New approaches in assessment of competitiveness of products

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Abstract. In market conditions of business development a huge role is given to maintaining the competitiveness of the organization, measures that promote in due time to changes in consumer preferences in the framework of improving consumer properties of products. Abroad benchmarking is one of the most common methods of assessing the competitiveness of organization in comparison with competing organizations that produce similar products. Benchmarking shows how other firms achieve the best results in the market being the object of attention of marketing research. There are various approaches in studying of business processes and in particular estimations of consumer indicators of goods in benchmarking. One of them is the graphic method which is expressed in creation of an area chart - "rose of technical level" and definition of the complex indicator of product technical level (defining competitive advantages of products in comparison with similar goods). In submitted article we offer improving earlier developed method of calculation of a complex indicator of product technical level "Roses of technical level". The technique offered in the article is more universal and can be used for assessment of competitiveness of products of various industries. Due to the reduction of unit of measure of all considered products indicators to uniform value, the quantity of these indicators can be significant. Both the priority of consumer properties of products and external factors that affect the preference of buyer upon purchase is also considered in this article.

1. Introduction

According to the World Economic Forum in Davos on Innovation Opportunities, Russia ranks 36th out of 140 countries [1]. If advanced countries develop on the basis of innovation, then Russia, according to experts, belongs to the group of countries moving from development based on factors of production to development based on efficiency. The share of high-tech goods in total exports is only 2.35% [2]. At the present stage, one of the central problems of the Russian economy is to strengthen its competitiveness. Regardless of the specific direction of the regional or state economy, everyone has begun to rely more on innovation, as new technologies become the most important factors in increasing productivity and competitiveness. The demand for innovations is harmoniously combined with the demands of society for sustainability, humanization, and fair distribution. At the intersection of these requirements, we get sustainable innovative entrepreneurship as a characteristic feature of the modern technological wave [3].

The purpose of our research is to improve the methodology for determining the competitiveness of products. The problem is that the methods studied have a number of drawbacks:

- does not take into account the importance for the consumer of consumer properties of the goods;
– do not consider the influence of environmental factors;
– parity of consumer properties of goods is not considered;
– when constructing the chart "Rose technical level" indicators of competitiveness of products for each organization are presented in real terms and are not reduced to a single unit of measurement, which further reduces the reliability of the value of TUI.

Today the important role in functioning of organization is occupied by the correct assessment of advantages of own products in relation to products of competing organizations. Benchmarking is one of techniques of comparative assessment of consumer properties of products with further development of the measures involving the improvement of considered properties in relation to analogue products.

Benchmarking (English bench – the place, marking – to note) represents a way of studying of activity of economic entities, first of all the competitors, for the purpose of use of their positive experience in the work [4].

A number of scientists expand this definition, considering benchmarking "a philosophy and a tool for marketing research to identify sources of competitive advantage, growth of competitiveness and formation of effective business strategies" [5].

At the same time, according to D A Nazipova benchmarking is not borrowing strengths points from market leaders, which can be described simply as copying, but a thoughtful, balanced decision to improve the business. Benchmarking is carried out on the basis of systematic analysis of competitors, allows you to develop new strategies for success, based on the experience already obtained in the market as a whole [6].

Lately benchmarking has become one of the most effective and recognized technique of business improvement and is one of the most popular management tools. Data from various foreign studies indicate that up to 90 % of companies use benchmarking in their activities [7].

The majority of benchmarking algorithms are based on relatively small number of models that have been developed by authors such as Bateman, Baxter, Codling, McNair and Leibfried, Shetty, Spendolini, Watson. Analysis of models shows commonality and similarity in the structure and procedures of offered models of benchmarking process [8].

In modern science and practice there are various types of benchmarking, such as general, internal, functional and competitive. There are different opinions on the feasibility of using certain types of benchmarking. A number of scholars believe that competitive benchmarking has certain difficulties using it because of confidential information from competing companies.

D V Chernova and O M Salnikova consider "as competitive benchmarking is, as a rule, carried out in conditions of confidential information, it is quite difficult to reveal strong and weaknesses of the competitor and to define his /her advantage, to adopt his /her experience. In Russia due to its geographical location and existence of a small of exhibition business centers the competitive benchmarking will hardly find broad practical application. The most possible and perspective in exhibition and fair business is carrying out an individualbenchmarkingbased on self-assessment" [9].

Other part of scientists believes that the analysis of competitors has to be basis of benchmarking.

An important direction of application of this technique many authors recognize the analysis of activity of competitors, considering benchmarking more detailed, formalized and ordered function than the method and approach of competitive analysis [10].

