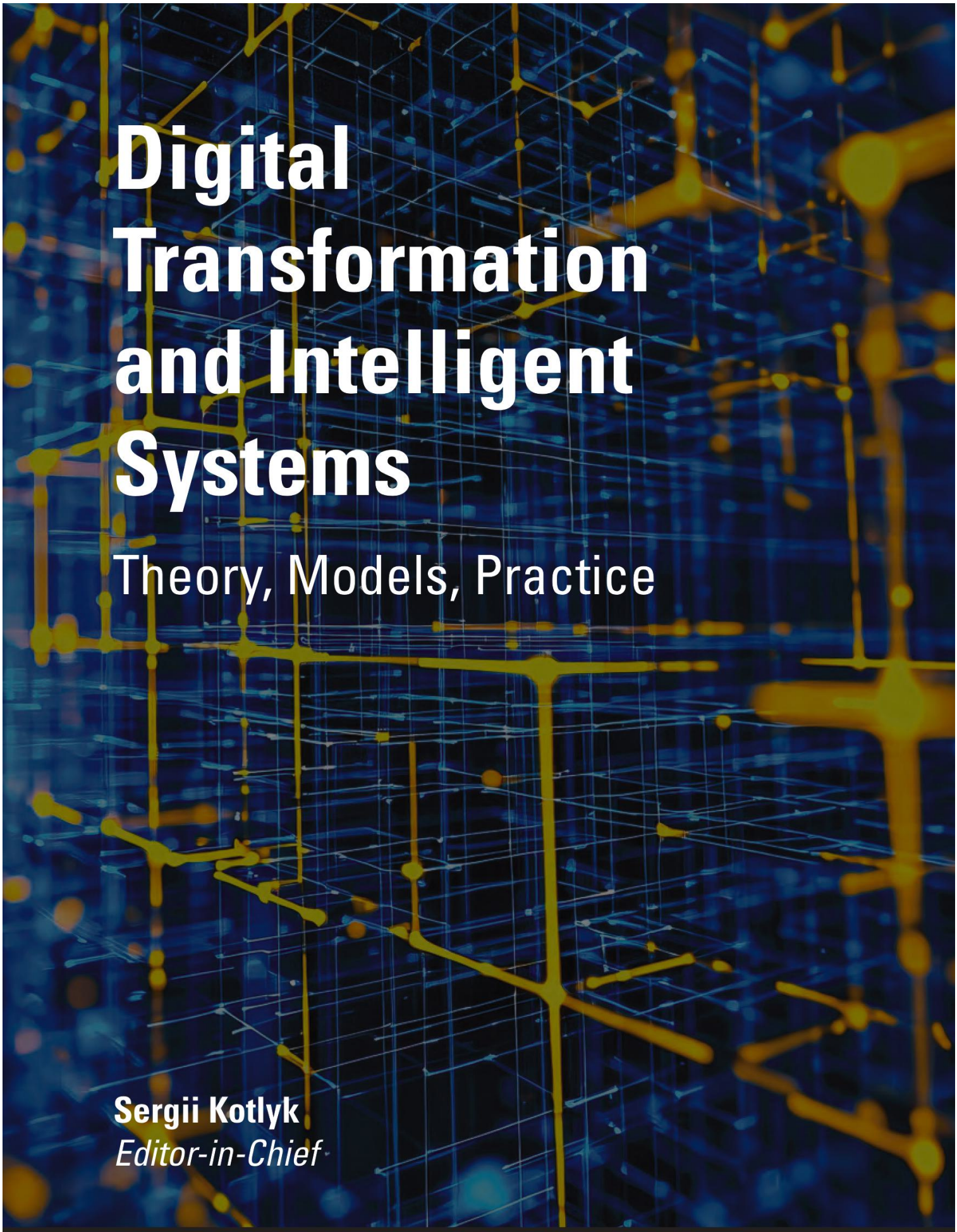

Digital Transformation and Intelligent Systems

Theory, Models, Practice

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9. ANALYTICAL REVIEW ON THE DEVELOPMENT OF AN INTERACTIVE PROJECT OF EXCURSIONS ON MAPS OF DESTRUCTION

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The paper presents an analytical review of the development of an interactive project of destroy map excursions. Analyses projects that use interactive maps to demonstrate the consequences of destruction and identify the problems that will be encountered during development. The main stages of the methodology for developing a project are highlighted. The methodology for developing such a project consists of several key stages that ensure the sequence of actions and project development. A comparative analysis of technologies that can be used for different aspects of the project was carried out.

The development of modern technologies and the growing interest in interactive media projects open new opportunities for presenting historical and socially significant events. One of the most relevant areas is the creation of interactive tours based on maps of destruction, which allow users to immerse themselves in the context of events, assess the scale of the consequences, and feel an emotional connection with the places that have suffered losses [1].

In modern conflicts, natural disasters, and man-made accidents, it is important not only to document the facts of destruction but also to provide a wide audience with the opportunity to get acquainted with them in a convenient and understandable format [1, 2]. Interactive maps of destruction are becoming an effective means of visualizing and transmitting information, helping to raise public awareness and support for the affected regions [3].

Currently, some projects utilize interactive maps to showcase the impacts of destruction.

«Google Crisis Response: a platform that provides up-to-date information on natural disasters and emergencies using interactive maps.

«Ushahidi: an open platform for collecting and displaying information about crises and conflicts in real-time.

Problems that will be encountered during development:

1) data collection and processing. One of the main challenges is obtaining reliable and up-to-date data on the destruction. This can be complicated

by lack of access to the affected areas or restrictions on the transfer of information [2; 4];

2) technical limitations. The development of interactive maps requires the use of modern geographic information system (GIS) technologies, processing of large amounts of data, and ensuring fast operation of applications on various devices [5; 6];

3) Ethical aspects. Presenting information about the destruction and victims may have ethical implications. It is important to ensure respect for privacy and consider the possible impact on the audience [7; 8];

4) user experience (UX). Creating an intuitive and user-friendly interface is key to attracting users and effectively communicating information.

Technologies and methods:

Geographic information systems (GIS) are used to collect, analyze and visualize spatial data. For example, ArcGIS, QGIS [2].

Technologies that allow integrating maps into web applications. Among them are Leaflet, Mapbox, and Google Maps API.

Using aerial photographs to create detailed terrain models and determine the extent of damage.

Advantages of interactive media projects:

1) interactive maps allow you to present large amounts of data in an understandable format;

2) interactivity promotes more active user interaction with the content;

3) projects can be used for educational purposes to raise awareness of historical events or contemporary issues.

Interactive tours of destruction maps can have a significant social impact:

Awareness-raising activities help to inform the public about the extent of the devastation and its consequences;

assistance to humanitarian efforts can be used to raise funds or resources for the reconstruction of affected regions;

preservation of historical memory records events for future generations, contributing to the preservation of cultural heritage [7].

