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METHODS AND TECHNIQUES FOR THE INFORMATION AND ANALYTICAL SYSTEMS OF DATA PROTECTION AND CONVERSION ASSESSMENT

The goal of the research is to create an algorithm for analyzing vulnerabilities discovered and to enhance the data protection technique based on system penetration testing as a means of evaluating data security. The primary responsibility is to modify established security assessment techniques to fit the evolving technical landscape, namely cloud technologies and security system requirements. The issue of data protection evaluation of electronic documents is discussed in the article, and specifically, an A/B test was conducted. To address this issue, an analysis was conducted on current data protection evaluation methodologies and techniques, and an A/B testing system was constructed. These methods help to determine the level of danger of vulnerabilities, which allows you to effectively and visually determine the overall level of system security by evaluating each vulnerability found. The article examines the practical use of the method, prospects for further development, and features of the effectiveness of penetration testing as a method of assessing the security of information systems and the development of an algorithm for evaluating the vulnerabilities found. Researching the methods and means of security assessment, the work was aimed at creating a convenient and effective tool for assessing the security of data and documents in the network. The theoretical significance of the work is determined by the expansion of scientific knowledge in the field of information and analytical systems of electronic document management. The research aims to explore and apply big data analysis and machine learning techniques to improve data protection. The novelty of the research lies in the synthesis of modern methodologies of A/B testing and analytics within a single platform, which will allow electronic documents to protect data and increase efficiency from hacker attacks. The principles of the method are described along with the main approaches and techniques that contribute to the analysis of hacker attacks on online systems and cloud environments. The components of the method, which provide for data protection, were separately analyzed, and an analysis of system testing was carried out to determine the requirements for the new system and increase the level of protection against data theft. The application of methods and tools for assessing the security of networks, which use a complex of general scientific, experimental, practical, statistical, and mathematical methods for the implementation of algorithms and the formation of the determination of the levels of danger of vulnerabilities, is considered. The method includes data analysis tools, as well as analysis techniques that provide an opportunity to conduct flexible testing of changes on the site with further analysis and impact on conversion, which is important for increasing data protection and meeting consumer needs.

Keywords: data protection, data analytics, conversion assessment, hacker attacks, electronic documentation, A/B testing.

Introduction/ Вступ

The research objectives. Recently, the problem of data protection has been that consumers around the world are turning their attention to online platforms where they can easily and conveniently store data on web resources. This trend presents e-commerce businesses with difficult tasks related not only to attracting the attention of customers but also to converting this attention into data protection from hacker attacks. This research focuses on developing an information-analytical method for analyzing electronic data conversions. Conversion is an essential performance measure in the realm of e-commerce, and it determines how many users use your platform to store documents, images, and other forms of data. Information and analytical systems that collect, process, and analyze data stored in cloud settings contribute to better understanding and conversion. The main goal of this work is to develop and test a web application for A/B testing to optimize web services and increase conversion for companies working in the field of electronic data processing. Data analytics is a critical topic in the world of e-commerce, providing numerous benefits to businesses working in this sector. At its foundation, data analytics helps e-commerce companies to obtain a thorough

insight into their customer's behavior, preferences, and purchasing trends across all storage platforms. Furthermore, data analytics plays an important role in inventory management and storage. This enables you to estimate demand, optimize inventory levels, and address concerns such as excess or insufficient storage capacity.

Machine learning algorithms can verify actions and detect model transit results, thus protecting companies and customers from fraud. Recommender engines, commonly seen on e-commerce platforms, use analytics to suggest personalized data storage suggestions. Data analytics scrutinize user interactions and website traffic to identify conversion bottlenecks and inform data-driven improvements that increase conversion rates.

The object of the study – penetration testing as a method of assessing the security of a computer system. In addition, data analytics enables companies to develop customer retention strategies by identifying at-risk customers and tailoring loyalty programs and special offers based on individual behavioral data. Data analytics ensures that companies stay on top of these developments, shaping product development and making strategic decisions.

The subject of the research – methods, algorithms, and means of data processing, assessment of data security, and development of an algorithm for assessing identified vulnerabilities.