Expanding this approach, G. Reuters expressed the opinion that "this technology pulls together in unique system of strategy development, industry analysis and analysis of competitor. The scientist believes that this method is applicable for:

a) evaluation and comparison of "the best in class" competitors in relation to key success factors in particular industry, as well as beyond its bounds (transfer of experience of other industries);

b) determining how "the best in class" achieve their indicators;

c) using these data as basis for determining company's goals, strategies and implementation techniques [11].

Using competitive benchmarking for proper self-assessment of products competitiveness, different approaches, including different product methods are existed.
2. Experimental Part

2.1. Methods and Materials. Product methods for assessing the competitiveness of enterprise

Product methods for assessing the competitiveness of enterprise are described in works of A Yudanov, N Yashina, M Porter, T Poznyakova, A Pechenkin, V Fomin. Authors consider the product competitiveness as a basic concept in the system of competitiveness, and other aspects of its derivatives [12].

Each company is looking for solutions to convince customers to purchase their products, and thus ensure a safe and stable position in the market. Customer satisfaction is determined by their attitude and preferences. Customer satisfaction assessment allows you to determine which features should be included in the products and services offered by the enterprise [13].

The indicators of competitiveness of industrial enterprise in product methods is calculated through the average value among the indicators of competitiveness for each type of product, which in turn is used the economic and parametric indexes:

\[ K = \sum a_i \cdot \frac{P}{E} = \sum a_i \left( \sum b_i \cdot \frac{g_a}{g_e} / \frac{c_a}{c_e} \right) \]  

where \( K \) – competitiveness of studied industrial enterprise; \( a_i \) – specific weight of \( i \)-kind of products in total sales; \( P \) – parametric index; \( E \) – economic index; \( b \) – weight coefficient of \( i \)-parameter; \( g_a \) – actual value of the estimated parameter; \( g_e \) – reference value of the estimated parameter; \( c_a \) – cumulative expenses of consumption of analyzed products; \( c_e \) – reference expenses of consumption.

In turn these indexes are determined by summing the partial indices for each estimated parameter taking into account the weight coefficients [14].

The scientist V M Kozhukhar presented a slightly different method of determining the competitiveness of a product in his work "Innovative management". The presented method is based on the definition of the indicator of product technical level (PTL), taking into account the preparation of the diagram "Roses technical level". Measurement of the areas according to the diagram and correlation of the areas corresponding to each product with the area of the "ideal" product, allows estimating the actual technical level of each product achieved at the appropriate stage of social and technical development [15].

In our opinion the presented method, despite the positive aspects associated with the simplicity of calculations, visibility, has a number of disadvantages, such as:

- the importance of the technical characteristics considered for the consumer is not taken into account;
- in creation of the diagram "Roses technical level" considered indicators of production for each organization are presented in their physical quantities, which are not given at single unit of measurement, further reducing the reliability of the value of PTL.

3. Results and discussion

We offer to improve this technique with possibility of its use for assessment of consumer properties of any products taking into account the importance of consumer properties of products for the consumer and bringing them to a single unit of measurement.

We offer to consider the given technique in more detail. Initially the range of organizations producing similar products and the main consumer properties of the goods is determined. Indicators in the context of organizations are recorded in Table 1.

The complex indicator of consumer properties is defined for determination of competitive advantages of products in relation to considered organizations-competitors.

Consider the algorithm for determining of complex indicator of consumer properties of given organization.
Table 1. Indicators of consumer properties in context of considered organizations.

| Name of organizations / consumer property | A | B | G | D | E | K | R | P |
|------------------------------------------|---|---|---|---|---|---|---|---|
| 1                                        | a₁ | b₁ | g₁ | d₁ | e₁ | k₁ | r₁ | p₁ |
| 2                                        | a₂ | b₂ | g₂ | d₂ | e₂ | k₂ | r₂ | p₂ |
| 3                                        | a₃ | b₃ | g₃ | d₃ | e₃ | k₃ | r₃ | p₃ |

The specific indicator of consumer properties is determined by the ratio of given indicator to the best indicator of considered organizations

\[ V_i = \frac{V_p}{V_n} \]  

where \( V_i \) – specific indicator; \( V_p \) – indicator of consumer properties of considered organization; \( V_n \) – the best indicator of consumer properties of considered organizations.

Figure 1. Rose of consumer properties of considered organizations.

Estimated complex indicator of consumer properties for each organization is defined as the sum of the areas of triangles in the made rose of consumer properties of production presented in figure 1.

