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ASPECTS REGARDING THE POSSIBILITY TO USE "NEURAL NETWORKS" IN THE SELECTION OF THE "R & D" STRATEGY IN THE "NONCONVENTIONAL TECHNOLOGIES" FIELD

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Abstract: *The paper referes to the possibility of using neural networks in selecting the "Research-Development" strategy, in the nonconventional technologies field. It presents a selection and the main key elements of the Research and Development (R & D) strategies, applicable in the nonconventional technologies (NT) field and, thus, the specific analytical elements of such a methodology. It also refers to the possibility of using neural networks ("NN") up to the level of taking managerial decisions regarding the manufacturing processes. Research Objectives: Defining components from the neuron 's structure into the organizational systems, in order to select ptime strategies for the organizational management. Expected Results: Transposing the entire methodology in a software.*

Key words: artificial network, neural network, artificial intelligence, management, research-development

1. Introduction

In the nonconventional technologies field the studies and the research are limited, you can not find a clear definition for the terms "neural network" and "neuronal network". Thus, there are few who know the difference between them: the neural network is related to a technical system, while the neuronal network refers to a biological system, the neuron.

A selection and the main items of the R-D strategies applicable in the nonconventional technologies field are being presented and also the specific elements to analyse such a methodology, together with the possibility of using "NN" up to the managerial decisions level towards the manufacturing processes.

The three parts that form the neuron (Figure 1) are: *cell body*, *dendrites and axon*[1].

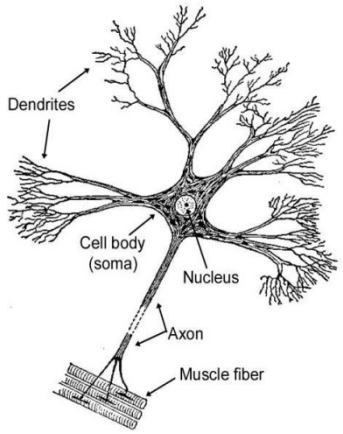


Figure 1. The parts of the neuron

Source: (Dzitac, I.- Artificial Inteligence, Aurel Vlaicu University Publisher, Arad, 2008)

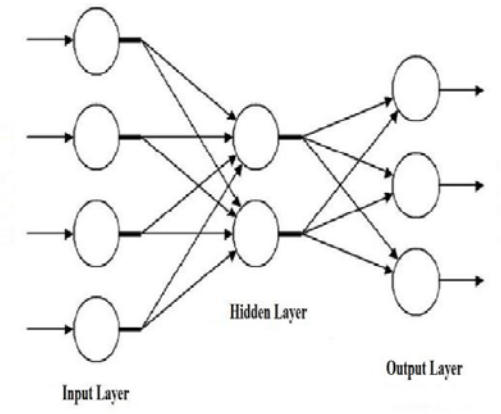


Figure 2. Artificial Neural Networks

Source: (Dzitac, I.- Artificial Inteligence, Aurel Vlaicu University Publisher, Arad, 2008)

The artificial neuron (Figure 2) [1], represents a simplified copy of the biological neuron. It is the basic structural and functional element of the distributed information processing systems that mimic the operation of a biological neuron, with strong connectivity properties. [2]

It is composed of a body, a set of *n* inputs and one *y* output. The *x* inputs are signals coming from other neurons or from the outside world and are represened through real numbers *x1, x2, ..., xn.*[1]

In 1959 appeared the first practical application, the perceptron. It was performed by Frank Rosenblatt and used for character recognition [3].

2. Select options for Research and Development Strategy (R&D) in the "Nonconventional Technologies (NT)" field

In practice it is quite difficult to reach a clearly defined R&D strategy in the NT field; it is determined by a continuous process of evaluation and analysis of interdependencies between these factors: organizational strategy, environmental conditions, the organization's potential and the R&D papers' portfolio in the "NT" field.

The main starting point of the management impact moments is the important area of the scientific research, where the management action directions are explained by the considered types of strategies:

a. the offensive strategies, characterized by high risk, high compensation potential in terms of financial results obtained as a result of assuming a risk, high potential in technological innovation, competence to analyze the market and of realizing commercial products;

b. defensive strategies, characterized by low-risk and low compensation potential, are suitable for those industrial organizations able to make a profit in conditions of strong competition, through the ability of controlling some of the market;

c. acquiring strategies (purchase of licenses) at which two aspects can be considered:

- purchase of licenses;
- patenting some of its major innovations: represents a support strategy for small companies and a convenient strategy for large companies;

d. interstitial strategies, which have as main condition for applying the knowledge of the strengths and weaknesses of competitors;

e. "incorrect" strategies: the application of new technologies in the industrial organization has great experience in developing new products whose market is owned by other companies.

