Methods of Information Technology Quality Control at the Enterprise

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Abstract - The article deals with the methods of information technology quality control recommended for use within the enterprise to increase the efficiency of digital transformation.

Keywords - information technologies, quality, control methods.

I. INTRODUCTION

Digital and information technologies are used in all spheres of production, transforming technological and enterprise management processes. Companies are in urgent need of automation. Their needs are rapidly growing, but the costs of information technology are increasing. Management methods are required to be improved and made automatic starting with control methods that provide reliable information to the decision-making system in due time.

Control environment should be considered as a process aimed at checking and evaluating one's own work carried out in one's own interests with the purpose to obtain confidence in one's effective and constructive activities.

In the digital economy, the sphere of information technology is one of the priorities for development in modern conditions.

Under these circumstances it is necessary to take into account that the sphere of IT requires systematic approaches to management including special control methods that can be integrated into the control environment of the enterprise and be effective as well.

IT covers hardware and software areas, diverse technical support, and the processes of development, implementation, and maintenance of information systems. As a whole, the sphere of information technology requires infrastructure and architectural solutions. It is necessary to keep documentation, functionality, incidents, releases and user requests under control. This requires IT competencies, knowledge of various regulatory requirements and the application of the most effective control methods.

The purpose of this article is to determine the methods of quality control of information technology from the standpoint of the process approach.

II. STATEMENT OF THE PROBLEM AND METHOD OF ITS SOLUTION

Methods of information technology control involve the definition of stages and goals of control, as well as objects of control in the sphere of information technology.

Let's consider the regulatory documents describing the requirements for the field of information technology.

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Determination of requirements will allow forming a system of relevant indicators.

The issues of quality management and control of information technologies are of topical matter. Voronina V.T. considers the issues of determining the criteria for the quality of information systems [1]. One of the critical indicators of information technology control is information security, and a lot of scientific research is devoted to this IT object. The problem of information systems security control and approaches to control is disclosed in the research done by Grishin S.E. [2].

When forming a control system, it is necessary to allocate responsibility for managing the quality of information technologies. The authors of scientific studies presented in the work [3] raise the issues of delimiting the responsibility of information systems.

To manage information technologies and form control indicators, it is necessary to determine the stages and objects of control. The scientific research by Shaitura S. presents the life cycle of information systems [4]. There are also a number of standards and recommendations, the most popular of which are the ITIL library [5], the COBIT methodology and the TOGAF architecture management standard [6], ISO 20000 standards for IT service management. The life cycle of the process of an automated system creation is regulated by state standards.

The standards define some stages of creating an automated control system and a list of documents recording the results of the work. It is advisable to implement IT processes in accordance with the requirements of standards, as they are developed in order to streamline and unify activities. The requirements for the information system are described in requirements specification and design solution. The requirements for the order in which functions execute in the information system are described in the manual and user instructions.

The market generates a variety of proposals for IT audit: technical, infrastructure, comprehensive, operational, targeted, information systems audit, IT audit of business processes, information security, etc.

Particular attention should be paid to the importance of classification and systematization of the types of IT audit. The purpose of each type of IT audit is to consider a specific object of control, and interconnect it with periods of the Deming cycle. That is, each of the audit subtypes goes through the stages of the Deming cycle. However, it differs from what happens in practice: an extensive list of control objects is located in an arbitrary order, and the types of audits

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are of a general nature. Thus, the audit may become less effective, and the cost of its implementation may increase.

Companies offering services for monitoring and assessing the true state of IT facilities at an enterprise do not always have an exhaustive set of tools and they are not always able to meet the needs of a customer in full. Therefore, before checking, it is necessary to find performers who meet the needs, as well as determine the requests and expected results of the check. Then you need to formulate the goals of control measures in the requirement specification for conducting an IT audit.

One can organize a more thorough audit, for example, an audit of a specific business process (functionality), or a specific object of the IT infrastructure, for example, the workload of the data network.