Development prospects:

1) integration of artificial intelligence (AI). Using AI to automatically analyze images and determine the extent of damage;

2) a community of users. Involve users in adding and updating information, which will increase the relevance and accuracy of the data;

3) cross-platform solutions. The development of applications available on different devices and platforms will provide wider access to the project.

The development of an interactive media project for guided tours of the destruction maps is a challenging but promising task. It requires a combination of modern technologies, an ethical approach, and a deep understanding of the audience's needs. Considering the challenges and actively implementing new methods will allow us to create a project that will inform and help raise awareness, support humanitarian efforts, and preserve historical memory in society [3, 7].

The relevance of the chosen topic is due to several factors:

1) preservation of historical memory and cultural heritage. Military conflicts, natural disasters, and man-made accidents have left many historical monuments and infrastructure facilities in ruins. Interactive destruction maps allow you to document these events, ensuring the preservation of information for future generations. This contributes to the formation of collective memory and raises public awareness of the importance of preserving cultural heritage [3; 7];

2) public need for reliable and accessible information. In today's information overload world, offering quality content grounded in reliable sources is crucial. Interactive media projects can serve as trustworthy sources of information by integrating data from various resources and presenting it in a clear and easily understandable format;

3) educational potential. Interactive tours serve educational purposes by helping students and pupils better comprehend historical events and their impacts. This fosters critical thinking and promotes active citizenship.

4) social impact and civic engagement. Projects highlighting the destruction and its consequences can encourage the public to take active steps to restore the affected regions or prevent similar events.

Examples of successful projects confirm the relevance of the topic. Interactive tours serve educational purposes by helping students and pupils better comprehend historical events and their impacts. This fosters critical thinking and promotes active citizenship. They help inform about the scale of destruction and coordinate humanitarian aid and resources for recovery [9; 10].

In the context of current events, the topic of destruction is of particular importance in Ukraine. The hostilities in the east of the country have resulted in significant losses of infrastructure and cultural facilities. In particular, residential buildings, schools, hospitals, transport networks and historical monuments were destroyed. The creation of interactive media projects covering these events will help raise awareness of the situation among citizens and the international community and stimulate efforts to restore and support the affected regions.

Developing such projects requires the integration of various technologies, including GIS, web development, 3D modeling, and other innovative solutions. This creates opportunities for professional growth for IT and design professionals and stimulates the development of the IT sector as a whole [6; 11].

In addition, there is a growing interest in interactive media among users of different age groups. The modern audience is looking for new forms of information consumption that combine informativeness and interactivity. This makes projects related to interactive tours particularly attractive and in demand.

The study of the methodology for developing an interactive media project of excursions based on maps of destruction is timely and necessary. It will contribute to the development of new approaches in the media, as well as increase the effectiveness of information transfer and interaction with the audience.

The development of an interactive media project for guided tours of destruction maps requires a systematic approach and clear planning. The methodology for developing such a project consists of several key stages that ensure the sequence of actions and the achievement of the goal.

The main stages of the methodology:

1) analysis of existing analogues and competitors, namely the study of existing projects, allows

identify best practices and avoid common mistakes; understanding what functions and features are in demand;

assess the opportunities for differentiation and uniqueness of your own project. Methods of analysis:

monitoring online platforms and media projects with similar themes; SWOT analysis of competitors.

2) defining the concept and content strategy of the project, which is where the general idea of the project is formed:

Project goal;

main topics and sub-topics; content structure (text, images).

3) collecting and processing data on destruction is a key stage that ensures that the project is filled with reliable information:

Collecting data from various sources:

archival materials; satellite images;

photographs and videos of witnesses; official reports and statistics.

4) selection of technological tools and platforms. the success of the project depends on the right choice of technologies:

choice of a development platform: web technologies (HTML5, CSS3, JavaScript); frameworks (React, Angular, Vue.js);

5) development of interface design and user experience (UI/UX), namely the creation of a user-friendly and attractive interface:

development of prototypes and layouts, use of Figma, Adobe XD, Sketch tools. adherence to the principles of UX design, namely intuitive navigation and visual hierarchy;

ensuring correct display on different devices (desktop, tablet, smartphone).

6) testing and optimization of the project. After development, it is necessary to check the project for errors and compliance with the requirements:

checking the operation of all functions and interface elements; ensuring cross-browser compatibility and adaptability; Reducing page loading time;

optimization of images and media content.

7) publication and promotion of the project, namely, after successful testing, the project is ready for publication:

setting up a domain and hosting; security (SSL certificates);

use of SEO strategies to increase visibility in search engines (if it is really necessary for distribution).

Choosing technologies and development tools aims to select the best technological solutions for creating an interactive media project.

Comparative analysis of technologies that can be used for different aspects of the project (Table 9.1):

web technologies for the frontend: HTML5, CSS3, JavaScript; frameworks for interactivity: React, Angular, Vue.js.

Table 9.1

Comparison of technologies

Criterion	React	Angular	Vue.js
Productivity	High	Medium	High
Ease of integration	Medium	High	Medium
Community and support	Large	Medium	Large
Cost	Low	High	Medium

Strategies for implementing and supporting the project launch and ensuring its sustainable operation (Table 9.2):

setting up the server environment, monitoring, and logging.

Table 9.2

Task/subtask, method, and result

Tasks/Subtasks	Method	Result
Analyzing analogues	SWOT analysis	Identifying competitive advantages
Concept development	Brainstorming, mind maps	Project concept
Data collection	Data processing	Destruction database
Choice of technologies	Comparative analysis	Selected technological solutions
Architecture design	UML diagrams, circuitry	System architecture
Prototype development	Prototyping	Interactive prototype
Implementation of functionality	Programming	Working website
Testing	Unit and integration testing	High-quality and reliable product
Implementation	Setting up servers, monitoring	Launched and supported project

When developing a methodology, applying mathematical methods to justify the decisions is advisable. For example, the hierarchy analysis method (HAM) can be used to prioritize functions:

building a hierarchy of criteria;

compare the criteria in pairs and fill in the comparison matrix; calculate the eigenvectors and determine the criteria weights; check the matrix's consistency.

In developing an interactive project of excursions on destruction maps, it is important to conduct an in-depth analysis of existing analogs and platforms implemented in Ukraine [9, 12, 3, 10, 13]. This will allow us to consider best practices, avoid possible mistakes, and find ways to improve our project. The following examples are worth highlighting.

«Map of Destruction» (Fig. 9.1) by the Ministry of Culture and Information Policy of Ukraine. The Ministry of Culture and Information Policy of Ukraine has created an interactive map that displays destroyed and damaged cultural heritage sites due to the hostilities. Users can view information about each object, including photos, descriptions, degree of damage and geolocation. The map is regularly updated based on data received from local authorities, experts and citizens [9].

