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The development and application of non-standard approach to the management of a pilot project

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Abstract. The aim of the paper is to describe and substantiate the approach to the implementation of pilot IT projects. The discussed approach helps to enhance the quality of projects implementation via quality improvement of IT solutions testing and, as a consequence, helps to increase the level of digitalization of project activities. The result of analysis of pilot projects realization was described, and characteristics of such projects are carried out. The paper gives the description of the approach to planning and management of pilot projects. The management process and the results of the pilot project of testing the IT system (software package) for predicting failures of storage systems are described. The evaluation was carried out and recommendations were formed for decision-making on the implementation of the tested IT solution. The principles of pilot projects and recommendations for improving the adopted standard of management of IT projects are formulated.

1. Introduction

Taking into account high rates of creation of new information tools and technologies, development and emergence of the narrow branch IT products allowing to bring to higher level quality of problem solving support in companies on the base of automatization, the need for improvement IT security and the necessity for support IT solutions in general increase.

All of the above mentioned cause the complexity of the choice of a specific IT solution and assessment of the capabilities of these IT products and technologies to perform a specific task.

To address this issue, IT products are increasingly evaluated through the implementation of pilot projects that allow testing and evaluating the effectiveness of a particular product or technology in solving the specific problem.

Another aspect of the need to implement projects for testing IT solutions is the necessity for substitution of foreign IT products, actively used for a long period in Russian companies, for Russian analogues.

In this paper the problem of enhancement of the IT project management on the example of a project devoted to developing and testing of the IT complex for prediction failures in data storage systems is discussed.

The management of data storage systems' fault tolerance is the basis for the design of a reliable information system.



As an example of one of the first works in this area the classic work of K. Warwick and M. T. Tham [1] can be mentioned. Big companies such as TDK Corporation, Seagate Technology, Hitachi Global Storage Technologies [2], etc. have been solving the issues of reliable storage devices design for decades. The research groups address the problems of predicting disk failures for large-scale storage systems [3]. In particular, such solutions as data duplication (mirroring), multi-level redundancy coding [4] for digital archives data [5], deduplication systems for parallel data backup [6] are offered. The nature of problems in storage systems is learned taking into account the age of the system [7]. The concept of a survivable storage system has become popular [8]. The reliability models for data storage systems are suggested [9–10]. At the same time the question of data enter power management is studied [11].

Among the examples of studying of the problem of reliability of data warehouses in Russia are works of D. V. Ganin [12] and R. V. Klimov [13], S. V. Zapechnikov [14], A.V. Igumnov and S. E. Sarajishvili [15].

Thus, the task of improving the efficiency of management of pilot IT project devoted to developing and testing of the complex for prediction failures in data storage systems is significant.

2. Description of methodologies and approaches

2.1. Methodologies and approaches

The paper describes the adopted approach to the implementation of IT project management.

The aim of the work was to analyze the reasons for the implementation of pilot projects and their characteristics. On the basis of such analysis it was recommended to make a decision on the beginning of the project of testing the IT solution, namely the project of development of the program complex for forecasting the failures in the data storage systems. The description of the concept of the pilot project, the characteristics of this type of projects were given, as well as the approach to the implementation of testing projects with the allocation of stages and results.

2.2. The specifics of the developed project

The program complex developing for forecasting of data storage system failures is designed to diagnose and predict the state of the data storage system and components of the data storage system in real time [16]. In the process of modelling the idea of the system dynamics model was used [17].

The program complex (software package) is used for the data storage systems running on the platform YADRO TATLIN in various configurations. The hardware included in the data storage systems on this platform consists of a set of storage controllers, PCI-express factory, disk chassis and disk drives.

Structural scheme of the Software package for predicting data storage system failures (SPP DSSF) is presented in figure 1. SPP DSSF consists of modules: monitoring and data collection of storage components; storage of information about the state of storage components; synchronization of data on storage components in the database; issuance of data; predicting failures.

