented, practical action with immediate and economically advantageous use. They tend to take care of possessions, do what is profitable and attract the maximum profit for their own interest. They are well organized in their work, they keep everything in their place, they are ordered, they systematically approach the tasks, they do everything in their own time. They prefer pre-planned and routine activities. They have a purpose to aim for, not abandon the problem until it has been resolved. They focus their efforts on clear and definite objectives, knowing precisely the direction to be taken. They prefer positions with clearly defined and specified requirements and objectives. They tend to focus on the task and limit the field of activity according to the goal to be achieved. Other features that manifest: addiction, circumspection, anxiety, authoritarianism, dogmatism, Machiavellianism, obedience, economic orientation, conformism, responsibility, bureaucratic orientation, self-discipline, self-assertion, non-affirmation.

Comparative assessment of the psychological and behavioral profile of engineers, teachers and doctors

The three socio-professional categories generally prefer the pattern of arranging the workspace they face day by day. The question arises whether they chose the job because of these preferences or that the daily routine determines their preferences.

The most orderly are teachers and engineers, and doctors are the messiest. Doctors and teachers prefer more the predictable space. Engineers like lines and straight shapes, and teachers like lines and round shapes. Teachers reject the idea of fixed furniture and prefer modular furniture.

All categories prefer to work in a large, airy room with 1 to 5 people. Engineers also accept to work with 6-10 people, and teachers want to work alone in small, intimate spaces.

During the break, engineers prefer to stay in the dining room, teachers and doctors in the work area. Teachers smoke the least, and engineers the most. When they work, engineers listen to pop music and teachers and doctors to classic music. Of the three categories, engineers mostly listen to rock music, and teachers listen very little to rock music. Engineers prefer in the highest percentage to be with colleagues and walk with them during the break, maybe because their tasks are not often linked to other people. During the break, all categories prefer to work out outside.

All three categories have the dominant style of communication the assertive style; engineers have scored a slightly lower score. Engineers also have as subdominant styles, more pronounced than teachers, the manipulative and aggressive style. As subdominant styles, doctors are non-assertive and manipulators. The least non-assertive are the teachers. The most non-aggressive are the doctors. The most manipulative and aggressive are the engineers.

Engineers prefer the managerial style E, half-measures, and the other two categories prefer the C style, with a strong focus on task and relationship.

Engineers tend to have a practical, organizational and goal-oriented spirit. Teachers have an organizational spirit and a practical spirit. Doctors have organizational spirit, practical spirit, variability and goal orientation.

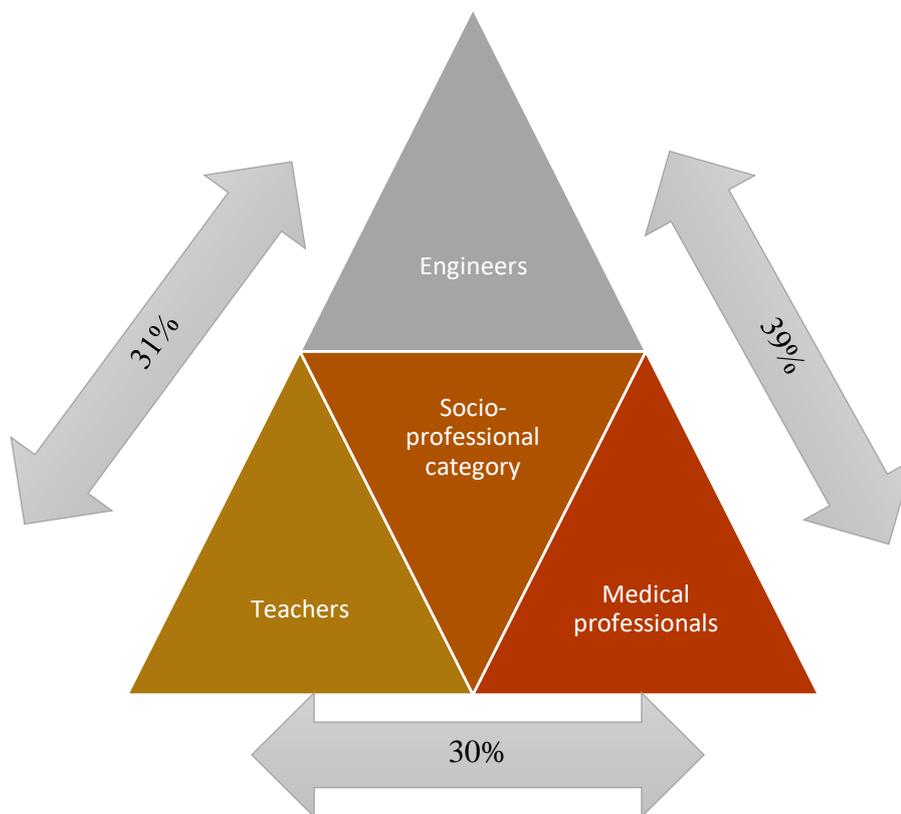


Figure 2. Compatibility of the three socio-professional categories.

