

INNOVATIONAL CULTURE THROUGH PERFORMANCE AND INVENTICS SCHOOL FROM IAȘI

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Abstract: *In a competitive system the value of human actions evolves continuously as manufacturers are restless to bring new products on the market. In this context is required a new instrument based on methodology, and in the same time technical and economical as well, which will allow to guide the all process to the optimal solution. More than that, it is necessary to define a strategy and a new line of thoughts for the analysts to follow up throughout the entire life-cycle of the product. In this action, the "oxygen" of creative designing is functional analysis and application of the methods of inventics. For the training of an inventor first is necessary a new scientific discipline namely the Iași school INVENTICS. From the experimental data gathered over more than 30 years, it was demonstrated that it is possible to develop a pedagogy of creativity for every level of education and that no matter how mysterious are the connections between the continues and the sub continues, between one's intellectual and emotional sides, based on which the personality of the inventor is structured, the basic personality traits that encourage invention can be developed by education, by an engineering of technical creativity.*

Key words: *innovational culture, performance, inventics school.*

1. INTRODUCTION

It is question less that the historical existence of the human being relies directly on the ability to turn knowledge into creation.

Such a point of view allowed Pierre Janet to state that social life is subject to two fundamental laws: the law of invention and the law of preservation on one hand and the law of creation and repetition on the other.

Submitting to these laws in the process of adaptation, cohabitation and survival man began to understand that he has a potential too great to waste. "To have ideas and waste them is indecent" notes Mircea Malița.

As such, to avoid similar "indecencies", the education and stimulation of the creative resources of all the members of the human community is a prime objective.

In a competitive system the value of human actions evolves continuously as manufacturers are restless to bring new products on the market.

They can be outdated by better projects, new materials and effective technologies. A good performance of the product is assured by programmed action, innovation based on patents, know-how and protected by products of industrial estate.

It is necessary to continuously research costliness, by rethinking objects, reassessing materials, introducing new technologies and creating new products that match some innovative requests.

In this context is required a new instrument based on methodology, and in the same time technical and economical as well, which will allow to guide the all process to the optimal solution. More than that, it is necessary to define a strategy and a new line of thoughts for the analysts to follow up throughout the entire life-cycle of the product.

Creative designing along with costliness engineering fulfils this objective by systematic and conceptual way of action, maximizing the ration between the functional value of a product and its cost.

In this action, the "oxygen" of creative designing is functional analysis and application of the methods of inventics.

Costliness engineering also contributes essentially to this intercession by being a method of organizing engineering and economical activity which is based on techniques and procedures that ensure a rise in creative performance and effectiveness of the operators in this activity.

The objectives and problems of creative engineering may be:

- rising the performances and quality of products and their ability to compete;
- reducing fabrication costs;
- reducing the amount of material, energy and workload;
- predicting accurately the development of technology;
- rising production rate without significant and important investments;
- finding solutions for technological strangulations;
- replacement of unusual materials and supplement subassemblies;
- detecting, reducing and removing wastrels;
- improving the ecological indicators of production.

According to theory any object has reserves to improve his resources.

- dissonance between the objet specifications and his functional and necessary indicators in the real working conditions;
- ineffective use of science and technical information;

- insufficient information of the operators on new constructive solutions, on utility of materials, on prices and deficits;
- technical conservatism of the specialists;
- not enough cooperation between specialists who are specialized in narrow fields.

Even by triggering the perfecting mechanisms, after some time, as a result of new technical and scientific developments (discoveries, inventions, new materials, technologies, administrative methods) the product becomes obsolete and more improvement actions becomes necessary.

Innovation becomes vital if confronted with fierce competition that cannot be surpassed only by creating super products, an objective impossible to reach without the increase of the technical creation activity. "Innovate to survive" is a concept launched in 1980 by the president of French National Council of Patronage. "Those who miss technological corners are bound to vanish or to become peripheral". Under these circumstances, innovation is no longer an academic debate or luxury, but a battle for survival.

In the drawing in Fig. 1 the industrial-economical curve of Kondratiev, drawn in 1925 is represented. It that shows the periodicity of the economic crises, that occur once every 50 years, and the innovational curve drawn by the Japanese researcher Tosio, for emergence from crisis.