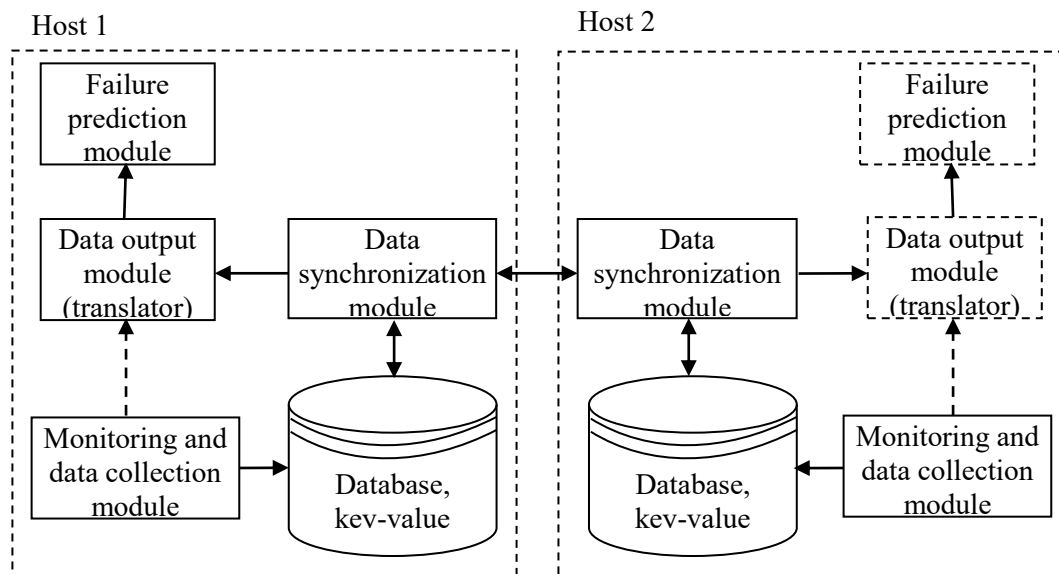


Figure 1. Structural diagram of the Software package for predicting data storage system failures.

The data collection, database, synchronization and data output modules work in a single process (hereinafter referred to as the ‘Collector process’), which is implemented as a Linux daemon.

The fault prediction module is a separate process that is started and executed as needed.

3. The Modules of the program complex

The monitoring and data collection module (figure 1) solves the problem of collecting information about the state of storage components. The monitoring and data collection module in the collector process is executed on each node of the TATLIN storage cluster. The monitoring module receives data from two different sources — RESTapi of the system and logs of the system storage software.

The block diagram of the monitoring and data collection module is shown in figure 2.

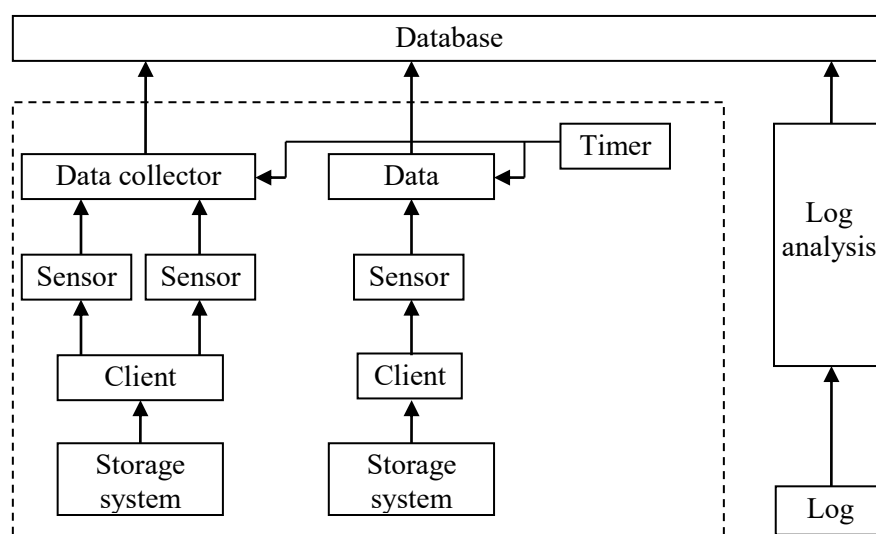


Figure 2. Block chart of the Software package for predicting data storage system failures.

The Data output module solves the problem of conversion located in the database data collected by the monitoring and data collection module in the format of the input data of the diagnosis module. The output module is implemented using the http server that provides a set of REST requests that correspond to the possible modes of data output:

- output of the current state displays the current values of the parameters on the storage node;
- a set of values for the time range gives an array of parameter values on the storage node for a specified period of time (the start and end timestamps must be specified).

Synchronization module is designed to ensure the availability of data on all nodes of the storage at the current time and for a specified time of data storage.