After the comparative analysis of a number of 127 items from the questionnaire, the maximum points of proximity between the three professional categories were marked.

Engineers are the most like medical professionals, in a percentage of 39%, and teachers with engineers, in a percentage of 31%.

3. PART III. EXPERIMENTAL APPLICATION OF THE RESEARCH RESULTS IN ORDER TO EXPAND THE PRODUCTIVITY OF EMPLOYEES.

3.1. OBJECTIVES

O1 - Experimental application of research results on the psychological and behavioral profile of engineers at the organization level.

O2 - Ergonomic design of the workspace of engineers, in order to increase their well-being and productivity.

O3 - Mathematical modeling of employee behavior at work.

3.1. STRUCTURE

The third part of the thesis includes an experiment at an organization in Sibiu, which aimed at the ergonomic arrangement of the engineers' workspace in order to increase their well-being and productivity. The method used was the experiment and mathematical modeling. The two chapters represent 11% of the total content pages:

- Chapter 12. Experiment on the correlation between ergonomics, employee well-being and productivity (4 sections);
- Chapter 13. Human behavior modeling through game theory (5 sections).

3.2. CONTENT ELEMENTS

The third part of the paper has an applicative character and justifies previous research, the social investigation. It is a significant part of the work since it deals with causal relationships, existential realities and the essences of the human psyche.

Based on the previously identified psychological and behavioral profile of an engineer, an experiment was developed to apply the elements of psychology to the ergonomics of the workplace.

Chapter 12, **“Experiment on the correlation between ergonomics, well-being and productivity of employees”**, includes an experimental empirical research, which follows an inductive-deductive-inductive approach: from the theories present in the literature, regarding the causal link between the employees’ state of well-being and productivity (inductive approach), verifiable hypotheses are derived (deductive approach), which will be correlated with other data collected during the research (inductive approach) (David, 2006).

The research hypotheses were:

H1 - If we introduce the ergonomics and management elements to the work environment, adapted to the psychological and behavioral profile of the engineers, then they will increase the well-being of the employees.

H2 - If employees’ well-being increases, then their productivity increases.

Statistical hypotheses - the invalid hypotheses were:

N01 - The introduction of ergonomics and management elements, adapted to the psychological and behavioral profile of engineers, do not lead to an increase in the well-being of employees.

N02 – Employees’ well-being does not correlate with their productivity.

The research was conducted at an IT company in Sibiu. The subjects were represented by all the company’s representatives, who have the IT engineer qualification. The number of subjects is 7. Three tools that measure employee well-being and productivity will be used:

- Warwick Edinburgh Mental Well-being Scale (WEMWBS) – a questionnaire for analyzing the well-being of employees;

- Evaluating employee professional performance in execution positions - the organization's productivity measurement tool;
- Employee expectancy level grid - tool developed to measure employee productivity by directly engaging in the setting of professional development goals.

Employee well-being was approached from two perspectives (Stewart-Brown, 2008):

1. The subjective perspective of happiness (affectivity) and life satisfaction (the hedonic perspective);
2. Positive mental status, good relations with others and self-realization (eudemonial perspective): self-development capacity, positive relationships with others, autonomy, self-acceptance and competence.

Hedonism is an ethical principle that states that the purpose of life is to seek pleasure. Eudemonism is an ethical concept that claims that the purpose of human existence is to find happiness.

The experimental design involved the identification of dependent and independent variables. Independent variables were the elements of ergonomics and management. Dependent variables were well-being and productivity.

The independent variables that were introduced are as follows:

- Fitness bikes;
- Stepper;
- 10 pots with small and medium sized firs;
- 2 sprinklers;
- A table with two chairs;
- Visual, motivational management elements: staircase messages, messages on the protocol table;
- Dream management elements: messages in the firs, gifts in firs, calendar to count the days left until Christmas.

According to the methodology outlined above, the work environment of the employees was changed during the experiment. The variables have been introduced all at once to capture employees and produce a sudden change of state. Employee well-being has been verified three times: at the beginning, during, and at the end of the experiment. The time interval between the

tests was two weeks, this being the standard period of the well-being test. Productivity and expected staffing levels were verified at the beginning and end of the experiment.

