THE DEFINITION OF THE ENTERPRISE’S EFFICIENCY UNDER CONDITION OF UNCERTAINTY USING GESTALTS SYSTEM

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Abstract: The article shows the process of creating a enterprise’s gestalt system for decision-making under uncertainty. The gestalt system is a model that relies on the analysis of the internal and external environment of the enterprise. Practical calculations are made on the basis of Tsurupinsk Ltd. The final phase of the system as a gestalt model for decision making under uncertainty is described. The complete cycle of operation of gestalt system is showed. The practical calculations within the system with the output node and integral values have been done. The application of gestalts system of enterprises under uncertainty is justified.

Keywords: enterprise efficiency, uncertainty condition, gestalt system, decision-making.

Introduction

The current state of the market economy is characterized by the constant change of conditions of the economic environment of the country with its dynamic processes and the lack of quality information. Under such circumstances decisions are made under conditions of uncertainty. Therefore it is actual problem to develop algorithms of making decisions under uncertainty. The objective of the algorithms is: based on integrated modelling to create a system that, based on mathematical calculations, will provide high quality information for the practical application of economic subjects.

We propose to use the notion of Gestalt in the context of economic processes, namely the formation of indicators and management solutions with considering expectations. On the one hand gestalt is a psychological vision (image) of manager of the current situation, the desired state, gap and measures for its elimination. A human, based on its psychological characteristics, all phenomena around interprets in certain images of different quality depending on the input data from which they are formed.

On the other hand, the gestalt is certain economic indicators of the system different levels. We know the value of quality which they calculate, and can interpret that into integral image (bad value, satisfactory or good). If indicators interpret phenomena and processes of reality in a certain mathematical value, we can consider their multidimensionality according to the multidimensionality of processes that they reflect. Considering that who interprets information (a human), we, based on his features, can combine the first psychological gestalt importance with its economic phenomenon (multidimensionality).

As a result, economic category gestalt can be represented as a combination of relatively objective image that is implemented as single or group index and relatively subjective ways to obtain this image.

In work of P. Shelukhin, G. Koposov “The enterprise management under uncertainty through the development of gestalt system (images)” (2012, p. 195-198) it is proposed to use the gestalt system as an algorithm for making decisions under uncertainty. In this work it is described in details the theoretical component of the method and the algorithm of its calculation.

Gestalt system is a system built in a hierarchical sequence of economic categories practical areas of functioning enterprises, represented as polygonal pattern (gestalt) that synthesize environmental factors with the objectives and then display the results of the implementation of management decisions.

The aim of the article is completing of the gestalt system development by calculating the integral values of the highest order and their optimal combination. In our research we used method of economic analysis (for determination of key elements of the enterprise's functional scopes); logical and factorial analysis (for build a system); mathematical method (for calculation of the system); Harrington’s desirability function (for calculation of integral values of effectiveness).
Results

We consider that the basic principle of the system gestalt should be their hierarchical division, which will be based on the main determinant of Gestalt, reflecting the effectiveness of the potential of the company and all indicators of different areas that will determine its magnitude and dynamics in time.

The initial value of the system is the condition of profit maximization (MC = MR), that acting as general (accumulating) gestalt. This condition takes into account the status and influence of the external and internal environment, with its achievement is only possible if they detected reserves of the enterprise, taking into account the effectiveness and cost of existing resources that will affect on the volume and dynamics of production, based on the calculation of the additional revenues per unit costs.

Further, according to the hierarchical structure through production function get target gestalts that are functional areas of the enterprise: personnel, production, marketing, financial and investment activities. The areas form functional branches that are represented by standard, generally known parameters and formulas for their calculations. The gestalt system acts as a automatic stabilizers that react to changes of the target and the general gestalt by displaying result state changes, weak zone, with subsequent offerings measures to eliminate the gap and showing new balance of the system.

The Fig. 1 shows forming of target and general gestalt.

![Diagram](image)

Fig. 1 The formation of general and targeted gestalts (indicators)

Integral value of each branch is calculated using the Harrington’s desirability function (Shelukhin, Koposov, 2011, p.101 – 109). The calculation takes into account each indicator branches. It reveals the "weak zones" at the lower levels of the system and their impact on target gestalt. The basis of the construction of generalized functions is the idea of converting natural values of individual reviews to dimensionless desirability scale or benefits. The function value has a range from "0" to "1", where "1" - the best result and therefore "0" - the worst.

The sequence of calculation can be expressed as follows:

1) Calculation indicators on each branch.
2) Determination of the range normative values for intermediate gestalts according to specific of functional area. Expert or statistical evaluation.
3) Transfer parameters in table of nodal values. The calculation of dimensionless quantities.
4) Determination of the specific values of the desirability function;
5) Calculation of the generalized desirability function that will serve as an integral value of target gestalt.
6) Transfer obtained values of target gestalt in table of nodal values.
7) Calculation of dimensionless quantities.
8) Identification of the specific function values of second order desirability.
9) Calculation of integral function desirability, which will serve as the value of the general gestalt.