Indeed Tosio found that where the Kondratiev line shows minimums, representing economical depressions, the innovational curve shows maximums, a fact that is explainable: under the pressure of a crisis man uses all his creative possibilities to overcome it.

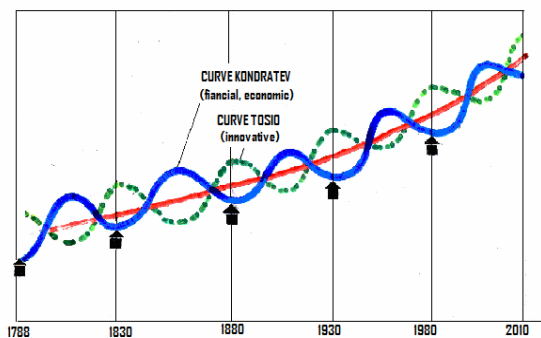
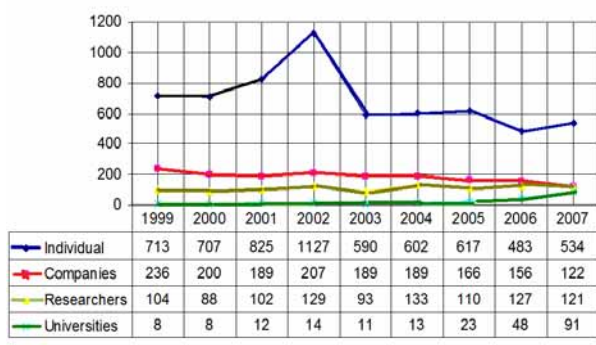


Fig. 1. Curve of Kondratiev.

Table 1
The number of patent applications at national level, during 1999-2007



But intensifying the creative processes is determined by a second group of convincing arguments: the rapid growth of the complexity of technical systems and implicitly the number of the problems that need to be solved by creative constructors.

An invention brings along progress, but more important to the society is the education of the inventor.

An invention is only a product, while an inventor is the mean to produce it, capable to increase the number of products and their quality.

A complete engineer is characterized by four fundamental attributes:

- know the technique,
- apply the technique,
- operate with technique,
- create technique.

The traditional academic technical education (still practiced in many places today), focuses on forming an engineer that meets the first three characteristics, the creative side being played down as an activity that should happen spontaneous. The structure of the academic courses often creates inertia and psychological jams to creative thinking.

For Romania the integration on the European Union cannot be done only by raising the human activities to those of the advanced European structures, but from the specific Romanian contributions, in areas that they have an advanced place in the world (Table 1).

One of these areas is INVENTICS. For the training of an inventor in the first way is necessary a new scientific discipline named by the Iasi school INVENTICS which is name given by the well known French specialist in communicatorics, engineer and mathematician Arnold Kaufman, *L'inventique*.

The Romanian concept of inventics is the polyvalent since and art of the optimal way, a result of the creative synthesis, logistics and algorithms of the heuristic ways, established like a praxiologies of the entire way from:

- finding the domain of the creation;
- finding the lacks of the actual level of the techniques, defining of the product performances;
- discover the solution that assures performances, till the industrial implementation of the original solution.

The development of such a science – INVENTICS – began in Romania in 1967, when in Iași a team of scientists, academic professors, organized the first post academic courses of technical creation.

An independent system emerged of the processes of invention, forming as a collective under the famous academic professor Vitalie Belusov: The Invention School of Iași.