Chapter 13, “**Modeling human behavior through Game Theory**”, proposes, in a five-step approach, not only a mere mathematization of results, but a metaphysical vision of human relationships at work that directly influences ergonomics in organization. Chapter 13 explains mathematically the organization’s decision to invest or not to increase the well-being of employees.

With Game Theory, models have been built for the following identified issues:

- The organization wants employees to have maximum productivity. Employees want to feel good, be appreciated, have good salaries, etc.
- The following question arises: What happens to productivity if we change employees’ well-being?
- The organization where the analysis is made includes 5 employees and the employer.

To model the social issue as a “game”, the Ad-hoc approach was used, using intuition to find an answer. Starting from the game theory according to which individuals do what they can best according to what others do, respecting a set of rules, there have been identified 3 items that help in formulating the social problem as a mathematical model, called game:

1. Players $i=1,2,\dots,n$;
2. Strategy: player’s actions $i \rightarrow a_i$; set of strategies A_i ;
3. Rewards r_i , according to chosen strategies $r_i (a_1, a_2, \dots, a_n)$.

What the players want most is set according to their individual priorities:

- Exclusive well-being;
- Exclusive productivity;
- Both in a different percentage.

Organization wishes from its employees:

- Maximum productivity of 70 (the maximum possible score for an employee in the performance appraisal);
- An average level of well-being of 50, without excesses in any direction, i.e. a state of equilibrium. The value of 50 is the average value of the well-being test.

The social problem determines social interactions, as a result of which the organization makes a decision: whether to invest in the well-being of employees or not.

Nash equilibrium is the combination of strategies in which no player can get a higher reward if they change the strategy unilaterally.

$$R_1(a_1^*, a_2^*) \geq R_1(a_1, a_2^*)$$

In the specific case, the Nash equilibrium was defined as follows: no employee can have a higher level of well-being and better productivity if only the organization’s management and ergonomics change.

From a psychological point of view, it can be said that the employees, before starting the experiment of increasing the well-being, were in balance with their own person and with the other colleagues, a balance defined by a certain attitude, way of communication, style of work. After the experiment, it was intended to see to what extent the employees and the group reached another balance, at another level.

In order to identify the Nash equilibrium at the level of each individual in relation to the organization, the following matrix was designed:

Table 1: Matrix for Nash Equilibrium Analysis

		Organization	
		Well-being	Productivity
Employee	Well-being	1.Initial, initial	2.Final, final
	Productivity	3.Final, final	4.Initial, initial

The strategies used were as follows:

1. The employer is interested in the state of well-being; the organization is interested in the state of well-being. The organization does not invest in the well-being of employees because the ultimate goal is productivity. The strategy will be: A - SB_i, O - SB_i.

2. The employee is interested in the state of well-being, the organization is pursuing productivity. The organization invests in the well-being of its employees: A - SB_f, O - P_f.

3. The employee is interested in productivity; the organization is looking after the state of well-being. The organization invests in the well-being of its employees: A - P_f, O - SB_f.

4. The employer and the organization are interested in productivity. The organization does not invest in the well-being of its employees: A - P_i, O - P_i.

Following the matrixes analysis, the organization can make the investment decision in the well-being of employees, depending on the particularities of each employee.

3.3. RESULTS

Following the experiment, the following conclusions can be drawn:

- Of five employees, for one of them the well-being has also fallen (from 47 to 43) and the productivity (from 60 to 55).
- At the level of the four employees, the well-being (from 55.75 to 56.25) and productivity (from 58.75 to 59.75) increased, so we can say that well-being and productivity are directly proportional to all 5 team members.
- Employees of the organization tend to be more oriented towards eudemonics, to happiness by reason. The high negative variation of eudemonism decreases productivity, and the high positive change in hedonism increases productivity. In this case, we can say that declining rationality in well-being has led to declining productivity, and increased enjoyment has increased productivity. Only for this studied case can we say that the lack of reason generates the decrease of the results in the daily life, and the increase of pleasure generates the growth on other levels of interest. The two directions of well-being do not exclude each other. Probably they exist in a balance in each individual, and their change in a negative and positive sense generates changes in the actions of the individual's everyday life.