The main factors to be taken into account in formulating the R&D strategy in the "NT" are:

1. Technological prognosis on the environment in connection with the managerial strategy of the industrial organization treated in the strategic planning;

2. The risk-compensation relationship: R&D should consider the risks arising both in addressing the entire set of "NT" projects and individual projects. Inherent risk occurs in the global approache of the "NT" problematic and is divided into the projects' crowd at a certain level.

The analysis techniques of the risk allow, in the "NT" field, the comparison of the preliminary compensations, in the case of some alternative projects, in the following way (Figure 3):

- Project A: Low risk and low profit, so the value of the compensation has a small level.
- Project B: High risk, high return, the compensation has a high level.

After analyzing the risk, it results that the large industrial organization, able to relate risk to a large number of R&D projects, can favour an offensive strategy, while a small company, because of the fact that it performs a limited number of projects, should focus, at first glance, towards a defensive strategy.

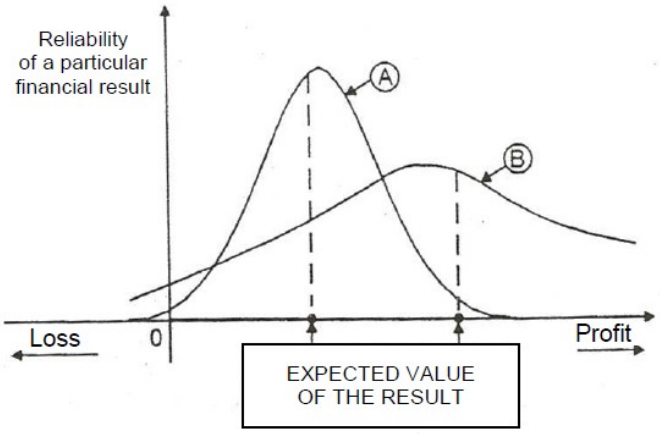
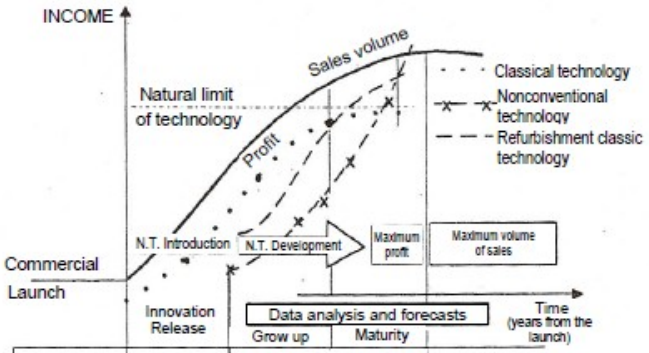


Fig.3. Risk analysis

1. The industrial development cycle shows the same type of evolution as the products. The correlation of the four factors with the product life cycle, takes place, life cycle explained by profit and sales volume (Figure 4) [4].



Industrial Life Cycle	**Phase I** - rapid growth - reduced competition	**Phase II** - market growth - increasing competition	**Phase III** - minimal increase - strong competition
Strategy Type	The accent over R-D strategy in the nonconventional technologies field		
OFFENSIVE - new products - new technology	High	Medium	Reduced
DEFENSIVE - product improvement	Reduced	High	Medium
- technology improvement	Reduced	Medium	High

Fig.4 The industrial development cycle

Source: (Marinescu R.,D., s.a.- Unconventional Technologies' Management, Editura Economica, 1995)

Subsequently, the management decision (Figure 5) [4] can have two contradictory reactions:

- the decision to transfer the R&D effort fast, in the "NT" field and reducing the attempts to bring the classical technology closer to the upper limit of the performance;
- the decision to invest the bulk of capital in the existing technology.

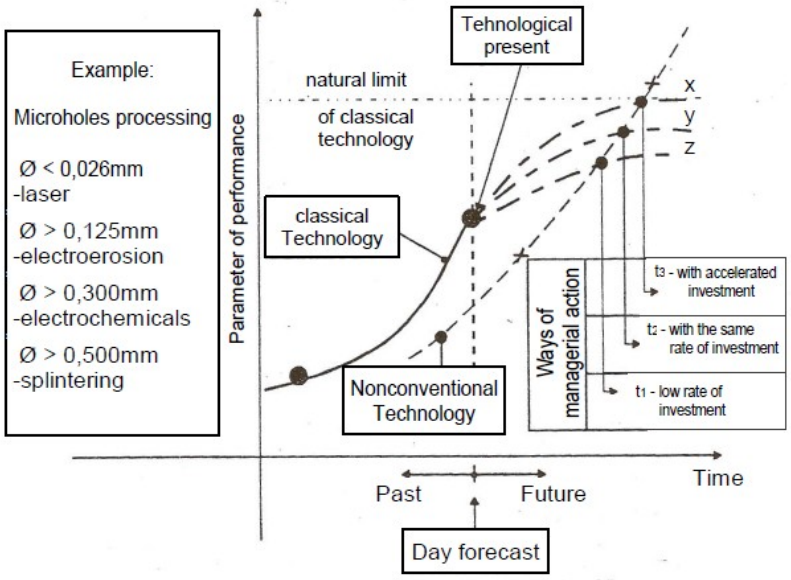


Fig.5 Establishing the management decision

Source: (Marinescu R.,D., s.a.- Unconventional Technologies' Management, Editura Economica, 1995)