Advantages:

an official source of information that ensures high data reliability;

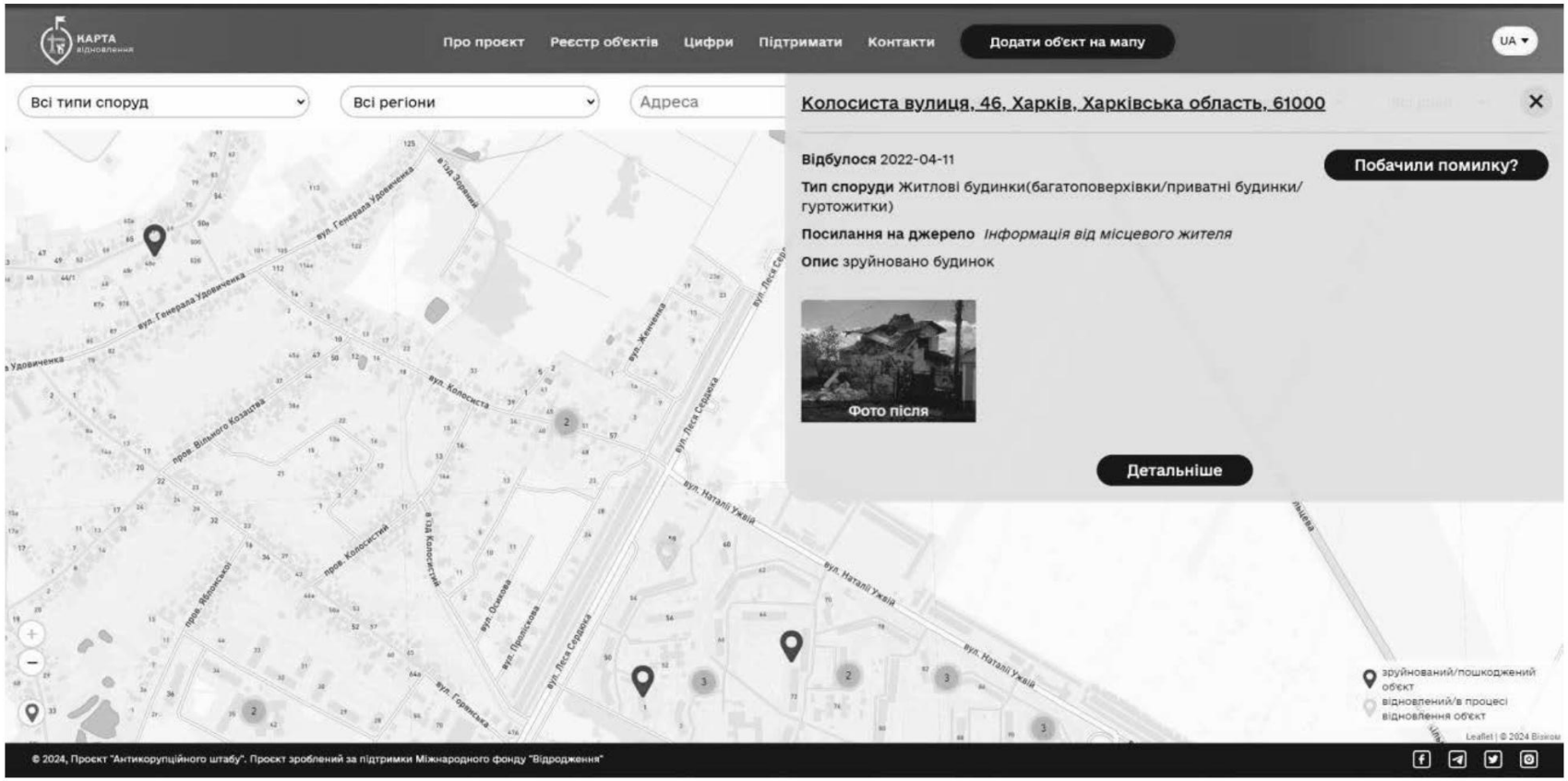

Figure 9.1. The Destruction Map web project [9].

a user-friendly interface with the ability to filter objects by category, degree of damage, and region;

availability of photographic materials that visualise the scale of the destruction and increase the emotional impact on the user;

multilingualism allows foreign users to get acquainted with the situation in Ukraine.

Disadvantages:

limited interactivity: users cannot add their own information, comments or photos;

the inability to view historical data or compare the condition of objects before and after the destruction;

focusing only on cultural heritage sites, without considering other types of destruction (residential buildings, infrastructure).

This project is an important source of information about the destruction of cultural heritage.

"Save Ukrainian Cultural Heritage Online" (SUCHO) (Fig. 9.2) is an international volunteer initiative aimed at preserving Ukraine's digital cultural heritage. The project brings together more than 1,000 specialists from different countries who are archiving the websites of museums, libraries, archives, and other cultural institutions that may be lost due to military operations. SUCHO uses specialized tools to copy and save web content [3] automatically.

Advantages: the scale and international support, which demonstrates the great importance of the project; focus on digital data preservation, which is critical in today's world; openness and opportunity for volunteers from different countries to join the project.

Disadvantages: lack of an interactive map or data visualization for a wide audience; focus on preserving rather than presenting information to users in a convenient format; SUCHO emphasizes the importance of preserving digital data and cultural heritage during war.

"Map of Human Rights Violations" from the ZMINA [13] (Fig. 9.3). Human Rights Centre The ZMINA Human Rights Centre has created an interactive map that displays cases of human rights violations on the territory of Ukraine, including in the context of the armed conflict. Users can view information about specific incidents, including dates, locations, types of violations, and a situation description. The map allows users to filter the data by various parameters.

Advantages: a focus on humanitarian and human rights aspects, which underlines the social significance of the project; a detailed description of

each case, which helps better understand the context and scope of the problem; the ability to filter data by type of violation, region, and other criteria.

Figure 9.2. The web project "Save Ukrainian Cultural Heritage Online" [3].

Disadvantages: limited visualization of the damage to physical infrastructure; The absence of multimedia materials (photos, videos) in many records.

The project is important for highlighting humanitarian issues and human rights violations.

RebuildUA [12] (Fig. 9.4) is a platform aimed at documenting the destruction of infrastructure in Ukraine and planning its restoration. The project uses satellite imagery, volunteer data, and special algorithms to create a detailed database of damaged facilities. The platform also presents concepts and plans for reconstruction developed by architects and engineers.

Figure 9.3: ZMINA web project [13].

Figure 9.4. RebuildUA web project [12].