The purpose of the work – to show the effectiveness of penetration testing as a method of assessing the security of information systems and to improve it by adding an algorithm for assigning a rating to the system being tested. Such an assessment will help the customer and, if the results are disclosed, other persons or organizations to better understand the level of their security system.

Following the purpose of the work, the following *tasks* must be solved:

- determine the relevance of penetration testing in the modern world;
- investigate the methodology of penetration testing;
- develop an algorithm for evaluating test results;
- practically conduct demonstration penetration testing;
- analyze the obtained results and evaluate them.

Therefore, the task of this research includes comprehensive analysis and development of tools for effective monitoring and analysis of system vulnerability assessment to hacker attacks and theft of personal data.

Improvements in system protection can be achieved using the level of system protection based on the main characteristics of the information and such metrics as the complexity of the attack, the level of damage caused, and the conditions in which the attacker is located.

The analysis of the security assessment methodology – penetration testing showed its relevance in the modern world and its necessity for almost all types of organizations in which electronic circulation of important information takes place, regardless of the scale of the network.

Analysis of literary sources. In the real world, not everything is as it is in theory, and vulnerabilities are far from evenly distributed across all nodes and aspects of a computer network. Most often, vulnerabilities are located in places that, it would seem, no one will ignore, but still [1].

The general definition of vulnerability is the system's inability to resist the implementation of a certain threat or set of threats. That is, there are certain flaws in the comuter system, thanks to which it is possible to intentionally violate its integrity and cause incorrect operation. [3]

Among the latest research and publications is worth highlighting [2, 5], where the need to create complex information protection systems in distributed corporate networks, in which information with limited access is processed, is substantiated. Scientific works [6, 7] developed a method of protecting confidential information based on the use of operations of extended matrix cryptographic transformation and proposed the introduction of an improved system of monitoring and observation of incidents with the calculation of the possibility of realizing threats to information security. The scientific study [8] is devoted to the design of modern methods and technical means of civil protection, which became the basis for the creation of information systems for the prevention of fires and the transfer of operational information for making management decisions.

The strategically correct solution to the problem of information protection is to use the achievements of cryptography, as it expands the possibilities of information protection and ensures network security. In [4] it is proved that the use of extended matrix functions of the cryptographic transformation increases the speed of data processing in cryptosystems due to the parallel process of crypto-conversion operations.

Penetration testing, carried out using tests to overcome PCM protection (penetration testing – pentest), is a fairly popular worldwide audit service that allows [2]:

- identify deficiencies in the field of information security (IS) from the point of view of an outside observer, not taken into account when developing a security policy;
- to reveal internal and external attempts to penetrate the information system (IS) and prevent them.

Information and analytical systems combine, analyze, and store as a single unit information that is extracted both from the organization's databases and external sources [4]. Data repositories, which are part of information and analytical systems, ensure the transformation of large volumes of detailed data into generalized verified information that is suitable for making informed decisions. In contrast to ordinary databases, repositories contain a processed, ordered, and understandable presentation of data.; they become a composite conveyor for the preparation of information in an integrated, consistent, visual form to support management decision-making.

A/B testing [9], a common practice in e-commerce, is supported by data analytics. This technique helps optimize website design, product descriptions, and marketing strategies. Analytics tools track the performance of different options, driving informed decisions. A/B testing adapts content and recommendations based on user behavior, increasing engagement and loyalty, and improving app performance, user interface, and in-app features.

Research results and their discussion / Результати дослідження та їх обговорення

Penetration testing should help to find out, firstly, whether all the provisions of the security policy achieve their goals and are used according to the previous intention, and secondly, whether there are gaps in the security policy

that can be used by an attacker to achieve their goals. Such testing can be carried out both as part of an audit for compliance with standards and as independent work. For example, during an audit for compliance with the ISO 17799 standard [18], pentest elements can be used to evaluate the effectiveness of the implementation of such protective mechanisms as protection against malicious code, network security, etc. In the form of independent work, the tests can aim to:

- substantiation of the need to carry out works to improve security;
- determination of an independent assessment of the security level of the information system.

The main groups of methods used in information-analytical systems are [5]:

1. General scientific methods: analysis, synthesis, abstraction, generalization, comparison.
2. Methods of empirical research: sociological methods, surveys, observations, experiments, statistical analysis.
3. Information and forecasting methods: modeling, expert assessment.
4. Methods of creating information products: summarizing the content of information (referencing, annotating) and generalization (creating overview information).
5. Methods of user information service: current information, reference, and information service.