The objects of control in the sphere of information technology are documents (instructions, design decisions, role models, etc.), IT infrastructure, software, Information Security.

III. RESULTS OF THE STUDY

The paper is proposing the following methods of control, which are built on a logical relationship of an object being checked. These methods encompass documentary control, conformity assessment, risk-based control, control of IT block development.

A. Documentary control

Documentary control is a check of the regulatory support of the company's IT block with documents, records and data. It also evaluates the degree of the company's IT unit formalization.

A frequent problem of companies is the low quality of the regulatory framework, which controls all actions of the staff. If specific procedures and rules are not clearly documented or they are not regulated at all, the personnel have to act on their own. This approach brings chaos to the company's environment and is fraught with a clash of subjective interests.

The IT documentary base includes the following documents as: the scheme of information flows; the scheme of interconnection of services and systems; technical characteristics of the IT infrastructure; requirements specification for the emergency system; the user's manual; test report; maintenance organization manual; description of the software package; test program and methodology; system administrator's manual; database administrator's manual; description of IT department processes; IT personnel job descriptions; service level agreement. It is necessary to point out that this base isn't restricted by the above mentioned documents.

Information about structural subdivisions, processes, and operations is added to the configuration database as reference information. For each accounting unit, a structured card is filled out. The following information is indicated in this card:

- name of an accounting unit;
- owner, administrator, users;
- specifications;
- physical location (if that makes sense);

- list of functions and tasks;
- necessary resources (including links to other accounting units).

With regard to IT at the enterprise, one needs to determine and regulate not only the list of the documents required, but assign those who are responsible for their creation and implementation. It is also important to get the personnel acquainted with these documents and update these documents when required.

When checking documents it is essential to define the purposes of control and specify the approaches to be used (analysis, observation, survey, unloading from information systems).

The most important task is to provide access to technical documentation to all persons interested in it. If IT department fails to solve this problem, all documentation efforts will be in vain. All users of the documentation should be provided with the following:

- clarity of the documentation structure (the ability to understand what document you need);
- the ability to find quickly any document desired;
- confidence that the document found contains up-todate information.

Documentary control of the IT block regulatory framework allows finding many shortcomings at the preliminary stage of technological and management processes.

B. Conformity assessment.

This method of control can be carried out provided, however, that the regulatory requirements for the object being checked and quality criteria are established.

Compliance verification is largely of a technological nature, focusing on the execution of technical specifications, descriptions, operation schedules, maintenance job regulations and safety rules. Compliance with personnel interaction algorithms and user work technologies is checked. of the information system requirement Conformity specification to the terms of its development and compliance with the conditions for its maintenance and dispatching is checked as well. The quality of functioning of IT infrastructure facilities, communications and telephony, as well as involvement of IT in the field of cloud technologies is under control.

The main task of information technology quality control is organization of non-stop functioning of information systems. Therefore, in the course of control, it is necessary to conduct a constant analysis of the specified deviations of indicators from the established requirements. In the case if the parameters of IT objects do not meet the specified quality indicators, the quality control system helps to identify the most likely causes of this discrepancy quickly and eliminates them.

Undoubtedly, the basis for assessing conformity is documentation – some parameters and indicators that are regulated. It is noted that in case if internal database of documents isn't available, an enterprise should be guided by state standards or recognized international practices. At the same time, the development of own documents describing information technology of the enterprise should become one of the main tasks of the enterprise.

C. Risk-based control

This type of IT control differs from the ones above mentioned because risk identification and assessment have been added to the control and analysis functions. It is based on the methods for studying potential threats, assessing the extent of possible damage and the degree of probability of a negative scenario for the timely identification and elimination of risk factors. Thus, risk-based thinking is aimed not only at assessing those events that carry potential threats but emerging reserve opportunities as well.

When monitoring information system functionality, for example, availability of duplicate functions in various information systems, frequency of failures and downtime, completeness and reliability of data in information system, availability of an access register and reliability of information security are checked. Functional suitability involving completeness, correctness and expediency of performing certain tasks is also checked.

