Methodology of creation and application of business process management model based on organization information space in an organization

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Abstract. The interaction of the management system with the organizational system appears during the control actions transfer and feedback reaction via information, i.e. it realizes an informational interaction of two systems. It defines the main matter of the control system as the system that generates and consumes information about the educational process and based on the data transformation. Consequently, a controlled process can be interpreted as an information generating environment, and the control process as an environment which generates and uses information

1. Creation of organization functional structure
From the point of view of the interaction with the controlled process, this one is a cycled cybernetic process with feedback aimed to regulate some parameters of the controlled process.

This scheme of data transformation may be considered as a sequence of stages of the control process and may be applied to organizational systems using appropriate terminology (see figure 1).

1. Standardization
2. Planning
3. Analysis
4. Regulation
5. Accounting
6. Controlled process

Figure 1. The interaction of the control process stages.

Standardization, planning, accounting, analysis and regulation may be considered as stages or general control functions.

The content of these functions can be formulated as follows:

Standardization is a function of the management process, which consists in establishing technical, economical and organizational limitations (norms and standards) of the process running.
Planning is a control function that develops tasks for stated intervals and organizes these tasks as activity indicators for its monitoring and assessment.

Accounting is the management process function, consisting in fact and phenomena observations, its measurement, registration, grouping and transformation to a form suitable for analysis.

Analysis is the management process function, that consists in comparison of the planned and accounting parameters and information display to design a control action.

Regulation is the management process function, that consists in developing, on the basis of analytical information, managerial decisions aimed to adjust the operation parameters of the controlled process.

The overlaying of the general control functions sequence on the organizational system matrix provides a three-dimensional matrix of the organization’s business processes (see figure 2).

![General control functions](image_url)

**Figure 2.** The matrix of the organization’s business processes.

Since the formation of the organizational system matrix provides a certain internal homogeneity of each cell, it may be assumed that the same homogeneity is inherent in each cell of the management process matrix.

Each cell may be considered as a specific control function, and in general such a matrix may be called the functional structure or structure of the organization’s business processes.

2. Business Process Modeling

The above functional model of the business process does not provide a complete insight into its application technique and allows to define the demarcation only within the functions as the enlarged components of the business process. For the more detailed description of each individual contractor activities, it is required to differentiate each business process to the level of information units - documents and operations. The information process description is greatly simplified when using some standard operations to convert information units to describe processes.

The selection of typical functions allows to reduce the task of modeling to the business process displaying in the form of the obtaining, transmitting and processing of data reflected in the workflow.
It should be noted that the formation of the basis of typical functions is associated with the accepted abstraction degree to display some material actions as the mathematical formulas. For typical functions, in turn, its own basis may be introduced to display these at its lower execution level. From typical functions it is possible to form various schemes of business process execution.

The basis of typical operations (functions) for paperwork may be determined as:

\[ F = F_{\text{doc}} \cup F_{\text{rec}}, \]  
\[ F_{\text{doc}} = \left\{ f_{i}^{q_{i}} \right\}, \]  
\[ F_{\text{rec}} = \left\{ f_{i}^{t_{i}} \right\}, \]

where \( F \) is the set of document circulation functions, \( F_{\text{doc}} \) is the set of paperwork functions, \( F_{\text{rec}} \) is the set of functions for property work, \( f_{i}^{q_{i}} \) is a typical function for property work, \( f_{i}^{t_{i}} \) is a typical function for paperwork.

Let’s select the main typical functions of property work (\( f_{i}^{t_{i}} \)) to describe the documents processing. The appearance of typical functions greatly simplifies the process of functional and informational modeling, since the user does not need to formulate the working functions detailed each time, and it suffices to select the desired typical function from the list. Functional blocks with typical functions have a predetermined amount of input and output properties, as well as a certain control and execution mechanisms. This reduces the error number when filling in the functional model.

The introduction of the typical functions basis of paperwork and property work allows to display the management process in the form of typical functions, which order is determined by the hierarchical structure of the functional model.

3. Method of organization’s General control functions (GCF) formation

Objectives of the GCF formation

At a certain development stage an organization faces three main problems:

- formation of the organization development strategy, optimization of the organizational and functional structure;
- relevance to reduce the information load for staff and to provide to the managers and decision-makers with more actual and high-quality data;
- ensuring the organization certification in accordance with the ISO 9001 standard and, above all, solving the problem of business processes forming and describing also as the tasks sharing and responsibilities assignment.

As it is shown by the practice of improving management systems, the solution of the problems noted above goes through a series of general stages, denoted in different descriptions by various terms, but having a common theoretical and methodological basis, called system modeling or system design.

The suggested method proceeds from the fact that within an organization’s GCF formation, the following main tasks are solved:

- identification of the whole composition of the business processes of the educational institution;
- formation and assignment of the full range of functions to executives ensuring the efficient realization of business processes;
- formation of streaming diagrams of the activities of functions by specified executives;
- formation of documents database, business process models and workflow;
• analysis of the organization’s business processes efficiency and development of recommendations for organizational rationalization, for technique of business processes realization, and for information system construction.

