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VIRTUAL PLATFORM FOR VOLUNTEERS

As a result, the Virtual Platform for Volunteers should become not just a tool, but a strategic resource that will change the way volunteer work is organized in Ukraine, giving it a new, modern dimension. The use of advanced technological solutions will not only optimize the processes of interaction between volunteers and those in need, but also guarantee transparency and convenience of making donations. The practical significance of such a platform will increase the efficiency of volunteer coordination and help ensure a quick and effective response to the urgent needs of society.

Keywords: ***Virtual Platform for Volunteers, Next.js, Vercel, CI/CD processes.***

Background

Modern Ukraine is going through a period of intense challenges caused by the ongoing war and social instability (Osadchenko, Perepeliuk, & Olkhovetsky, 2023). These circumstances have led to an increase in the need for volunteer assistance, which requires not only enthusiasm and sacrifice from individuals and groups, but also a high level of organization and coordination. The answer to these requirements is the development of a virtual platform aimed at ensuring a rapid response to urgent needs in times of crisis by improving coordination and communication between participants in volunteer initiatives. The platform should be focused on the Ukrainian audience, taking into account local needs and customs. As a result, the Virtual

Platform for Volunteers should become not just a tool, but a strategic resource that will change the way volunteer work is organized in Ukraine, giving it a new, modern dimension. The use of advanced technological solutions will not only optimize the processes of interaction between volunteers and those in need, but also guarantee transparency and convenience of making donations. The object of the study is the process of interaction between volunteers and organizations through the use of digital platforms. The subject of the study is the functionality of a virtual platform for volunteers, including registration, task management, and analytics.

The practical significance of such a platform will increase the efficiency of volunteer coordination and help ensure a quick and effective response to the urgent needs of society.

Overview of existing platforms. Scientists in many fields are engaged in optimizing the work of volunteers. For example, a study (Alimehr, & Hashjin, 2021) showed that the health volunteer program in the primary health care system faces a number of problems, most of which are organizational and managerial. Therefore, a multifaceted approach should be used to improve the participation of health volunteers. In addition to motivational factors, factors such as allocation of adequate resources, empowerment of trainers, and community mobilization should also be considered.

Paper (Riang'a et al., 2024) explores the possibility of introducing income-generating activities for volunteers as a tool to increase their motivation, improve their well-being, and, as a result, reduce staff attrition.

Study (Ye et al., 2013) focuses on the creation of an intuitive web product that allows a volunteer with limited technical computer skills to create a useful website about a rare disease in a short time. This software product provides access to news and research results, promotes community participation, presents concise information about the disease, and allows for temporary management of volunteers who are likely to change periodically.

Study (Daneshvar et al., 2023) aims to identify the key factors influencing the adoption and use of volunteer crowdsourcing technologies, in particular VGI, in urban governance. Using a combined Delphi method and a quantitative survey, as well as factor analysis, the

paper identifies the main components that explain the successful implementation of such technologies.

The Templet Web cloud service described in (Vostokin, Artamonov, & Tsarev, 2018) opens up new opportunities for scientific research. Through the use of volunteer computing, the service allows democratizing access to high-performance computing and thus accelerating scientific progress.

In recent years, web-based volunteer platforms have gained great popularity as they provide the necessary tools to coordinate and support volunteer activities, raise funds, and interact with users. Analyzing the popular platforms, we can distinguish such basic functions as user registration and authorization, volunteer project management, tools for collecting donations and analyzing activities, as well as communication tools for effective information exchange between participants.

The main advantage of such platforms is the ability to attract a large number of volunteers from different regions, which ensures a wide coverage of initiatives. The platforms provide a high level of organization and efficiency, allowing volunteer organizations to manage resources and coordinate their activities in real time. Additionally, integration with modern payment systems simplifies the fundraising process and ensures transparency of financial transactions (Fig. 1).

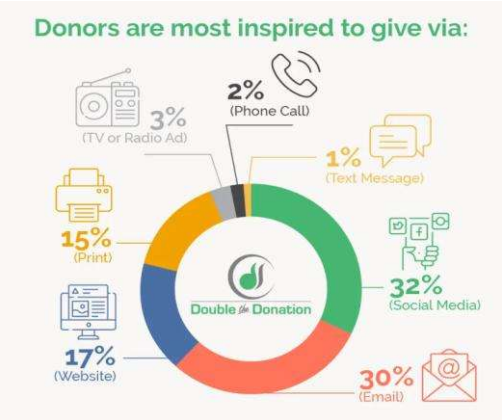

Fig. 1. *Fundraising statistics (Double the Donation, 2024)*

However, there are some drawbacks. Data security is a critical aspect, as breaches in security systems can lead to the leakage of confidential information. In addition, the high dependence on technical support and the need for constant software updates can create additional difficulties for organizations with limited resources.