According to Figure 6, the evolution of the life cycle of a particular nonconventional technology results as a synthesis of the life cycles of the components. They evolve by the same law, but there is a certain hierarchy, according to their share when developing this technology.

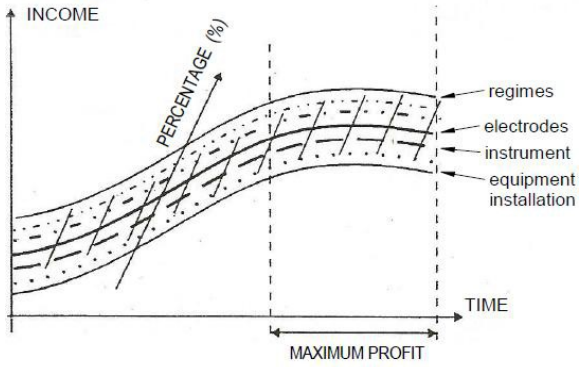


Fig.6 The evolution of the lifecycle of a nonconventional technology

For small companies (Figure 5) specialized either in production or in R&D in this area, with a limited material base, it is considered that the design and the construction of the related tools and the used operating modes, have the decisive influence over the technologie's rentability, while for the large, specialized, companies, the ranking may be different.

In these circumstances, the companies must predict the evolutionary way of the commercial launch's lifecycle of a technology, for establishing the moment of action in order to enhance, so that it withstands the competitive market.

This prediction consists in determining the nodal point in achieving the maximum corresponding to components for determining the timing of action on each one (Figure7a) Considering that the four action courses over the "nonconventional" product's life cycle are being reduced to two main directions: I-conceptual direction (embedding specialized facilities and equipment); II- user direction (embedding processing tools and schemes), the analysis of the life cycle curve highlights both the preponderance of the first and creating the premises of any local or general monopoly (Figure 7b).

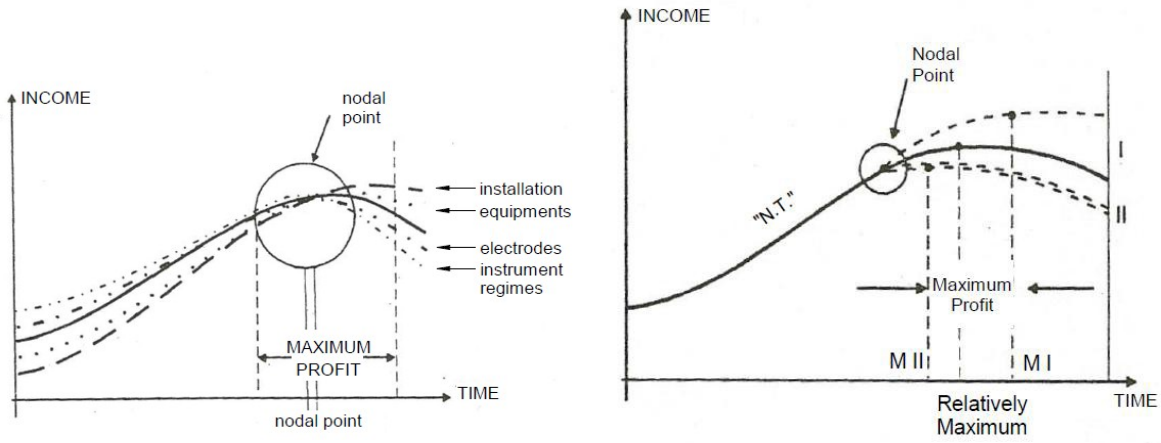


Fig.7.a,b Determination of nodal point

It is noted that the maximum profit is achieved in two limited by maximum (MII me), corresponding to the two directions.

Determining when nodal point can be achieved depending on the specifics of each companies, correlated with its involvement in the two strands, given the inherent difference between the two absolute maximum (Figure 7c, d).

