IOP Conf. Series: Materials Science and Engineering **142** (2016) 012103 doi:10.1088/1757-899X/142/1/012103

A System of Evaluation of Engineering Solutions Competitiveness of a Company Based on its Image

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Abstract. The paper presents a system of evaluation of engineering solutions competitiveness of a company based on its image using point rating criteria obtained through survey and questionnaire.

1. Introduction

The main task in achieving a stable position on the market is ensuring competitive engineering solutions.

Many Russian and western authors examined the problem of competitiveness of both a product and a company.

J.Robinson, for example, believed that competitiveness was not only the ability to withstand competition, but also to evade the fight, developing new markets of diversified products [1]. J.Schumpeter pointed out that a company's competitiveness depended on the ability to create new technologies, new markets and new ideas [2]. P. Drucker considered the human factor to be the basis of competitive advantage, that is a company can be more competitive if there are efficient managers in it and if the focus is made on knowledge [3]. M.Porter pointed out that competitive advantage was in a more efficient use of resources [4]. G.Hamel defined competitiveness as a notion based on skills, knowledge, experience, abilities, foresight, intellectual leadership [5].

Russian authors have also made their contribution in defining the concept of competitiveness. For example, E.A. Gorbashko believes that competitiveness is the company's ability to compete [6]. G.D. Antonov, O.P. Ivanova and V.M. Tumin defined competitiveness as the ability to stay ahead of the others, using one’s own advantages to achieve the set goals [7]. I.A. Tarasova defined competitiveness as a complex of consumer and cost characteristics of goods, which determine its success in the market [8]. In an explanatory dictionary, competitiveness is defined as the ability to compete in the markets of goods and services [9].

In [10], the authors define the term competitiveness of a company as its advantage in relation to other companies in the industry at home and abroad. They also pointed out that competitiveness was not an intrinsic quality of a company. This means that a company's competitiveness can be applied to a group of companies operating in the same industry or producing similar goods (services). Thus, competitiveness is determined only by comparing the companies on the national and world scale.

2. Criteria of a company engineering solutions evaluation based on its image.

Evaluation of competitiveness of a company engineering solutions is rather a difficult task because there are certain economic, financial performance, and others indexes which characterize the performance of a company.

In this paper we consider the system of evaluation of competitiveness of a company engineering solutions based on its image, using the experience of assessing the competitiveness of a knowledge-based engineering products, as in [11].

Mechanical engineering in Russia is one of the most common industries in territorial aspect [12]. Currently, modern technological engineering systems [13] are required for the development and improvement of public production as a basis for achieving the economic power of the country.

Mechanical engineering is the main branch of industrial production, which affects the development of various spheres of economic activity of the country, it reflects the scientific and technical condition of the country [14]. The range of products is very diverse and includes shearers, shaft lining, Jib mobile cranes, etc.

At the beginning of 2011 the Russian mines used 134 shearers, 108 of which were imported, mainly from Ukraine, Poland, Germany and the United States [15]. The problem of low demand for Russian shearers is partly due to low competitiveness of domestic producers. This is not just the problem of mechanical engineering companies, it is characteristic of all the sectors of the Russian economy.

The image of a company in the eyes of its consumers plays an important role in the evaluation of its engineering solutions.

The image of a company is one of the important aspects of perception and evaluation, which produces a special impression on others. The image of a company is in people's minds. Formation of a positive image for a company is an advantageous and less laborious process than correcting a negative image, which is sometimes formed spontaneously.

The main condition to achieve sustainable business success by a company now is its positive image, because it gives a certain market weight, strength; it ensures the involvement of consumers and partners; it improves the company's competitiveness in the market; it protects the company from the substitute products of competing companies; it increases sales; it helps to maximize profit; it opens prospects for crediting; it provides a better access to various resources, etc.

The negative image not only arouses negative emotions of the public, but also leads to reducing the number of orders and sales volumes, which can lead to a shutdown.

Creating a positive image of a company includes a number of such activities as advertising, presentations, press conferences, symposia, meetings, patronage, sponsorship, public performance, publication of articles about the company, etc. Depending on the characteristics of a company, its scope of activities, location, customers, and other factors, specific actions for the formation of the image will be identified

Company image is formed of the following components:

- the image of the product, commodity or brand;
- the internal image of a company, which is the notion of employees on their company;
- the image of the company management team;
- the visual image, which is the opinions of others on the appearance of a company and personnel (interior, exterior, branding);
- consumers' image, when large customers may become the "face" of a company;
- service image, which is the notion of direct and indirect purchasers on the quality of service;
- social image, which is the notion of the general public about the social purposes and the role of a company in economic, social and cultural life;
- business image of a company, which is the notion of competent bodies and experts on the goodwill, good faith, performance of obligations, economic ties, patent and license protection, etc.

Survey and questionnaire have long been used for the assessment of different states of a controlled object.