Advantages: use of modern technologies (satellite images, drones, GIS systems) to accurately document the damage; focus on future recovery and reconstruction, which adds practical value to the project; cooperation with professionals: architects, engineers, and government organizations.

Disadvantages: the complexity of the interface for untrained users; limited opportunities for interaction for a wide audience.

RebuildUA shows the potential of combining information about destruction with recovery plans.

"Russia Will Pay" (Fig. 9.5) [10] is an initiative aimed at documenting war crimes and destruction caused by Russian aggression in Ukraine. The project collects photographs, videos, and eyewitness accounts, creating a database of evidence for future trials. Users can view a map with the locations of crimes and destruction marked.

Advantages: collecting evidence to bring the perpetrators to justice; the ability of users to submit their own materials, which helps to fill the database. an interactive map with the ability to view the details of each case.

Disadvantages: the main purpose is legal, which may limit accessibility to a wider audience; lack of in-depth analysis of the consequences of the destruction for society and cultural heritage; possible risks to the confidentiality and safety of witnesses.

Russia Will Pay» [10] emphasises the importance of documenting the facts and involving the public in gathering evidence.

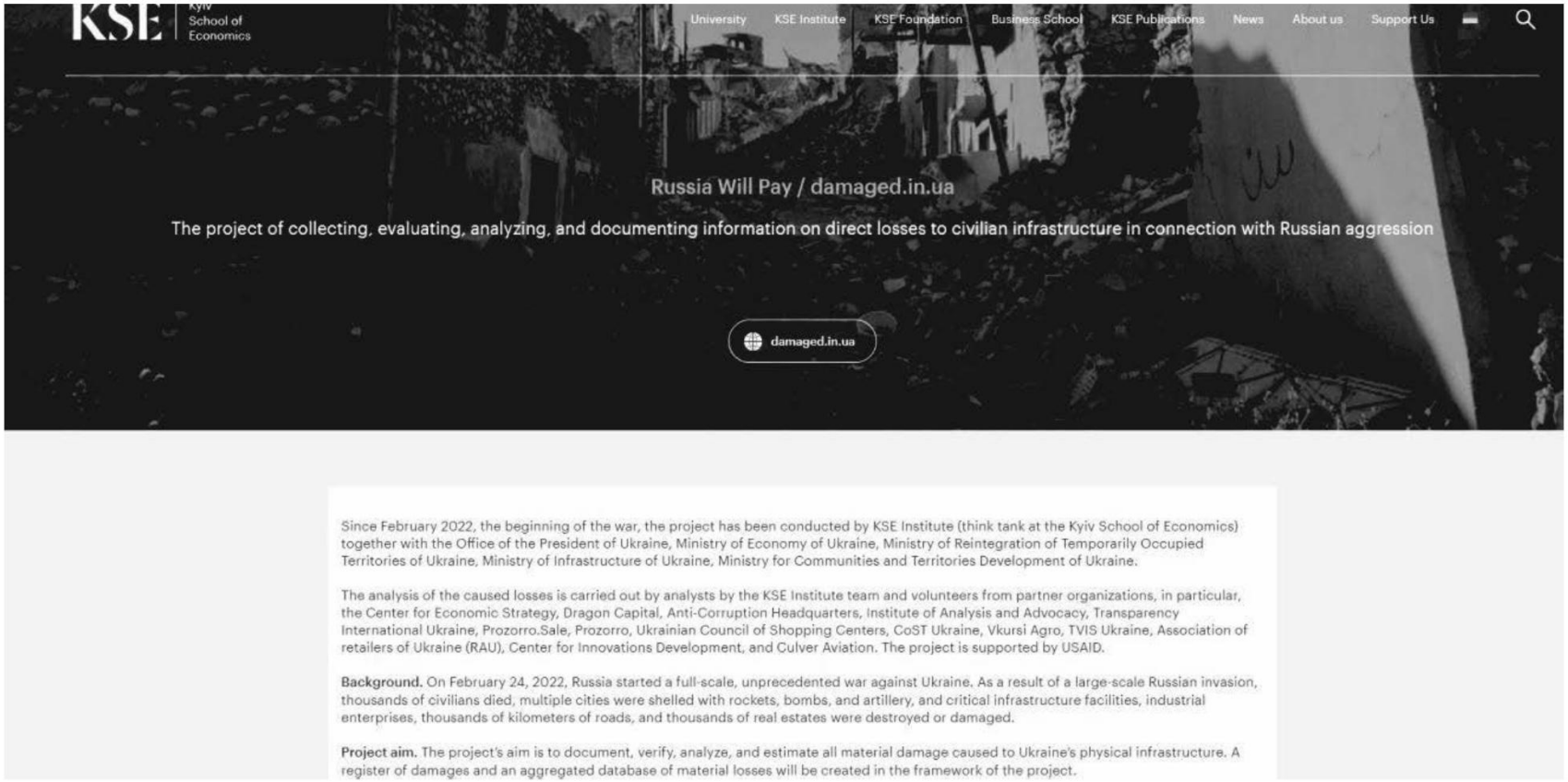

Figure 9.5. Russia Will Pay web project [10].

«The review and analysis of existing interactive projects and platforms showed that despite the existence of many valuable initiatives, there is a need for a comprehensive and interactive solution that would combine information about the destruction, enable user interaction, and promote the preservation of historical memory.

In developing an interactive project, an important step is to select the appropriate tools and technologies that will allow you to implement the planned functionality efficiently and with minimal resource costs. Properly selected technologies will facilitate rapid development, easy support, and the possibility of further project scaling.

User interface design and development. User interface (UI) design is critical in creating a successful interactive media project. Its quality and usability determine how effectively users can interact with the platform, receive the necessary information, and research a topic. The project envisages the creation of an intuitive and attractive interface that will be accessible to a wide audience, including students, researchers, journalists, and interested citizens.

It is important to understand which features and information will be most useful to users and which design elements will facilitate easy perception and navigation of the platform. The analysis includes studying user behaviors on similar platforms, interviewing potential users, and researching current trends in web design.

The main goal of the design is to create intuitive navigation and an attractive visual style that matches the project's theme. The structure of the site should be logical and organized in such a way that users can easily find the information they need.

Choosing a visual style is an important aspect of design. For a project dedicated to documenting the destruction, a restrained colour scheme was chosen to reflect the seriousness of the topic. Shades of grey and blue create a calm atmosphere, while accent colors such as red or orange highlight important elements and draw attention to key details. This approach helps users navigate the page quickly and focus on the important information.

Typography plays a significant role in the perception of content. We chose modern sans-serif fonts for the main text that ensure high readability on both large and small screens. Headings are designed in serif fonts to create visual contrast and improve information structuring. Ensuring sufficient contrast between text and background also contributes to better readability and usability of the platform.

