Management of the Organization with Usage of System Model

G.G. Kulikov
Department of Computer Science and Robotics
Ufa State Aviation Technical University
Ufa, Russia
e-mail: kulikov@ugatu.ac.ru

K.A. Konev
Ufa Scientific Production Enterprise "Molniya"
Ufa, Russia
e-mail: molniya@bashnet.ru

Abstract[1]

This article is about management quality estimation technique at the organization with usage of system model.

1. Introduction

For management of the modern organization and its economy are necessary knowledge of internal processes of it of the organization and formalization of this knowledge as standards, instructions, etc. Such formalization can be carried out at construction of system of a quality management according to requirements of ISO 9001:2000.

But for management of the organization not enough formal standards which only establish rules. Mechanisms of realization and the control of performance of the rules established in standards are necessary for achievement of the purposes of management, sold with the help of information technologies. Thus, there is a problem of integration of methodology of a quality management and методологий constructions of information systems.

The review of decisions of a problem of integration offered in the literature shows, that all of them are connected or to automation of the separate sides of a quality management [1], or with use of results of a quality management, such as algorithms of functioning of processes of the organization, the created patterns of forms of documents for simplification of automation of the organization. Thus there are only read out examples of simultaneous development and system of a quality management, and information system of the organization [4].

2. Management of the Organization and System Model

Application of cycle PDCA (Plan - Do - Check - Act - Plan) for management of the organization is recommended for management within the framework of system of quality management of Russian Standardization Institute [6]. Cycle PDCA will consist of stages of planning, performance, the control and standardization of experience.

The first 3 stages do not demand additional explanatories, and at 4-th stage - a stage of standardization of the received experience:

- At absence of problems at performance of the previous stages of a cycle and achievement of the put plan - conformity of the established order is ascertained and there is a transition to new iteration of process;
- At presence of problems at performance of stages 1 - 3 or not achievement of parameters of the plan - there is a correction of the description of process and specification of the plan, and then new iteration begins.

Such approach demands presence of system of the standards describing business - processes of the organization.

Standards can be not only text, but also submitted as the formalized models as it is recommended in [6].

It is necessary to note, that cycle PDCA is not something essentially new and in general coincides with a contour of management known in the literature business - process.

Thus, exist, including described in the literature, ways of transition from model of a control system of the organization submitted as text standards to functional model. As methodology SADT allows to proceed from process model to functional, and from it to information IDef1X [3], that the received model can be a basis for creation of information system. In this case management in cycle PDCA will come to an end specification of functional model and information system of the organization.

Proceedings of the 8th International Workshop on Computer Science and Information Technologies CSIT'2006
Karlsruhe, Germany, 2006

3. Formation of System Model and a Package of Documents of System of a Quality Management

At formation of system model it is necessary to make use of the corporate experience of the organization which have been saved up in its standards. Experience shows, that the standard of the organization can give up to 40-70 % of the functional model, business - process described by it.

It is in parallel necessary to form the register of forms of the documents used in business - processes.

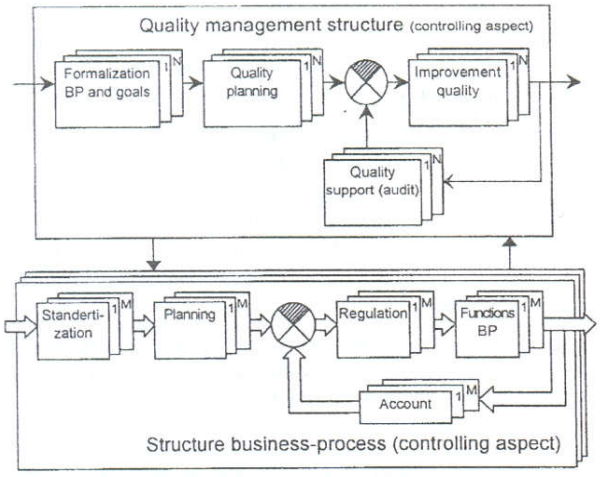

Figure 1. Circuit of Interaction of a Quality Management with BP

Program BPwin allows to generate from functional model almost all package of the documents necessary for certification of system of a quality management on conformity ISO 9001:2000 such as a network and the register of processes, a matrix of distribution of powers and the responsibility, regulations about divisions, duty regulations, the register of documents, the register of documents with the data on quality, standards of the organization.

The system model can serve both to the purposes of automation of the organization, and the purposes of standardization. On the one hand, it is a basis for formation under standard IDef1X of information model, and with another in various aspects closes practically all requirements to formation of normative documentation CMK.

The technique of construction of system model with use of standards of the organization allows to operate the organization. It opens such opportunity, as forecasting of possible reaction of system for managing influence on its system model.

4. Management by Means of System Model

On the basis of the analysis literature it is possible to make output that the built-in resources of the ABC-analysis are not approach for an quality estimation of handle on functional model. On the other hand, the performed browse of existing methods of quality estimation displays, that a unique resource permitting to evaluate management quality on entropy of states number without usage of probability estimations – is the solutions correspondence exponent to the object states offered in [1].

Development of this criterion became the theory of systems organization offered by Prangishvili I.V. in [5], which is created on the analysis of the system uncertainty measure – entropy.

The entropy is a quantitative measure of uncertainty in the system and is defined by number of valid system conditions. Than it is more for the system number of valid states S, the more entropy. As the log – number dimensionless, also entropy is a dimensionless quantity. If the system can be only in a unique valid state $S = 1$, then $E = \ln 1 = 0$.

