

TECHNICAL-ECONOMICAL COMPETITIVENESS OF FOOD INDUSTRY

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ABSTRACT

In the literature, different definitions of competitiveness exist. The EU Commission (2003) uses as a definition of competitiveness: the ability of an economy to provide its population with high and rising standards of living and a high level of employment for all those willing to work, on a sustainable basis. Another definition which is more focused on the manufacturing (Lall, 2001) sectors states: competitiveness in industrial activities means developing relative efficiency along with sustainable growth. According to Canada's Agri-Food competitiveness Task Force competitiveness is defined as: the sustained ability to profitably gain and maintain market share (Martin, Westgren & van Duren, 1991; Fischer and Schornberg, 2007).

At the firm level, the view of competitiveness can be given as (Buckley, et al., 1988): A firm is competitive if it can produce products and services of superior quality and lower costs than its domestic and international competitors.

This paper presents a new approach of technical-economical competitiveness for food industry, and a new type of competitive management of them, so that their technical-economical performance be maximized.

KEYWORDS: competitive control, information technology, knowledge management, marketing knowledge.

1. INTRODUCTION

On world wide plan, enterprises are confronted with a more and more accelerated dynamics and unpredictable changes. This is influenced by the technical and scientific progress, dynamic requirements of the customers, science of management and mathematical economy. These changes enforce an aggressive competition at the global scale that assumes the request of a new settlement equilibrium between economy, technology and society.

This paper presents a new approach of technical-economical competitiveness for processing food, and a new type of competitive management of it, so that its technical-economical performance be maximized. The competitiveness is defined by the economical factors and indicators obtained. We can say that

by competitiveness of food enterprises we understand the capacity (the potential) of enterprise operated comparative performance with other food enterprises in the punctual mod context macro economical concrete to a given moment. The performance is the measure in which the enterprise meets the aim for which it is created. In this moment the algorithm for technical-economical competitiveness evaluation is not defined and, more over the technical factors are not taken into account, also consumptions and expenses caused by the technological processes are generated by the technical actions. In this context, the notion competitiveness has new valences, because it assembles the factors and politics which determine the enterprise capacity to occupy a favourable place on market, to keep that place and to improve the position, unless the competitiveness characterizes synthetically and completely the viability of food enterprise.

The algorithm will be able to materialize

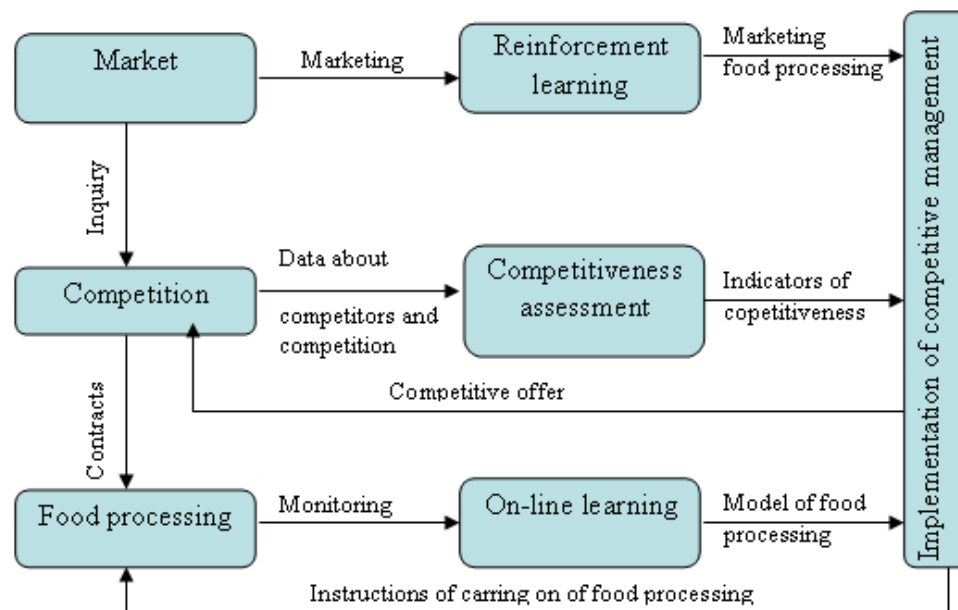


Fig. 1 Competitive Management of food processing

2. COMPETITIVE MANAGEMENT WITH APPLICATION TO FOOD INDUSTRY

The authors of the paper propose a block scheme and on its bases they can elaborate a competitive management algorithm, figure 1.

The food processing enterprise receives contracts after auctions of the market. The competitive management system means the competitiveness evaluation and, on its bases the action on the processing system, through instructions on caring on mode of the food processing to obtain maximum competitiveness.

Watching each line from block scheme (figure 1), we can see the following: the modelling algorithm of the market-processing system relation includes data base from economical environment (auctions), extraction of knowledge through data mining and realisation of the model through reinforcement learning; in order to punctual competitiveness indicators data bases will be constituted from competition environment and will extract knowledge to evaluate competitiveness; the offers from the market enter the competition environment to generate contracts for the processing system; the modelling algorithm of the processing system is realised leaving from the contract specifications and identifying the system.

through relations system between numerical

values of the exogen and endogen factors of the processing system taken over from reality, through the modelling of the system-economical processing environment relation, on one hand, and functional modelling of the processing system, on the other hand. The algorithm is based on the reinforcement learning method and on-line learning. The testing of the elaborated algorithm will be done through the simulations on the virtual food enterprise.

Learning ability is a natural talent in every normal human being through which he/she can adapt himself/herself to the dynamic environments surrounding him/her. It is through learning that human beings arrive at new concepts and insights that guide them to effective decisions for appropriate reactions and immediate correction of mistakes and errors [6]. As part of human nature, the role and impact of learning extend to our business and career and consequently, its quality determines the rate of success in our organizational tasks.