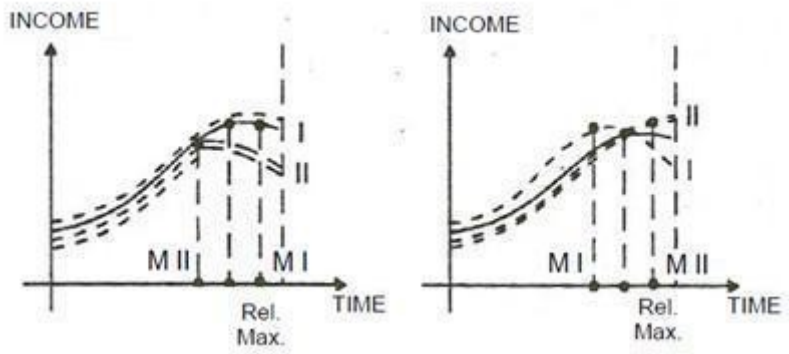


Fig.7 c,d Determination of nodal point

Finally, the correct analysis of the life cycle of the unconventional technology allows the establish of the optimal strategy for the company, for extending the profit period, and in the conditions of the analysis of some similar competitive products of the directions of action, in order to maintain and extend the marketplace with its own products.

In the presented context, "NN" may be particularly useful in forecasting the future strategy of joining the network (indications) and the corresponding outputs (proposed strategy) being highlighted in the table (matrix) 1 and Figure 8.

Table 1

Analysis indicators for the selection of the strategical variant using the "NN"

Strategy / Indicator	Offensive	Defensive	Absorbance	Interstitial - D -	Incorrect
a. risk	high	low	low	medium	low
b. compensation potential regarding financial result	high	low	high	low	medium
c. potential in technological innovation	high	medium	high	medium	medium
d. the competence to analyze the market	high	high	high	high	high
e. the competence to concrete commercialize the products	high	high	high	medium	medium
Note: Each indicator will receive a score between 0 and 1, the allocated share being established by the					

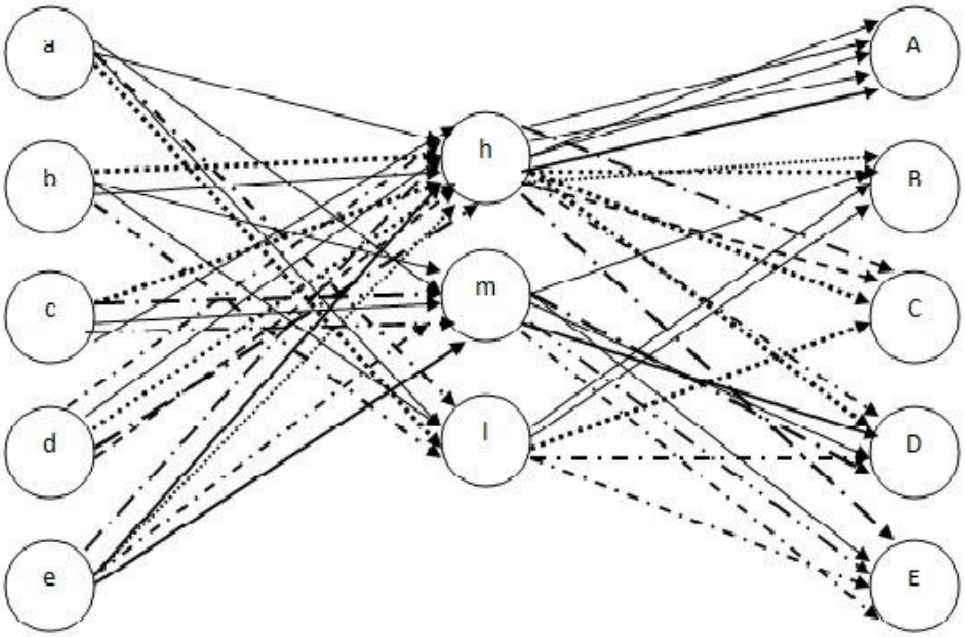


Fig.8 The neural network for establishing the strategy

3. Conclusions

Through similarly with the possibility of using the "NN" in selecting the strategy of a company specialized in "NN", the application can expand -in accordance with the "product's life cycle" (as shown) and on the nonconventional technology- considered as product- described through the four features: plant, specialized equipment, tools, operating modes.

Using "NN" - in taking managerial decisions in a comercial company – is being constituted in a provisional method, useful to the top management in order to ensure the maintenance and development of the company on the competitive market.

The paper briefly presents how to use the "NN" in the decision making process of establishing a future R&D strategy of a company specialized in NT, as well as the possibility of applying the method even up to the technological processes.

In conclusion, it follows that the success and development of any industrial organization, that in the market economic system aims at designing, implementing and developing the "NT", means the adoption of appropriate R&D strategies in all of the manifestation directions of the enterprise's functions.

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