

# Assessment of the IT Business Competitiveness

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**Abstract:** *The most modern, the so-called new information technology (IT) holds a special place among the applied technologies. The existing information technology can be formally divided into two large interconnected classes: program mathematical tools for informatization meant for designing the modern information technology and applied information technology that provides decision-making and support.*

**Keywords:** *assessment, competitiveness, business, IT products.*

## I. INTRODUCTION

Most technologies emerged almost at the same time as computer systems in the form of special and general software, operating systems of various classes and purposes, and application packages. These technologies, along with their more advanced modifications, are described in detail in the scientific literature, and the developers of economic information systems quite actively use them now. Specialized software packages (complexes) serve as the basis of the project management information technologies. The software technologies differ in the number of reporting forms, the quality of documentation, the convenience of processing the data exchange, the availability of a graphical interface, the support for a wide class of external devices, and other characteristics [1, 2]. The information technology effectively solves the tasks of scheduling work and resources, as well as operational management, using the programs.

## II. PROPOSED METHODOLOGY

### A. General description

A segment of IT consulting, consisting of a wide range of both interconnected and independent services, the demand for which is determined by the goals and objectives of the clients, is one of the most important segments of the information technology market. The main representatives of Russian companies operating in the IT consulting market are a small group of large multidisciplinary IT companies such as IBS, LANIT, I-Teco, Energy Consulting, Croc, IT, and FORS.

The segment of IT consulting represents the most

significant part of the current IT market, since the equipment segment is usually represented by standard options, and software is purchased largely on the recommendation of companies providing IT services. As such, competition in the segment of IT services has decisive impact on other enclaves of the IT market, and the competitiveness of the entire IT business largely depends on the situation in the field of system integration [3, 4].

The definition of the term "system integrator" should be clarified in order to correctly establish that a company belongs to a segment of the market of IT service providers (IT consulting).

Sources of competitiveness include the internal and external environment of the organization, whereas the external environment is divided into the market (immediate environment) and the external environment itself.

The success of operation in the information technology market is largely determined by the recognition of competitive advantages, the implementation of which allows to concentrate the company's resources in the areas where it is able to achieve a significant advantage over its main competitors and gain the best market position [5]. The cost of production is of primary importance. A certain cost structure is formed in any industry, which depends on the industrial and management technologies used, the availability and branching of sales channels. The key factors in the cost formation should be defined, and their impact on the business should be minimized.

Salaries, social benefits, and personnel maintenance make up significant expenses of the enterprise in the IT consulting market. There is a shortage of IT personnel in the labor market at the moment.

According to statistics, only 0.6 % of the employable population of Russia works in the IT industry, while in more developed countries this figure is up to 5 %. This forces employers to compete for human resources and increase the costs of their maintenance. However, highly qualified IT specialists are the key to successful project implementation and the company's competitive advantages. Reduction in personnel costs allows to achieve cost benefits that help strengthen the company in the market.

The importance of strategic partnerships in building competitiveness cannot be underestimated. A Russian company has little competitiveness in the market in itself – it needs a locomotive of a foreign partner supplying software. Software best practices can be the key to a quality end product in addition to company experience and employee experience. The quality of the tools used to implement the project and the quality of the IT product significantly influence the formation of competitive advantages.

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Special attention in this regard should be paid to the need for BigData methods in medicine, automation of medicine, and sports.

Another competitive factor is the use of innovation. The innovation management system is defined by a combination of factors that influence the development and distribution of new products with the most efficient use of labor resources at the level of individual companies.

The search and implementation of innovations in IT companies should not be episodic, but a part of an ongoing activity, which can become the key to success and prosperity in the long term. Innovation activity is based on a systematic approach and involves an interconnected series of scientific, technical, organizational, and financial events aimed at the development of innovative processes in the organization.

Besides, the formation of competitiveness is influenced by the internal business organization complex. Of particular importance are such internal factors as a coordinated company strategy, absence of unnecessary bureaucratic obstacles and friction during internal coordination, and the level of operational management of the company operation.

