THE MANAGEMENT OF QUALITY COSTS OF INFORMATION FUNCTIONING IN SOCIAL ECONOMIC SYSTEMS

© 2008 L.V. Glukhova*

Key words: cost management, structural analysis and synthesis, "production - HEI", competitiveness, the system of quality management.

The article illustrates the methods of structure analysis and synthesis which are used for management of quality costs in social economic system. The suggested methods are integrated in the system of staff training "plant-university".

The conception of the national Russian state policy in the field of production and services quality is developed by the State Standard of Russia together with the Ministry of Economic Advancement of Russia and the Ministry of Industry and Sciences of Russia following the order of the Russian Federation president № PRF-662 pt. 2 from April 4th 2000 and the Government of the RF № IK-P8-18 976 from June 30th 2000.[1] Its socio-economic objectives are to upgrade the quality of output goods and to secure its high competitiveness on the market. Effective management of the production quality presupposes the active usage of systems based on balanced estimated figures which provide the possibility to process data and information for the analysis and schedule of costs for the quality and controlling of them. This information is desirable for making management decisions and for estimation of work of certain branches and processes within the developing or applicable socio-economic sphere of the quality management system.

Nowadays quality becomes a yardstick for all interrelations. The objective of any quality management is to create an environment where people would act fully satisfied with each other. In this case management is to be directed at providing and sustaining satisfaction of both sides. One should mention that the life cycle of production making and selling is accompanied by the basic, auxiliary and organizational processes. Each process possesses its own value and with its well functioning participants are interested in facing minimized expenses for the processes, in other words, in a constant management of quality.

Internal and external processes of organization makes a link between consumers and production suppliers while the key objective of management is to establish a precise interrelation between the processes and to eliminate mismatches (barriers). In connection with that the term "quality" will remain its existence until dissatisfaction, caused by the division of labor among groups of people (consumers and suppliers) is not completely reduced to nothing. That is why under present conditions of economics development a special treatment is given to perfection and upgrading of the processes and to such a connection between them that could exclude appearance of various problems.

We, consequently, introduce methodology of processes functioning quality management which allows eliminating such dissatisfaction. Let us consider its realization by way of example of expenses management of specialists training quality within the sub-system "plant - university" where quality expenses management is performed by means of such functions as planning, accounting, analysis and control. The realization of these functions is primarily based on integration of methods of structural analysis and synthesis and also process, systematic, structural, divergent, qualimetric approaches with consumer-oriented character of all the processes. The methodology is realized almost in a form of automated system of informational processes functioning quality management and is proved by the author's useful model patent[2].

Here we are to make some brief explanations. The structural analysis of the system is a method of researching stable internal system interrelations and of reasoning of structure's mathematic model according to the predesignated important feature of the system on the whole. The structural analysis' final part is reasoning of configuration of the system's integrative feature - its integrity[3].

The systematic approach is applied for discovering functional requirements for the sys-

* Ludmila V. Glukhova, Candidate of Pedagogy, associate professor of Togliatti State University.

tem, it morphology. The structural analysis is the further development of the systematic approach[4]. It is directed at revelation of influence of system's each part upon the quality of system quality functioning on the whole towards specific attribute and also at proving of requirements for each of the system's parts in the light of the external surroundings' requirements.

Below one can see the structural model of providing of the considered attribute:

$$P(\pi_i \geq \pi) = \overset{s}{\underset{i=0}{S}} \{P_i\} \geq \frac{\gamma}{100}, \qquad (1)$$

with ε - as probability of providing system attribute criterion which is expressed in percents; $S\{P_i\}$ - symbol of the structure.

The divergent approach allows singling out cause-and-effect relations which are, in turn, structural transformations within the system. The principle of the process approach helps to single out the key process, its value, evaluate and estimate added value, identify the process' runner[5].

The methodology of the system attributes structural researches, which is under proposal, allows estimation of this features' parameters not only in a parametric dimension but also with certain probability of their display. It allows getting a probable estimation of goal achieving simultaneously for the external and internal environments, which excludes cases of barriers and controversies appearing at the border of the done work of the object's life-cycle one stage and its transition to doing work of the next stage because each stage of life-cycle requires an objective calculation of the desired probability of its fulfillment[6].

