ANALYSIS OF SERVICE QUALITY MANAGEMENT IN THE MATERIALS INDUSTRY USING THE BCG MATRIX METHOD

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Abstract

For each product or service, the area of the circle represents the value of its sales. The BCG (Boston Consulting Group) matrix thus offers a very useful map of the organization's service strengths and weaknesses, at least in terms of current profitability, as well as the likely cash flows.

The criteria function concept consists of transforming the criteria function (CF) in a quality-economical matrix M_{QE}.

The levels of prescribing the criteria function were obtained by using a composition algorithm for three vectors: $\overline{T}$ vector – technical parameters' vector (t_i); $\overline{E}$ vector – economical parameters' vector (e_j) and $\overline{P}$ vector – weight vector (p_1).

Keywords: quality management, services, BCG Matrix Method, materials industry.

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Introduction

Service Quality Management (SQM) holds an important position in the materials industry, especially given the current worldwide financial and economic crisis (Cerban et all, 2002).

The Boston Consulting Group (BCG) matrix model is a portfolio planning model developed by Bruce Henderson of the Boston Consulting Group.

The BCG matrix is a chart that helps corporations with analyzing their business units or product lines. It helps the company allocate resources and is used as an analytical tool in brand marketing, product management, strategic management [8].

For the analysis of the service quality management in the materials industry, I have created the criterion function (CF) concept. This concept consists of a quality-economical matrix (M_{QE}). The M_{QE} matrix has three main components (vectors) [2]-[7]:

- $\overline{T}$ vector – technical parameters' vector (t_i);

- $\overline{E}$ vector – economical parameters' vector (e_j);
- $\overline{P}$ vector – weight vector (p_1).

The BCG model is based on the classification of products (and therefore also company business units) into four categories based on options of combining *market growth* and *market share* relative to the largest competitor.

The main results consist of applying a new concept to optimize the service quality management in the materials industry. This new concept is based on the BCG matrix method and the quality-economical matrix (M_{QE}) too.

1. Research for optimizing the service quality management in the materials industry

1.1. BCG matrix

Each product and service in the materials industry has its product life cycle. Each stage in the product's life-cycle represents a different profile of risk and return. Generally, a company should maintain a balanced portfolio of products and services. Having a balanced product portfolio includes both high-growth as well as low-growth products and services.

For each product or service, the area of the circle represents the value of its sales. The BCG Matrix thus offers a very useful map of the organization's product (or service) strengths and weaknesses, at least in terms of current profitability, as well as the likely cash flows.

The BCG matrix scheme has four main fields (components), figure no 1.

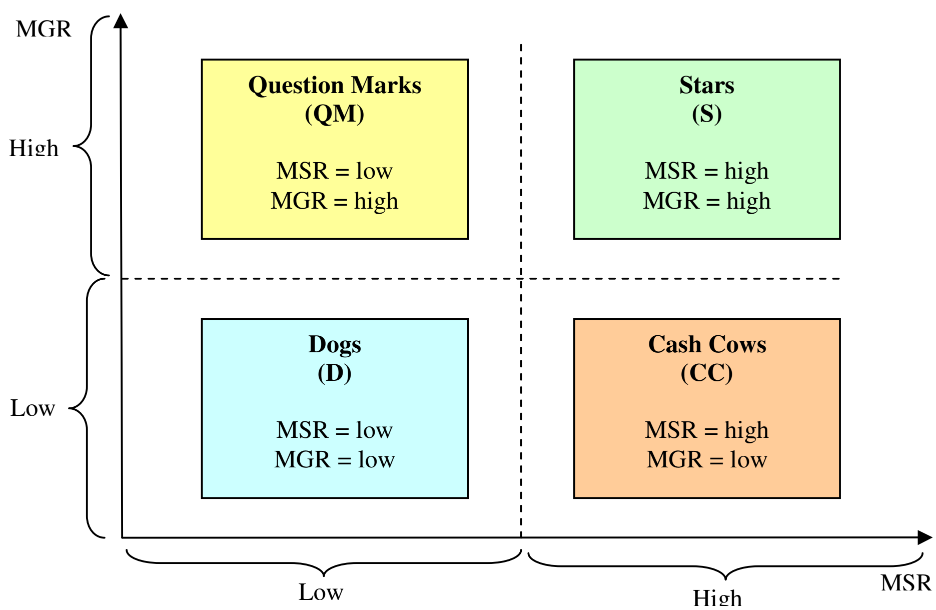

Figure 1. BCG matrix scheme

MSR – Market Share Rate; MGR – Market Growth Rate

The use of the BCG matrix is based on the following concepts (components of the relative market shares and growth rates):