2. THE INVENTION SCHOOL OF IAȘI

- based on the analytical study of the factors in creativity;
- from the positive results obtained through methods of stimulation of the creative capacity;
- from the experimental data gathered over more than 30 years, has demonstrated that it is possible to develop a pedagogy of creativity on every step of education and that no matter how mysterious are the connections between the continues and the sub con-

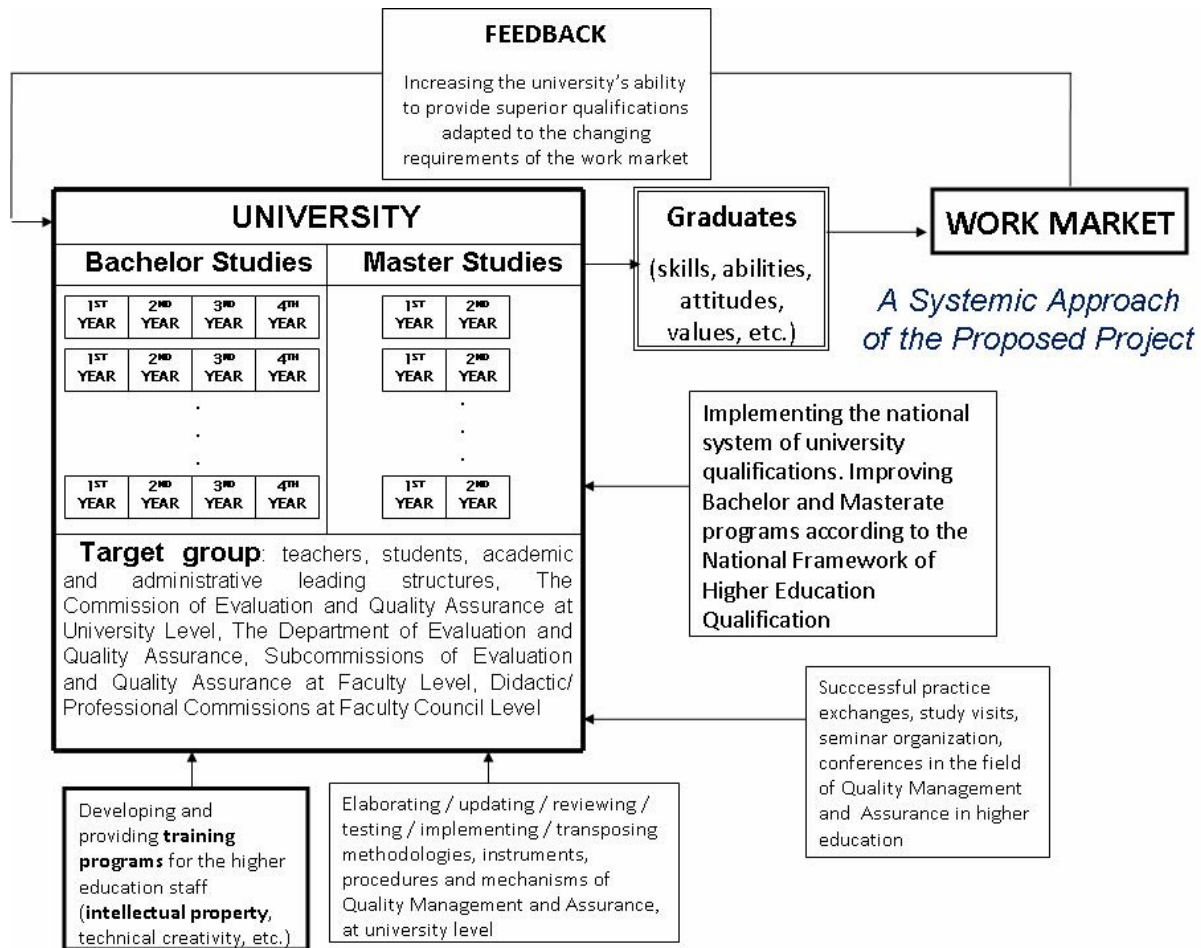


Fig. 2. Industrial property promotion in the strategic plans of the university and future objectives.

- tinues, between one's intellectual and emotional sides, based on witch the personality of the inventor is structured, the basic personality traits that encourage invention can be developed by education, by an engineering of technical creativity (Fig. 2).

3. STUDY PROGRAMS AND STRATEGIES

There are two ways to increase the creative training of the students: either through introducing a special creativity object, or through complete conversion of the way to teach of almost lectures.

The basic role in preparing the engineers for creation must lie in the academic teaching both by converting the specific lessons in a creative way or by introducing courses of technical creation or creative design.