The management of volunteer activities on these platforms (Fig. 2) is often achieved through sophisticated project creation and management tools that allow volunteers to easily find and engage in relevant initiatives. Communication tools, such as forums, chats, and emails, ensure constant communication between participants, which increases overall efficiency and helps avoid misunderstandings and double work.

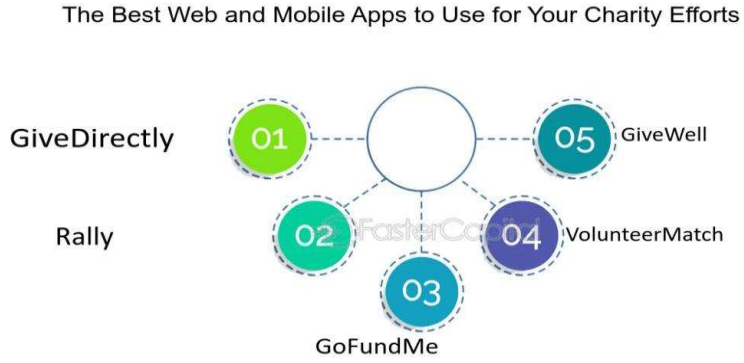

Fig. 2. *Examples of the best web and mobile applications to support charitable initiatives (Double the Donation, 2024)*

An example is the GoFundMe platform (GoFundMe, n. d.), which is widely known for its ability to organize fundraising campaigns for various purposes. It allows users to quickly create a fundraiser, visualize progress, and engage donors through social media. Although effective for fundraising, the platform is not always ideal for managing long-term volunteer projects, as the main focus is on funding.

Another example is VolunteerMatch (VolunteerMatch, n. d.), which specializes in connecting volunteers with organizations that need help. The platform includes project management and participation tracking tools to help organizations effectively manage their volunteer resources.

JustGiving (JustGiving, n. d.) is another popular fundraising platform that provides tools for creating campaigns, automatic donation collection, and analytics. Its special feature is integration with social media, which allows users to spread information about their campaigns widely. The disadvantage may be a high payment processing fee, which can potentially alienate donors.

Goal and objectives. The purpose of the work is to develop a virtual platform to improve the efficiency of volunteer coordination and optimize resource allocation using digital technologies. Tasks - to achieve the goal, the following tasks were set and solved:

- designing a server architecture and developing scalable user components to implement a role-based system with the ability to create, edit, and track campaigns;
- implementing the platform, integrating a payment gateway to process financial transactions of volunteer contributions, and analyzing the results to assess the effectiveness of the platform and its impact on volunteer activities.

Technology stack. The choice of the technology stack for the development of the virtual platform for volunteers was driven by the need to create a reliable, scalable, and easy-to-maintain system. Next.js 14 improves page loading speed and optimizes SEO, which is critical to ensure high visibility of the platform in search engines. MongoDB Atlas is used as a cloud database, which provides flexibility and scalability, while Mongoose allows you to easily interact with MongoDB in a Node.js environment through a convenient API. Tailwind CSS and Ant Design provides a high level of customization and fast interface development without sacrificing performance, thanks to the utilitarian approach of Tailwind CSS and ready-made components from Ant Design. TypeScript provides strict typing, which helps to increase code reliability and reduce errors during the development phase. As a payment gateway, Stripe was chosen for its reliability, security, and ease of integration with web applications. Clerk provides user authentication, secure and convenient session and authorization management. Firebase allows you to store images, quickly and securely upload and access media content. Nodemailer makes it easy to integrate email into the platform's business processes. Vercel provides convenience in managing the productive environment and CI/CD

processes. The choice of each technology is based on its ability to meet specific project requirements.

For example, the choice of Next.js and MongoDB was driven by the need for rapid development, scalability, and ease of integration with other services and libraries. Stripe and Clerk were chosen for their ability to secure financial transactions and user data, respectively. On the server side, Node.js and MongoDB form the backend foundation, helping to manage data and processes. The client side is built on Next.js using React, which provides a rich interactive interface.