- *Dogs*, or more charitably called *pets*, are units with low market share in a mature, slow-growing industry. These units typically "break even", generating barely enough cash to maintain the business's market share. They depress a profitable company's return on assets ratio, used by many investors to judge how well a company is being managed. *Dogs*, it is thought, should be sold off.
- *Cash cows* are units with high market share in a slow-growing industry. These units typically generate excess cash above the amount of cash needed to maintain the business. They are regarded as staid and boring, in a "mature" market, and every corporation would be thrilled to own as many as possible. They are to be "milked" continuously with as little investment as possible, since such an investment would be wasted in an industry with low growth.
- *Question marks* (also known as problem child) are growing rapidly and thus consume large amounts of cash, but because they have low market shares they do not generate much cash. The result is a large net cash consumption. A question mark has the potential to gain market share and become a star, and eventually a cash cow when the market growth slows down. If the question mark does not succeed in becoming the market leader, then after perhaps years of cash consumption it will degenerate into a dog when the market growth declines. Question marks must be analyzed carefully in order to determine whether they are worth the investment required to grow market share.
- *Stars* are units with a high market share in a fast-growing industry. The hope is that *stars* become the next *cash cows*. Sustaining the business unit's market leadership may require extra cash, but this is worthwhile if that's what it takes for the unit to remain a leader. When growth slows down, stars become *cash cows* if they have been able to maintain their category leadership, or they move from brief *stardom* to *dogdom*.

1.2. Quality-economical matrix

The optimization of the service quality management in the materials industry is based on the following principles [2]-[5]:

a. The principle of analogy – consists of competently observing and analyzing competently the modeled reality, using both analogy with other fields of research and logical homology. According to this principle, the following steps were used for elaborating mathematical models:

- *The modeled subject definition* – represents the first phase of the modeling analysis. This step must comply to both the purpose and the simultaneous system's aims, ensuring their compatibility;
- *The efficiency criterion's definition* – is a step imposed on the correct definition of the system's aims and allows the optimization of the modeling solutions;
- *Selecting the options* – based on accessing some realistic, *original and efficient solutions*;
- *Choices evaluating* – related to the established efficiency criteria;
- *Choosing the final solution* – based on the analysis of the different solutions of the modeling.

b**. **The principle of concepts is based on the systems' theory, including on the ***feedback*** concept.

c. The hierarchy principle consists of making a hierarchical system of models, for ***structuring the decision and coordinating the interactive subsystems***.

The system's ***criterion function*** (CF) is the ratio between ***quality and price***:

$$CF = \left(\frac{QUALITY}{PRICE} \right)_{\max} \qquad (1)$$

The mathematical model of prescribing the criterion function concept consists of transforming the criterion function (CF) in a ***quality-economical matrix*** M_{QE}, as in the scheme presented in figure no 2.

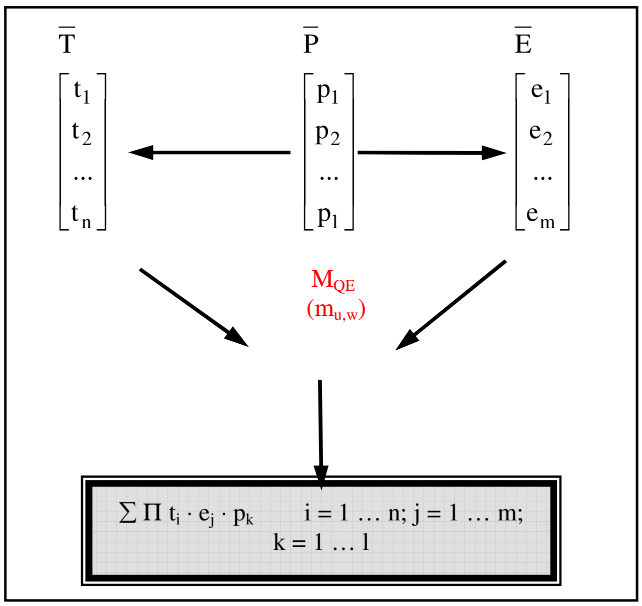

Figure 2. Quality-economical matrix (M_{QE})

The levels of prescribing the criteria function could be obtained by using a composition algorithm for three vectors:

- $\overline{T}$ vector – technical parameters' vector (t_i);
- $\overline{E}$ vector – economical parameters' vector (e_j);
- $\overline{P}$ vector – weight vector (p_l).

2. Results and conclusions

The components of two vectors $\overline{T}$ and $\overline{E}$ which are considered to have important weight in the criteria function's evaluation are:

- t_1 – the steel's chemical composition;
- t_2 – the steel's purity (in gases);
- t_3 – the steel's purity (inclusions);
- e_1 – the specific consumption of basic material and materials;
- e_2 – the specific consumption of energy;
- e_3 – the elaboration process's productivity in EAF.

The best level (NO) for each component of the 2 vectors is:

- for t_1 – the prescribed variation limits of the elaborated steel quality composition arithmetical mean.
- for t_2 – the minimum prescription of the gas content.
- for t_3 – the minimum prescription of the inclusion content.
- for e_1 – the minimum content specific consumption prescribed of basic materials
- for e_2 – the minimum prescribed specific energy consumption.
- for e_3 - the maximum prescribed productivity of the elaboration process.

The correlation between the criteria function's (C.F.) prescribed levels and the $\overline{T}$ vector's (vector) components' variation (fig. no. 3) and respectively the $\overline{E}$ vector components' variation (fig. no. 4) are presented in fig. no. 3 and 4.