This indicator is determined by the first organization as follows:

\[ S_1 = 0.5 \cdot a_1 \cdot b_1 + 0.5 \cdot b_1 \cdot g_1 + 0.5 \cdot g_1 \cdot d_1 + 0.5 \cdot d_1 \cdot a_1 + 0.5 \cdot a_1 \cdot e_1 + 0.5 \cdot e_1 \cdot k_1 \]  

Generalizing the above expression, we present the algorithm of calculation for the first organization in the form of formula:

\[ S_1 = \sum (0.5 \cdot F_{ij} \cdot F_{kj}) \]  

where \( F_{1i}, F_{ij} \) – indicators of consumer properties of products on the first considered organization for axes A, B, G, D; \( F_{2i}, F_{2j} \) – indicators of consumer properties of products on the first considered organization for axes E, K, R, P.

Estimated complex indicator of consumer properties for products of other organizations is determined similarly.

Many authors point out that positive result from products sale depends not only on the consumer characteristics of the product, but from success factors affecting the approach of buyer to product.

Based on the conducted research of N S Sharafutdinova, according to buyers’ opinion, the main factors of success from the effectiveness of sales are those that are in one way or another connected with the creation of favorable conditions directly or indirectly affecting the activation of interest of buyer to product. We consider these factors as direct factors directly affecting the buyer (on completion of
purchase of goods), as well as indirect factors that form a favorable environment for bringing e goods to buyer.

On the basis of the analysis of results of questionnaire conducted by N S Sharafutdinova we have compiled classification taking into account the priority of factors affecting the effectiveness of sale products, which is shown in Table 2 [16].

**Table 2. Classification of factors influencing the effectiveness of sale products**

| Priority | Name of factor | Percent of interviewed consumers pointed to the considered factors, % | W |
|----------|----------------|---------------------------------------------------------------------|----|
| **Direct success factors** | | | |
| 1. | Low price | 26 | 0.26 |
| 2. | Quality of goods | 23 | 0.23 |
| 3. | Quality service | 13 | 0.13 |
| 4. | Wide range of products | 12 | 0.12 |
| 5. | Convenient location of company | 8 | 0.08 |
| 6. | Product delivery | 4 | 0.04 |
| 7. | Pickup | 2 | 0.02 |
| 8. | Replacement of defective products | 7 | 0.07 |
| 9. | Renewal of assortment | 5 | 0.05 |
| **Total** | | | 1.0 |
| **Indirect external factors** | | | |
| 1. | Preference is given to shops that have noticeable design | 35 | 0.35 |
| 2. | Walking distance | 33 | 0.33 |
| 3. | Goods were recommended by acquaintances (formed relevant groups) | 21 | 0.21 |
| 4. | Convenient working hours | 11 | 0.11 |
| **Total** | | | 1.0 |
| **Indirect internal factors** | | | |
| 1. | Provided consultations when choosing goods | 22 | 0.25 |
| 2. | Existence of self-service hall | 18 | 0.20 |
| 3. | Possibility to order goods on website | 14 | 0.16 |
| 4. | Skill level of personnel | 11 | 0.13 |
| 5. | Polite communication personnel with customer | 9 | 0.10 |
| 6. | Application of progressive methods of sales | 6 | 0.07 |
| 7. | Possibility of payment by credit card | 5 | 0.06 |
| 8. | Notification about promotions and discounts | 3 | 0.03 |
| **Total** | | | 1.0 |

*Table is made on the basis of research of N S Sharafutdinova [16]*
On the basis of considered quantitative indicators of the ratios in Table 2, we can determine the parity of each factor. The presented studies show that the purchasing power is influenced by both direct factors (quality, price, etc.) and indirect—favorable conditions created by the company for the promotion of products. In our opinion, considering the competitiveness of products it is necessary to take into account the consumer importance of each factor. In this case, according to buyers’ opinion, we offer to consider the importance of each factor in relation to each other.

The indicator of each factor of the company is determined on the basis of:
– the standard indicator divided by the number of considered organizations;
– presence of this factor;
– comparison of this factor with the best factor of considered companies.

If competitor's indicator is better than your organization’s, so the factor indicator for your organization will be zero, and the competitor's indicator with the worst indicator will be equal to the ratio of the numerical value of the standard indicator to the number of considered organizations. The indicator following the worst organization will be defined as a previously defined indicator (the worst organization) multiplied by two, etc. In Table 3 there are examples of possible combinations of factors conditions of considered organizations.