This goal was achieved by "Gheorghe Asachi" Technical University in 1981 and has spread to other universities in the country.

In order to increase IP importance and to improve creativity culture inside the university, a human resource development program proposed an objective which could meet these requirements.

Over the years there were many post academic courses in invention that were completed by over 2100 engineers, high school teachers in witch theoretical and practical knowledge was spread.

The actions and achievements of the invention school represented the support for the birth in 1992 of the National Inventics Institute of Iasi.

Developing the strategy of research in invention, developing the logical foundations of creation by algorithmize the heuristics, developing procedures, techniques and logical methods of creation, the Institute is involved in an intense activity to train new inventors.

In over 19 years of activity, the National Inventics Institute of Iasi promoted, in countless occasions actions to support the presentation of one's own scientific results and offered adequate space for the cooperation of specialists in invention, technical creativity and innovation.

As a result of these initiatives new strategies for research were developed, collaborations, programs were launched in new fields of work.

In 1999 the Technical University Gheorghe Assachi, Faculty of Machinery Construction start the master courses Creativity and Technical Performance.

4. EDUCATIONAL STRATEGIES IN INNOVATION. INNOVATIONAL CULTURE AND THE NATIONAL INVENTICS INSTITUTE

Based on the entire construction developed by us in inventics and the systematical approach to the complexity of forming such an innovational environment, allows us to point out that the solution to this problem is a string of projects of content and management:

- Determining the place of innovative culture in general culture, it's influence on crucial areas of human activity (economy, law, leadership, education, politics).

- Creation for the solutions to previous problems, the informational and instructive system which will be applied in the educational system.
- Developing a set of recommendations to governmental institutions, popular structures with the purpose of promoting innovational culture.
- Rising the level of innovational culture as a factor of evolution.

The process of innovational development has two main components:

- realization of innovational projects,
- development of the innovative potential.

In our opinion, the essence of this stage is illustrated in the concept of "innovational development". The justice of the approach requests precision, in the assembly which assess the essence and the mechanisms of the innovational development.

The novelty itself, even scientific, by the technical-scientific development, in inventions became a innovative product under the way of product, service, method.

As such, an innovational cycle begins in the first step of scientific research, of conception, design and construction. The results obtained create that fertile space on which the innovational activity begins both in real economy as in other domains. Innovational development has to bear a complex character as we understand it primordially as a chain of novelty. It has a greater success when it not only comprises of a small domain but multiple areas that influence the final result (leadership, marketing, instruction, finances, etc.)

The relation between *quality culture*, *IP culture* and *creativity culture* is shown in Fig.3.

The idea can be potentially innovative when there is the certainty that, by crossing the scientific - technical stage and through the innovative cycles, will materialize in an innovative product.

Any innovational development is not only an innovative process but the creation of a system of factors and conditions, necessary for its completion – so a innovational potential.

The absence of any landmarks regarding the innovative-inventive instruction of the members of the companies and institutions of scientific research makes impossible the innovative activity.

To this we add the construction of a system, a problem that is crucial for the entire innovational activity: the promotion of the industrial property protection.

From here, the concrete problem arises: the measurement of the entry parameters of the second component – the innovative potential and establishing its place in the general potential of the company, school or leadership department.

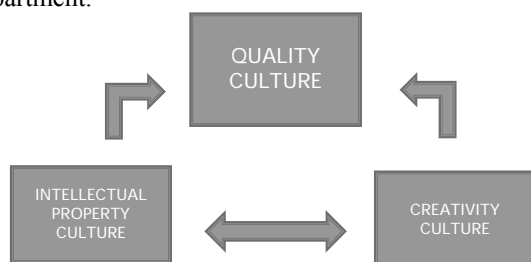


Fig. 3. Relation between quality, IP, and creativity culture.

4. THE SYNERGIC ACADEMIC SPACE, TECHNICAL UNIVERSITY – NATIONAL INVENTICS INSTITUTE – REGIONAL CENTER FOR PROMOTING THE INDUSTRIAL PROPRIETY IAȘI

All this has created the premises for birth in this area in 2001 through an agreement with the National Office of Inventions Iasi became a part of Romanian Patlib Network.

