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Technology for creating an intelligent system for managing the activities of the department of a higher educational institution

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Abstract. The main element of the activity leading to the creation of software is modeling. The designed department management model will allow you to visually demonstrate the desired structure and behavior of the system. In the implementation of the software product, the following stages were defined: development of requirements for the creation of an intelligent information system for managing the activities of the department; 2. The stage of the project implementation, which includes the task - to determine the totality of the software product, tools and means for the implementation of an intelligent information system for managing the activities of the department; 3. The stage of correction and control, the purpose of which is to identify the advantages and disadvantages in the intelligent information system for managing the activities of the department, as well as eliminating them. It is advisable to identify the criteria for evaluating the system, as well as experimental verification of the developed intelligent information system for managing the activities of the department and determining the results of the activity from its implementation. To determine the criteria for evaluating the effectiveness of the information system, testing of the created software product was carried out. Testing a software product is the most important process, consisting of identifying, correcting and correcting errors found in a program created on an electronic computer. To make sure that the intelligent information system meets the declared characteristics and requirements, the following criteria were defined: 1. Functional testing is intended to verify the designed technical task, that is, the requirements set for the functionality of the system. Examples are load testing (tools: Grinder, Locust, LoadStorm), configuration testing of an information system, and others; 2. Security testing to check the safety and reliability of data storage, use of user access by individual login and password, protection of personal data by system users; 3. Testing in use. This testing involves checking the effectiveness of an intelligent information system and the convenience of its use (time spent to perform certain actions on the part of users).

INTRODUCTION

Over the past two years, Uzbekistan has made some progress in the development of information technologies in our country. The main driving force behind this process is the strategic vision of the government and the high level of political support.

In the Strategy for Innovative Development of the Republic of Uzbekistan for 2019-2021, by 2030, it is planned to include Uzbekistan in the ranking of 50 leading countries in the Global Innovation Index. The Decree of the President of the Republic of Uzbekistan was issued on April 28, 2020 No. PP-4699 "On measures for the widespread introduction of the digital economy and e-government" in accordance and 5-appendix in paragraph-12.1, as well as Decree of the President of the Republic of Uzbekistan on October 5, 2020 No. UP-6079 “On the approval of the strategy “Digital Uzbekistan-2030” and measures for its effective implementation”, in which the development of innovative information systems is given relevance [1,2,3].

In this regard, the development, implementation and operation of the intellectual system for managing the activities of the department is relevant, since the department is responsible for the quality this training and graduation of students in a certain specialization, since the development of our society depends on today's graduate.

In the development of an intelligent information system for managing the activities of the department, foreign and domestic experience was studied.

An analysis of the current state of the practice of using intelligent systems for managing the activities of the department shows the need to create such systems as a means of tomatization, allowing real-time optimal control of technological processes.

In creating a software product, it is necessary to determine the main stages of creating an intelligent information system for managing the activities of the department.

METHODOLOGY

As a result, the stages of the project for the creation of an intelligent management system for the department of a higher educational institution were determined, including 1. Preparatory stage, 2. Stage of project implementation, 3. Stage of correction and control.

1. *The preparatory stage* includes the goals and objectives, the definition of architecture as a way to build an intelligent system, the development of requirements for the creation of an intelligent information system for managing the activities of the department [4]; 2. *The project implementation stage includes the task* - to determine the totality of the software product, tools and means for the implementation of an intelligent information system for managing the activities of the department [5]; 3. *Stage of correction and control.*The purpose of this stage is to identify the advantages and disadvantages in the intelligent information system for managing the activities of the department, to eliminate the identified shortcomings. There is a need to identify criteria for evaluating the system, as well as experimental verification of the developed intelligent information system for managing the activities of the department and determine the results of efficiency from its implementation [6].