The availability of equity also increases the competitiveness of the company – first of all, due to the ability to provide installment payments to customers. Installment payments for products on the IT market are an attractive offer for many customers who do not have enough funds to pay one-time for expensive IT products and services. In addition, the cost of production does not increase by the amount of interest if the company has no loans, and therefore no financial obligations to banks.

In order to reduce financial risks, including cash gaps, an IT company can ensure uniform cash flow through small projects, as well as projects with quick return due to diversification of the business, which helps strengthen the position of the company in all markets and is used as a method of penetrating new markets.

Access to sales networks is another important factor in the competitiveness of the company, achieved by many methods. This may be, for example, the control of sales channels as an affiliate network, which is especially important for distribution activities. An extensive affiliate network of distributors, for example, a foreign IT company, allows to cover various market territories and develop a business throughout the country and beyond, but without having to open its own branches [6].

As a rule, the product of an IT company is complex; it is often one of the components of business for the client, which enables their company to operate. Therefore, the company's reputation in the market becomes a significant factor. An interesting pattern is observed, illustrated by studies of the effect of reputations according to the Hotelling spatial differentiation model. The results have indicated that defining a reputation as a competitive advantage leads to an increase in the product cost for the client. An IT market is a market for credence products; there is a significant level of information asymmetry, and the image of the company providing IT services becomes very important.

As a result, eight factors of competitiveness can be distinguished: product quality, application of innovations, access to sales networks, human resources, business diversification, company reputation in the market, strategic

partnership, and internal organization of the company.

### B. Algorithm

Increasing the competitiveness of IT products is inextricably linked with the influence of the whole complex of factors. As a result, the formation of a classification system of such factors is relevant.

The competitiveness factor of IT products is understood as the operating condition and driving force that can influence the competitiveness of IT products.

To date, there are many classifications of competitiveness factors for IT products developed by various domestic and foreign scientists. In the opinion of the authors, the principle of comprehensiveness, which allows taking the totality of influencing factors into account, is one of the fundamental principles in the formation of a system of factors influencing the competitiveness of IT products [7, 8].

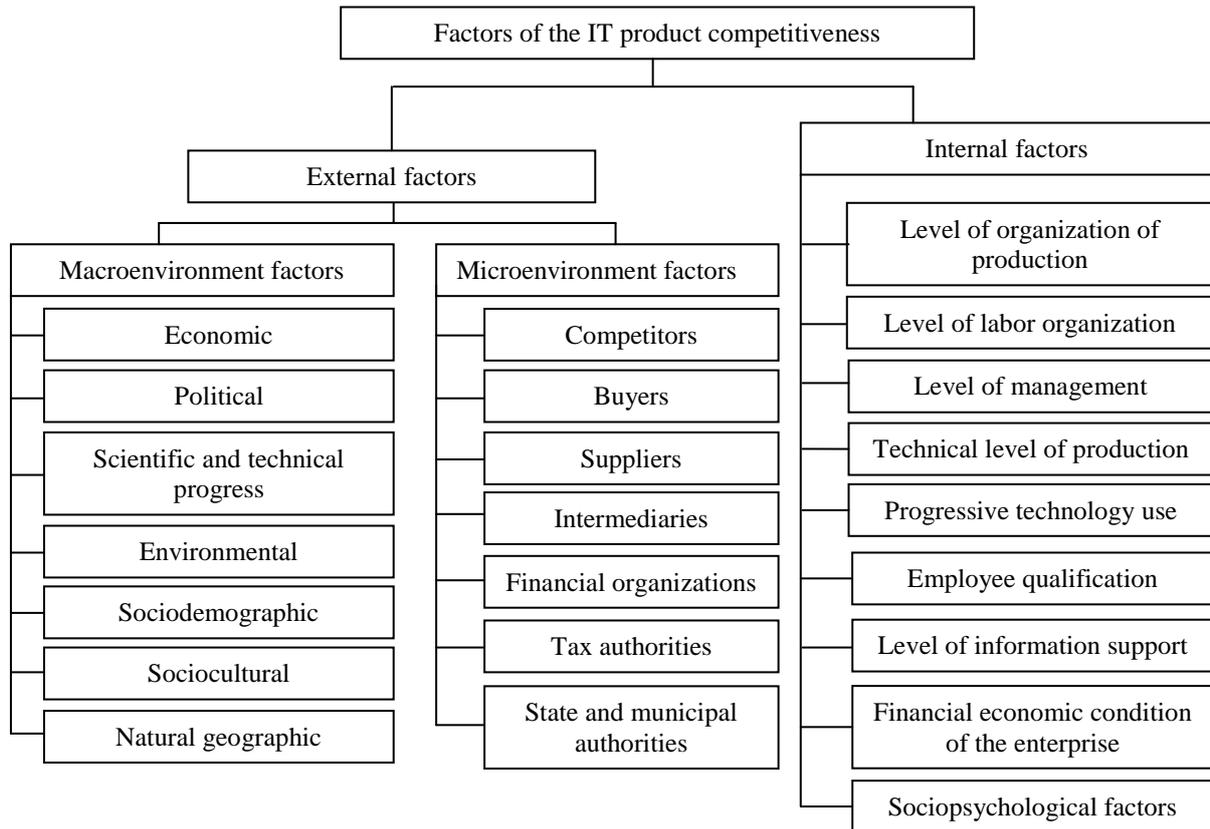
An analysis of writings of some authors exploring this problem revealed that the classification of factors was based on their division into two groups: external factors and internal factors. The authors share the position regarding the division of factors into external and internal, because they consider it necessary to distinguish between the influence of the external and internal environment.