Given the variety of devices that users can use to access the platform, it is important to ensure that the interface is displayed correctly on all screens —

from desktop computers to smartphones and tablets (Fig. 9.6). To achieve this, we use responsive design, which automatically adjusts interface elements to the screen size. In addition, special attention is paid to the accessibility of the interface for people with different abilities. Including text alternatives for images, sufficient contrast, and the ability to navigate using the keyboard make the platform inclusive and open to all users.

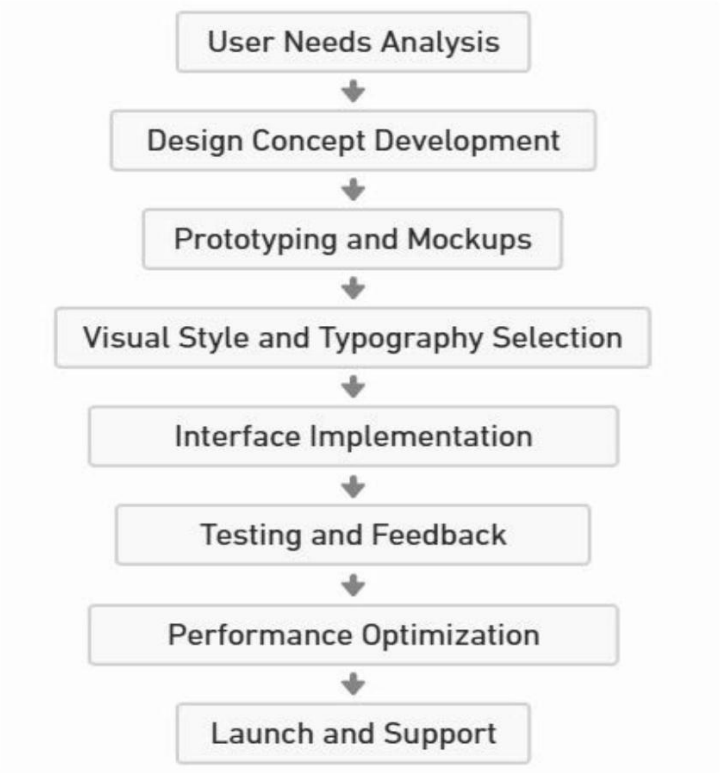

Figure 9.6. Diagram of the user interface design and development process

This diagram shows a logical sequence of steps, starting from analyzing user needs to launching and maintaining the interface. Each stage is closely related to the next, ensuring consistency and coherence in the development of the interface.

The technical implementation of the design is carried out using React as the main framework for front-end development. This allows you to apply a component-based approach and facilitates the management of the application state. The interface is stylized using SCSS, which helps to develop an attractive and functional design quickly.

After the main interface development is completed, comprehensive testing is carried out, which includes checking the functionality of all elements, ensuring correct display in different browsers and on different devices, as

well as assessing usability from the user's point of view. The involvement of focus groups in testing the interface allows us to identify possible problems and improve the design before the widespread implementation. Based on the feedback received, the necessary changes and improvements are made to improve the overall quality of the product.

Loading speed and responsiveness of the interface directly affect user satisfaction. To optimize performance, we use techniques such as minimizing and merging CSS and JavaScript files, using caching for static resources, and optimizing images for fast loading. In addition, attention is paid to optimizing the performance of React components to reduce system load and ensure smooth operation.

After launching your website, it's important to continue monitoring the interface and collecting user feedback. This allows you to identify new needs and respond quickly to possible problems. Regularly updating content, adding new features, and improving the interface will help you retain your audience and attract new users. Continuous development of the interface ensures its relevance and compliance with modern user requirements.

User interface design and development are key stages in the creation of an interactive media project. A thorough analysis of the audience's needs, attention to visual and functional aspects, the use of modern technologies and constant testing ensure that a user-friendly, attractive and effective interface is created. This helps to achieve the main goal of raising awareness of the consequences of the destruction and engaging the public in preserving historical memory and restoring the affected areas.

Choosing a technology stack for the front-end. Several JavaScript frameworks and libraries are popular today for building a web application interface, including: React; Angular; Vue.js.

React is a JavaScript library for building user interfaces developed by Facebook. It provides a component-based approach to development that facilitates code reuse and easier application state management.

Advantages of React: component architecture allows you to divide the interface into independent components, which simplifies development and testing; the use of virtual DOM reduces the number of manipulations with the real DOM, which improves application performance; a large number of ready-made libraries and components, and an active community of developers.

Reasoning for choosing React: given its ease of use, flexibility, and popularity, React is the best choice for our project. In addition, the availability of numerous libraries for integration with mapping services makes it particularly attractive for creating interactive maps.

Working with and displaying data. To store and manage data on destruction objects, you need to select the appropriate format and method of loading them into the application.

Data storage options:

JSON files are suitable for small amounts of data that can be stored locally. GeoJSON is a standard format for representing geospatial data supported by

Leaflet.

APIs and databases if you need to dynamically download data from the server. The rationale for choosing GeoJSON:

GeoJSON is a convenient format for storing and transmitting geospatial data. It is supported by Leaflet out of the box, making it easy to display points, lines, and polygons on a map.

Additional libraries and tools. The following libraries can be used to extend the functionality and improve the user experience:

React Router to organize navigation between pages in an application.

Axios or Fetch API to download data from the server or external APIs.

Material-UI or Ant Design interface components for quick development of an attractive interface.

Redux or Context API to manage the application's state as its complexity increases.

Image processing and optimization. Since the project involves adding photo objects, it is important to ensure fast page loading and image optimization.

Recommendations:

Modern image formats like WebP or AVIF provide a smaller file size while maintaining quality.

Use lazy loading and delayed loading of images when they enter the screen's visible area.

Optimise image size using tools such as ImageOptim or online services.

Deployment and hosting. To publish an application, you need to choose a hosting platform. Options:

GitHub Pages is a free static website hosting service suitable for React apps after build.

Netlify or Vercel are modern platforms for deploying front-end applications with additional features (CI/CD, SSL, domain names). Justification for choosing Netlify or Vercel:

These platforms provide easy and fast deployment of React apps, process automation, and a free plan for small projects.

The development of a technological scheme is a fundamental stage in the creation of an interactive media project. It defines the system architecture, the choice of technologies, and their interaction, which ensures the effective implementation of functional requirements and stable operation of the platform.

This diagram shows the technological process of developing an interactive media project. It shows the main stages of project creation, from planning and design to deployment and support.

The first stage of the interactive media project development process involves planning and design, including prototyping and user interface (UI) design. Tools such as Figma are used to create a prototype. Once the design is approved, the UI development begins using React.

The next stage of front-end development integrates image formats such as WebP and implements Lazy Loading technology to optimize photo loading, which ensures fast page loading.