Let us consider the example of both systems' application:

1) Models of prediction of expenses for the staff training sub-system functioning quality within the system of "plant-university" at any moment of time following any structure of the system's attributes. This model makes it possible to prevent losses with the help of constant assurance and sustain of system functioning quality and its development by up-to-date modernization;

2) Model which gives reasons to the risk of non-fulfillment of the parameter required figure, which are under consideration, at the given time. This model enables to identify the necessity of preemptive impact in order to reduce potential negative consequences. The model takes the following form:

$$P(S) = \sum_{m=0}^{s} C_n^m \left(\prod_i^r Q_i\right)\left(\prod_i^s P_i\right), \qquad (2)$$

under provided $r+s=n$

with S - structure expressed in a probable aspect; n - general number of elements within the structure; m - number of structural elements which determine the required condition of the object;

- number of combinations; Q_i, P_i - probabilities of appearing of the object condition certain features.

With considering of negative attribute (expenses for quality), the model's structure takes the following form:

$$\overset{s}{\underset{i=1}{S}}\{P_i\} = \sum_{m=1}^{r} C_n^m \left(\prod_{i=1}^{m} \left\{Q_i\left(\sum R_i < 1\right)\right\} \cdot \prod_{i=1}^{r-m} P_i\right) =$$

$$= 1 - \sum_{m=0}^{s} C_n^m \left(\prod_{i=0}^{m} \left\{Q_i\left(\sum R_i \geq 1\right)\right\} \cdot \prod_{i=0}^{s-m} P_i\right). \qquad (3)$$

Model which gives reasons to the risk of non-fulfillment of the parameter required figure, which are under consideration, at the given time (in order to decide upon the necessity of preemptive impact in order to reduce potential negative consequences) is calculated through the formula:

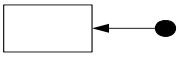
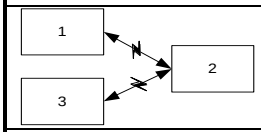
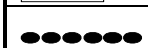
$$Z\{t; Q_i; Z_i\} = \sum_a Q_a(t) \cdot Z_a + \sum_b Q_b(t) \cdot Z_b +$$

$$+ \sum_c Q_c(t) \cdot Z_c + \sum_d Q_d(t) \cdot Z_d, \qquad (4)$$

with a - structural scheme's elements with serial connection; b - structural scheme's elements which are placed in parallel branches of the structural scheme; c - structural scheme's elements which are placed serially within parallel branches; d - structural scheme's elements which are placed under the arrow; $Q_{ai}(t)$; $Q_{bi}(t)$; $Q_{ci}(t)$; $Q_{di}(t)$ - probabilities of expenses for restoration for i-negative situation of the system's elements which are placed within the serial chain, parallel branches or under the arrow during the given time; Z_i - total expenses for i-negative situation, the system's elements with indexes of the system (a, b, c, d); $Z(t, Z_i)$ - function of total costs and functioning losses increasing for the given period of time t.

Models of prediction of expenses for the staff training system functioning quality within the system of "plant-university" at any moment

Explanation of notations at the picture

Notation	Explanation
	Notation of subdivision within public corporation "AVTOVAZ"
	Notation of directive for subdivisions
	Interrelations of subdivisions 1 and 2 based on the concordance of bilateral relations; Concordance of unilateral activity of subdivision 3 to subdivision 2
	Notation of other productions
DS	Directorate of staff
DTD	Directorate of technological development
DTP	Directorate of technical provision
DIS	Directorate of informational systems
DQSPC	Director of quality supervision of public corporation "AVTOVAZ"
DASPSOTS	Directorate of automobiles and spare parts supplies organization and technical service
DEFTD	Directorate of exports and foreign trade development
DP	Directorate of purchase
BD	Board of directors
BAL	Body-assembly line
MAL	Mechanism-assembly line
PL	Press line
ML	Metallurgical line
LPPL	Plastic parts production line
PMPPL	Press molds and punches production line
TPL	Tools production line
PWPL	Production waste processing line
TEPL	Technological equipment production line
DLWO	Department of labor and wage organization
DM	Department of marketing
PTDDTR	Production-technological department of DTR
DSMDQS	Department of staff management of DQS
TCDS	Training center of DS
HCDIS	Head computing directorate of informational systems

of time following any structure of the system's attributes takes the following form:

$$Z\{Q_i; Z_i P_i; t)\} =$$

$$= \sum_{m=0}^{n} C_n^m \left(\prod_{i=0}^{m} \{Z_i Q_i(t) \cdot \prod_{i=0}^{n-m} P_i(t)\}\right). \quad (5)$$