The methods of obtaining expert assessments are the Delphi method, risk assessment, SWOT analysis, functional cost analysis, etc.

The Delphi method [10] is an absentee and anonymous survey of an expert group (5–10 people) in several rounds with the agreement of experts' opinions. Each expert is given a specific task. Experts fill out questionnaires on the investigated problem. The results of each intermediate round of the survey are provided to the participants of the examination in the form of averaged statistical values. When receiving answers from experts, the following situations may arise experts have reached an agreement, and experts' opinions are divided. In the first case, the opinion is accepted because of solving the task, in the second case, the examination process will be continued.

SWOT analysis occupies a special place in heuristic methods [11]. The method has shown high efficiency when making decisions in systems characterized by dynamism, controllability, dependence on internal and external factors, cyclicality, etc. SWOT analysis – determination of the organization's strengths and weaknesses, as well as opportunities and threats arising from its market environment. Carrying out a SWOT analysis comes down to filling in a matrix, the cells of which reflect the organization's strengths and weaknesses, market opportunities, and threats.

The technology and method of creating information and analytical systems covers the following types of activities:

1) collection, analysis, and detailing of requirements for the information and analytical system, determination of priorities for the implementation of these requirements and setting tasks for their implementation, determination of requirements for architecture, reliability, and protection against unauthorized access and determination of data composition;
2) development of design solutions for all aspects of building an information and analytical system, determining the composition of information sources, methods of data transmission, the composition of applications for the organization of data access, architectural design, and database design;
3) development of analytical applications, selection, and configuration of tools for collecting, transforming, and cleaning data and organization of user access to data, development of metadata, testing, and development of documentation for users.

Recommendations for the performance of works and tasks include recommendations on collecting requirements, identifying data sources, extracting, and transforming data for storage, creating thematic data showcases, developing regulatory reports, using advanced data analysis tools, and data storage issues.

In this section, we will describe the general structure of the system that was built and describe the diagram of the system components, as well as the third-party libraries that were used to ensure the functioning of the system. Several key libraries and tools were used in the development of our analytical system, which played a key role:

Remix Run [12]: Remix Run is the core framework that runs our Shopify app. It offers a sophisticated approach to server-side rendering (SSR) and client-side navigation. Remix Run provides fast page loading, efficient routing, and smooth transitions between pages, providing an exceptional user experience. Thanks to the integration with React, we can create highly interactive and dynamic interfaces that respond to user actions in real-time.

Shopify App Bridge and Shopify CLI [13]: Shopify App Bridge helps bridge the gap between our app and the Shopify platform. It provides a set of tools and APIs that allow our app to easily integrate with the Shopify admin interface. This integration allows you to manage A/B tests and analyze the results in the Shopify environment. The Shopify CLI streamlines our app development by simplifying tasks such as app creation, local testing, and deployment to the Shopify App Store.

Polaris Design System is Shopify's official design system and component library [10–13]. It plays a crucial role in creating the user interface of our application. Polaris offers a wide range of pre-designed components such as buttons, forms, and navigation elements that follow Shopify's branding and design principles. By using Polaris, we maintain a consistent and professional look throughout our app, improving the user experience and building trust with sellers.

Prisma ORM [15]: Prisma ORM serves as our data access layer, enabling seamless interaction with our database. The Prisma Client, part of Prisma, simplifies database queries and management, allowing us to store and retrieve data for A/B testing and efficient user interaction. Prisma's approach to schema first ensures that our database operations are well-defined and serviceable, which contributes to the robustness of our application's data processing.