Next, we test and optimize the functionality to ensure a high-quality user experience. After successful testing, the CI/CD process via GitHub Actions is used to automate the build and deployment of the application.

The final stage is deployment to the Netlify platform, where the application is deployed, stability is monitored, and data is updated via static files or APIs.

Advantages of the chosen technological scheme:

simple architecture without a server part reduces maintenance costs; Optimised static data ensures fast loading of information;

React guarantees high frontend performance;

using Netlify ensures the stable operation of the application and its easy updating;

The CI/CD process through GitHub Actions allows you to quickly implement changes by automating the deployment process.

To successfully create an interactive media project for guided tours of destruction maps, it is important to choose an appropriate development model that will ensure the effective implementation of functional requirements and flexibility in the development process [6; 14]. There are several software development models, each of which has its advantages and disadvantages. This section will discuss the main development models and their suitability for interactive media projects.

The first is the waterfall model. It is one of the oldest and simplest software development models. It involves the sequential execution of the following stages: requirements, design, implementation, testing, deployment, and

maintenance. Each stage must be completed before the next one starts, which provides a clear structure and control over the development process [15].

Advantages of the waterfall model:

simplicity and clarity of the process;

clear definition of requirements at the initial stages;

ease of project management due to the sequence of stages. Disadvantages of the waterfall model:

inflexibility in making changes after the completion of the stages; high probability of errors due to the lack of interactive testing; poor adaptation to projects requiring rapid changes and updates.

For interactive media projects that require flexibility and the ability to respond quickly to changing requirements, the waterfall model may not be effective enough [6].

The next model is the spiral model. The spiral model combines elements of the waterfall model and the iterative approach. It involves going through a series of iterations, each of which includes planning, risk analysis, engineering, and evaluation. This approach allows for continuous improvement of the project, taking into account new requirements and reducing risks.

Advantages of the spiral model:

flexibility to make changes at each iteration;

focus on risk management, which reduces the likelihood of failure and the ability to detect and correct errors early.

Disadvantages of the spiral model:

complexity of process management due to numerous iterations; high cost due to the need for constant risk analysis;

the need for qualified specialists for effective application.

The spiral model is suitable for large and complex projects where the risks are significant, but for small or medium-sized interactive media projects, it can be too cumbersome [15].

The third would be Agile methodologies, such as Scrum and Kanban, which focus on iterative and incremental development. They involve dividing the project into small parts (iterations or sprints), with regular meetings to assess progress and make changes.

Advantages of Agile methodologies: high flexibility and adaptability to changes; constant feedback from users and customers; fast delivery of working parts of the project. Disadvantages of Agile methodologies: the lack of a clear structure can make it difficult to manage large projects, requires high communication and cooperation between project participants, and can be challenging for organisations accustomed to traditional models.

For interactive media projects where requirements can change rapidly, Agile methodologies are very suitable due to their flexibility and user-centricity.

The fourth and final iterative-incremental model involves developing a project through a series of iterations, each of which adds new functionality to existing ones. This allows you to gradually build the project, taking into account feedback and changing requirements on the go.

Advantages of the iterative-incremental model:

flexibility in development and the ability to make changes at any stage; the ability to detect errors early and correct them;

constant delivery of working versions of the project. Disadvantages of the iterative-incremental model:

the lack of a clear end goal can lead to a vague project; which requires high discipline and team organization;

can increase costs due to constant changes and updates.

This model is well suited for interactive media projects where gradual development and the ability to adapt to new requirements and ideas are important.

A comparison of development models is presented in Table 9.3 and Figure 9.7.

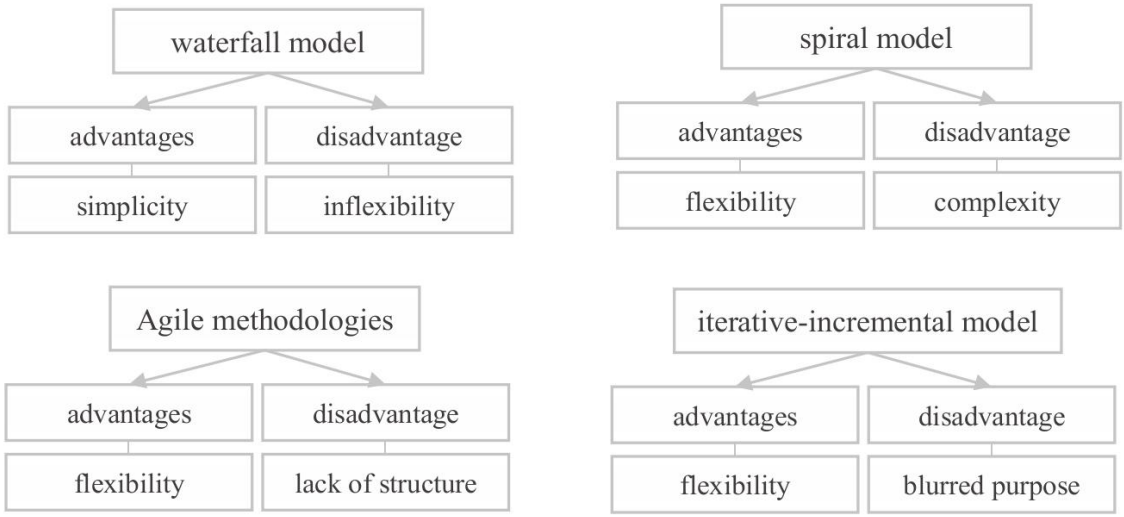

Figure 9.7. Comparison of development models

Additional aspects of model selection.

Identify the needs and requirements of the project: understanding the specifics of interactive damage maps; Identification of key functionalities (e.g. interactivity, multimedia); Identifying the target audience and their expectations.

Table 9.3

Comparative table of development models

Model	Advantages	Disadvantages	Suitability for interactive media projects
Waterfall	Simplicity, clarity of requirements, ease of management	Inflexibility, high risks, poor adaptation	Low
Spiral	Flexibility, risk management, early detection of errors	Complexity, high cost, need for specialists	Medium to low
Agile (Scrum, Kanban)	Flexibility, feedback, fast delivery	Lack of clear structure, high communication	High
Iterative- incremental	Flexibility, early detection of errors, consistent delivery	Blurred goals need for discipline, possible costs	High

Team structure and communication: Ensuring high communication between team members; defining roles and responsibilities in the team; introducing regular meetings to discuss progress and resolve issues.

Tools and technologies: use of modern project management tools (e.g. Jira, Trello for Agile); Implementation of version control systems (e.g. GitHub);

Agile methodologies and the iterative-incremental model are the most appropriate for developing an interactive media project for guided tours of destruction maps. Both models allow for a flexible response to changing requirements and ensure constant interaction with users, which is critical to achieving high quality and meeting the audience's expectations [14].