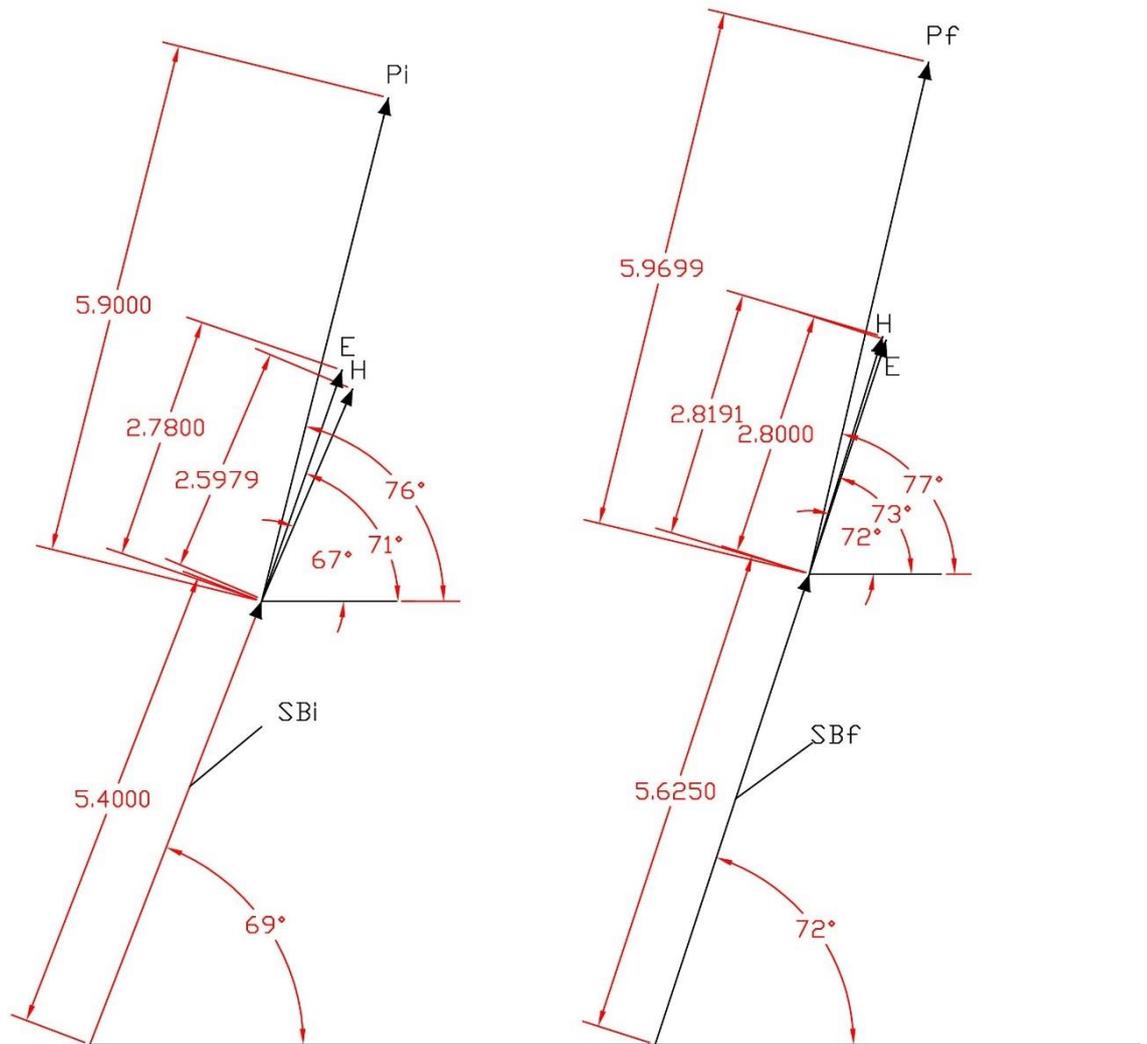


Figure 3. Well-being and Productivity vector at the start and end moments

In the figure above, the Well-being and Productivity vectors are presented at the start and end time of the experiment. It can be noted that the size of both vectors increased after the experiment. If the state of well-being was initially governed by eudemonism, at the expense of hedonism, in the end the value of eudemonism remained roughly constant, while the value of hedonism rose visibly, which may lead to the idea that the well-being of the employees increased due to hedonism, that is to say, those materials from the work environment that aimed for pleasure (the smoking and sports area, as well as the plants).

In conclusion, both null hypotheses are rejected:

1. Introduction of ergonomics and management elements, adapted to the psychological and behavioral profile of engineers, leads to the improvement of employees' well-being.

2. The well-being of employees is correlated with their productivity.

The second hypothesis has a large magnitude of the effect from the perspective of its manifestation both in a positive (at the group level) and negative sense (the employee who has reduced his/her well-being and productivity).

The results of the experiment presented above were introduced into matrices to identify the existence of Nash equilibrium at the individual and, implicitly, organizational level.

Three employees out of five achieved Nash equilibrium in pure strategies: J2 - PP; J4 - P, SB; PP; J5 - P, SB. The other two players, J1 and J3, have a dynamic game and the balance has been identified by the recursive induction algorithm.