Combined, these libraries and tools form the foundation of our Shopify A/B testing and data analysis application. Together, they enable us to provide a highly efficient, integrated, and visually appealing solution that meets the needs of both merchants and end users in the Shopify ecosystem. There are various methods and tools for describing the structure of software and the relationships between its components. One of them is the use of component diagrams, which allow you to visualize the structure of the software and its components.
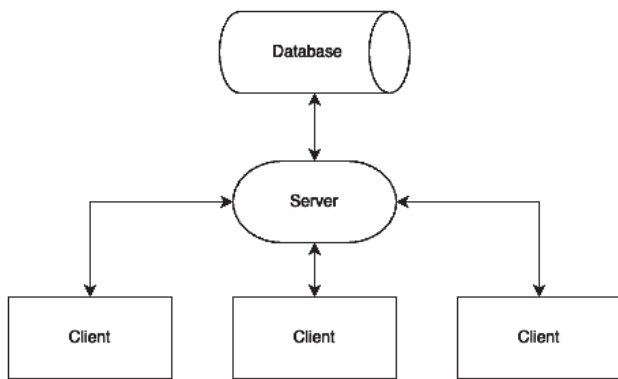
Fig. 1. Structural diagram of the system taking into account information flows / Структурні схеми системи з урахуванням інформаційних потоків

The component diagram (Fig. 1) is a useful tool for modeling and analyzing software architecture and helps to better understand and interact between system components. This diagram shows 5 groups of modules: Frontend, Backend, Database, Third-party libraries, and External Services. Each of the groups is connected through a module within it.

Integrated information and analytical systems in the field are defined as a special class of information systems designed for analytical data processing, and not for automating the day-to-day activities of the organization.

Information and analytical systems combine, analyze, and store as a single unit information that is extracted both from the organization's databases and from external sources. Data repositories, which are part of information and analytical systems, ensure the transformation of large volumes of detailed data into generalized verified information that is suitable for making informed decisions. In contrast to ordinary databases, repositories contain a processed, ordered, and understandable presentation of data.; they become a composite conveyor for the preparation of information in an integrated, consistent, visual form to support management decision-making.

Implementing user authentication and authorization in the Shopify ecosystem [13, 14, 15] has been challenging due to the need to integrate with Shopify's authentication mechanisms. To solve this problem, we used the @shopify/Shopify-app library and followed Shopify's authentication guidelines to ensure secure access to the app. Shopify's extensive testing and documentation were used for reference, resulting in a robust authentication system. Scalability and performance were critical aspects of the application development. Ensuring optimal performance, especially under heavy workloads with many concurrent users and tests, required careful optimization. To solve this problem, we applied performance profiling tools, caching mechanisms, and database optimization. These measures improved the app's scalability and responsiveness, providing a user-friendly experience.

Protecting user data and ensuring data privacy, especially when collecting A/B test data, required special attention. We have implemented data encryption, access control, and data privacy practices to protect user information. In addition, we performed security audits and penetration testing to identify and fix vulnerabilities, ensuring the highest level of security.

Testing and quality assurance [10, 16] were fundamental to ensure the reliability and functionality of the program. We have developed comprehensive testing procedures, including unit testing, integration testing, and end-to-end testing. Using testing infrastructures and tools, we've automated and optimized the testing process, enabling thorough testing across multiple scenarios and browsers.

Documentation and customization were vital for user onboarding and collaboration. Providing clear documentation and training materials for users and contributors was important but time-consuming. To address this issue, we've invested in creating user-friendly documentation, including setup guides, API documentation, and user guides.

Finally, deployment and continuous integration were critical to maintaining the availability and reliability of the application. We've implemented CI/CD pipelines, automated deployment processes, and staging environments to minimize downtime during upgrades and enhancements. This approach has ensured a seamless deployment and allowed us to continuously deliver new features and improvements to users.

These issues and their solutions reflect our commitment to creating a robust and robust A/B testing program while addressing the complexities inherent in Shopify application development and data analysis. Overcoming these obstacles contributed to the successful implementation of your project.

Each component in the groups is related to providing a specific function in the app, contributing to the overall performance of Shopify's A/B testing program [14]. Components within a group are interdependent and may also rely on components from other groups to perform their tasks.

Frontend Group:
1. The "Pages" component needs the "UI elements" component to build the user interface.
2. The Pages component requires the Remix component from third-party libraries for page management and routing logic.
3. The Routing component needs the Forms and Input component to determine the navigation flow based on user actions.
4. UI elements component, uses the "Polaris" component from third-party libraries to match Shopify's design system.

Backend Group:
1. The "API endpoints" component needs the "Server-side functions" component to process requests and execute application logic.
2. The "Server-side functions" component can interact with "Prisma" to facilitate work with the database.