Agile methodologies ensure rapid development and the ability to update the project, taking into account user feedback regularly. This allows for rapidly introducing new features and improvements, making the project more adaptive and user-centric [14; 16].

The iterative incremental model also supports flexibility and allows you to gradually add new features to the project, which helps improve its functionality and user experience [6].

Both models support continuous improvement and project optimisation, which is important for interactive media platforms where technologies and requirements can change rapidly.

In the modern world, the development of information technology provides many opportunities for creating interactive media projects that can

significantly improve the way information is presented and perceived [1; 17]. This is especially true for projects related to historical heritage and documenting important events, such as the destruction of architectural monuments [3; 7]. For the successful implementation of the interactive Destruction Map Tours Project, it is necessary to choose an appropriate methodology and technology stack that will ensure the efficiency, flexibility, and quality of the final product.

For the development of the interactive project, it is proposed that the Agile Agile development methodology be used with elements of the iterative-incremental model. This combined methodology allows combining the advantages of both approaches, ensuring high adaptability to changes and constant interaction with users.

Agile methodologies are characterized by:

continuous cooperation with customers and end users to ensure that the product meets their needs;

the ability to respond quickly to changing requirements and adapt the development plan to new circumstances;

product development takes place in a series of short cycles (iterations), each of which adds value to the user.

The iterative-incremental model complements Agile with the following:

each iteration adds new functionality to the product;

regular testing and feedback allow us to quickly identify and correct errors;

continuous product improvement through analysis and implementation of improvements.

The combination of these methodologies provides:

the ability to quickly implement changes based on feedback;

ensures that the project meets their expectations and needs;

allows you to gradually add new features and improve existing ones. The stages of development according to the proposed methodology are

The development process consists of the following main stages:

1) Planning and analysis of requirements

developing a clear vision of the project's goals and objectives;

assessment of technical capabilities, resources and risks.

2) Conceptual design

creating the overall system architecture, defining the main components and their interaction;

detailing key features such as interactivity.

3) Prototype development

implementation of a minimum set of functions to demonstrate the main capabilities of the system;

implementation of key components, such as interactive elements;

testing the prototype with users to collect feedback and identify shortcomings.

4) Iterative development and testing

adding new features at each iteration, taking into account priorities and feedback;

checking the compatibility of new components, conducting unit testing and integration testing;

prompt response to identified problems and their elimination.

5) Implementation and launch

improved performance, security and stability;

preparation of documentation and infrastructure;

deployment of the system for a wide range of users.

6) Support and updates

tracking the system's operation and analysing performance indicators; introducing new features and fixing identified problems;

constant communication with users to improve the system.

Choice of technologies and tools (Fig. 9.8, Table 9.4).

Table 9.4

Table of Development Model Selection

Aspect	Agile methodologies	Iterative-incremental model
Flexibility	High	High
Change management	Easy to adapt to changes	Easy to adapt to changes
Feedback	Constant feedback from users	Constant feedback from users
Development speed	Fast delivery of spare parts	Fast delivery of spare parts
Risk management	Through regular assessments and adaptations	Through the gradual addition of features and improvements
Communication needs	High	High
Cost	Ideal for agile projects	Ideal for agile projects
Complexity	Medium	Medium

Frontend: React is a popular JavaScript library for creating dynamic user interfaces. It provides high performance and a component-based approach.

Data: GeoJSON is a JSON-based format for representing geospatial data. It allows you to store information about geometric objects and their

properties; JSON is a lightweight data exchange format that is convenient for transferring structured information.

Hosting: Netlify and Vercel are cloud platforms for hosting static and JAMstack applications. They support automatic deployment from GitHub.

Code management and CI/CD: GitHub is a platform for version control and code collaboration; GitHub Actions is a tool for automating CI/CD processes that integrate with GitHub.

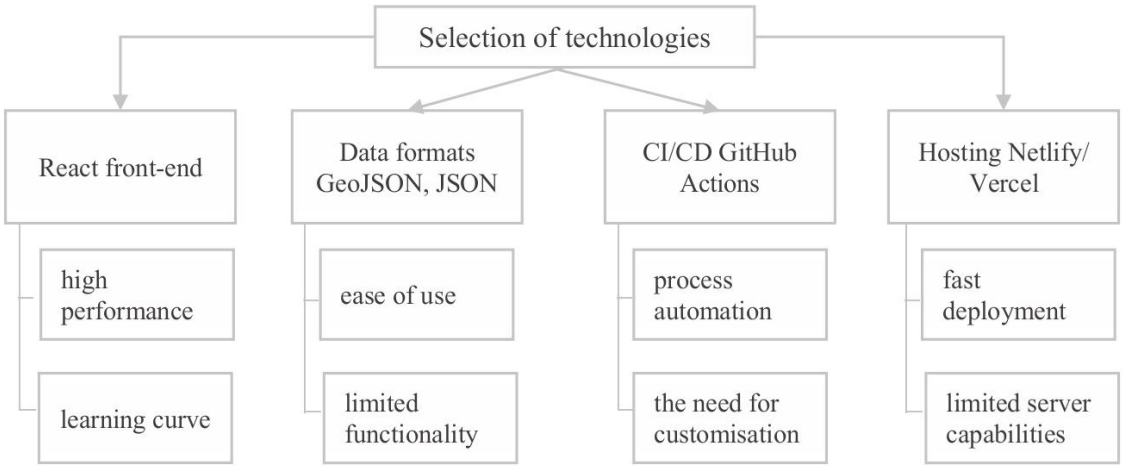

Figure 9.8. Diagram of technology selection

The choice of the technology stack, which includes React for the frontend, the Netlify platform for hosting static sites, and GitHub Actions for automating CI/CD processes, is based on their advantages [6; 18; 19]. React provides high performance and flexibility in creating a dynamic user interface. The use of GeoJSON and JSON allows you to efficiently store and process geospatial data, which is key to the functioning of interactive maps [2].

Netlify was chosen for its ability to quickly deploy static sites, ensure high availability and support modern web technologies. GitHub Actions automates continuous integration and delivery processes, which significantly increases development efficiency and minimises the risk of errors.

The proposed technological scheme and development methodology provide a stable basis for further stages of development, allowing the team to respond quickly to changes, introduce new features, and continuously improve the project in accordance with user needs and technological innovations. This contributes to the creation of an effective, efficient, and safe product that meets modern requirements and expectations of the target audience [1; 17].