The diagnostic module is designed to determine the current state of storage and storage components. Algorithms based on the methods of correlation analysis, time series analysis and artificial neural networks, including the algorithm Random Forest, which consists in the use of the Committee (ensemble) of decision trees, as well as an algorithm based on the use of the system-dynamic model (SDM SHD), which implements the definition of classes from the ontological description of the system on a set of information features, are used to implement the diagnostic module. The diagnostic module is started by a separate process in case of a request to determine the status of the system, or by a timer. The diagnostic module receives data from the output module in accordance with the algorithm of the output module and the structure of its output data.

4. Identified features of the pilot projects and their management features

Pilot IT projects can be divided into four types:

- associated with the development or adaptation of a 'boxed product' to solve the problem in the industry with little or no experience in the use of such systems;
- aimed at testing the applicability of new technology not previously used for a specific task;
- aimed at testing the possibility of optimizing processes for further implementation of IT solutions;
- focused on the selection of one of the planned projects devoted to software development with low financial and technical risks.

The implementation of the pilot project may require the allocation of unplanned resources, the involvement of key staff and the adjustment of plans and budget.

In terms of the implementation of pilot projects, the following stages and work within these stages are singled out:

1. Survey and design: define the scope of the project, conduct a detailed survey, prepare requirements and technical specifications.
2. Implementation and preparation: includes work on setting up (adaptation) of the system, preparation of equipment for solution deployment, elimination of issues with information security, testing before transfer to the pilot use and training of the customer's target group of users.
3. Pilot testing: the stage of testing the solution by the target group of customers. It is the key in the evaluation of the results of the pilot project and the tested solution to support the implementation of the customer's tasks. It requires special control by the project manager to ensure the effectiveness and efficiency of the stage to control the regularity of the involvement of the test team to work with the system. In the process of performing the stage, the comments from the testing group are collected and eliminated, at the end of this stage the feedback and users' opinions are collected.
4. Completion of the project: the stage involves the formation of a General report on the results of the project, assessment of the achievement of the criteria formed at the planning stage of achieving the results of the project, the closure of the project with the contractor.

5. Pilot project management Plan and its structure

When describing the implementation of a pilot project, it is necessary to delve as much as possible into the specifics of such projects and evaluate the results of its implementation. To do this the problems of

the automated business processes of the project were analyzed, a list of stages and results of each stage of the project was taken into account. When implementing the project stages, it is necessary to evaluate the results of the implementation of each stage when reaching the end of it. Based on this analysis, it is possible to plan the next stage. This will allow, especially for pilot projects, to take into account all the problems and risks that have been implemented at the last stage (project stage).

When carrying out a detailed analysis of the adopted passage to the management of IT projects for the implementation, development and replication of systems, the need to form a knowledge base on non-standard projects for the formation of a set of measures to identify risks and threats was revealed.

At the next stage of the study, the experience of pilot projects, the current and potential relevance of the implementation of such projects in the future and the reasons for the start of pilot projects were analyzed. Among the key reasons for the implementation of the pilot projects were identified the possibility of using new technologies, narrow IT solutions, as well as the possibility of import substitution of the systems used for Russian analogues. It is important to adapt the information (the characteristics of pilot projects and the approaches to pilot projects' management) for the current project.

The study and the results of the practice of the pilot project, which at the beginning of the project was atypical with respect to ongoing IT projects, were developed and presented.

The implementation of the pilot project begins with a detailed planning of the project as a whole, which is reflected in the document 'Pilot project management Plan'. This document includes a list of sections that are critical for detailed planning and control of the project. The structure of the document does not differ from the standard document when implementing the implementation project, however, some sections require more detailed study for quality management of the pilot project. Sections of the pilot project management plan include [18–21]:

- goals and expected results of the project: correspond to the goals at the planning stage (pre-project works);
- project limitations: the available time, cost and technical limitations of the project are formulated;
- 'road map': includes a list and deadlines for the completion of the project phases;
- project risks: this is a critical point for the pilot project, a list of risks is formed with a description, prioritization and risk response activities;
- quality control plan: defines the list of works at each stage with the formation of the quality control matrix by the project team members;
- organizational structure of the project: description of the project team and distribution of roles within the project [22–24];
- management of communications in the project (formalization of approaches to the interaction of project team members for successful execution of works) [22–24];
- project risk management (describes the approach to working with risks in the process of project implementation);
- list of tasks of the pilot project: describes the full list of works performed at each stage of the pilot project with the definition of the duration and resources involved.

First of all, consider the list of risks identified in the framework of the pilot project and the approach to work with them. Risk assessment, as well as a plan to reduce them, is worked out either by the results of a weekly status meeting with the project team, or through communication by e-mail. If the risk is outside the competence of the project team members, the issue is escalated to the higher management.