Database group:
1. The Tables component needs the Prisma models component to provide an abstraction layer for interacting with the database.

Third-party libraries group:
1. The Remix component can be used by the Pages component for advanced routing and server-rendered views in the front end.
2. "Polaris" component, uses "UI elements" for consistent style and behavior of components in the interface.
3. The "Prisma" component is used by the "Server-side functions" component for object-relational display and interaction with the database in the server part.

External services group:
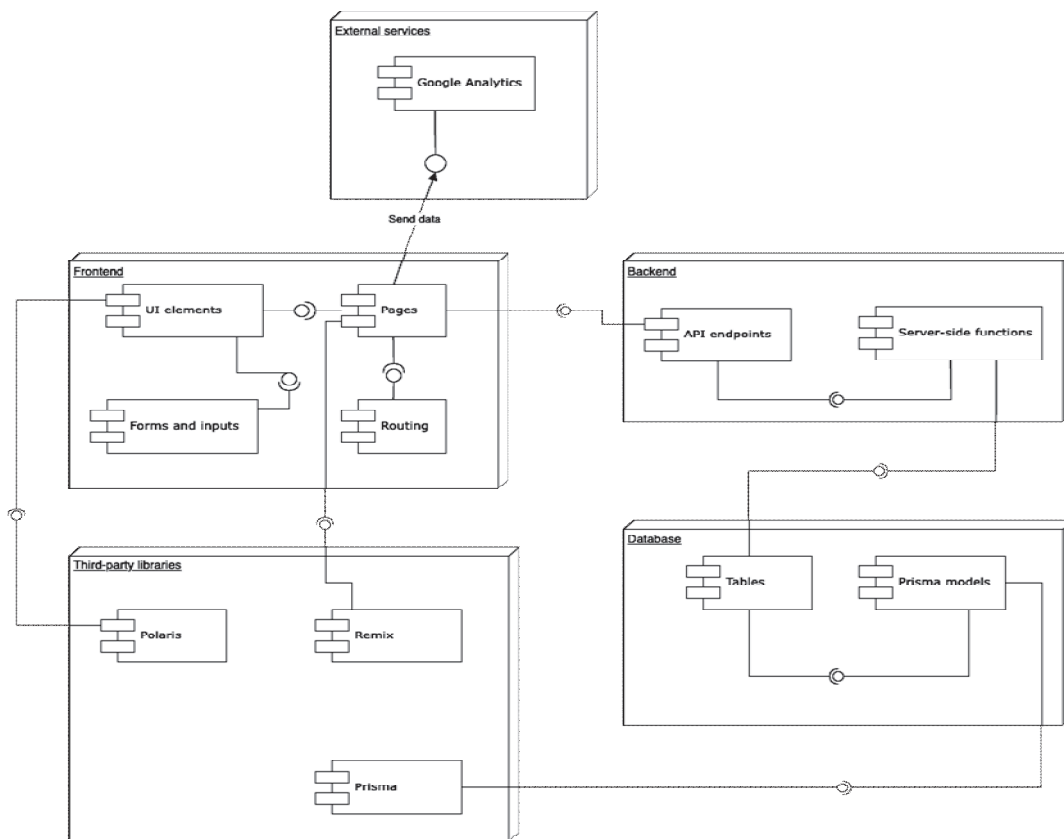1. The system sends data to Google Analytics for tracking and analytics.

Fig. 2. Component diagram / Діаграма компонентів

At the entrance, we obtain tracked user data suitable for analysis. Controlling techniques include data quality control and an algorithm for establishing the test's statistical significance. The mechanisms include the data analysis algorithm and the A/B testing algorithm.

The conceptual model of information-analytical and predictive decision-making support of systemic geopolitical and economic monitoring includes the following stages:

- research design;
- information and analytical modeling and creation of forecast estimates and scenarios;
- generation of final documents and proposals.

The information stage includes the collection and processing of received information with the help of modern information technologies, verification of the reliability of received data, summarization of expert assessments, maintaining databases, the formation of multifunctional information environments, the creation of proprietary programs and systems, the formation of an extensive environment of information resource centers.