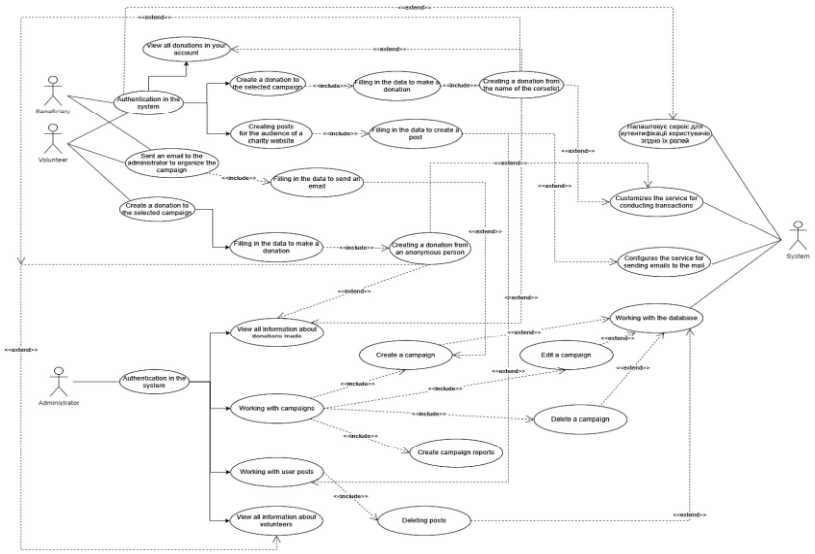

Fig. 3. *Precedent diagram*

Results

Design and implementation. To illustrate the functionality of the platform, we used a precedent diagram (Fig. 3), which demonstrates the main interactions between users of the system and its components, as well as a database diagram (Fig. 4), which shows the structure of storing data such as users, organizations, campaigns, and donors.

The use case diagram helps to understand how the system supports various functions, such as authorization/authentication, creating and

managing organizations, making donations, and access to analytics for administrators. Each user (actor) has a well-defined set of capabilities and actions that they can perform, and the system handles these requests accordingly.

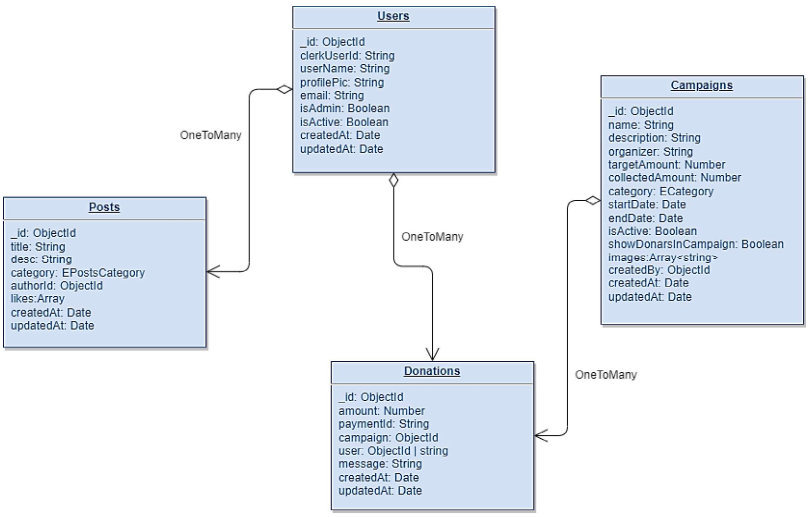

Fig. 4. *Database diagram*

The database diagram demonstrates the relationships between different tables and their elements, including how campaigns are linked to donors, and how users can create posts and manage their profiles. This ensures transparency of financial transactions, allows volunteers to easily manage their contributions, and allows administrators to monitor campaign performance and respond quickly to new requests.

The system architecture for the virtual platform is designed to provide flexibility, efficiency, and scalability in handling large numbers of users and data. The system consists of several high-level components (Fig. 5) that interact with each other through defined interfaces and protocols, thus ensuring the integrity and continuity of the service.

The client side of the system is made in the form of a web application developed on the basis of Next.js, which allows you to take advantage of universal rendering (SSR - Server-Side Rendering). This improves the performance of the website, providing fast page

loading and improved SEO optimization. Users interact with the platform through modern web browsers, which ensures wide accessibility and ease of use.

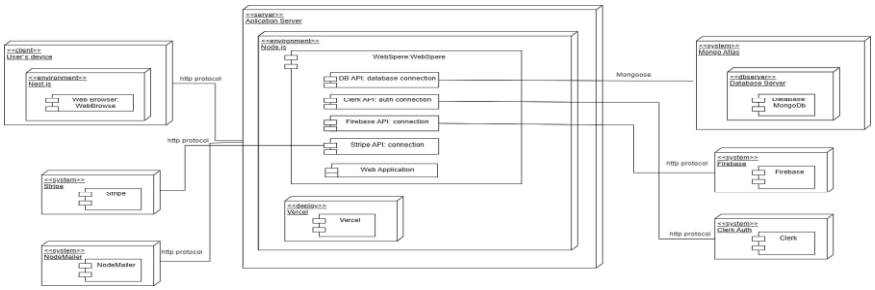

Fig. 5. *Deployment diagram*

The backend is based on Node.js, which supports asynchronous request processing and high performance. Next.js, used as the main framework, handles the logic of the web application, including page rendering and route management.

