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DEVELOPMENT OF SOFTWARE FOR INTERACTIVE INTERACTION WITH THE LIBRARY

Abstract. *The paper presents the development of a Web-application for remote interaction with the library, which allows to get acquainted with the available literature sources and opportunities provided by the library, increases the speed of material processing, and makes the system cross-platform. The main object of research is the system of a personal account for convenient searching, ordering, booking and sorting of books available in the library. The created service will allow to completely rebuild the outdated system using the library-computer and user-computer interfaces, will attract more visitors and will encourage students to spend more time on books. The use of the application will allow to use the project as an interactive platform for presentations, conferences, speeches by various speakers and the opportunity to discuss and comment on content, feedback available information and books. The use of modern technologies and frameworks will update the existing KNUTD library project and improve scalability), design, interactivity – the ability to interact with other students and teachers online, speed. To create the application there are two modern software to choose from: Mandarin M5 and Genesis G4. Their advantages over the IRBIS-64 software currently used by the KNUTD library are that they use modern security protocols that are faster and have online support available 24/7/365. And the main advantage is the AI (artificial intelligence) system which personalizes the work with the database for each user according to his preferences.*

Keywords: *library; MS SQL; ASP.NET Core; Entity Framework Core; Microsoft Azure; HTML; CSS; Repository; Angular.*

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РОЗРОБКА ПРОГРАМНОГО ЗАБЕЗПЕЧЕННЯ ДЛЯ ІНТЕРАКТИВНОЇ ВЗАЄМОДІЇ З БІБЛІОТЕКОЮ

Анотація. *В роботі представлено розробку програмного забезпечення для віддаленої взаємодії з бібліотекою, яке дає змогу ознайомитись з наявними літературними джерелами та можливостями, які надає бібліотека, підвищує швидкість опрацювання матеріалу та робить систему крос-платформною. Основним об'єктом дослідження є система особистого кабінету для зручного перегляду, замовлення, бронювання та сортування книг, наявних в бібліотеці. Створений сервіс у вигляді web-додатку дозволить повністю перебудувати застарілу систему роботи завдяки інтерфейсам бібліотекар-комп'ютер та відвідувач-комп'ютер, привабить більшу кількість відвідувачів та заохотить студентів проводити більше часу за книгами. Використання додатку дозволить використовувати проєкт як інтерактивну платформу для презентацій, конференцій, виступів різних спікерів та можливості обговорювати та коментувати контент, давати оцінку наявній інформації та книгам. Використання сучасних технологій та фреймворків оновить існуючий проєкт бібліотеки КНУТД та поліпшить масштабованість, дизайн, інтерактивність, як можливість взаємодіяти з іншими студентами та викладачами онлайн та швидкість. Для створення додатку розглядається два сучасних програмних забезпечення: Mandarin M5 і Genesis G4. Їхні переваги над програмним забезпеченням ІРБІС-64, яке використовується на сьогодні бібліотекою КНУТД, полягають в тому, що вони використовують сучасні протоколи захисту, які є швидшими та мають доступною онлайн підтримку 24/7/365. Але найголовнішим плюсом є система AI (штучного*

інтелекту), що персоналізує роботу з базою даних для кожного користувача відповідно до його вподобань.

Ключові слова: бібліотека; MS SQL; ASP.NET Core; Entity Framework Core; Microsoft Azure; HTML; CSS; Repository; Angular.

Introduction. The rapid development of information and communication technologies has changed the requirements for the organization of libraries, especially in educational institutions. Changes primarily occurred in information functions, database development, providing access to networks, both domestic and international.

It was the task to develop software for remote interaction with the library, which allows to get acquainted with the available literature sources and opportunities provided by the library, to increase the speed of material processing, to make the system cross-platform.

The created service in the form of a web application which will allow to use the project as an interactive platform for presentations, conferences, speeches of various speakers (online in connection with the current situation in the world) and opportunities to discuss and comment on content, evaluate available information. The technical aim is to use modern technologies and frameworks (software infrastructure that facilitates the development of complex systems, in other words – a kind of integrated library) to update the existing library project KNUTD and improve items such as: scalability (the ability to change individual components of the application for programmer with a minimum amount of time, money and effort), design, interactivity (the ability to interact with other students and teachers online), speed.

Problem announcement. The main object of research is the system of a personal account for convenient searching, ordering, booking and sorting of books available in the library. The created service will allow to completely rebuild the outdated system using the library-computer and user-computer interfaces will attract more visitors and will encourage students to spend more time on books.

The ability to select books by different filters, mark "favourites" and book the desired ones. In addition, there is an opportunity to participate in online marathons and events organized by the library with partners, performances by coaches, guests and others.