The organization coefficient R of the system is a measure of system structuredness and organization and expressed as follows

$$R = 1 - \frac{E_{real}}{E_{\max}} = \frac{NE}{E_{\max}} \qquad (1),$$

where E_{max} – maximally possible entropy of the system, when NE is equaled to zero;

E_{real} – real (actual) entropy of the system;

NE – negentropy of the system.

There is a numerical value permitting to judge about quality of the system organizations. The value depends on number of interelement couplings and for a case of functional model is defined on number of uncertain and maximally possible interelement couplings of S_{def} and S accordingly.

As a matter of fact organization of model displays its quality.

Rating of the maximal number of connections in system

$$S_{\max} = n^2 + nm - n \qquad (2)$$

where n - number of functions;

m - number of inputs and outputs, including tunnel.

Rating of number of uncertain connections

$$S_{undef} = S_{\max c} - S_{def} \qquad (3)$$

where S_{def} – number of the certain statuses in functional model.

We research changes of a parameter of structural organization in a contour of management of business - process on levels of structural decomposition of system model. The cycle of management of business - process defines a circuit of functions - from top up to bottom levels. Researches show, that the parameter of structural organization decreases with increase in levels of system model in some times.

Let's consider application of a parameter of structural organization as criterion for management of structure of

business - process at change of quantity of connections. Above system it is possible to carry out management with the help of addition ΔNE (information) with the purpose of indemnification casual entropy factors

$$R_{QS} = \frac{NE_b + \sum \Delta NE - \sum \Delta E}{E_{\max}}, \quad (4)$$

where NE_b - an initial negentropy in CMK;

$\sum\Delta$ NE - the sum of the negentropy entered into system for the period of time t;

$\sum\Delta E$ - the sum of an entropy for the period of time t.

Efficient control business - process is reached(achieved) at a presence(finding) of a parameter of structural organization within the limits of an inequality 5

$$R_{QS}^{\min} \le R_{QS} \le R_{QS}^{\max}, \quad (5)$$

where R_{QS}^{min}, R_{QS}^{max} - borders of efficient control.

Value of parameter R as criterion defines the compromise between the formalized part of business - process and its not formalized part determining a degree of freedom at its performance.

5. Application of a Technique

The technique of construction of system model on the basis of standards of the organization today is applied on USPE "Molniya" to creation of the complete set of the documentation for certification of a QS on conformity ISO 9001:2000. For its support the program the "Standard" is developed, allowing to broadcast reports of program BPwin in text documents - standards of the organization.

The Report of the Program "BPwin"

```
Activity Number: 0
Activity Name: Управление стандартами
Mechanism Name: Высший менеджмент + Подразделения
предприятия
Output Name: Стандарты предприятия
Input Name: План по стандартизации + Требования внешних НД +
Изменения процессов
Control Name: ГОСТ + СТП

Activity Number: 1
Activity Name: Разработка СТП
Mechanism Name: Высший менеджмент + Подразделения
предприятия
Output Name: Утверждённый СТП или извещение
Input Name: Требования внешних НД + Изменения процессов + Проект
изменений подлинника и извещение
```

The Report of the Program "BPwin", "Standard" Processed by the Program.

```
4.1 Разработка СТП
4.1.1 Организовать разработку проекта СТП
Основанием для разработки и пересмотра стандарта предприятия
является план по стандартизации и унификации на календарный
период, утвержденный руководителем предприятия. Приказами или
протоколами в план могут быть включены стандарты,
необходимость в разработке которых возникла после его
утверждения. Стандарты предприятия системы менеджмента
качества (СМК) разрабатываются и пересматриваются в
соответствии с планом работ по подготовке к сертификации и
лицензированию, ежегодной программой развития СМК,
результатами анализа и оценки системы качества,
определяемыми плановыми оперативными совещаниями по
качеству у генерального директора - главного конструктора,
предложениями подразделений предприятия. Руководитель
подразделения, ответственный за разработку и пересмотр
стандарта, назначает своими распоряжениями ответственных
```

Figure 2. Example of Work of the Program "Standard"

In addition to the program "Standard" which is at a stage of completion, the program "Duty regulations" which will allow to form regulations about divisions and duty regulations on technical officers of the organization is developed. The foreign organization develops the beta-version of the professional software product realizing besides other functionality of the program "Standard".

6. Conclusion

The integrated quality management of business - processes of the organization on the basis of system model allows to solve the important scientific - practical problem of creation of the mechanism of a rating of quality various on structure and the description of business - processes of the organization in a uniform scale that allows to improve quality of management of the organization and its economy due to forecasting consequences at decision-making.

References

1. Anfilatov V.S., Emeljanov A.A., Kukushkin A.A. "The systems analysis in handle: the manual". Finance and statistics, Moscow, Russia, 2002.
2. Kaljanov G.N. "CASE-technologies. Consulting at automation of firms". SINTEG, Moscow, Russia, 1997.
3. Kulikov G.G., Nabatov A.N., Rechkalov A.V. "The computer-assisted design is informational - controlling of systems. System simulation of data domain". USATU, Ufa, Russia, 1998.
4. Pogorelov G.I., Kulikov G.G., Konev K.A. "The concept of quality assurance in an air engine building". In: *Proc. of National space university by Joukovski «HAI»*. HAI, Kharkov, Ukraine, 2003.
5. Prangishvili I.V. "A system approach and general-system legitimacies". SINTEG, Moscow, Russia, 2000.
6. Guideline R1.1.26-2002 *The system of quality management. The methodology of functional simulation. Main positions and order of holding of operations*. Gosstandart Russian Federation, Moscow, Russia, 2002.