The cumulated correlation between the criteria function's (C.F.) prescribed levels and the $\overline{T}$ and $\overline{E}$ vectors' variation are presented in fig. no. 5.

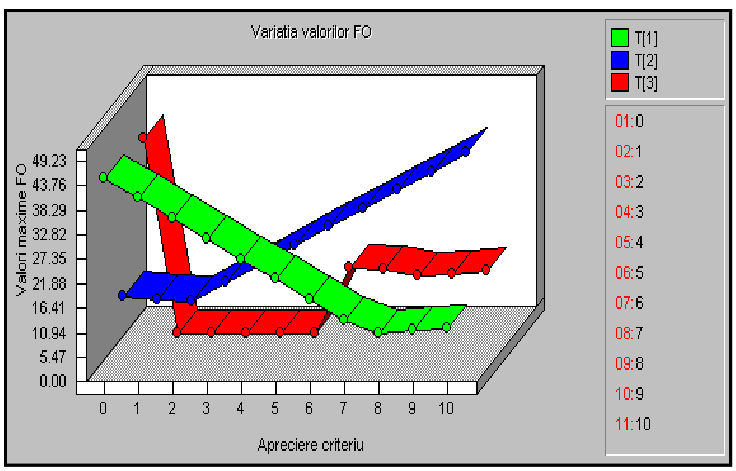

Figure 3 The correlation between the criteria function's (CF) prescribed levels and the $\overline{T}$ vector's components' variation ($\overline{T}_1$, $\overline{T}_2$, $\overline{T}_3$)

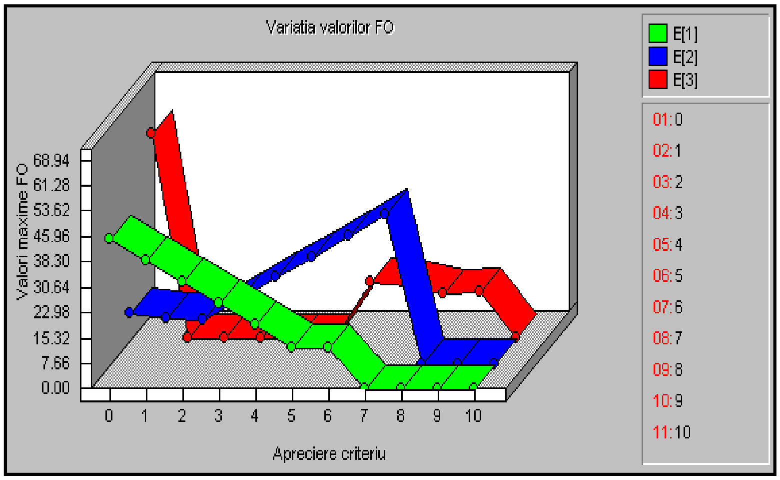

Figure 4. The correlation between the criterion function's (CF) prescribed levels and the $\overline{E}$ vector's components' variation ($\overline{E}_1$, $\overline{E}_2$, $\overline{E}_3$)

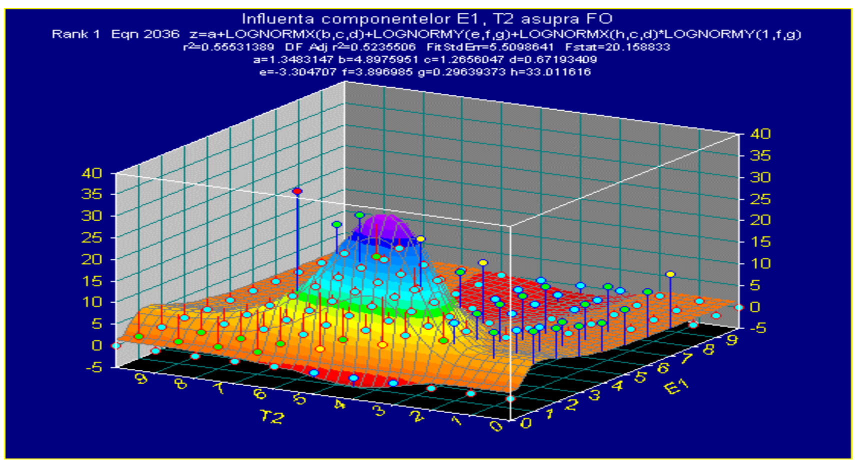

Figure 5. The cumulated correlation between the criterion function's (CF) prescribed levels and $\overline{T}$ and $\overline{E}$ vectors' variation.

You may notice the obtaining of:

- the criteria function's maximum level $FO_{T,max}$ = 43,76 for the $\overline{T}$ vector's variation (t_1 component - the prescribed variation limits of the elaborated steel quality composition arithmetical mean).
- the criteria function's maximum level $FO_{E,max}$ = 55,31 for the $\overline{E}$ vectors' variation (e_3 component - the maximum prescribed productivity of the elaboration process).

- And respectively the criteria function's maximum level $FO_{CUM,max}$ = 19,85 for the $\overline{T}$ and $\overline{E}$ vectors' cumulated variation.

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