The external factors are understood as influencing factors of the external environment of the enterprise, and internal factors are those that have influence at the level of the enterprise. At the same time, competitiveness factors are often mixed with competitiveness indicators and means aimed at increasing the level of product competitiveness, which is incorrect and may violate the research logic. Therefore, the classification of factors of product competitiveness is presented in Figure 1 with due consideration for the identified shortcomings.

The microenvironment has direct impact on the competitiveness of the company's products, exposing it to the need to consider for the conditions of suppliers and intermediaries, customer preferences, and competitor strategies.

The influence of factors of the macroenvironment on the level of competitiveness of products is more difficult to identify and study, but cannot be ignored, because they often determine the trends that will eventually influence the factors of the microenvironment.

In modern conditions, the role of the organization of production is rapidly growing as an internal factor in increasing the competitiveness of industrial enterprise products [9]. The results of the enterprise activities, including the competitiveness of products, largely depend on the level of organization of production.



**Fig. 1: Classification of factors influencing the competitiveness of IT products**

Organization of production allows combining and ensuring the interaction between personal and material factors of production, establishing relationships between participants in the production process, ensuring the coherence of their actions, and creating conditions for the realization of economic interests and social needs of workers at the enterprise.

The main goal of organizing production at the enterprise is to reduce the production time, to increase the efficiency of production activities, to ensure high quality production processes, and, as a result, high product quality [10].

The application of the principles, methods, and tools of the organization of production allows to effectively influence the increase in the competitiveness of enterprise products without significant financial investments, by improving the product quality while reducing costs and duration of the production cycle. Due to this, of key importance is the choice of the ways and methods of improving the production organization that can help achieve the highest possible level

of competitiveness of products in the target market.

Let us consider the basic principles of organizing the production of competitive products and determine the area of their influence on the product competitiveness in Table 1.

As such, it is advisable to increase the competitiveness of products of an industrial enterprise using methods and tools for organizing production, which should be implemented in accordance with the directions formed in line with the selected indicators of product competitiveness.

The development of methods to increase the product competitiveness primarily depends on its correct, reliable, and timely assessment [11].

Making a purchasing decision, a consumer selects products among similar ones and prefers the product that most satisfies their need. Each need is described by a certain set of parameters that determine the beneficial effect for the consumer. A purchase is made if the parameters of the need coincide with the parameters describing the product.

**Table 1: Principles of organizing the production of competitive products**

Principle	Content of the principle	Impact on the product competitiveness
<i>Principles of organization of production</i>		
Integration principle	Ensuring the unification between the development, creation, and production.	The informational union of participants in the production process and the formation of an integrated production structure allow to reduce the number of defects in the finished product, leading to an increase in its quality.
Principle of optimality and multivariance of decisions	The need to develop several options for organizational concepts that meet the goals of production and its organization. Out of several options, one is selected that ensures the optimal combination of structural elements of the production system.	Availability of several solutions allows to choose the best suitable version of the organization of the production process, ensuring the output of high-quality products at low cost for the shortest possible time.