Table 1. Criteria for the competitiveness of an engineering company solutions based on its image and evaluation score

Criteria of company image	Score
1. Image of the company head (I_{ch})	
1.1 Positive image of the company head	10
1.2 The indicator is above the average	7
1.3 Average	5
1.4 Below the average	3
1.5 Negative image	0
2. Image of the employees (I_e)	
2.1. Positive image of the employees	10
2.2. The indicator is above the average	9
2.3. Average	8
2.4. Below the average	5
2.5. Negative image of the employees	0
3. Social image of the company (S_{ic})	
3.1. A high level of social responsibility of the company	10
3.2. The level of social responsibility of the company above the average	8
3.3. Average level of social responsibility of the company	6
3.4. Low level of social responsibility of the company	3
3.5. The company does not care about the social level	0
4. Image of products or services (I_{ps})	
4.1. A high quality level of products and services is a major factor in the competitiveness of the company	10
4.2. The stability of production and services. It allows the company to be competitive.	7
4.3. Products and services partially affect the level of competitiveness of the company	3
4.4. Products and services do not affect the company's image	0
5. Business culture of the company and its style (B_c)	
5.1. Highly cultured style of the company	10
5.2. Average business culture of the company	7
5.3. Low business culture of the company	2
5.4. Lack of business culture in the company	0
6. Symbols and attributes (B_a)	
6.1. A highly professional and well considered symbols and attributes associated with the activities of the company	10
6.2. Bright and interesting symbols and attributes of the company	9
6.3. High-grade symbols and attributes of the company	8
6.4. Business style symbols and attributes	6
6.5. Simple and unvaried symbols and attributes	2
6.6. There are no symbols or attributes in the company	0
7. Business image (B_i)	
7.1. Highly professional business image	10
7.2. Middle level professional business image	8
7.3. Stable and reliable business image	5
7.4. Low level of stability, reliability and competitiveness of the company	1

For example, paper [16] presents a method of survey of engineering companies aimed at evaluating the performance of the staff from among the graduates from the Russian universities. In order to determine the competitiveness of the engineering company solutions based its image, the authors suggest using a questionnaire as a method of expert evaluation of the above indicators using score-rating methodology. As estimates, the 10-score evaluation scale can be used. The list of criteria for the competitiveness of an engineering company solutions based on its image and evaluation score (points) are presented in Table 1.

The score-rating technique has already been widely used. According to [17], the shortcomings of using expert techniques can be overcome by clearly articulating the task, by including universal performance indicators for expert evaluation, and by developing a dedicated decision-making software.

The authors of [18] also used the score-rating methodology. However, they faced a number of challenges that they offer to solve with the help of:

1. A clear formulation of a problem.
2. Inclusion of universal performance indicators into the procedure for expert evaluation.
3. Developing a dedicated decision-making software application.

In our case, the first task is defined. It is the evaluation of the competitiveness of the engineering company solutions.

The second task is the expert evaluation of competitiveness of a company engineering solutions based on its image using the proposed universal performance indicators.

Calculation of the competitiveness of the engineering company solutions based on its image (Kim) is carried out with the help of the following formula:

$$Kim = \frac{1}{10n}\sum_{i=1}^{n}\sum_{j=1}^{7} a_j Kio_{ij},$$

in which:

Kim is the index of competitiveness of the company's image;

Kio_{ij} is the assessment by *i*-expert of *j*-index of the image;

i is the number of experts;

j is the number of estimated criteria of the image;

a_j *is* the impact of *j*-criterion of the image;

10n is the maximum possible score that an evaluated criterion may get.

The third task is to use a special decision-making software "Automated monitoring of the competitiveness of a company image", registered in the Federal Service for Intellectual Property dated 5/14/2015, number 2015615283.

Studies to evaluate the competitiveness of engineering solutions of mechanical engineering companies based of their image were made using this method. The following companies were studied: «Caterpillar» (USA), «Joy» (USA), «Glinik» (Poland), «Ostroj» (Czech Republic) и «JSC PA Yurmash» (Russia, Yurga). The students of Yurga Institute of Technology took part in the survey (in total, 10 students were polled). The results are given in Table 2.

According to the results of the study, the highest level of competitiveness of engineering solutions of a company based on its image belongs to «Caterpillar» (USA) and amounts to 67.9 points. The runners up are «Joy» (USA) and «Glinik» (Poland) which scored 67.3 and 64.3 points, respectively. The next is «Ostroj» (Czech Republic) with the result of 62.3 points. The last in the list of five is «JSC PA Yurmash» with a score of 57.8 points.

The main reason for high results achieved by the leaders is the level of quality and low price for their products. The following reasons can be qualified as additional ones: highly qualified personnel;

compliance with the required standards and safety requirements; a well-developed marketing campaign.

Table 2. Evaluation of competitiveness of a company engineering solutions based on its image

Company name	Evaluation criteria							Total
	I_{ch}	I_e	S_{ic}	I_{ps}	B_c	B_a	B_i	
«Caterpillar» (USA)	9,4	9,5	9,6	9,8	9,9	9,9	9,8	67,9
«Glinik» (Poland)	9,1	9,2	9,1	9,3	9,1	9,4	9,1	64,3
«Joy» (USA)	9,5	9,5	9,4	9,6	9,8	9,7	9,8	67,3
«JSC PA Yurmash»	9,1	8,2	7,3	8,1	7,2	9,1	8,8	57,8
«Ostroj» (Czech Republic)	9,4	8,5	8,8	7,5	9,8	9,1	9,2	62,3

Consequently, «Caterpillar» can be described as dynamically growing company. The same can be said about «Joy» and «Glinik» companies. The position of «JSC PA Yurmash» in the market of mining equipment is rather weak.

Enterprise management in the modern market economy is an art that requires innovative solutions in the field of strategic management. Lack of such solutions will prevent a company from developing effectively in the long term.

Thus, «JSC PA Yurmash» should consider new engineering solutions for filling a new segment in the mining equipment market.

3. Conclusion

Any company should persistently pay attention to the creation of a loyal attitude to itself. Only in this case, it can count on the continued success and acceptance in the business community.

Creating a positive image of a company is a complex and multi-faceted process, which requires a serious attitude and tremendous effort.

Thus, the image of a company is one of the main components that determine the competitiveness of company engineering solutions

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