Player 1, who is the one who recorded the decline in well-being and productivity after the experiment, reaches the state of balance through the state of well-being and initial productivity before conducting the experiment. His team's strategy should focus on final productivity, in relation to his final productivity, i.e. not to try to change his state of well-being, but to report his final productivity to the employee's results.

Player 3 is the one with the best team results. The balance for J3 is SB_f, P_f , and the organization would be SB_i, P_i , that is, if the results of the most productive employee in the team continue to increase, then the team will refuse to make progress and migrate to the balance before the experiment. A solution to the problem may be to separate the most productive employee from the rest of the team.

Analyzing the possible strategies of the employees and the working group, it was recommended that the organization invest in the well-being of employees in order to increase their productivity.

A more in-depth approach to the theory of games applied in psychology could lead to erroneous results, as the human being makes rarely or almost no rational decisions (Laszlo, 2007).

The exuberant and insoluble result of the doctoral thesis is presented in subchapter 13.5, **“Psychological entropy. The irrational game in Game Theory”**.

Life is born only from the spark of opposites (Jung, 2007). Every object and human being has an internal energy. Carl Jung approached people's internal energy from a closed-door perspective. But we see, both empirically and through scientific research, that man is an open system that has energy exchanges with objects and beings around it (without space and time barriers).

Man, as an energetically charged system, exhibits psychic entropy, a phenomenon of energy transfer. Entropy measures the equilibrium of a system. Even though most theories state that entropy is the degree of disorder of a system, Jung found that it is based on opposite notions: warm - cold, clear - unintelligible and gives us the idea to define entropy through antagonistic theories (Şerban, 2010). Entropy is a creative force that forms dispersion, opposed to gravitational force. Together, the two forces make possible the vast array of random or not, called universes (Şerban, 2010).

Mental entropy can explain the possibility of applying the Theory of Games also at the level of the group's syntality. Entropy can address how well the individual's well-being propagates at the group level. At the level of the group, it is a permanent game of attracting the energies of others and of dissipating their own energy. Entropy explains why people with strong, positive or negative energy give it to others, and the extent to which they absorb energy around them is almost non-existent.

Finally, there is a state of harmony, equilibrium at the level of the group, a state of Nash Equilibrium, specific to each group. Balance arises from the forces of attraction existing within the group and from energy dissipation. The stronger these forces, the stronger the sentiment of the group is created. However, the concept of enantiodromia warns us that any excess force produces an opposite effect to the desired one. We can say that mental entropy at group level refers to any type of energy manifested by the individual: well-being, productivity - as creative, working energy.

Previous analysis of the Nash equilibrium of each employee in relation to the workgroup led to direct results for three employees. The two employees who could not be mathematically and statistically transposed directly are those who have extreme behavior in the sense that one is the unhappiest employee and the second is the most productive employee. Their game, even if it is more or less rational, causes essential changes at the group level. The mental entropy of the two employees determines the well-being and productivity of the entire group. However,

once the extreme threshold is over, there is a phenomenon of enantiodromia, namely the excess productivity of an employee inhibits the results of others.

The mental entropy of the happiest and most productive employee determines the group to play a compensatory, balancing game that ultimately leads to a higher Nash equilibrium.

Another interesting conclusion is that, regardless of the organization's satisfaction with employee outcomes, there is always a higher-level of Nash equilibrium that can bring extra benefits from both sides. We can talk about lifelong learning, learning organizations and emotional intelligence. Investments can have minimal value, as long as it compensates through intelligence and opportunity. The stated conclusions also explain the Kaizen philosophy, the Japanese management system of continuous improvement.

4. PART IV. FINAL CONCLUSIONS, OWN CONTRIBUTIONS, FUTURE RESEARCH DIRECTIONS.

4.1. OBJECTIVES

O1 – Identifying final conclusions, own contributions, and future research directions.

4.2. STRUCTURE

The fourth part consists of two chapters and represents 10% of the total content pages of the paper:

- Chapter 14. Final conclusions of the research, own opinions and recommendations (5 sections);
- Chapter 15. Summary of own contributions and future research directions (3 sections).