Table 9.5

Comparison of selected technologies

Technology	Description	Advantages	Disadvantages
React	Library for creating user interfaces	High performance Flexibility A large community	The learning curve for beginners
GeoJSON, JSON	Formats for geospatial and structured data	Ease of use compatible with many tools	Limited functionality compared to databases
Netlify	A platform for hosting static applications	Automatic deployment; Free plans; High availability	Limited options for configuring server logic
GitHub Actions	A tool for CI/CD processes	Integration with GitHub; Flexibility of settings	Takes time to learn complex scenarios

Thus, the chosen methodology and technology stack not only meet the technical requirements of the project, but also provide the necessary flexibility and adaptability, which are key factors for the successful implementation of the interactive media project of tours of destruction maps.

Practical implementation of an interactive media project of excursions on maps of destruction. The main screen of the interactive media project displays a map of Ukraine with highlighted regions (Fig. 9.9). Users can select any region to access relevant information about destruction or cultural heritage. Interactivity is provided by React technology and the Leaflet library for working with maps. Each region has a colour that changes depending on the selection, which adds visual convenience and makes it easier for users to navigate.

Figure 9.10 demonstrates the cross-browser and adaptability of the project. Figure 9.11 shows detailed information about the Kharkiv region, including textual descriptions and photographs. Interactive elements allow users to view images of the destruction or cultural sites in the region. This approach provides a deep dive into the context of the region, allowing users to see the extent of the damage. Figure 9.12 shows the thematic blocks on different regions of Ukraine.

All of the illustrations above are united by the interactivity achieved through the use of modern technologies: React is used to create dynamic interfaces that respond to user actions; Leaflet and GeoJSON are used to integrate cartographic data and implement interactive maps; Netlify and GitHub Actions — to automate deployment and testing.

Figure 9.9. Map of Ukraine with interactive regions

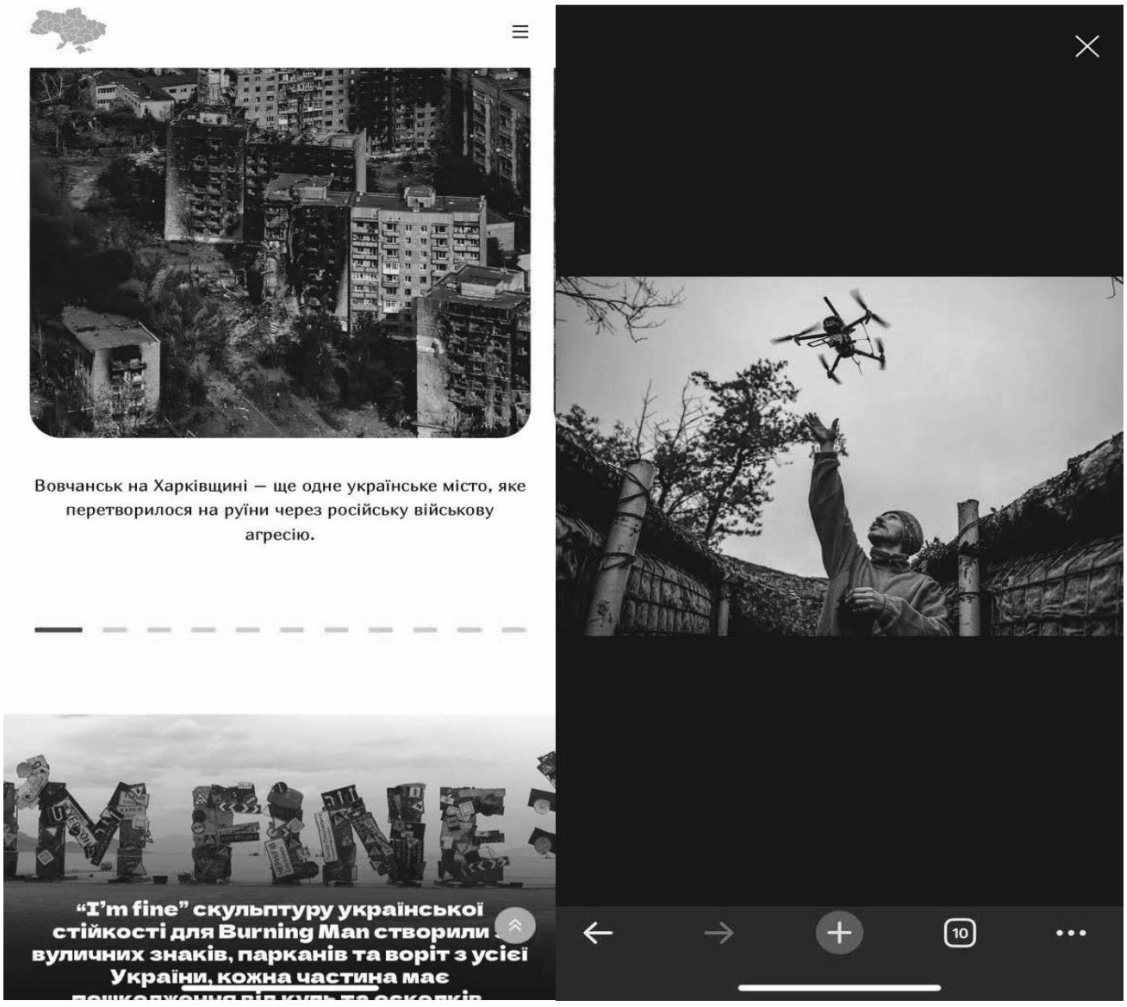

Figure 9.10. Dismantling cross-browser and responsiveness

Figure 9.11. Characteristics of the Kharkiv region

Figure 9.12. Informative content of the Interactive Media Project on Destruction Maps

This ensures the effective implementation of the project's functionality and creates the basis for scaling and further development. The interactive media project is an example of the successful integration of technologies that allows users to immerse themselves in the historical context of Ukraine's regions, raising awareness and engagement in social issues.

Conclusions. During the work, a comprehensive study and practical implementation of the methodology for developing an interactive media project of excursions on maps of destruction was carried out. An analysis of modern technologies and existing platforms has shown that there is a significant need for interactive solutions that not only reflect the extent of the destruction but also engage users in active interaction and preservation of historical memory.

The developed methodology included all the necessary stages, from analyzing the target audience and collecting reliable content to choosing the optimal technology stack and user interface design. The use of modern technologies, such as React for front-end development and the Netlify platform for hosting, allowed us to create a product that is efficient, scalable, and user-friendly.

The testing of the developed interactive media project confirmed its effectiveness and compliance with the set goals. The project helps raise public awareness of the consequences of the destruction, stimulates social activity and supports the preservation of cultural heritage

The results of the work confirm that the integration of modern technologies and methodologies into the development of interactive media projects is an effective approach to solving current social and cultural problems. The proposed methodology can be used to create other projects aimed at preserving historical memory, raising awareness and engaging the public in important social issues.

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