The final step in the development of the method is the transfer of gestalt system to autonomous operation. For this purpose the logic algorithm is developed to calculate the general gestalt in the context of target gestalts (functional areas) with the feedback. This allows make full cycle of the system. So we can answer the question:

- What is the current state of the enterprise? What does affect on this state?
- What do I want to get in the future? What is the gap between the desired and actual?
- What should be done to bridge the gap? How much funding to eliminate the gap?

The practice testing of gestalt system is based on the data of enterprise Tsyurupinsk Ltd. (wine production). As already mentioned, the lower levels of gestalt system are calculated by standard method (mathematical calculations known figures). Our task is to determine the effectiveness of the method of calculation of the target and the general gestalt. The present method is a Harrington’s desirability function.

Let's make calculation of the target gestalt marketing based on the values of intermediate indicators in a hierarchical sequence by determining the degree of desirability in this category:

1) Scale abscissa and ordinate are constructed. On a scale of ordinates are introduced dimensionless quantities desirability from 0 to 1. On the abscissa scale we enter coded values (-3, 3). Zero is 0.37.

2) The determination of the range of normative values for intermediate gestalts according to specificity of functional area. This is expert or statistical evaluation. In determining normative values, management uses own image (gestalt) desired state. Therefore as criteria may be general normative values or subjective measure of importance. The forming of the nodal values.

3) The allocation the actual calculated data on a graph, the calculation of dimensionless values. The graph demonstrates the situation before implementation of management decisions to improve the situation and achieve the desired state of the system after its implementation. Graph will look like:

![Fig. 2. Graph of Harrington’s desirability of the marketing activities](image)

4) The determination of concrete values of the desirability function and calculation of generalized desirability functions, which will serve as an integral value of the marketing target gestalt. The formula will look like:

\[ D = \frac{1}{n} \sum_{i=1}^{n} d_i m_i f_i \]

where \( d_i \) - score of single indicator; \( m_i \) - coefficient of indicator weighting; \( n \) - number of indicators that are considered

<table>
<thead>
<tr>
<th>Indicators, (coefficients) of:</th>
<th>Current period</th>
<th>Planning period</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>( d_i )</td>
<td>( m_i )</td>
<td>( f_i )</td>
</tr>
<tr>
<td>local market share</td>
<td>0.05</td>
<td>0.285</td>
<td>0.15</td>
</tr>
<tr>
<td>change in sales</td>
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<td>advertising</td>
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<td>communications</td>
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<td>0.37</td>
<td>0.05</td>
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<tr>
<td>Integral value</td>
<td>-</td>
<td>0.247</td>
<td>1</td>
</tr>
</tbody>
</table>
Let's present the values of the desirability function and their qualitative characteristics in Table 1. In order to complete the developing of the economic model, we add the value of the probability \(p_i\) of achieving of the desired state (gestalt) under current funding level. It gives us a complete picture of the weak/strong points of the enterprise with their financing. Manager will identify priority areas for action and funding. There is some specific of the probability application. When we define the current state, the probability is equal to unity, because the event has already occurred. In this case we enter a data of the funding share \(f_i\). When manager considers a planning period, value of the probability shows a percent of achieving the desired state taking into account current volume and share of funding. Based on the obtained values, manager correlates a data of the effectiveness with amount of funding and takes decisions to liquidate the gap. The value of probability is evaluated by expert, taking into account the calculated value of the coefficient under current funding.

**Discussion**

Let’s note the main moments of the article.

1) It is described the process of the economic model developing using simple calculation of the effectiveness with minimal necessary information.

2) It is proposed usage of the psychological category "gestalt" in the economy. The economic category gestalt can be represented as a combination of relatively objective image that is implemented as single or group index and relatively subjective ways to obtain this image.

3) Gestalt system is a system built in a hierarchical sequence of economic categories practical areas of functioning enterprises, represented as polygonal pattern (gestalt) that synthesize environmental factors with the objectives and then display the results of the implementation of management decisions.

4) The general gestalt is condition of profit maximization (MC=MR). Through production function we define the functional scopes: labor, production, marketing, finance. Each scope has one’s own targeted gestalts (effectiveness and cost). The targeted gestalts are calculated hierarchically inside each scope.

5) The integral values (general, targeted gestalt) are calculated by Harrington’s desirability function.

6) The probability of achieving of the desired state under current funding level is added in the model.

7) The economic model does not provide exact figures (this is impossible under condition of uncertainty). One’s task is demonstrates weak and strong points and directions for further actions.

8) The model can be calculated directly from the high levels of the system (targeted gestalts). Full hierarchical calculation inside each scope can be used as verification of the model.

9) The calculation of current period (table 1) has been made using real marketing data of the company "Tsurupinsk Ltd". The planning period data are hypothetic and obtained by expert way.

10) The task for further research in this direction is adjusting model by empirical usage. Also, in order to increase accuracy of the obtained results it is necessary to apply effective mathematical model for calculation of the probability of achieving of the desired state under current funding level.

**References**