According to Garratt [7], a learning organization is the application of organizational development and learning. Therefore, in order to come to consumers' satisfaction, it is necessary for the organization to develop its personal and group learning abilities. Moreover, organizational learning is considered as a dynamic process based on knowledge, implying moving along the different levels of action,

from the individual to the group levels, and then to the organizational level and back again [8]. As viewed by other studies [9], the authors have discussed and identified knowledge as the antecedent and the bases of organizational learning.

In reinforcement learning the machine interacts with its environment by producing actions a_1, a_2, \dots . These actions affect the state of environment, which in turn results in the machine receiving some scalar rewards r_1, r_2, \dots . The goal of the machine is to learn to act in a way that maximizes the future rewards it receives (or minimizes the punishments) over its lifetime. Reinforcement learning is closely related to the fields of decision theory (in statistics and management science), and control theory (in engineering).

The stages of the algorithm are:

- the determination of the relations of the processing system with economical environment through reinforcement learning;
- the determination of the relations results from functional modelling of the processing system;
- the determination of the system of relations among the groups of endogenous and the exogenous factors of the processing system.

In general, the learning process is an action, which improves the capacity of reaction of the processing system, so that, at subsequent solicitations, it should undertake increase actions with its efficiency. Conception of methodologies of modelling in real-time, based on reinforcement learning, for the relation of the processing system with economical environment, means that the processing system "learns" what to do in certain situations, based on given data from economical environment, so that the undertaken actions should lead to an increased possibility of reaching the suggested aim. The system must "exploit" what it knows that has already obtained profit, but it must at the same time "explore" the possibility of finding other future actions. The processing system must try a variety of actions and then choose the optimal ones.

3. ON-LINE IDENTIFICATION OF TECHNICAL - ECONOMICAL COMPETITIVENESS OF PROCESSING SYSTEM

In a competitive market, the incapacity of the company to quickly and adequately successful request for quotation can influence severely on its capacity to survive

economically. Indeed, an underestimated cost will result in losses while an overestimated cost will prevent the company from remaining competitive. So, there is a strong need expressed by industry to have sound cost estimating solutions, both in terms of design and quotation, that can improve the performance of these strategic functions.

To face this need, and to replace the analytical-based methods commonly used in food processing planning, many companies apply parametric and analogous cost estimation methods. These methods are really fast because they are essentially synthetic; they provide the total cost of the product according to some of its characteristics.

After a detailed study of the cost estimating problem in food engineering, it can be concluded that two support models are required: a knowledge model and a reasoning model.

In food processing, cost estimating is the art of predicting how much it will cost to make a given product or batch of products. Various techniques there are for cost estimating. The processing cost can be estimated using one of four basic methods: intuitive, analogous, parametric and analytical.

This mechanism is characterized by an ability to perceive the economical process environment and make real-time decisions about interactions between the processing system and the economical environment. The behavioral approach is characterized by an ability to perceive the economical environment and make real-time decisions about tasks. The competitive management includes and bases on behavioural modelling and on-line learning, and it is necessary to know at every moment the manufacturing system state, namely the relation between its capacity to function at the optimal performance parameters and economical environment, suddenly, in a given situation.

The answer at this necessity is generated by the mathematic evaluation methodology of the technical-economical competitiveness of processing systems in a given frame. In the concrete case of the manufacturing system, the performance can be evaluated through profit rate P , given by the relation:

$$P = (p - c)q[\text{Euro/hour}] \quad (1)$$

where:

p is the price, c is the cost and q is the productivity. This relation will be analysed in connection with other aspects, such as, investment amount and business efficiency.

For identification of system state relation, it is necessary to establish and

multiply some processing system attributes – productivity, quality, flexibility, saving, predictability both its with external environment attributes - owned market section, the evolution of client requirements dynamics, market price, concurrent systems. Mainly, the methodology of mathematical evaluation and on-line identification of competitiveness will generate solutions for competitiveness measures knowledge, in a concrete mode above explained, and based on on-line learning and will give the management disposal dates and solutions to elaborate the politics which follow to get, to keep and to increase the technical-economical competitiveness level. For the verification of the accuracy and applicability of the concept of competitive management of the processing systems, it is necessity to obtain results on a concrete case. In this sense, it is simulated and modeled a real processing system of a pilot enterprise which works in the real conditions on a real market with values of parameters taken from the economical reality.

4. CONCLUSION

This paper proposes a modern approach about processing system competitiveness because: processing system competitiveness is approached in a new original manner by using investigation modern methods, which take into account all the factors which influence the realisation, keeping and increasing of food industrial enterprise competitiveness; it is proposed a mathematical evaluation methodology of technical-economical competitiveness of processing system; it is proposed a new management concept of processing systems, based on behavioural modelling of ensemble of processing systems-market and management setting at the processing system level, which is applicable to all levels and appropriate for the actual market requirements.

In this context, the competitive management can offer solutions for development and competitive food enterprises. Through this type of management the technical phenomenon is associated with the economical phenomenon.

Increasing competitiveness is not a process of exploiting short-time advantages but it appears as a complex process and constitutes the support of economic structures based on capital investments, on scientific research, development and innovation. It is necessary to put in obvious the correlations among economical average (the market, competition) and the manufacturing system and to study the role which they have in the acquirement and the

increase of enterprise competitiveness. This becomes even more pressing due to the fact that scientific literature includes studies on competitiveness at least to the level of the food enterprise, and studies about process and technology of processing system do not establish a connection between the two entities in the context of technical economical competitiveness.

The paper develops the notion of competitive management of the processing system through behavioral modeling and on-line learning.

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