In this crucible of the University, The National Inventics Institute and the Regional Center, young inventors, through their creative activity, become the catalyst of novelty in the university and then in the industrial space that they work in. The decision to introduce in the teaching plans of the "Gheorghe Asachi" University the course of "the basis of technical creation" lead to the substantial growth in the number of propositions for inventions registered at the National Office for Inventions and Trademarks. Year by year the invention school from Iasi realizes an important production of student inventors. The technical university Gheorghe Asachi of Iași realizes one of the greatest densities of recorded inventions if the country.

Participation together to all those are concerned in all phases of the transfer from the idea into industrial product in these consortia: University – National Inventics Institute – Regional Center assures the synergic space for grooving the quality of inventive act (Fig. 4).

Zone A – the interaction between the individual and the university institutions or invention institute matches the engineering domain of creativity.

Zone B – of interference between the individual and the subsystem regional centre, this contributes to through the creative potential and expert knowledge of industrial property.

Zone C – between the teaching institution and the regional centre means efficient organizing and the capacity to utilize effective development strategies.

Zone D – integrates the sum of the subsystems and can be considered a zone of maximum creative efficiency, a "transcreativity". An effective strategy in developing systems has to amplify this zone in order to mace the whole act of invention effective.

In this synergic system it is necessary to establish the concrete content of each factor and develop typical organizational patterns, to create an environment in which innovational potential to form, taking into consideration the characteristics of the region we work in.

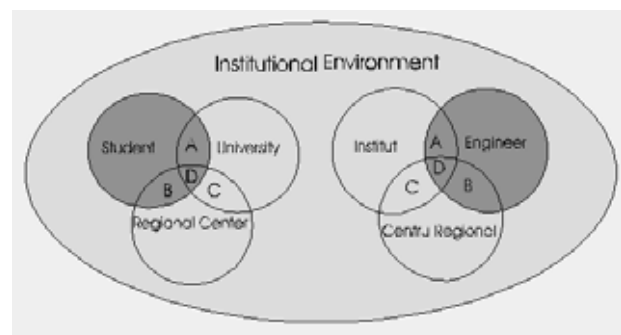


Fig. 4. Interaction between participants in consortia.

Table 2

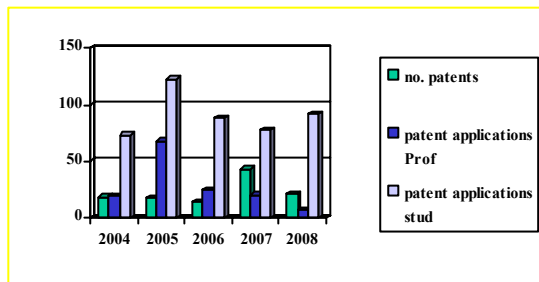


Fig. 5. Evolution of the number of patent request by the students.

This is about, for example, the solution to the structure and organization of the activity of analyzing and patenting

Given the important role of the innovational factor and the insufficient training of many specialists in the problems of leadership in the innovational world, the basis of the model are to be presented to companies as a real form of support from the national institute of invention.

Understanding exactly where, how, and in what succession should the efforts be directed, will allow uniting in the innovational area the possibilities of the companies and those of the regional institutions. This way the possibility to eradicate routine and use effectively the new achievements, inventions and know-how will present itself. Without large costs we will succeed to mobilize a huge resource, which now is neglected. The strategic resource of the new century is innovation culture.

World experience shows that surpassing innovational stagnation through investment only is not effective. According to the opinion of European experts, written in 1995 in the green book, the state of innovation in the European Union is unsatisfactory. This has a lot to do with companies avoiding the risk and with multiple barriers to creativity: bureaucracy. This way we find that many problems come from other areas beside the financial one.

Still it is obvious that the training and educational resources alone won't be enough. To radically change the situation it is necessary that the state supports the politics and initiatives in innovation culture there is an unlimited are for the innovational culture to manifest: from creating conditions for the creative potential in the interest of the society to ensuring a balanced process to reform it.

