

# UTILIZATION OF STATISTICAL METHODS WITHIN THE EUROPEAN PERFORMANCE SATISFACTION INDEX (EPSI) RATING METHODOLOGY

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## 1 INTRODUCTION

A number of studies have shown that the long-term success of an organization is closely related to its ability to adapt to customer needs and changing preferences. Every organization should identify carefully the various parameters, which may be indicative of the satisfaction of their customers. Customer satisfaction, according to ISO 9000:2005, is defined as customer's perception of the degree to which the customer's requirements have been fulfilled. Customer satisfaction studies are carried out in order to assist organizations in understanding the factors influencing customer satisfaction and ultimately helping with decision making, thus their significance in quality management is unquestionable. In order to measure and monitor customer satisfaction, and to take action for improving it, a number of different methods have been developed and tested.

EPSI Rating methodology is used for measuring customer satisfaction at national scale in Europe. Currently customer satisfaction measurements have been conducted in 15 European countries in 5 common industries (retail banking, fixed line telecoms, mobile phones, insurance and supermarkets) and a number of country-specific sectors. These measurements can partially substitute customer satisfaction measurements at organizations scale or to complete them. Utilization of EPSI Rating methodology enables quantification of customer satisfaction and estimation of impact magnitude of factors influencing customer satisfaction and loyalty through the use of various statistical methods.

## 2 EPSI RATING METHODOLOGY

EPSI Rating methodology is based on the EPSI causal model, where the drivers of satisfaction as well as its resulting effects on loyalty are explicitly introduced. This approach of customer satisfaction survey is based on a principle of EFQM Excellence model. The EPSI model contains seven components (latent variables). The causal connections between components are described in figure 1. The components on the left side represent driving factors and the components on the right side represent results.

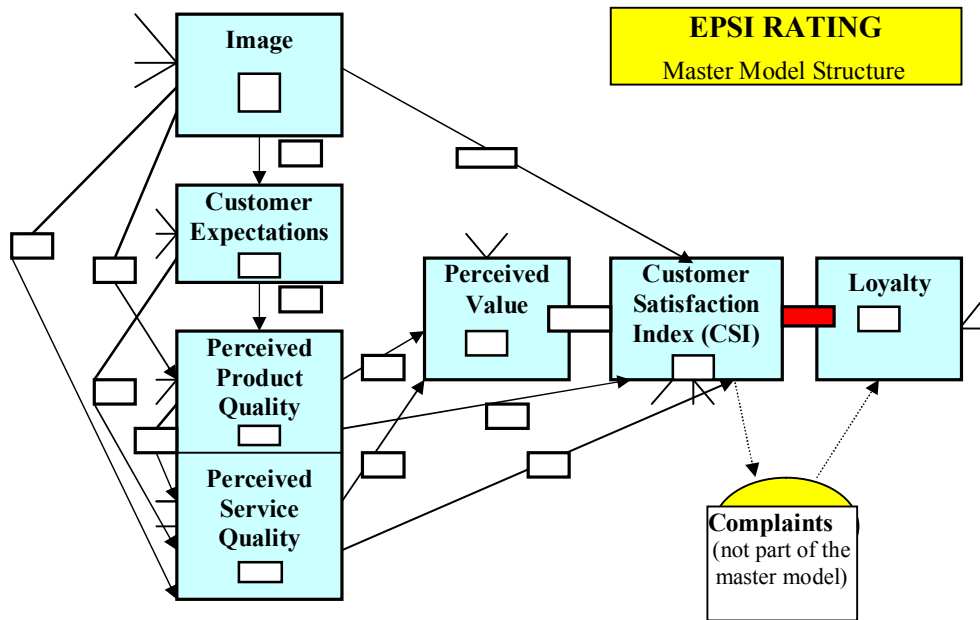


Figure 1 –EPSI model

The components are viewed as latent variables determined by a set of manifest variables. Each manifest variable is measured, the index value of each component estimated, the relevant connections between the components established and the magnitude of the connections estimated. In order to estimate the model, to calculate the index values of components and the magnitude of the impacts, data must exist that is representative for the customers of the organization. Survey design considered consists of:

- the design of a questionnaire for measuring the latent variables via the manifest variables (manifest variables are evaluated by customers on a scale from 1 to 10),
- the selection of a representative sample of customers,
- the field operations for collection the data from the sample using the questionnaire
- the data analysis.

## 2.1 EPSI model estimation

Before the index value estimation of each latent variables, the 1-10 scale (from questionnaire) is, for ease of interpretation, transformed into a 0 -100 scale.

$$\hat{x}_{ij}^l = \frac{10}{9}(x_{ij}^l - 1) \quad (1)$$

The index values of latent variables are estimated as arithmetic mean according the following equation:

$$e^l = \frac{\sum_{j=1}^{k^l} w_j^l \cdot \hat{x}_j^l}{10 \sum_{j=1}^n w_j^l} = \sum_{j=1}^{k^l} \tilde{w}_j^l \cdot \tilde{x}_j^l; \quad \text{where } \tilde{w}_j^l = w_j^l / \sum_{j=1}^{k^l} w_j^l \quad \text{and} \quad \tilde{x}_j^l = x_j^l / 10 \quad (2)$$

$e^l$  is a vector of  $l^{\text{th}}$  latent variable

$\hat{x}_j^l$  are vectors of  $j^{\text{th}}$  manifest variable connected with  $l^{\text{th}}$  latent variable

$w_j^l$  are weights of  $\hat{x}_j^l$  vectors

The weights are estimated as:  $w_j^l = \text{cov}(\hat{x}_j^l, y^l)$ ; where  $y^l = \sum_{j=1}^{k^l} \hat{x}_j^l / k^l$

where:

$k^l$  is a number of manifest variables connected with  $l^{\text{th}}$  latent variable, number 10 at the equation (2) deals with the used scale (1- 10) in questionnaire

$\tilde{w}_j^l$  are standardized weights ( $\sum_{j=1}^{k^l} \tilde{w}_j^l = 1$ ) of respective  $\hat{x}_j^l$  vectors

$\tilde{x}_j^l$  are rescaled  $\hat{x}_j^l$  vectors ( $0 < x_{ij}^l \leq 1$ )

Except the above mentioned method, the Partial Least Square (PLS) can be also used for index values estimation.