The project identified a list of risks, which are mainly technical and organizational. In the description of risk is given:

- risk category (technical, qualitative, organizational);
- description of the risk, which is an event that may occur during the implementation of the project and affect the result of its implementation both in the negative and in the positive direction;

- risk priority (low, medium, high) to assess the impact of risk on the project;
- risk response, describing the planned approach to work with risk in the project.

In order to consider in detail the approach to the implementation of the pilot project and compare it with the implementation of the project in accordance with the adopted methodology, a scheme was formed to compare the planned approach to the implementation of the pilot project with the company's standard of IT projects.

6. The main differences in the implementation of the pilot project

The main differences in the implementation of the pilot project are as follows.

Stage 'Evaluation': in the pilot project is not made the formation of business requirements for the project, as the General survey conducted at the pre-project stage of work (in the process of planning and preparation for the start of the project), and compliance with the functionality of the 'box solution' (typical solution) to the tasks allows to exclude this artifact stage 'Evaluation' due to the understanding of the requirements for the implementation of the project by the business customer. Instead of business requirements at the 'Assessment' stage, the technical specifications for the implementation of the project were prepared.

Stage 'Selection': the purpose of the stage in the pilot project is to choose an approach to the deployment of customized and adapted boxed it solutions and technical capacity to perform this task. For the formation of a technical project for the subsequent adaptation of the system, a detailed survey of the subject area, clarification of the availability of the required list of data for the adaptation of the IT solution and the construction of schemes of the affected business processes with reference to the modules of the system to automated operations. The main difference between the work of the pilot project and the standard approach is the absence of the concept of an IT solution and the definition of embedding this system in the IT architecture, since the adaptive solution is not intended for implementation in the company's circuit. Consequently, the solution to the issues of information security and IT architecture is to make decisions on the approach to data transmission and deployment environment of the adaptive system. Also, at this stage, the contractor is not selected, as this issue is solved at the beginning of the pilot project.

Stage 'Definition': at this stage, the pilot project does not develop the terms of reference, as at the beginning of the project the terms of reference were formed. At this stage, the preparation of all the necessary data for the transfer to the contractor and configuration of the IT solution are also initiated.

Stage 'Development and implementation': the passage of a full cycle of preparation of the system to adapt the selected it solutions to the formed requirements. An important difference of the pilot project is the implementation of the technical features of the system deployment on the demonstration stand, and not the implementation on the test and productive circuit.

Stage 'Pilot tests': in the pilot project at the stage of a comprehensive testing of the adapted system, the collection and elimination of emerging comments in the testing process, an interim evaluation of the results of the system. Taking into account the lack of integration with adjacent systems in the pilot project under consideration, daily loading of productive data into the test (integration) database was also carried out.

Stage 'Completion': at the final stage, the document 'Final report on the results of the pilot decision testing' is forming. The considered stage is critical, as well as the previous one, since in the process of its implementation, a detailed assessment is made not only of the results of the project implementation, but also an assessment of the tested IT solution based on a detailed analysis of the results obtained during the test implementation of the project.

As a result, the possibility of using an adapted IT solution to support the customer's business processes is justified, within the framework of which the justification and recommendations on the need for full implementation in the context of each module (given in the description of the system) of the analyzed system were formed.

As a result, the modules of the Software complex for predicting data storage system failures were recommended for implementation using this non-standard methodology:

- monitoring and data collection of storage components;
- storage of information about the state of storage components;
- synchronization of data on storage components in the database;
- data output module;
- module of predicting failures.

7. Conclusion

As a result of the analysis of the effectiveness of the implemented approach to the management of the pilot project, the applicability of the principles and results of the projects is confirmed.

In order to draw a conclusion about the effectiveness of the approach, the analysis and evaluation of the results of a specific pilot project were discussed. These results concern the problems of assessing the applicability and feasibility of the pilot solution, as well as the analysis of the effectiveness of the applicable approach to the management of the pilot project, which confirmed the feasibility of this decision.

The resulting conclusions were formed and presented at the end of the pilot project, and recommended for further use in the project management of IT projects broadly.

Also recommendations for improvement of activity on management and implementation of projects of approbation of IT systems were formulated; the need of allocation of this type of projects in the standard of project management existing in the company was justified.

The results generated in the presented work can be further applied in the planning and implementation of pilot projects, as at the moment the practice of management of such projects is rather small.

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