Let us turn to consideration of the socio-economic system requirements by way of example of public corporation "AVTOVAZ". As the analysis of this system's functioning quality control problems shows, the enterprise needs a group of specialists-managers. Let us consider the existing relations between the branches of this system. The picture illustrates that the general principle scheme of subdivisions relations of public corporation "AVTOVAZ". The table gives explanation to some notions definition which are used in the picture's scheme. As seen from the picture, the direct communication are established unilaterally starting from the top-management staff up to the enterprise's subdivisions. All other links between the subdivisions are performed only when there is a mutual agreement or at the current time taking the form of factory interrelations which are directed at improvement of these factory interrelations. As a result of unilateral or bilateral relations, the system witnesses establishment of firm links (factory interrelations) which assign working functions of each subdivision of public corporation "AVTOVAZ". Nevertheless, as the analysis of factory relations, taking place not only

at public corporation "AVTOVAZ" but also at some other enterprises, shows and proves, this thesis about the concordance of each adjoining production subdivision's actions is not always appropriate for the realization of the labor's results. The problem bears special actual character at extensive manufacturing where such a concordance is more than ever necessary for provision of output goods' high quality.

The availability of objective-like barriers of concordance sets a significant slowdown before the production processes. As it is seen from the scheme of interrelations (see picture) between subdivisions themselves, the procedures of concordance between the productions of extensive orientation take place almost all over (they are marked by a special symbol ⟶⟶). Such a run of things surely fails to promote the overall control and management over quality of output goods[7].

That was exactly the reason why there was developed the system of international quality standards ISO-9000 and some other successive normative documents of this international standardization organization.

The aforementioned documents should reproduce and present the given enterprise's policy which is expressed through the regulated level of responsibility of each subdivision within the organization on the whole and managers of any position, also through the registration of the whole enterprise work results which were aimed at rising the output goods' quality and reducing of non-production expenses.

Application of the methodology for the step-by-step estimation of quality expenses consequently led to the results which demonstrated all the requirements for provision of quality of system's parts functioning according to the external environment's requirements. The methodology makes it quite possible to:

1) detect the centers of expenses and organize a criterion-estimation device for them;

2) establish the models for management of quality expenses;

3) perform the analysis of concordance between the calculated expenses and the required models which do not allow the planned level of expenses to exceed the expectations;

4) find out management solution for correcting impact upon the processes.

Consequently, all management functions are regarded as interrelated and compiling the chain of operations which in turn form the added value.

---

[1] *Lavrechenko N.I., Gerasimov B.I.* Economic and mathematic methods of quality expenses / Edited by Dr. of Science, prof. *B.I. Gerasimov.* Tambov: pub. Tamb., 2005. 112 p.

[2] Pat. № 71789, Thee Russian Federation, МПК G06F 17/30 (2006.01). Automated system of the informational processes functioning management. / L.V. Glukhova; applier and patent-holder L.V. Glukhova. Appl. № 2007143523/22; priority 26.11.2007; Publ. 20.03.2008, bull. № 8.

[3] *Glukhova L.V.* Methodology of the specialist training informational systems functioning management (by the example of speciality "Engineer-Manager"): Autoref. dis. .. Dr of Technical Sciences. Togliatti, 2007. 34 p.

[4] *Glukhova L.V.* Reasoning of the mathematic model of the specialist training informational systems functioning management // Samara Science Center of the Russian Academy of Science Spec. edit. № 3 "Technologies of enterprise management. Quality of production and services". Samara, 2007. pp. 34-44.

[5] *Glukhova L.V.* The informational systems assemblage quality management // Vest. mashinostroenia. Assemblage in machine engineering and.instrument engineering 2007. № 7.

[6] *Glukhova L.V.* Estimation of risk of the aim non-fulfillment under development of the specialist training informational systems // Science Center of the Russian Academy of Science Spec. edit. № 3 "Technologies of enterprise management. Quality of production and services". Samara, 2007. pp. 45-52.

[7] *Glukhova L.V.* Testing and estimation of efficiency of the quality engineer-manager training informational systems; Monograph. SPB., 2005. 180 p.