DISCUSSION

The purpose and objectives are to analyze and justify the choice of methods and tools for the implementation of an intelligent information system for managing the activities of the department, designing and creating a model for an intelligent information system for managing the activities of the department, as well as identifying modern requirements to the development of activities in the field of management of intelligent information systems.

Let us assume that for the implementation of the planned intellectual system for managing the department, we can use the following model of scenarios for using this system (Table 1), as well as its a architecture.

Scenario using “A” - system administrator: General system management.

Tasks: Creation of accounts for users of the system, attachment of users (dean) to the corresponding faculties.

Steps to manage the scenario:

1) Login to the system;
2) Creation of an account by the user;
3) Create "faculty names";
3) Attach users (dean) to the corresponding faculties;
4) Providing the user (dean) with access to the system (login and password).

Table.1. General model of scenarios for using the intellectual system for managing the activities of the department

Identification number	Use case	users	Scenario type
A	Creation of accounts for users of the system (dean of the faculty)	Administrator	Main
U1	Creating new accounts and adding users to them (Head of Department)	User (Dean of the faculty)	Extended
U2	Creating a new account and adding users to them (teachers)	User (Head of Department)	Extended
U3	Creating a new account and adding activities according to an individual plan	User (teachers of the department)	Extended

Use case for “U1”: Creating new accounts and adding users to them (Head of Department).

Tasks: creation of groups for users (head of department).

Steps to manage the scenario:

1) Login to the system;

2) Create "personal data";
3) Create "names of chairs";
4) Providing the user (head of the department) with access to the system (login and password).

“U2” use case: Creating new accounts and adding users to them (teacher).

Tasks: creating groups for users (teacher).

Steps to manage the scenario:

1) Login to the system;
2) Create "personal data";
3) Create a user "teacher";
3) Providing the user (teacher) with access to the system (login and password).

“U3” use case: Creating a new account and adding plans and resources to them according to an individual plan.

Responsibilities: creation of personal data, placement of resources according to an individual plan.

Steps to manage the scenario:

1) Login to the system;
2) Filling in personal data;
3) Filling in individual plans for the academic year;
4) Loading resources according to an individual plan.

Next, consider the necessary requirements for the project of creating intelligent information systems: requirements for the system as a whole; ergonomic requirements; safety requirements and others.

Requirements for the overall functionality of the system. The system should be a highly efficient and high-tech tool, developed in accordance with methodological and organizational principles, constituting the technological support of mental activity.

In the development of the system, it is necessary to provide the ability to collect, store, input information, process it, and also ensure the output of information. One of the necessary conditions is the issuance of accurate and timely information for making managerial decisions of the department, automated issuance of the necessary reports, the data in the system must be stored in a single database to reduce the risk of information loss, the system must take into account the level of average user preparedness. At the same time, the system should be easy to learn and eliminate uncertainty when choosing solutions. The mode of operation of the system must be able to operate 24 hours a day, 7 days a week, 365 days a year. The system should also have a well-thought-out structure (well-thought-out commands for performing various operations, for example, the ability to independently personalize the main page by the user, subscribe with a choice of notifications by e-mail or notifications on the site (notification center / shortcuts with the number of changes), - the ability to enable / disable any options provided in the system (meters, open access or pre-mediation, etc.), to provide manual data entry, and the issuance of data as reports.

The internal capabilities of the system should include: creating and managing user accounts; the possibility of placing related materials of the work done and downloading in file and text form; the ability to evaluate and control the development of users of the system; the ability to reflect the history of actions of all users in system logs and determine the period of their storage by the administrator [7].

Safety requirements: The system must ensure the safe operation of users without requiring additional instructions and special safety training.

Safety must be ensured during installation, adjustment, operation, maintenance and repair of system equipment, including protection against the effects of electric current, electromagnetic fields, acoustic noise, as well as requirements for permissible levels of illumination, vibration and noise loads, if necessary.

The requirements for ensuring safety during the adjustment, operation, maintenance and repair of the system equipment must be set out in the operational documentation for the equipment.