| Name of factors                                      | Standard | Own company | Competitor 1 | Competitor 2 |
|------------------------------------------------------|----------|-------------|--------------|--------------|
| Direct success factor                                |          |             |              |              |
| Low price                                            | 0.26     | 0           | 0.173        | 0.087        |
| Quality of goods                                     | 0.23     | 0.153       | -            | 0.077        |
| Quality service                                      | 0.13     | 0           | 0            | 0.13         |
| Wide range of products                               | 0.12     | 0.04        | 0.04         | 0.04         |
| Convenient location of company                       | 0.08     | 0.053       | 0.027        | 0            |
| Product delivery                                     | 0.04     | 0.013       | 0.013        | 0.013        |
| Pickup                                               | 0.02     | 0           | 0.02         | 0            |
| Replacement of defective products                    | 0.07     | 0.07        | 0            | 0            |
| Renewal of assortment                                | 0.05     | 0           | 0.025        | 0.025        |
| Total                                                | 1        | 0.329       | 0.298        | 0.372        |
| Indirect external factors                            |          |             |              |              |
| Preference is given to shops that have noticeable design | 0.35     | 0.12        | 0.23         | 0            |
| Walking distance                                     | 0.33     | 0.11        | 0.11         | 0.11         |
| Goods were recommended by acquaintances               | 0.21     | 0           | 0.21         | 0            |
| (formed relevant groups)                              |          |             |              |              |
| Convenient working hours                             | 0.11     | 0.037       | 0            | 0.073        |
| Total                                                | 1.0      | 0.267       | 0.55         | 0.183        |
| Indirect internal factors                            |          |             |              |              |
| Provided consultations when choosing goods            | 0.25     | 0           | 0            | 0            |
| Existence of self-service hall                        | 0.2      | 0.2         | 0            | 0            |
| Possibility to order goods on website                | 0.16     | 0           | 0            | 0.16         |
| Skill level of personnel                             | 0.13     | 0.086       | 0.044        | 0            |
| Polite communication personnel with customer          | 0.1      | 0.033       | 0.033        | 0.033        |
| Application of progressive methods of sales           | 0.07     | 0.035       | 0.035        | 0.035        |
| Possibility of payment by credit card                | 0.06     | 0.02        | 0.02         | 0.02         |
| Notification about promotions and discounts           | 0.03     | 0.01        | 0.01         | 0.01         |
| Total                                                | 1        | 0.384       | 0.142        | 0.258        |
| Total                                                | 2.783    | 0.98        | 0.99         | 0.813        |
| V                                                    | 0.35     | 0.36        | 0.29         |

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In determining the complex indicator it is also necessary to take into account the importance of consumer indicators of goods in relation to each other (Table 4). To do this, it is necessary to periodically monitor consumer requests of consumers by conducting online surveys, using foresight methods: Delphi, critical technologies, building scenarios, extrapolating trends, reviewing the literature, building a roadmap and forming expert panels [17].

For this purpose it is necessary to carry out periodically monitoring of consumer needs through online-questionnaire, tests and further according to results of the held events to form priority of consumer properties on the basis of their importance in relation to each other. In our opinion the indicator of importance is more accurately determined based on the comparative matrix, where the specific weight of each indicator in relation to the total importance of all indicators is taken as the basis for the calculations.

Table 4. Example of determining the importance of the indicator of consumer properties of products.

|   | A  | B  | G  | D  | E  | K  | R  | P  | V  | W  |
|---|----|----|----|----|----|----|----|----|----|----|
| A | 1  | 2  | 0  | 1  | 0  | 2  | 0  | 0  | 6  | 9.23|
| B | 0  | 1  | 2  | 0  | 2  | 0  | 2  | 0  | 7  | 10.76|
| G | 2  | 0  | 1  | 2  | 1  | 0  | 2  | 2  | 10 | 15.38|
| D | 1  | 2  | 0  | 1  | 0  | 1  | 0  | 2  | 7  | 10.76|
| E | 2  | 0  | 1  | 2  | 1  | 2  | 0  | 1  | 9  | 13.85|
| K | 0  | 2  | 2  | 1  | 0  | 1  | 1  | 0  | 7  | 10.76|
| R | 2  | 0  | 1  | 2  | 1  | 1  | 2  | 1  | 11 | 16.92|
| P | 2  | 2  | 0  | 0  | 1  | 2  | 0  | 1  | 8  | 12.3 |
| S | 65 | 100|

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Where $V$ – indicator of importance; $W_i$ – specific weight of indicator of importance:

$$W_i = \frac{s}{w}$$  \hspace{1cm} (5)

Assessment of the importance: 1 – equal importance; 2 – assessment of greater importance of considered consumer property in relation to other consumer property; 0 – assessment of smaller importance of considered consumer property in relation to other consumer property.