Such technology should help students and library staff to improve their interaction with each other and create the latest electronic system and database. Creating an interactive platform to help students and teachers conduct conferences, publish articles, research and receive grades, feedback online.

Research methods and tools were: observation and analysis, systems approach, inductive and deductive methods, analysis of modern platforms. Conducting a survey based on students' work on a closed beta test of the application.

To create the application there is two modern software to choose from Mandarin M5 and Genesis G4. Their advantages over the IRBIS-64 software currently used by the KNUTD library are that they use modern security protocols that are faster and have online support available 24/7/365. And the main advantage is the AI (artificial intelligence) system which personalizes the work with the database for each user according to his preferences.

In addition, the project provides a calendar, which, unlike knutd.lib, will show all events related to university life and the development of students and teachers (conferences, performances, concerts, challenges, meetings, etc.).

Results of the research. The result of the analysis of the task is the need to use the latest fast and affordable Web-technology, which would allow creating a Web-application in accordance with all modern requirements, standards and demands of society. In addition, there was another need to quickly process huge amounts of data, which consisted of a large number of personal accounts and a database of library books. To solve this problem, a fairly

young open-source cross-platform technology ASP.NET Core was chosen (Fig. 1), as well as the MS SQL database.

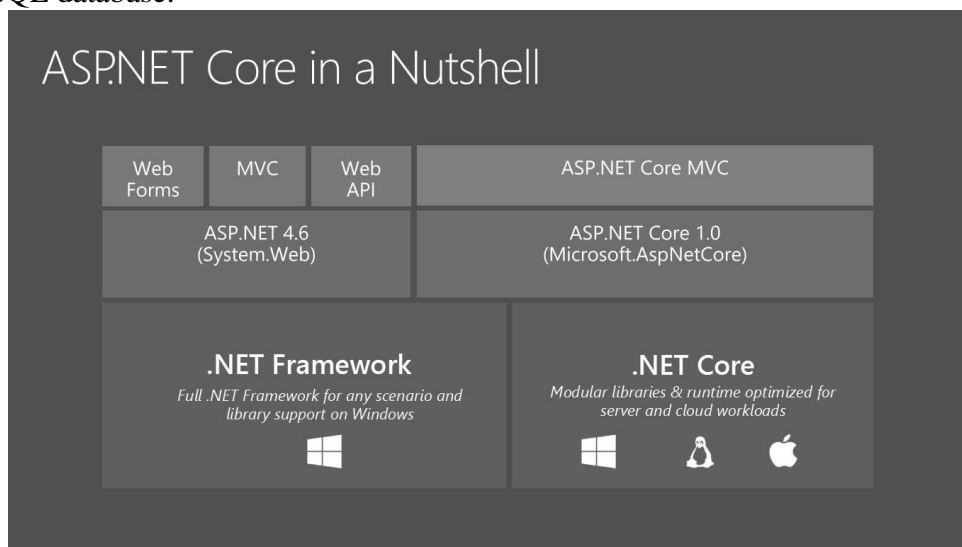


Figure 1. Scheme of technology .NET Core

Thanks to the availability of JIT technology (Just in time – allows you to compile code written by a programmer in machine bytecode during program execution) compilation and CLR (Common language runtime) we have an extremely powerful tool that allows you to ensure maximum speed of the application.

The main advantage of the technology is full interaction with the MS SQL database thanks to the Entity Framework Core and the ability to perform absolutely all operations asynchronously thanks to C # Task.

Entity Framework Core is an object-oriented, frivolous technology from Microsoft for accessing data. EF Core is an ORM-tool (object-relational mapping - mapping data to real objects). That is, EF Core allows you to work with databases, but has a higher level of abstraction: EF Core allows you to abstract from the database itself and its tables and work with data regardless of the type of storage. Thus, we can work with EF Core with any database, if it has the right provider.

Microsoft's database is a powerful and secure tool that will handle an incredibly large amount of information. Thanks to the built-in ASP.NET Core technology Razor pages, we have the ability to compile C # code with HTML markup (HyperText Markup Language), which allows you to work efficiently and conveniently with the front-end (client part of the Web-application) part and create a user-friendly interface (UI).

To create a good look of the site pages (Fig. 2), the CSS (Cascading Style Sheets) Bootstrap 4 framework and the JS (JavaScript) Angular framework for interactive site behaviour are used.

The architectural part of the application is implemented using the MVC template (Model-View-Controller), which allows you to separate the user interface, database (model) and logic. This flexible pattern allows us to do to make further changes and extensions of the project without any problems, and the structure of the application becomes clearer both separately for the front-end developer and for the back-end (developer of the server part of the application).