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Principle of the external environment	The goals of the organization of production and directions for improving organizational activities are formed in line with the requirements dictated by the external environment. This principle takes the relationship between the production system and the external environment into account.	Analysis of the external environment allows the company to organize the output of products that meet the consumer needs according to various indicators, thereby increasing the overall level of competitiveness of products.
Principle of the effect of organizational activities	Ensuring such an interaction between the elements of the production system, which would lead to an increase in the effect of synergy and coordination.	The use of methods and tools for organizing production leads to an increase in the quality of products while reducing costs and the duration of the production cycle, thereby resulting in a synergy effect – increasing the competitiveness of products.
Principle of profitability	Requires achieving the best results at the lowest cost.	Compliance with this principle allows the company to release products of the required quality at the lowest possible cost, thereby increasing its competitiveness.
<i>Principles of organization of production processes</i>		
Parallelism	Simultaneous execution of operations and production stages both within the production process and by participants in the product development process.	Reducing interoperational losses of working time leads to minimizing the duration of the production cycle, which results in a decrease in the order completion time as one of the main indicators of product competitiveness.
Flexibility	Possibility to quickly readjust production processes with minimal loss of time and money.	Prompt reaction during the readjustment of production within the transition to the output of new products leads to a reduction in the duration of the order completion and minimization of losses associated with the transition, thereby affecting the cost.
Straightforwardness	Spatial convergence of jobs and the unidirectional movement of objects of labor from initial to final operation.	Shortening transport interruptions minimizes the production cycle, thereby reducing the overall order completion time.
Proportionality	Consistency of all elements of the production process in terms of productivity and production capacity.	Reducing the loss of working time and equipment downtime leads to a reduction in the order completion time, and a reduction in work in progress ensures cost savings.
Continuity	Movement of objects of labor, where each subsequent operation starts immediately after the previous one.	Reducing the working time losses ensures the minimum duration of the production cycle, leading to a reduction in the overall order completion time.
Completeness	Minimum, but sufficient number of websites for the full range of works on the development, creation and production of products.	Reduction in the cost of developing and manufacturing products.
Adaptability	Ability to quickly adapt to design and technological changes in the production process with minimal loss of time and money.	Rapid adaptation of production to design and technological changes allows to reduce the overall order completion time and costs associated with changes, thereby reducing costs.
Rhythmicity	Regular repeatability of certain processes and their parts at strictly defined time intervals, the alternation of production processes and their parts in a given sequence.	Ensuring the rhythmicity of the processes allows achieving a uniform load on workplaces over time, improving the coordination of their interaction in space and time, and reducing the defects, thereby leading to an increase in the quality of finished products and a reduction in the duration of the production cycle.

A specific product must meet the consumers' needs and financial capabilities to enable a purchase. At the same time, the consumer seeks to optimize their expenses not only for the purchase of products, but also for consumption (operating costs) [12-14].

Due to the fact that the needs of each specific buyer are determined by many factors and are specific in nature, the perception of the same product by different consumers may differ. Consequently, the competitiveness of products in relation to different consumers can also vary.