This approach is based on the quality management principles. The most important element of the management process is a specified executive of a particular function.

Formalization, ordering and detailed description of the interaction "function" - "subject" is one of the most important tasks of the GCF formation. As a result, it is formed an organization GCF, providing:

Finally, complete content and organizational editing before formatting. Please take note of the following items when proofreading spelling and grammar:

• analysis of organization structure and formation of business processes composition;
• formation of the organization activity functions, assignment of functions and responsibilities, formation of structural unit’s regulations;
• analysis of workflow, building of management functional models, formation of job descriptions for staff;
• analysis and streamlining or reorganization of the organizational structure;
• reengineering of business processes and making recommendations on an organization’s information system building.

4. Implementation and application of GCF organization
The implementation of the organization GCF is realized in several stages:

• description of the organizational structure, formation of the composition of business processes and functions;
• analysis and streamlining of the assignment of functions and responsibilities, the formation of regulations on structural units;
• analysis of the paper flow, functional models building for management processes, formation of job descriptions for staff;
• analysis of the functional models and construction of the process ones.

After the organization has invested resources in the development and implementation of the GCF, it is possible to get a return through the implementation of the following steps:

• formation of the regulatory documentations;
• formation of the roles structure in the aspect of the organization’s manager reference book.

5. Implementation of the GCF in an organization
At the first stage, the basic information is prepared for building a business model, it is formed a matrix of the life cycle of resources, a tree of business processes and the composition of the educational institution functions or its department.

Business processes are considered as the sequences of a standard set of functions and are differentiated at a selected level from technological processes. At the same time, all business processes are determined and identified as an activity that has a certain purpose and results, and are classified according to the types of data objects (resources) and processes for its support.

It is also recorded the organizational structure, the staff list and assigns the participation of executives or departments (“who — where”) in the implementation of business processes.
When building a matrix of business processes, it is suitable to use the experience already existing in the standards, job descriptions and subdivisions on divisions to determine the nomenclature of the business processes under consideration.

The functional and informative analysis carried out at the second stage allows to regulate the assignments of control functions in an organization, to reveal any unattached functions, that are not peculiar to particular departments, cases of duplication of functions, etc. (see figure 3). Such analyze is realized via determination on the basis of the presented matrix of the functions reference composition, comparing it with the actually performed ones.

To initialize and control the business processes realization, it is supplemented with the necessary control functions (standardization, planning, regulation, accounting) and, accordingly, the roles and executives of these functions. Thus, for each business process with a data objects a management process is assigned, in compliance with the model (4):

$$
\begin{align*}
MRO & = \{DO\} \cup \{PEMP\} \\
MCF & = \{DO\} \cup \{CF\} \\
MCR & = \{Roles\} \cup \{CF\}
\end{align*}
$$

where DE is a set of data objects and information resources, PEMP is a set of primary education methodical processes, CF is a set of control functions, MRO - matrix of resources operations, MCF - matrix of data objects control functions, MCR is a role matrix for the control function, \(\cup\) - join operation.

The business process is a triad:
6. Application of organization GCF

Upon the implementation of the organization GCF accomplished it becomes possible to form a set of regulatory documents for an organization. In this case, it is possible to automatically generate a number of documents from the model.

The number of functions for an educational institution is measured by thousands, and for an average department by hundreds, therefore, to systematize them, it is required to use the modern software products of the orgware class. In addition, the collection of information and its systematization is impossible without a specific method that regulates the process in stages.

Thus, the formation of the organization management model is an integral part of the regular management system. The process of management model optimization is iterative, i.e. changes to the management model are made on the basis of the identified deficiencies and comments of staff during the organization activities. Changes in the organization activities are reflected in a management model as a system, that allows to generate the required documents pack automatically.

To date, there is a software package BackOffice, designed to generate normative documents from the system model of an organization. It includes BPwin, as the environment in which a functional model is created, ModelMart, which allows to store a functional model in Microsoft SQL and to provide a distributed access to it, a user interface created in a high-level language, and Microsoft Word with a macro that allows to assemble model elements into reports forming the required documents. At this stage, the formation of organization standards, process maps and organizational management structure were implemented.

7. GCF update

It should be understood that the organization GCF is not a static form, but a constantly improving mechanism. And the source of this improvement is the changes and refinements made to the model.

In organizations, including the educational ones, which in one way or another implemented GOST R ISO 9001 or a quality system that meets a different standard, there are standards and procedures for its update. Since, as it was shown above, it is possible to automatically form a standard from the GCF, embedding the standards in the GCF therewith embeds the update algorithm, since to refine the standards it will be required to refine the model in order to be able to create modified sheets to the
standard. Thanks to this opportunity, the GCF appears to be as actualized, as the included standards correspond to reality.

Thus, the technique of considering includes an update algorithm.

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