The system is integrated with several external services:

• MongoDB Atlas is used as the basis for data storage. This cloud database provides flexibility, scalability, and reliability of data storage.

• Firebase is used to store images and other media files, which optimizes the management of large amounts of media data.

• Stripe is integrated for payment processing, ensuring the security and reliability of financial transactions.

• Clerk is used for user authentication, ensuring the protection of user data and sessions.

Nodemailer allows the system to send emails, which is important for ensuring communication with users.

The system is deployed on the Vercel platform: https://crowd-funding-navy.vercel.app, which provides easy deployment, scaling, and management of web applications developed in Next.js. Vercel optimizes performance through a global CDN and automated optimizations, which allows for high loading speeds and web application reliability. The platform also provides Continuous Integration and Delivery (CI/CD), automatically deploying new versions of the web application after each code update in the repository. This allows developers to

focus on improving the product, reducing the technical barrier and shortening the time required to implement changes.

Results. The core program is designed to support and develop volunteer initiatives by providing a platform (see Fig. 6) that connects volunteers, donors, and nonprofit organizations to facilitate effective fundraising and campaigns.

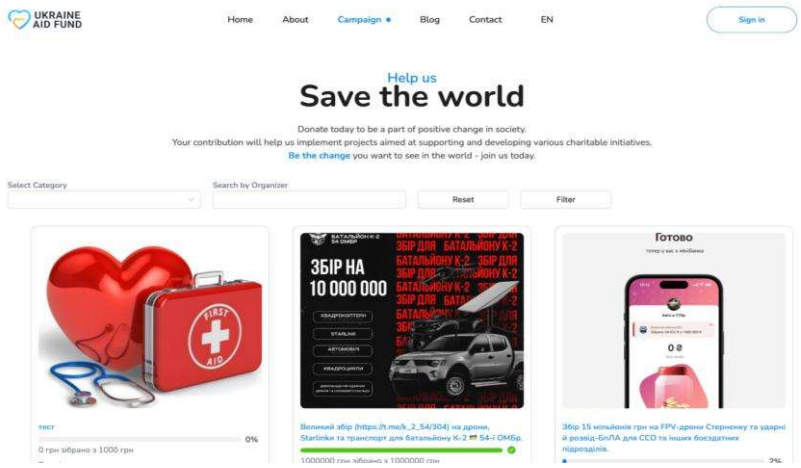

Fig. 6. *Screenshots of the platform*

An important feature of the program is its ability to adapt to the needs of different users through multilingual support, advanced authentication options, and various management functions. The main goal is to create a transparent and accessible environment where every participant can contribute to socially important projects and track the impact of their participation and contributions.

Discussion and conclusions

The unique value of this platform lies in its tailored approach to the specific needs of Ukrainian volunteers, including local language, cultural and logistical aspects. This localization addresses the lack of such specialized solutions on the market, providing an important tool for effective volunteer engagement during crises.

In addition, the introduction of advanced web technologies, such as server-side architecture and payment gateway integration, further enhanced the platform's efficiency. The project's focus on security,

scalability, and user experience ensures that it not only meets current volunteer coordination requirements, but also sets the stage for future improvements.

Issues such as data security and technical support are recognized and addressed, ensuring not only functionality but also sustainability of the platform. The design of the platform encourages broad user engagement, from individual volunteers to large organizations, making it a versatile tool for a variety of volunteer activities.

To summarize, the virtual platform for volunteers effectively meets the identified needs and objectives, demonstrating significant potential to improve volunteer management in Ukraine. Its development is timely, especially given the current social and military challenges in the region, and it offers significant practical utility and scalability for future adaptations.

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ВІРТУАЛЬНА ПЛАТФОРМА ДЛЯ ВОЛОНТЕРІВ

Віртуальна платформа для волонтерів має стати не просто інструментом, а стратегічним ресурсом, який змінить організацію волонтерської діяльності в Україні, надаючи їй нового, сучасного виміру. Використання передових технологічних рішень не лише оптимізує процеси взаємодії між волонтерами та тими, хто потребує допомоги, а й гарантуватиме прозорість і зручність здійснення пожертв. Практичне значення такої платформи підвищить ефективність координації волонтерів і допоможе забезпечити швидке й ефективне реагування на нагальні потреби суспільства.

Ключові слова: ***віртуальна платформа для волонтерів, Next.js, Vercel, CI/CD процеси.***

Автори заявляють про відсутність конфлікту інтересів. Спонсори не брали участі в розробленні дослідження; у зборі, аналізі чи інтерпретації даних; у написанні рукопису; в рішенні про публікацію результатів.

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