4.3. CONTENT ELEMENTS

Based on the analysis of all the data obtained from the research, in Chapter 14, “**Final conclusions of the research and recommendations**”, the final conclusions are grouped into five categories to facilitate access to data:

1. Organization of the environment
2. Preferred management style
3. Communication style
4. Personal Values
5. Employer’s guide

The conclusions can be used by the employer in the following situations:

- When employing you can see certain characteristics of the candidate and, depending on the job requirements, you can choose the best fit person;
- Arranging the workspace according to the employee’s psychological characteristics;
- Building the team according to psychic entropy and enantiodromia;
- Employee redistribution within the company on a job that fits better;
- Using elements that matter to the employee as a means of rewarding;
- Distribution of tasks to the employee defining him/her and reflecting his/her mental structure;
- Making minimal investments with maximum effects in the layout of the workspace;
- The composition of team-building sessions according to the values of the employees, adapted to their style of communication and personal social needs;
- Structure of the organization’s internal order according to the personal needs of the employees:
 - breaks and spaces intended for them;
 - ways of organizing/disorganizing work, depending on the type of engineers and tasks;
- Intelligent promotion of equal opportunities and gender, in the sense that everyone has the right to be in the right place, where he/she finds his/her balance;

- Adaptation of the communication and managerial style according to the employee's age, abilities, occupational interests, work values and working styles of each.

Final conclusions of the paper

Conclusions on the **ergonomic design of the workspace**, if 10 engineers work in an office:

- Description of the individual features of the 10 engineers:
 - 5 engineers would be women, 5 men.
 - 4 people would wear uniform, 6 conform to the organization's dress code.
 - One person would be dressed carelessly.
 - 2 are doing sports and wearing synthetic materials.
 - 5 would wear blue cotton clothes, 3 black cotton clothes, 1 blue cloth, and one white cloth.
 - 8 listen to music on headphones while working.
 - When they leave from work, 9 listen to music.
- Dimensioning of the room and location:
 - 10 engineers would work in 2 rooms. The first office includes 4 people, and the second office, 6, of which 2 would have individual speakers.
 - Each room is wide, airy. Space 1 would have 28m² and space 2 would have 42m². The dimensioning is done according to the normative stipulations that each employee has a working space that varies between 2/3 m² and 15/18 m² (Puiu, 2010). An average value of 7 m² per person was chosen.
 - In each space, 3 employees face the window. In space 2, those working in separate lodges face the door. There are three women and three men seated facing the window.
 - The perspective of the building, if we consider it to be included in a circle, would be: 360° mountains, hills, plain fields, and 83° perspective on the city.
- Arrangement of the office:
 - The offices would be white and the hallway orange. In a forest division, all the walls would be green. It is recommended to try painting the offices in the blue color.
 - 7 spaces stimulate the power of concentration.

- 7 offices / workspaces would be made of wood and 3 of modern materials (plastic combination with other structures).
- The office / workspace would be light, cheerful.
- 6 workspaces will be predictable, will not change often, and all IT will want to work in them. 4 spaces will be unpredictable, meaning they will often change their set-up.
- 6 spaces will be symmetrical, geometric, and 4 will be asymmetric (two of the asymmetric would be occupied by IT).
- 5 spaces will have lines and straight shapes with fixed furniture. 5 spaces will have curved lines, round shapes and modular, mobile furniture.
- 8 prefer a relaxed, comfortable position. 6 prefer to sit. 2 prefer nonconformist and comfortable furniture, of which 1 is IT engineer. In conclusion, the IT specialist and one other employee sit in cushion chairs. 6 have very comfortable chairs and pillows.
- There will be symmetrical / asymmetric 6 plants, 3 in each office. Of the 6 plants, 3 would be in the vicinity of the women's workspace.
- 10 offices are neat, but on 3 of them one can sometimes see papers that are not put in place.
- 4 have familiar objects on the desk (cups, personalized pad, personalized pen holder etc.), of which at least one woman and one man.
- Their behavior during the meal break (30 minutes to 8 hours of work):
 - 9 socialize with colleagues during the break, including the two working alone.
 - 8 go out and walk, one of whom walks alone. Four outdoor sports equipment can be fitted outside, of metal and plastic, and a wooden circuit and climbing ropes can also be used, which can also be used by women dressed in skirts.
 - 5 talk to each other standing.
 - 4 engineers would sit in the dining room and watch monitors with:
 - 12 minutes - music, of which 4 minutes pop, then radio;
 - 3 minutes - news;
 - 12 minutes - news in the field;
 - 3 minutes - meditation by wise men.
 - 2 would sit for coffee.
 - 2 would stay in the office (excluding those who sit alone).

- 2 would go smoking.
- In pause, employees are thinking about:
 - 5 - family (2 males and 3 females);
 - 6 at what they have to do at home;
 - 5 - friends.

Regarding the preferred **managerial style** of engineers, the following observations can be made:

- Engineers tend to be more oriented towards the relationship than to the task.
- Engineers prefer a balanced manager behavior, oriented both to staff and production. By practicing compromise management, the manager has a moderate-oscillating behavior that ensures a balance between the importance of the task and the importance given to people. It is an efficient management that ensures both performance in production and active involvement of staff.
- Managers tend to be concerned about interacting with engineers towards production. It seems, however, that engineers are very sensitive to relationships with the manager and other colleagues. The myth that engineers do not want to communicate with others, that they tend to isolate themselves is denied.