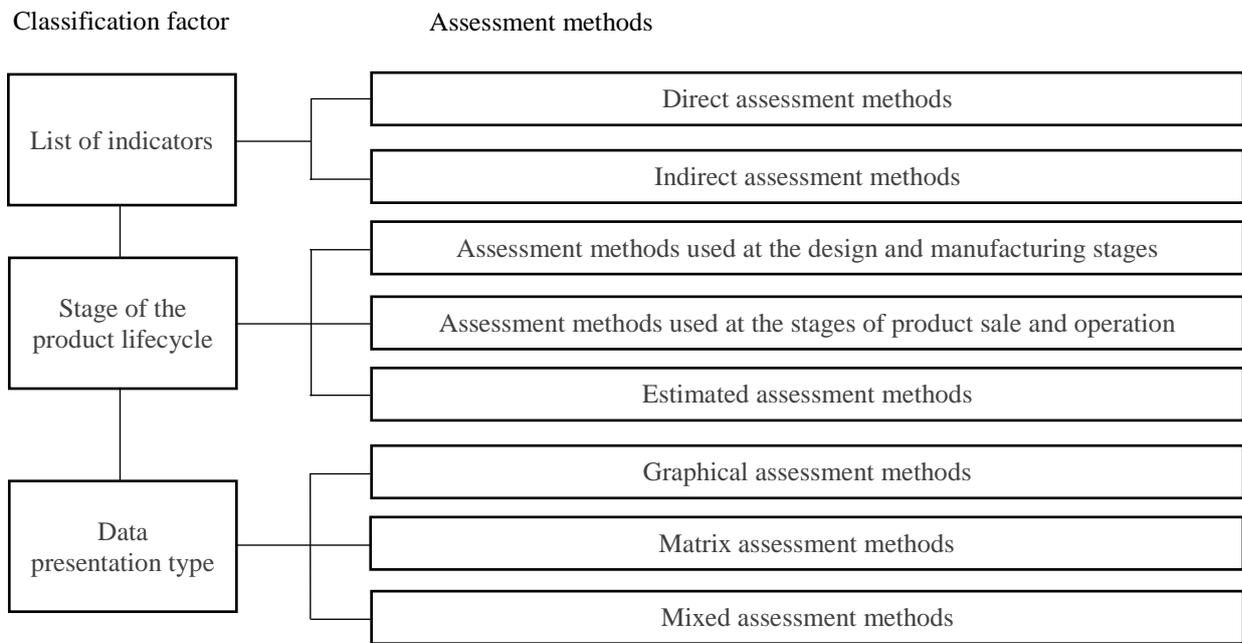
The products most in demand on the market are those most fully satisfying the needs. Therefore, they will be the most competitive.

### III. RESULT ANALYSIS

Based on the above, it can be concluded that the product competitiveness can only be determined as a result of

comparison and is a relative characteristic that reflects the difference from the competitor's products in terms of the degree of satisfaction of a particular need.

The problems of assessing the product competitiveness were explored by many authors in the scientific literature. However, despite the importance and relevance of this issue, there is currently no generally accepted and universal method for assessing competitiveness. This is due to the considerable complexity of the problem under consideration, since the competitiveness of products is affected by a large number of factors considered in Figure 3, which in turn are interconnected and can influence each other. Therefore, the researchers have a difficult task to choose the most important and significant factors from a variety of those influencing the product competitiveness, to determine indicators, and to develop criteria for assessing competitiveness [15].



**Fig. 2: Classification of methods for assessing the competitiveness of IT products**

The direct methods for assessing the product competitiveness are the most common in practice. The method of calculating the integral indicator of product competitiveness is the most common and often used for assessment, but other methods also exist and are applied.

Analysis of the literature and practice of enterprises in improving the product competitiveness allowed the authors to develop a classification of assessment methods. The classification of these methods by a number of factors is presented in Figure 2.

The above indicated method for calculating the integral indicator of product competitiveness can serve as an example of such a method. The advantage of this method is the complexity of the assessment, and the disadvantage is the lack of consideration of the degree of the parameters' significance [16-18].

Indirect methods are often based on quality indicators only and, therefore, allow to assess the product competitiveness only indirectly. Their application is only possible when prices for competing products are equal or close in value.

The methods used at the stages of implementation and operation involve the assessment of the competitiveness of products based on sales volume and speed. The more products are sold, the more competitive they are in comparison with similar products on the market. Accordingly, the higher is the speed of product sales, the higher is its competitiveness.

Researchers such as A. Pechenkin and V. Fomin use a relative share of sales of the assessed product compared to a sample product as an indicator of the product competitiveness:

$$B_{oi} = \frac{M_o}{M_o + M_i}, \quad (1)$$

where  $B_{oi}$  is the share of sales of the assessed products;

$M_o$  is the sales volume of the assessed products; and

$M_i$  is the sales volume of the  $i$ -th product sample.