It is assumed that at this stage the user could receive the main results of the work in the form of materials of a standard form that is used in world practice in the implementation of modern management standards and support of organizational processes and work in information and communication networks. The analytical stage includes the generation of an array of relevant information for further analysis.

Statistical hypothesis testing plays a key role in concluding data. Among the various hypothesis testing methods, the z-test is a powerful tool that is commonly used to compare the means or proportions of two populations based on sample data. In our method, we use the z-test, its

applications, assumptions, and how it helps researchers make informed decisions.

The main purpose of the z-test is to assess whether there is a statistically significant difference between the means or proportions of two populations. Security and privacy were top concerns throughout the development process. Protecting user data and ensuring data privacy, especially when collecting A/B test data, required special attention. We have implemented data encryption, access control, and data privacy practices to protect user information. In addition, we performed security audits and penetration testing to identify and fix vulnerabilities, ensuring the highest level of security.

Testing and quality assurance were fundamental to ensure the reliability and functionality of the program. We have developed comprehensive testing procedures, including unit testing, integration testing, and end-to-end testing. Using testing infrastructures and tools, we've automated and optimized the testing process, enabling thorough testing across multiple scenarios and browsers.

These issues and their solutions reflect our commitment to creating a reliable and robust A/B testing program while addressing the complexities inherent in Shopify app development and data analysis.

Integrating with Shopify's API and other third-party services also presented a certain set of challenges. Ensuring smooth data exchange, error handling and reliable integration required extensive testing and validation. To address this issue, we implemented comprehensive error handling and fallback mechanisms for API requests. In addition, we have thoroughly tested integration points with the Shopify API to ensure data reliability and accuracy.

Tabl. 1. Types of testing data variations / Типи тестування варіацій даних

No.	Action	Result
Test 1	User authentication	Users can successfully log in using valid credentials
Test 2	Dashboard navigation	Users have access to the dashboard after logging in
Test 3	Creating A/B tests	Required fields are checked and error messages are displayed if necessary. Variations (control and variation) can be added and edited correctly
Test 4	Test management	Start, pause, and stop A/B tests. Tests correctly display their status (e.g. active, paused, completed). Users cannot make unauthorized changes to tests
Test 5	Analysis of test results	Statistics such as confidence levels and conversion rates are accurately calculated. The method of finding statistical significance works well on many different tests
Test 6	View interactions	Explore user interaction in specific tests. The interaction is correctly classified. The number of interactions is displayed accurately
Test 7	Browser compatibility	Test the application in different web browsers (eg Chrome, Firefox, Safari, Edge) to ensure cross-browser compatibility
Test 8	Error handling	Intentionally initiating errors such as entering invalid data or submitting incomplete forms: error messages are displayed appropriately
Tset 9	Performance testing	Evaluate the application's performance by simulating many concurrent users or interactions to ensure that it remains responsive
Test 10	Data verification	Data entered forms or fields is validated correctly, preventing any inadvertent data corruption

Experiment 1: Increasing the use of resources and receiving a message from the system.

Result: Received notification of increased resource usage and possible scaling recommendations.

Experiment 2: Attempted unauthorized access to administrative functions.

Result: A response was received from the system about the detection and blocking of an unauthorized access attempt.

Experiment 3: Analysis of system response to critical errors.

Result: Check how the system detects and handles critical situations, ensuring a high level of resilience.

Manual testing was chosen for testing the system interface by playing various application execution scenarios.

Performance tests revealed that certain aspects of the application should be optimized, especially when handling many simultaneous user interactions. This optimization should result in faster response times and improved scalability. The analytical stage of the work ends with calculations that allow obtaining probable estimates, degrees of risk of the development of the situation, and making appropriate decisions in the areas of activity of the relevant state institutions.

The conceptual model of information-analytical and predictive decision-making support is implemented in an automated system based on the principles of a systematic approach to data analysis. Several statistics are collected and measured during stability testing; these numbers are analyzed by specialists to generate a report and identify potential performance issues.

Sequence diagrams are useful for showing the interaction between objects within a single use case scenario, helping to analyze process flows and identify potential problems in the interaction logic. They are also widely used for system planning and test case development. Each of these alternative approaches was carefully considered, and final decisions were made based on factors such as compatibility with the Shopify ecosystem, project requirements, development experience, and the need for customization and control. The approaches chosen were aimed at finding a balance between efficiency and effectiveness in creating an A/B testing program.