The style of communication used by engineers can be shaped as follows:

- Most engineers, 81%, adopt the assertive communication style. The second place of engineers' preferences for different types of communication is occupied by the aggressive style (34%), then the manipulating style (29%) and the nonassertive style (25%). One third of respondents have as secondary communication style the aggressive style, which can be explained by the fact that the dominant assertive style can be tedious, stressful, as it involves the management of one's own emotions, and when this gets out of control, the person becomes verbally aggressive. An assertive style acquired through linguistic exercise, without an emotional management exercise, becomes an aggressive style very easily.
- Engineers defend their rights without infringing others. They are not afraid to express their opinion, even if this is received with hostility. They have relationships based on

trust, cooperation and less on domination and control. They feel good in direct, straightforward, face-to-face contacts. In the event of disagreement, they seek realistic compromises on the basis of mutual interests. They prefer to be plain-speaking. In general, they manifest themselves as they are, without hiding their feelings. They are capable of being themselves, and are still accepted by most of the others. When they disagree with someone, they dare to speak and manage to make themselves understood. They speak without fear in public, in meetings. They have the patience to listen without interrupting the other. They finish what they have decided to do. They act as they feel. Engineers believe that handling and manipulation of others is not a solution to use. Generally, they know how to protest effectively, but without being excessively aggressive.

- In some situations, if they do not know the person they speak with, they prefer to hide what they think or what they feel. Sometimes they are more authoritative and decided. They do not dare to refuse certain tasks, even if they do not fall under their duties. They are considered quite competent and skillful in their relationships with others. In order to achieve what they are aiming for, they are always ready to do everything. In some situations, they know who to turn to and especially when to turn to; this led them to success. They know how to make people accept and adhere to their ideas. They believe that sometimes they do not have to express their intentions too quickly, this shows awkwardness. Engineers avoid situations that would put them in an unpleasant light. Depending on the situation, they criticize people and tell them what they think. They prefer to ask for help from colleagues. It is noticed that those occasional, situational behaviors of engineers are those that are perceived as dominating by society.
- The higher the level of training of engineers, the more people feel safe and act directly.
- The longer the seniority of work, the more people say what they think and criticize. The longer the seniority in the organization, the more the employee has the spirit of contradiction. After 10 years, this attitude decreases, perhaps due to habitual routine at work, and identifying the limits of each individual. The longer the employee is on the job, the better he/she is in his/her relationship with the others. 81% of engineers know to call on someone or something to succeed. In basic education, this is what engineers are told: they do not have to know everything, but only where to look.

- 58% of employees aged less than 35 years and 100% of employees over 45 years of age make compromises, so this attitude grows with age, either because of the education received during the communist period, or because sometimes compromise seems a wiser solution. The higher the seniority of employees in work, in the organization and function, the more compromises they make. Perhaps the society is built to clear our limits.
- The longer the seniority in work increases, the more people become more unselfconscious, the easier they express their feelings (66% for under 1 year and 91% for seniority over 10 years). Thus, if the employer looks for people to be in positions where they interact with other people, it is preferable to be engineers having more than 10 years of experience in the job. 34% of young employees and 64% of those over 10 years' experience admit that it is hard to be intimidated.
- 95% of people with children act freely, without hiding their feelings, compared to 73%, the percentage of those who do not have children.
- 27% of women and 46% of men speak without fear in public. This percentage denies a myth, according to which women are braver than men.
- Men (38%) mimic sincerity more than women (21%). If the employer needs a reliable, honest, trustworthy engineer who is correct and does not cover uncomfortable situations, it is preferable to hire a woman.
- If an employer needs an engineer who is obedient, they can hire a woman with children.
- Married engineers finish what they plan, while only 85% of the unmarried and 75% of those divorced do so.
- With the increase in seniority, people become more ironic. In order to have a balanced team, it is advisable to have both older and experienced employees.
- In conclusion, seniority in work and in the organization, as well as children, give people confidence in their own powers. This result may be the result of maturity, not of the age itself. The type of communication also varies by gender. Over time, people tend to move towards assertive communication and the percentage of those who communicate aggressively or in a manipulating manner decreases. People with children manifest in a higher percentage behaviors validated by society, being less manipulating and aggressive.