The development of information and software components of the system should be carried out taking into account the requirements for protecting information from unauthorized access.

Access to system data and functions should be restricted using standard application software security features. The system must also support user authorization using local accounts, i.e. the built-in security of the application software must be used.

The functionality of the system should provide centralized management of access rights to all objects, including documents, user profiles, information resources, etc., operational monitoring of information security events, as well as the collection, storage and analysis of information security events.The system must meet the following information security requirements:

1) the ability to differentiate user access to functions and data in accordance with their functional roles;

2) ensuring user authentication and auditing of their actions;

3) the possibility of periodic backup of settings and data and their prompt recovery in case of failures;

4) providing algorithms for the safe use of passwords, control of password change procedures and restrictions on the complexity of passwords being determined.

Software must be designed for scalability and fault tolerance. The failure of any constituent module of the system shall not result in the loss of the stored original data. The technical means and software of the portal must provide the possibility of updating the software without interrupting the operation of the system [8].

Ergonomic and user interface requirements: Users should interact with the system through a visual graphical interface. Input/output of data, acceptance of control commands and display of the results of their execution must be performed in interactive mode (without reloading pages), in real time. The interface must comply with modern ergonomic requirements and provide convenient access to the main functions and operations performed by subsystems.

The interface should be designed for the predominant use of the "mouse" type manipulator, that is, the system should be controlled using a set of on-screen menus, buttons, icons, and the like. The keyboard input mode should be used primarily when filling/editing text and numeric fields on screen forms.

From a technological point of view, the user interface should be implemented as a set of interconnected pages designed to be viewed in an arbitrary browser that ensures compatibility with the HTML markup standard.

User interface pages should be designed taking into account the requirements of unification:

- pages should be made in a single graphic design, with the same type of arrangement of the main controls and navigation;

- similar graphical icons, buttons and other control (navigation) elements should be used in interface sections to indicate similar operations. The terms used to denote typical operations (adding an information entity, editing a data field, etc.), as well as the sequence of user actions when performing them, should be unified.

- external behavior of similar interface elements (response to hovering the mouse pointer, switching focus, pressing a button, etc.) should be implemented in the same way for elements of the same type [9].

Interface requirements: The user interface must meet the following requirements:

1) in terms of external design, the presence of a graphical multi-window mode.

2) in the part of the dialogue with the user:

- a convenient and intuitive interface should be provided for a user who knows his subject area well and is not a specialist in the field of information technology ologue.

- must be optimized to perform typical and frequently used operations (template and autocomplete);

- user interaction with the system should be carried out in Uzbek and Russian. Exceptions can only be system messages that are not subject to translation;

- the user interface should contribute to reducing the likelihood of the user performing random erroneous actions.

Means for backing up information should be provided. The operational documentation should include a regulation that defines the procedures for backing up, restoring data and software. Backup tools are determined by the capabilities and functionality of the operating system [10].

Requirements for operation: The system must ensure operability in cases of changes in the number of controlled workstations and servers, changes in the configuration of the network and information system, the number and types of applications. In this case, the following requirements must be observed:

- the system must adapt to an increase in load capacity without the need to change the architecture with the possible installation of additional software for the system components;

- eliminate the need to reboot the system, except for cases of repair and restoration work.

The operational documentation should indicate the types, frequency and scope of maintenance of the system as a whole and its components.

Upon completion of the warranty technical support on the basis of the agreed conditions between the Customer and the Contractor, certain relationships can be established for maintaining and maintaining the system, as well as its restoration and storage on the basis of separately concluded agreements.

Registration of users (dean, head of department, lecturer) is carried out by the administrator by entering the following information:

- Log in;
- Password;
- First name, last name;
- E-mail address, etc.

After entering the above information, the administrator assigns users to the appropriate groups based on the name of the HEI, faculty, department.