The developed system provides convenient tools for conducting A/B tests and analysis of conversions, which helps to make informed decisions to optimize data processing and increase the effectiveness of information protection.

From the dashboard, you can manage your A/B tests. View test status, start and end dates, and key metrics like conversion rate and statistical significance.

You can start, pause, or stop tests as needed. Be careful when making changes to current tests, as this may affect the accuracy of the results.

Start the application for A/B testing using the appropriate command (eg npm start or npm run dev). The program works without errors. We are committed to addressing the identified areas for improvement to provide our users with a high-quality A/B testing solution.

In the experimental part, the application was tested, and its effectiveness was evaluated. The test results confirmed that using the developed application improves data protection in cloud environments.

The analytical system is based on the use of modern technologies that allow you to collect, evaluate, and analyze information obtained from online resources, and use it to make appropriate decisions and optimize various processes quickly and effectively.

The creation of information and analytical systems that meet the goals and objectives is recognized as a complex process that includes the following stages: concept formation, design, development, implementation, and support.

The very nature of this process requires the preliminary development of a fixed technological scheme. The technological scheme corresponds to the standard that describes the processes of the life cycle of software tools, the sequence of work, and tasks performed by certain performers. Thus, a general method of creating information and analytical systems is needed, containing the composition and sequence of works and tasks, the composition of role functions, and generated artifacts (documents, models, schemes, etc.).

Fig. 3. The fragment of the A/B test data structure / Фрагмент структури даних A/B тесту

Fig. 4. Example of completed test / Приклад виконаного тесту

Fig. 5. Application repository interface / Інтерфейс сховища даних

The technology and method of creating information and analytical systems covers the following types of activities:

- collection, analysis, and detailing of requirements for the information and analytical system, determination of priorities for the implementation of these requirements and setting tasks for their implementation, determination of requirements for architecture, reliability, and protection against unauthorized access and determination of data composition;
- development of design solutions for all aspects of building an information and analytical system, determining the composition of information sources, methods of data transmission, the composition of applications for the organization of data access, architectural design, and database design;
- development of analytical applications, selection, and configuration of tools for collecting, transforming, and cleaning data and organization of user access to data, development of metadata, testing, and development of documentation for users.

Discussion of research results. The strategic goal of information management is the exit through the predictive and analytical function to manage other resources, in particular labor, financial, and material. That is why the role of the state in the management of information resources, as a customer and coordinator, is crucial.

Having integrated information resources of national importance, it is possible to make analysis and forecast, to develop options for management decisions.

The information stage includes the collection and processing of received information with the help of modern information technologies, verification of the reliability of received data, summarization of expert assessments, maintaining databases, the formation of multifunctional information environments, the creation of proprietary programs and systems, the formation of an extensive environment of information resource centers.

It is assumed that at this stage the user could receive the main results of the work in the form of materials of a standard form that is used in world practice in the implementation of modern management standards and support of organizational processes and work in information and communication networks.

Fig. 6. Graphs of the results of the completed test / Графіки результатів виконаного тесту

In the work, a system analysis was carried out, including the construction of a problem tree and a goal tree. This made it possible to clearly define the main aspects of the problem and the goal of the project. The main goal of the work was to create a software module for A/B testing that would be easy to use and would enable users to effectively conduct tests and optimize conversions. Those suitable for testing have been identified templates and load testing was performed according to the proposed process. Based on this testing, a load was determined that was suitable for the system to operate according to the results of the system testing for cloud environments.

The proposed solution makes it possible to increase several indicators of the developed system, namely, the efficiency of the system increases load testing (increasing the amount of load generated by the testing system) by providing methods of its organization and using common design patterns of modules of this system. Also, the use of the proposed methodology for testing allows for an increase in the execution speed and reduces the cost of carrying out the load testing process of the selected system by using the specified methodology. The efficiency of complex testing systems increases to about 3.49 % only by changing one template of receiving messages (Fig. 6).

The scientific novelty of the obtained research results – has proven the effective application of big data analysis and machine learning techniques to increase conversion.