In addition, the Repository pattern is also used, which allows you to create one generic IRepository <T> interface, implement it in Repository <T> and inherit from the class to all other types and have the same functionality without duplicating code (Create, Delete, Update,

GetById, DeleteById, AddRange, etc.) Also thanks to the technology of registration of services as (Singleton, Scoped, Transient) and DI (Dependency Injection) we can adjust the weakest dependence of services on each other, increase productivity and control of RAM that will allow optimizing application still more.

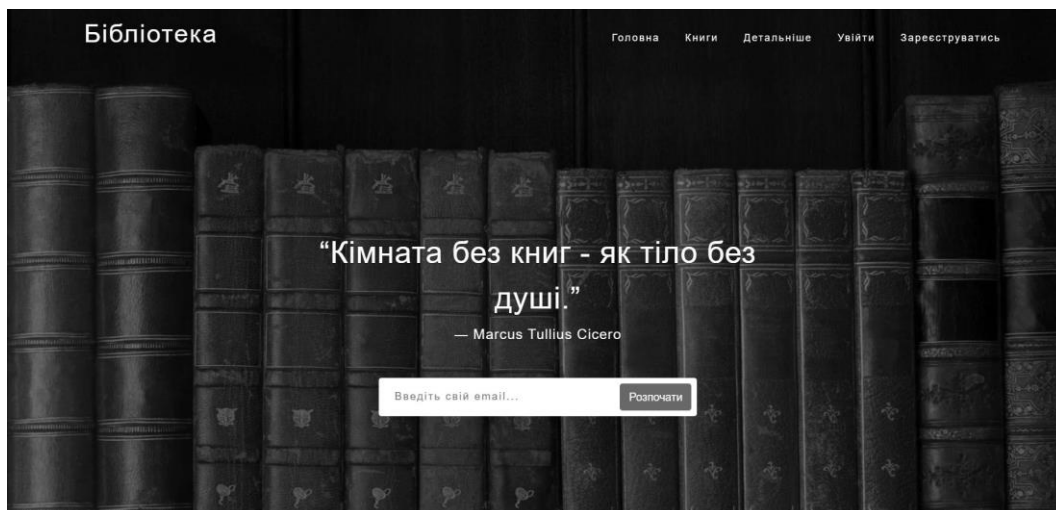


Figure 2. Main page of the site

Identity technology is used to implement a system of personal accounts. All personal user data will be stored encrypted in the project database tables in MS SQL. The functionality that will be available to users is: viewing all available books in the library and access to e-books, the ability to select books by various filters and add books to your favourites. In addition, there is an opportunity to participate in online marathons and events organized by the library with partners, performances by coaches, guests and others. The web application will be hosted on the Microsoft Azure cloud service, which will ensure the quality of the site anywhere and anytime.

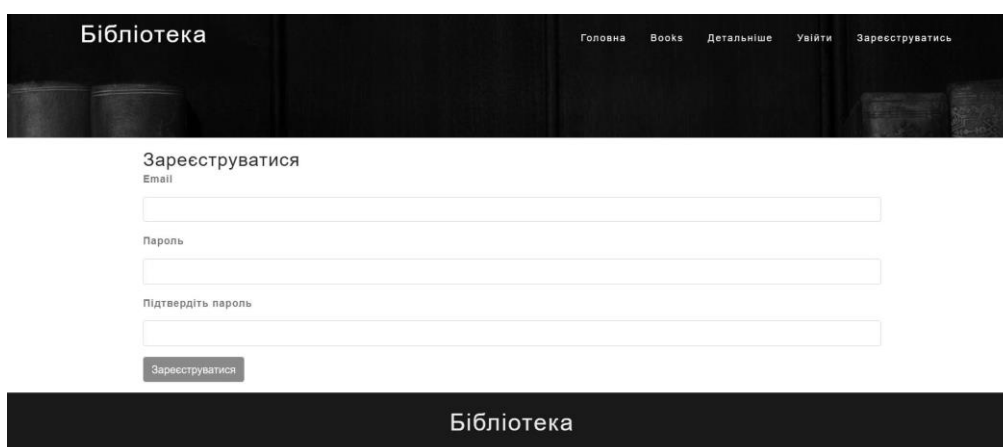


Figure 3. User registration page

In the future, the platform can be extended and, if necessary, the architecture can be improved to a multi-level (n-layered or Onior-architecture). In addition, there is the prospect of creating a mobile application for easier interaction with the Web-application.

Conclusions. The developed software product allows creating an interactive application for interaction with the university library according to all modern standards.

Planned micro-services within the project will create a variety of comfortable software for students and teachers, which will allow them to learn more productively and comfortably. The technologies used are the most competitive in today's Web-applications market, which proves their quality and performance, as well as allows you to easily maintain and expand functionality in the future, to improve the architecture to multilevel. In addition, there is the prospect of creating a mobile application for easier interaction with the Web-application.

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