These methods are simple in use and do not require preliminary collection of special data. However, they do not quantify the competitiveness indicator and may be unreliable

in conditions of product shortage or irregular supply.

The methods used at the design and manufacturing stages help build the forecast of the competitiveness of new products. A comprehensive quality indicator is usually used as a competitiveness measure, which is not always justified. The method of expert estimates is often used to determine the weight values of quality indicators, which leads to a decrease in the objectivity of the assessment [18].

Graphic methods include the "competitiveness polygon" method and the "competitiveness radar" method.

These methods have a significant drawback, despite the simplicity of application and the visualization of the presentation of the result, – they do not take the weight of the indicators into account, which can lead to a mismatch in the values of the integral competitiveness indicator determined by graphical and estimation methods. In addition, when using the "competitiveness radar" method, the area of the radar depends on the sequence of indicators, and if they are interchanged, the value of the generalized indicator can change.

The matrix methods for assessing competitiveness require the presentation of information as a matrix. The Matrix of the Boston Consulting Group (BCG) method is the most common among matrix methods. The idea of this method is to analyze the matrix built by analogy with the coordinate system, where the share of the market occupied by the products is horizontal and the growth rate of sales of products in this market is vertical. The matrix contains four areas: "goods – stars", "goods – cash cows", "goods – cats", and "goods – dogs", described by a certain set of characteristics. Occurrence of the object of assessment in a certain area is the basis for developing an appropriate line of behavior [19]. This method allows taking into account the stage of the product life cycle and the applied marketing technologies for promoting products on the market.

If the information is reliable, the BCG method ensures high efficiency of the assessment and the visibility of the results presentation. The drawbacks of the method include the fact that it does not allow to take the causes of the situation into account and provides only general information about the position of products on the market. As such, in-depth analysis of the situation is excluded, which greatly complicates the development of strategic decisions.

Estimated assessment methods are based on expert estimates. They include the method of summing up places, the method of scoring, the method of scoring accounting for the weighting coefficients of the evaluation parameters, etc. These methods allow assessing the product competitiveness when it is impossible to collect or process certain indicators, but they have a drawback of subjectivity of the assessment.

In practice, estimated methods are usually combined with matrix and graphical ones. This allows to get the most reliable assessment results and provide their visual representation.

In the opinion of the authors, there is no universal method for assessing competitiveness. Each of the methods has specifics, advantages, and drawbacks. The application of a certain method is determined primarily on the basis of the purpose of the study and the available information.

#### IV. CONCLUSION

Summarizing the analysis of methods for assessing the product competitiveness, it must be noted that the methods under study have undoubted advantages, but they are not without drawbacks. Moreover, aside from the particular drawbacks highlighted during the analysis, a number of common ones can also be noted. First of all, attention should be paid to the parameters that experts take into account when assessing the product competitiveness. Many researchers tend to use a large number of parameters in their assessment. On the one hand, almost any parameter included in the set during the assessment influences the product competitiveness to a certain extent. However, the influence of some parameters is so small and insignificant that they do not play a key role in determining the indicator of competitiveness. On the other hand, an excessive increase in the set of parameters taken into account leads to a waste of time for collecting and mathematical processing of information, which significantly reduces the possibility of practical implementation of some methods [20]. Some methods involve the use of expert estimates, which are often subjective and conditional. Therefore, the results of the labor-intensive process of assessing the product competitiveness using expert estimates cannot always be considered objective and reliable.

Another significant problem is that the criteria used to assess the product competitiveness are often measured in different units, i.e., they are multidimensional and heterogeneous. This leads to the need to establish coefficients that determine the weight value of each of the evaluated criteria. At the same time, it must be noted that the value of weighting coefficients can differ significantly under different evaluation conditions, and the establishment of uniform weighting factors to assess the influence of criteria on the value of product competitiveness is not always justified. It

follows that the results obtained during the assessment can be very conditional and approximate.

The drawbacks mentioned in the analysis of methods for assessing the product competitiveness suggest the need to develop an approach to assessment that would be aimed at real practical application. Such an approach should account not only for the current position of products on the market, but also for the development prospects.

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