The practical significance of the research results – is that an algorithm and program for determining the level of danger of vulnerabilities was developed and implemented, which made it possible to effectively and visually determine the overall level of system security by evaluating each found vulnerability. The developed method for assessing vulnerabilities is effectively applied to visually demonstrate the results of penetration testing and the vulnerabilities found.

Conclusions / Висновок

Corresponding information and analytical structures are already being created in Ukraine, which is developing its information processing technologies, but they still operate individually, fragmented, and without coordination and interaction. In the conditions of the development of a new economic and legislative system in Ukraine, which is based

on the ideas of a democratic developed society, there is a need to create progressive information-analytical and forecasting technologies to support management decision-making, powerful information resource centers, complex information processing systems as one of the most important factors achieving the level of sustainable development of society in the country due to the introduction of anticipatory development strategies.

The scientific novelty of the obtained research results lies in the synthesis of modern methodologies of A/B testing and analytics within a single platform, which allows for optimizing strategies and increasing the efficiency of interaction on online platforms or data repositories. The research is aimed at studying and applying methods of big data analysis and machine learning to increase conversion. The goal of the study was to achieve, based on the approbation of a web application for A/B testing, which allowed to effectively analyze user behavior and optimize web pages to increase sales.

In addition, the method of the information and analytical system of data protection ensures the reliability and security of information in online services, and also provides the possibility of flexible testing of changes on the site, with further analysis of their impact on conversion, which is important for increasing the company's revenue and improving indicators for A/B testing.

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МЕТОДИ ТА ТЕХНІКИ ІНФОРМАЦІЙНО-АНАЛІТИЧНИХ СИСТЕМ ЗАХИСТУ ІНФОРМАЦІЇ ТА ОЦІНКИ КОНВЕРСІЇ

Мета дослідження – удосконалення методу захисту даних на основі тестування систем на проникнення як методу оцінювання захищеності даних та виявлених вразливостей. Основне завдання – адаптація відомих методик оцінювання захищеності до змінюваного технічного середовища, зокрема до хмарних технологій та вимог до систем безпеки. У роботі розглянуто проблему оцінки захисту даних електронної документації, зокрема виконано

частину A/B тестування. Для вирішення цієї проблеми проаналізовано наявні методи та засоби оцінювання захисту даних та побудовано покращену систему для A/B тестування. Застосування цих методів допомагає визначити рівень небезпеки вразливостей, що дає змогу ефективно та наочно визначати загальний рівень захищеності системи за рахунок оцінювання кожної знайденої вразливості. У статті розглянуто практичне використання методу, перспективи подальшого розвитку та особливості застосування ефективності тестування на проникнення як методу оцінювання захищеності інформаційних систем та виявлених вразливостей. Вдосконалено методи та засоби оцінювання безпеки, спрямовані на створення зручного та ефективного інструменту для підвищення захищеності даних та документів у мережі. Теоретична значущість роботи визначається розширенням наукових знань у галузі інформаційно-аналітичних систем електронного документообігу. Дослідження спрямоване на вивчення та застосування методів аналізу великих даних і машинного навчання для покращення захисту даних. Новизна дослідження полягає у синтезі сучасних методологій A/B тестування та аналітики в межах єдиної платформи, що дасть змогу електронним документам захистити дані та підвищити ефективність захисту від хакерських атак. Описано принципи роботи методу разом із основними підходами та техніками, які сприяють аналізу хакерських атак на онлайнплатформи та хмарні середовища. Окремо проаналізовано складові методу, які передбачають захист даних, здійснено аналіз тестування систем з метою визначення вимог до нової системи та підвищення рівня захисту від викрадення даних. Розглянуто застосування методів та засобів оцінювання захищеності мереж, які використовують комплекс загальнонаукових, експериментальних, практичних, статистичних, математичних методів для реалізації алгоритмів та визначення рівнів небезпеки вразливостей. Розроблено метод засобів аналізу даних, який надає можливість виконувати гнучке тестування змін на сайті з подальшим аналізом та впливом на конверсію, що важливо для підвищення захищеності даних та задоволення потреб споживачів.

Ключові слова: реінжиніринг ІТ-проєктів, архаїчні системи, паралельне тестування, модель чорного ящика, матриця трасування вимог, хмарні технології.

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