After calculation of latent variables, the magnitude of the connections between them can be estimated. The causality model described in figure 1 leads to linear equation relating the latent variables:

$$e^l = \beta_0^l + \sum_{n=1}^n \beta^{ln} \cdot e^n + r^l \quad (3)$$

where:

$e^l$  is a vector of  $l^{\text{th}}$  latent variable

$\beta^{ln}$  is unknown regression coefficient of  $l^{\text{th}}$  latent variable connected with  $e^n$  vector

$r^l$  is error vector of  $l^{\text{th}}$  latent variable

$n$  is a number of connection of  $l^{\text{th}}$  latent variable with the other variables in the EPSI model.

### 3 UTILIZATION OF EPSI RATING METHODOLOGY IN THE ORGANIZATION

EPSI Rating methodology was applied for measuring customer satisfaction in the wholesale organization with metallurgical products. Before the survey realization, customers of the organization were selected into three segments (A, B, C) according to their share on organization profits. Questionnaire for customer satisfaction measurement was designed according to EPSI model. Manifest variables used in a questionnaire were tailored to the character of the metallurgical product wholesale distribution. Manifest variables designed in the questionnaire are related to following aspects:

- Image – customer orientation, credibility of organization, innovation and forward looking,
- Customer Expectation – expectation about the product quality, expectation about the quality of service delivery, expectation about the service flexibility and reliability
- Perceived Quality – product quality, range of the products assortment, range of service delivery, material portioning, service reliability, reaction flexibility to a customer`s requests, communication and contact accessibility, information about new products and services, employees competency and attitude
- Perceived Value – price with regard of product quality, price with regard of service quality
- Customer Satisfaction – overall satisfaction, level of expectation fulfillment, comparison of organization with ideal organization
- Loyalty – price tolerance, future purchase probability, purchase probability in other organizations
- Complaints – method of complaint handling

For evaluation of manifest variable the Likert 1-10 scale was used, where „1“ means the lowest evaluation and „10“ the highest evaluation. Because of organization character (service organization) the latent variable Perceived Quality was not divided into service and product quality. Index value for complaints was not estimated. Complaints are not part of the EPSI master model too.

After data collection, in order to estimate the latent variable index values and magnitude of the connections between them, the Octave software was used. Octave is a freely available open-source software. It provides an interactive environment for numeric computations and number of matrix operations and functions. The estimated index values and magnitude of the connections between latent variable for customer segment A (highest share on organization profit) are described in figure 2.

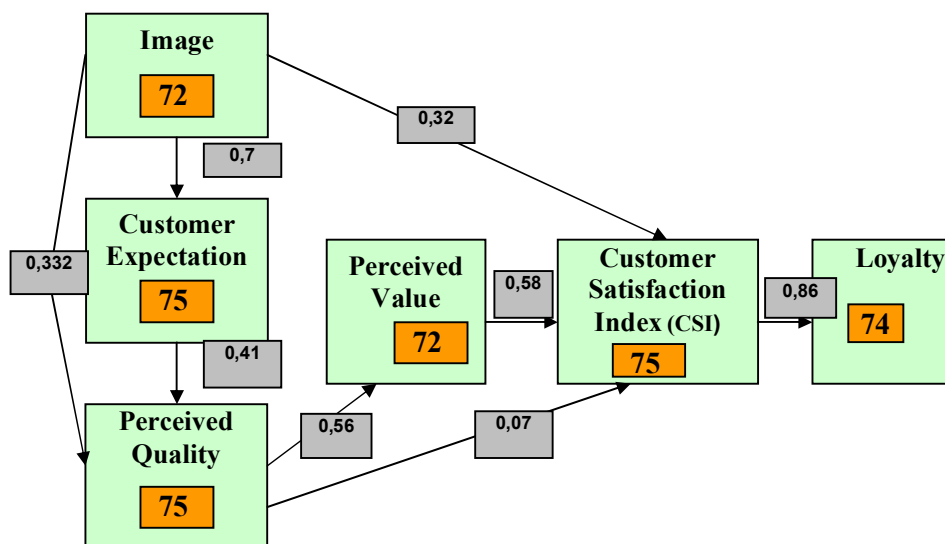


Figure 2 –EPSI model with results

#### 4 CONCLUSION

The values of each latent variable in the EPSI model are above the level of 70%. Customer Satisfaction Index is reaching the 74% level, which can be classified according to EPSI score category as an average level (from 75% good level). Latent variables Image, Perceived Quality and Perceived Value have a direct impact on Customer Satisfaction according to EPSI model. Perceived Value has significant impact on Customer Satisfaction (0.58), subsequently Image (0,32). Perceived Quality has the lowest direct impact on Customer Satisfaction, but it influences Customer Satisfaction in the model indirectly, through Perceived Value, too. Loyalty is very important factor and significantly influenced by Customer Satisfaction (0.86). Improving customer satisfaction by 1 unit increases loyalty with 0, 86 unit. The significant impact of Image on Customer Expectation creation (0,7) can be also seen from figure 2.

Customer satisfaction measurement according to EPSI model is based on the sophisticated and reliable methodology, which brings quantified and comparable results. The information value of these measurements increases with time over which the measurements are conducted.

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