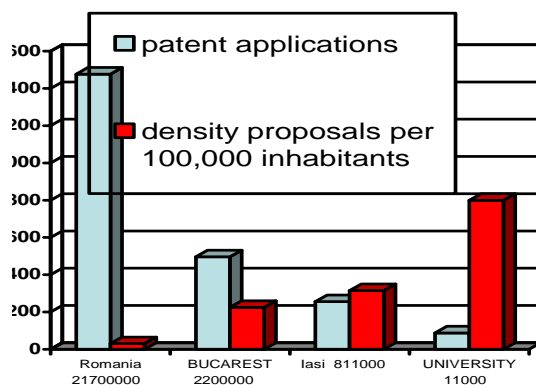


Fig. 6. Density patent applications per 100 000 inhabitants.

Patents obtained by Romanian universities during 1999-2007

No.	Titular	Total no. of Patents
1.	"GH. ASACHI" TECHNICAL UNIVERSITY	70
2.	"LUCIAN BLAGA" UNIVERSITY	11
3.	UNIVERSITY OF ORADEA	10
4.	TECHNICAL UNIVERSITY OF CLUJ-NAPOCA	10
5.	TECHNICAL UNIVERSITY OF BUCUREȘTI – RESEARCH CENTER FOR TECHNOLOGIES AND INDUSTRIAL EQUIPMENT	8
6.	UNIVERSITY OF CRAIOVA	7
7.	"DUNĂREA DE JOS" UNIVERSITY OF GALAȚI	5
8.	"ATENEUL ROMÂN" SOCIETY – ECOLOGICAL UNIVERSITY	4
9.	"ALEXANDRU IOAN CUZA" UNIVERSITY	3
10.	"GEORGE BACOVIA" UNIVERSITY	3
11.	OIL-GAS UNIVERSITY OF PLOIEȘTI	2
12.	TECHNICAL UNIVERSITY OF TIMIȘOARA – THE DEPARTMENT OF PROTOTYPES AND MICROPRODUCTION	2
13.	UNIVERSITY OF BUCUREȘTI	2
14.	"BABEȘ BOLYAI" UNIVERSITY	2
15.	"GRIGORE T. POPA" MEDICAL AND PHARMACEUTICAL UNIVERSITY	1
	Total	140

And the results in this collective effort are obvious as results from those two histograms of the evolution of the number of patent request by the students of the Technical University "Gheorghe Assachi" of Iași the density of patent requests at 100 thousands peoples in a comparative analyses, Romania in assembly Bucharest – Iași – University.

We add to this approach the scientific manifestations organized by the Institute for capitalization of the research results, national and international forums, which highlight the level of performance and quality of the new products and technologies from all technical domains.

All these must be a real knowledge exchange, experience and results regarding the conception, design and advanced construction of machinery, equipments, technologies and fabrication systems.

In this way is realized a reflection space, evaluation and a good defining at the new concepts of the research, development and realization in the field of engineering in general, offering to the specialists the opportunity of a profitable meetings and ideas exchanges.

A short look over the deployment of creativity and performance shows on that at the beginning of the new millennium we are whitens and in the same time the

actors of a new thinking of the global level. Through those central themes: no sphere – man – techniques.

Are postponed the chances and in the same time the risks involved in this evolution the inventive solutions and the challenge of the future.

5. CONCLUSIONS

1. Innovational culture reflects the general orientation of the individuals, based in knowledge, dexterity and adaptation, motivation and also in the way of conduct.

2. Training innovation culture is linked, above all, the development of creative ability and creative potential of individual achievement

3. With a highly innovative culture of the society by force of the inter-correlations and interdependence of its parts, one of the components attracts a quick change to another.

4. In the conditions of a modest innovational rate it is necessary a strong management and legal impulse for the self-regulatory mechanisms to operate, development in an organized process, governed by a determined dependency structure, rules of conduct, responsibilities of the participants.

5. It sunken theoretical assumptions on innovative culture, his scientific components highlighting the favored and restraining factors of innovation culture.

6. An important role here can be play by the world, regional international inventions Salons.

7. Setting the future is in our minds and hands, and in this world, smart ideas must be used as a resource that does not used up.

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