The personal values of engineers are the following:

- Engineers primarily exhibit a practical, organizational and goal-oriented spirit. The spirit of self-realization, variety and decision-making has minimal values.
- The organizational spirit of the individual increases once getting married, but the decisional spirit decreases.
- Engineers show a practical, materialistic and pragmatic spirit, with immediate and economically advantageous utility. They tend to take care of possessions, do what is profitable and attract the maximum profit for their own interest. They are well organized in their work, they keep everything in their place, they are ordered, they systematically approach the tasks, they do everything in their own time. They prefer pre-planned and routine activities. They have a purpose to aim for, they do not give up on the problem until it has been resolved. They focus their efforts on clear and definite objectives, knowing precisely the direction to be taken. They prefer positions with clearly defined and specified requirements and objectives. They tend to focus on the task and limit the field of activity according to the goal to be achieved. Other features: addiction, vigilance, anxiety, authoritarianism, dogmatism, Machiavellianism, obedience, economic orientation, conformism, circumspection, responsibility, bureaucratic orientation, self-discipline, self-assertion, non-affirmation.
- It is noted that in the questionnaire on personal values, the image of engineers approaches the perception of society regarding the rigor of the job. It may be that in this questionnaire, unlike the questionnaire on communication, the respondents could not have anticipated the “correct” answers, validated by the society, which would put them in a favorable light.

The conclusions of the experiment are the following:

- The ergonomic design of the work environment, based on the psychological and behavioral profile of engineers, increases the employees’ well-being, leading to better productivity.
- The Nash Equilibrium in Game Theory offers the solution to increase employees’ productivity with minimal investment from the organization.

- Migration to new equilibrium points by employees and managers leads to higher equilibrium points that combat the fear of change and imbalance of the people involved.
- Syntality of the working group can be scientifically explained, based on psychic entropy and enantiodromia.

Chapter 15, “Synthesis of own contributions and future research directions”, consists of three sections that synthesize the essence of the paper.

Following studies presented in the PhD thesis, the following original contributions are **considered relevant**:

- Making a picture of the psychological and behavioral profile of engineers;
- Structuring the results obtained from synthetic research in order to be used by organizations in which engineers work;
- Providing solutions for:
 - arranging the working space with minimal investment;
 - increasing the well-being of employees;
 - increasing employee productivity;
- Shaping a preferred managerial style of engineers based on their personal style of communication, their values and their own vision of management and leadership;
- Positioning engineers in relation to other socio-professional categories, which can take them out of the shadow cone in which they are socially perceived;
- Experimental demonstration of the correlation between employee well-being and productivity;
- Applying the data obtained during the social investigation in the experiment with directly observable and measurable effects;
- Mathematical modeling, with the help of Game Theory, of the possibility of creating new Nash equilibriums at the organizational level, with benefits for both employees and the organization;
- Characterization of a working team from the mathematical perspective of the state of well-being and productivity;
- Description of group syntality, based on the phenomenon of psychic entropy, following statistical calculations;

- Identifying, with the help of Game Theory, the phenomenon of enantiodromia in the work team.

Practical application of the research results

Some parts of the paper were the basis for the elaboration of scientific papers, which were presented at national and international conferences. The papers have been published in journals classified as ISI, or in BDI international databases.

As far as the applicability of the results is concerned, they will be disseminated among organizations interested in increasing employees' productivity and willing to assume the role of emotionally intelligent, lifelong learning organizations.

The results of the research, which, as we can see, are ample and with multiple possibilities of approach and interpretation, will continue to be published in specialized journals.

Future research directions

The psychological and behavioral profile of engineers contributes to the development of studies in the field of psychology and ergonomics in order to complete the specialized literature.

It would be ideal to extend research at European level to compare the psychological profile of engineers in Romania with those of engineers in Europe.

As a future research direction, it is recommended, for the statistical validation of the results obtained in the thesis, that the experiment be applied to a sufficiently large statistical group (1000 people). If the experiment is resumed on a smaller group of people, about 50, a prognosis can be made that the results will be identical by multiplying to another scale.

A possible direction of research would be to measure well-being more accurately on emotional reactions at work, but there are psychological limits to this approach.

It is advisable to invest in improving the workspace in order to increase the employees' well-being, especially during break times.

Depending on the interests of the employers, a guide can be developed that includes the psychological and behavioral profile of engineers, methods and means of approaching them at the moment of employment and at the workplace.

4.4. CONCLUSIONS

As a synthesis of the elements mentioned in the concluding chapter, it is found that the theme is of high importance and topicality, it is original by the idea, approach, methodology, being one of the first scientific approaches in the field. This complex scientific approach has unequivocally demonstrated the important role of employee knowledge in an organization in order to increase productivity in general and the undeniable value of employees' well-being in creating a higher-level balance in the organization, in particular, thus contributing to the development of the perception of ergonomics and management.

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