D. Control of the IT block development

This method of control is based on the information obtained when using the three above mentioned methods of control. It is not an easy task to develop useful corrective solutions, organize them skillfully and put them into practice in an efficient way. Therefore, it is also important to control them.

The development of information technology can be checked in the following ways:

- analysis of the availability and implementation of information technology development plan and IT strategy;
- completeness of the strategy (goals and objectives of the IT department, principles of its interaction with business departments, approach to company's IT development, main IT assets, plans for the development of IT infrastructure in the medium term, budget and personnel policy);
- verification of the adequacy and consistency of the IT development with the needs of the company, market and state policy.

Control of IT development is an integral part of implementation of the company's development strategy in the context of turbulent changes in external and internal technological, economic and social factors, the regulatory framework, etc. In view of this, IT control is an integral tool for implementation of strategic plans for the company's natural development, associated both with business requests, and with the requirements of standards: ISO/IEC 9001:2015; ISO/IEC 20000-1:2018; ISO/IEC 25010:2015; ISO/IEC 27001:2013; COBIT-5; ITIL etc.

Table I depicts methods of control in summery. These methods are built on the logical interrelationship of the object of control. They include documentary control, conformity assessment, risk-based control, control of the development of the IT block and the Deming cycle.

It complex The Deming cycle	IT infrastructure / Hardware environment	Software / Computer systems	IT management / IT organizational development	Business processes / Information system functionality
Planning / Documenting	Documentary IT control			
Organization / Implementation	IT conformity control			
Control/ IT audit	Risk-oriented control			
Changes / Improvements	IT development control			

METHODS OF CONTROL

TABLE I.

The classification of IT audits allows determining the purpose, object and type of audit itself. For example, if one needs to carry out an infrastructure audit, then the table shows that one needs to conduct all four types of audit at each stage of the Deming cycle. The type of audit depends on its purposes. It is possible to conduct only one type of audit (documentary verification or audit of compliance with any specific internal requirement, for example, GOST), but in this case, the entire IT complex must be checked.

One can organize a deeper audit, for example, an audit of a specific business process (functionality), or a specific IT infrastructure object, for example, data network congestion.

One of the IT development sub-processes is project management. This process requires special attention at the enterprises, since improper project implementation can lead to low automation efficiency. Project management is similar to the above methods:

- project documentation (task, plan, responsibility); conformity assessment in the implementation of the project and its final result;
- risks in a separate project or project activity as a whole;
- development of information technology involving project activities.

The result of each control method implementation separately or in combination depending on the objectives of the audit, should be described in an audit report. The report should include a description of the control method, object, documentation and recommendations for eliminating identified deviations or bottlenecks in the area of information technology being checked.

A report on quality is the document showing the results of each control method implementation, which is made separately or in combination depending on the objectives of control. The report should include a description of the control method, an object of control, and documentation containing recommendations for eliminating the deviations identified or bottlenecks in the information technology field that is checked.

One of the key IT objects is information security, which can be found in all IT objects. The report may contain a conclusion on the degree of compliance of the enterprise's security policy and the entire set of measures to protect information with the requirements of current legislation and departmental regulations. Apart from that the report includes the following aspects: evaluation of the economic efficiency of investments in information security facilities; organizational measures (returns from them); quantitative (monetary) assessment of possible losses from certain violations that may occur with the existing level of information security. It gives an objective account of the investment calculation needed to be made to achieve a certain level of security.

IV. CONCLUSIONS

The logical structuring of control methods in the management system will enable management to see the place and role of information technology in the enterprise's structure, as well as its impact on achieving the goals of the enterprise and the effectiveness of investments in IT. IT quality control allows getting up-to-date information about current level of IT development, improving measures of its efficiency, finding the most appropriate management decisions, which have a positive impact on the corporate management system.

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