Responsibilities of the administrator: upload and modify data from the Front end of the data site; registration of users based on the information provided; creating relevant groups for

users; creation of categories for the intellectual system; transferring backups from the system and ensuring basic information security; in case of identifying information security deficiencies in the software, take measures to eliminate them and update the software.

Administrator tasks: provide technical support; upload data to the system; creation of relevant sections of the information system; providing users with information related to their accounts.

User registration is carried out in the following way: it is carried out in a closed mode, it is formed by the administrator on the basis of the information provided and communicated to the persons managing the system.

The login user performs the following action steps:

- user access to the system is carried out by filling in the login and password fields in the authorization window on the main page or on the "Login" page;

- the user enters his password to log in (in case of loss of the password, the user can recover the password in the "Forgot password?" section).The general skills of a system administrator are as follows: technical understanding and management of an intelligent system; Experience in HTML/CSS/JavaScript interface development, PHP, MySQL or similar database tools; Experience with multiple OS platforms with a focus on Linux (Ubuntu, Debian) and Windows systems; Experience with an OS-level scripting environment such as the Bash shell Experience in a research environment where open source solutions are widely used; in-depth knowledge of the TCP/IP protocol suite, security architecture, protection and hardening of operating systems, networks, databases and applications.

System administrators lead the team and develop plans to add new sections and modules to the system.

Based on the analysis of the implementation stage of the project, modeling of the designed intelligent information system was carried out, which is shown in Figure 1.

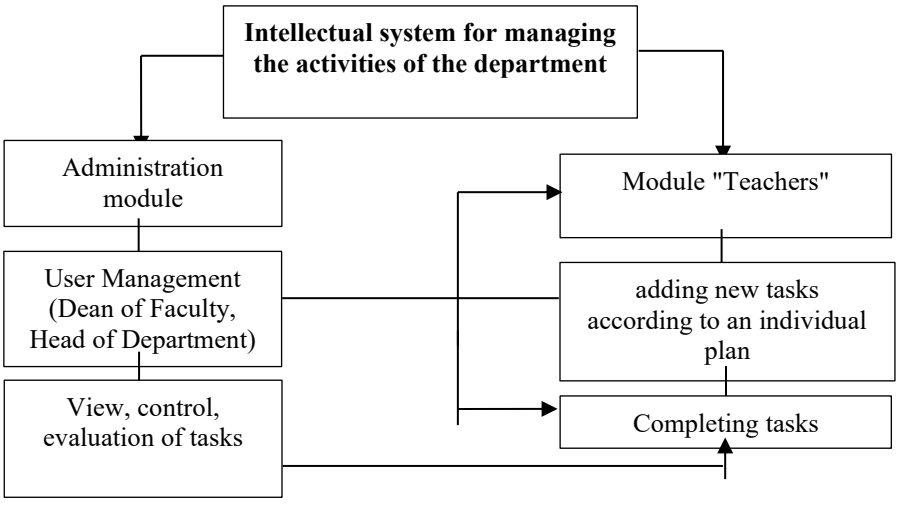

Fig.1. Modeling of the designed intellectual system for managing the activities of the department

CONCLUSION

The types of software testing we have considered are presented in the form of techniques that are necessary in order to check the performance and effectiveness of the created information system, eliminate errors that have arisen, test it in a real user environment, and correct problems and errors, configure functions in accordance with the terms of reference. In the course of testing the software product, testing modules were compared and designed, after which a comparison was made and differences from the presented one were identified. On the basis of which we have identified the correctness of the work of the developed information system.

The system is planned to be developed and modernized in the following areas:

- development of professional knowledge, skills and creative activity of the staff of the department, necessary to facilitate their work, improve and introduce into practice best practices and technologies in this area based on innovative approaches;
- integration with open data systems of other government agencies;
- increasing the number of users of the system and external applications using the data collected by the system, without compromising the reliability and speed of the system by increasing the efficiency of equipment and others [11,12,13].

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