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USING OF SOME ELEMENTS OF GAME THEORY IN BUSINESS ORGANIZATIONS

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Abstract — **It is proposed a game-theoretic approach to solving problems of strategic development and management of economic activity of the enterprise in a modern market economy. The expediency of using a bimatrix game with a non-zero sum as an economic - mathematical model of decision-making on the management activities of the enterprise is justified.**

Key Terms — **Consumers, game theory, development, management, strategic decisions.**

The importance of game theory in the mathematical modeling of some economic processes of production of individual interspecies has growing up in the last years.

Especially, it is very important in solving and analyzing of lot strategic problem of business development and it is very important in the range of formation of a stable model of successful work in the harsh conditions of today's market.

The relevance of these developments is due to the growing interest in game theory primary as a model for the perception and adjustment of strategic decisions, in conditions of competition and uncertainly of market risks. And first of all itself the game theory based on a mathematical model, which is most often used in the absence of complete information about the object of study, especially in the case of "conflict" situations between two or more opposing parts [2,3].

In addition, the possibility to take into account situations where the interaction of the interest of two sides of the "conflict" is a very important factor in the application of game theory as a mathematical model for solving of a lot of some situations in modern problems of enterprise management [5].

The definition of action of one party to the "conflict" directly depends on the behavior of the other only, and the process of solving such problem usually takes into account the chain interaction of both parts (players), and as result it is necessary to find the optimal lines of behavior of both parties (search for the optimal Paretto strategy) [1].

As a model of example, the formation of production relations was used in any team, where there are always two antagonistic parties "worker-employer" which are both interested in economic growth as a guarantee of their own prosperity, but views and methods achieving such results, strategic decisions on the process of managing the enterprise the formation of production relations, the process of organizing working conditions, incentives for workers and more in general can be diametrically different [4].

The survey also determined that ensuring the organization ability of enterprises under the influence of certain factors on productivity in order to increase it is necessary not only to take into account the interests of groups of domestic consumers, which may not always coincide (workers and management in this case) but also the results obtained.

Thus, the factors on the basic of which the model was built were selected those factors, that are " sustainable" important in the formation of production relations in the system "worker-employer" are constant and do not tend to change rapidly under the influence of any fuller conditions [6]

Given that the situation, in the "worker-employer" model is not antagonistic, and the interest of groups of workers and management are not diametrically opposed, and it is in economic structure (game as a mathematical model cannot be expressed as a zero-sum game,

bimatric game was used for the mathematical model. The solution to such a game as mentioned above is to find a Paretto-optimal strategy.

So, the calculations show the mathematical model in the next terms:

A – matrix of the management's profits,

B – matrix of the workers' profits.

According to it:

A_i – strategy of managements' behavior, and it is looking look like a proposition.

B_j – strategy of workers' behavior, and it is looking look like an agreements.

It was formed two bimatric game on the result s of the surveys, which was based on the asking of 120 employees and 30 employees of management department. These two games describe two situations.

A_1 – the proposition of the management about additional material encouragement of workers. In this way, for stimulation can be used: bonuses and penalties, which can also be applied as follows:

1) bonuses for each employee in the amount of 10%, or bonuses of heads of departments, in the amount 25%, with the possibilities to give bonuses to their workers, but this profit must be not bigger as 10% of increase the markets product від результату збільшення обсягу товарної продукції.

Then B_1 is a strategy of compliance of the employee with the є first proposition of bonus (10% of profit) and accordingly, inconsistency with the second situation. .

The B_2 position is a strategy of agreement with the second proposition of worker (25% bonus for the management and 10% for the workers) and full disagreement with the first strategy.

2) A_2 – management's proposition for system workers fines, which provides for each worker: a fine of 10% of the average cost of defective products of fines or fines of heads of departments in the amount of 20% of the cost of defective products with the possibility to fine workers, however, the amount of the fine shall not be bigger as 15%.

Analogically, B_1 – is the strategy of agreement of worker with strategy number first: to fine each worker in the average of 10%.

The B_2 position is strategy of agreement of worker with the second proposition (25% fine foe a manager and not more than 10% for workers from cost of defective products)

Results of this are two payment matrices:

$$A = \begin{matrix} a_{11} & a_{12} & A_1 \\ a_{21} & a_{22} & A_2 \\ B_1 & B_2 & \end{matrix} \quad \text{and} \quad B = \begin{matrix} b_{11} & b_{12} & A_1 \\ b_{21} & b_{22} & A_2 \\ B_1 & B_2 & \end{matrix}$$

Conclusions. The use of game theory and its mathematical modeling should be used in the economic theory of management decisions, so on the one hand it allows to take into account many dynamic indicators of the market system and on the other hand provides accurate mathematical calculations and obtain specific economically sound results.

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