At the same time the specific indicator of consumer property of goods on consideration of importance will be defined as:

$$P_i = w_j \cdot T_i$$  \hspace{1cm} (6)

where $P_i$ – specific indicator of consumer property of goods on consideration of importance; $i$ – number in the list of the organization which production is estimated on competitiveness; $w_j$ – specific weight of indicator of importance of one of considered consumer properties.

Therefore the complex indicator of competitiveness of products taking into account importance of consumer properties of products will be defined as:

$$S_i = 0.5 \cdot w_a \cdot A_1 \cdot w_b \cdot B_1 + 0.5 \cdot w_b \cdot B_1 \cdot w_g \cdot G_1 + 0.5 \cdot w_g \cdot G_1 \cdot w_d \cdot D_1 + 0.5 \cdot w_d \cdot D_1 \cdot w_a \cdot A_1 + 0.5 \cdot w_a \cdot A_1 \cdot w_g \cdot E_1 + +0.5 \cdot w_d \cdot E_1 \cdot w_k \cdot K_1 +...$$  \hspace{1cm} (7)

Summarizing the above expression, we present this algorithm for calculating the competitiveness of products for organization, taking into account the importance of consumer properties of products and the level of direct and indirect factors affecting the efficiency of sales in the form of formula:

$$S_n = \Sigma (0.5 \cdot P_n \cdot P_{1n}) + \Sigma (0.5 \cdot P_{2n} \cdot P_{2n})$$  \hspace{1cm} (8)

$$Z_n = S_n \cdot V_n$$  \hspace{1cm} (9)

where $P_{1n}$, $P_{ij}$ – indicators of consumer properties of products taking into account importance on considered organizations for axes A, B, G, D; $P_{2n}$, $P_{2j}$ – indicators of consumer properties of products taking into account importance on considered organizations for axes E, K, R, P; $V_n$ – level of direct...
and indirect factors affecting on effectiveness of sales; Zn – complex indicator of competitiveness of products.

The proposed method, having a simple algorithm of calculations, can be computerized and linked to a database of parameters of existing analogues of products. This will allow timely identification of problem areas and more precise adjustment of the elements of the labor process to change the parameters of products in the direction of their improvement.

This technique can be used for any type of production and services. All stages of the proposed method are described in the article in a certain sequence. If you strictly follow the present description and perform the necessary calculations (substituting in the formulas presented indicators of consumer properties of the product the organization in question) the end result is an integrated indicator of competitiveness of manufactured products.

In our opinion, the article is interesting for the international community due to the fact that the proposed method of assessing the competitiveness of products allows taking into account all the consumer properties of the product and the external conditions of sales of products to create a comprehensive comparative indicator that determines the place of goods among identical products of competitors. This indicator has an indicator character and allows at the initial stages of the product life cycle to evaluate and weed out alternative solutions for new consumer properties of the product that do not provide appropriate competitiveness.

This technique can be used in the organization of exports to foreign markets. At the same time, the state should simplify the certification of products, reduce its terms, so that the goods of exporters are more competitive, the national accreditation system should function properly, and the activities of export support institutions should be monitored [18].

A characteristic feature of this method is the ability to change the preferences of customers regarding certain consumer properties of products through a comparative matrix to adjust the overall assessment of the competitiveness of products.

The proposed method, having a simple algorithm of calculations, can be computerized and linked to a database of parameters of existing analogues of products. This will allow timely identification of problem areas and more precise adjustment of the elements of the labor process to change the parameters of products in the direction of their improvement.

4. Conclusion
Assessing the competitiveness of goods is one of the most important tools in maintaining demand and the existing market share of the manufactured goods.

The offered method, having a simple algorithm of calculations, can be computerized and linked to database of parameters of existing products analogues. It will allow to identify in due time problem places and more precisely to adjust elements of labor process on change of parameters of products towards their improvement.

Characteristic feature of this method is an ability to adjust the general assessment of products competitiveness changing preferences of buyers concerning these or those consumer properties of products through a comparative matrix.

The result of the presented work is the improvement of the previously known methodology for determining the integrated indicator TUI (product technological level). The scientific novelty of the methodology presented is as follows:
- in the presented methodology, all the indicators considered are reduced to a single measurement - these are the shares in relation to the best indicator in each considered type of consumer properties of the goods;
- takes into account the priority of the proposed consumer properties, taking into account the preferences of buyers (consumers of goods), and also takes into account the assessment of factors affecting sales efficiency in determining the proposed comprehensive indicator of product competitiveness.
The presented technique allows using it both in large companies with highly qualified specialists and individual entrepreneurs with basic knowledge of economics in view of the simplicity of its algorithm. The reliability of this algorithm is determined by the validity of the basic methods that this method is based on - this is the technique for determining the complex

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