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ДИДЖИТАЛ-СЕРЕДОВИЩЕ ЗАБЕЗПЕЧЕННЯ КОМЕРЦІАЛІЗАЦІЇ ІННОВАЦІЙ

3.1. СУЧАСНІ ТЕХНОЛОГІЇ СТВОРЕННЯ ВЕБСАЙТІВ (MODERN WEBSITE CREATION TECHNOLOGIES)

Each website page is a separate text document created in a programming language (HTML, PHP, JS or others). These text files are downloaded to the computer, processed by the browser and displayed on the computer monitor in the form of a site page. The modern Internet is a complex system that allows users all over the world to access a single information space, communicate with each other, publish certain information for the public, find any information, find a job and expand the circle of acquaintances, discuss important topics and just have a good time.

All pages of each site are united by a single root address, subject of information content and design. Today, the website is an important component in the work of both organizations and individuals. For commercial organizations, this is an opportunity to earn money and attract new customers. For educational organizations, this is an opportunity to provide educational services remotely. For the end user, it is an opportunity to gain new knowledge, to have access to entertainment content (movies, music, master classes based on interests). Therefore, the analysis of modern web development technologies and the ability to apply them to obtain the final product – website development is an urgent task today.

Main part. Web programming is one of the most popular fields of programming today, and according to experts, it will remain the leading one in the future. Today, it is even impossible to imagine our world without the Internet. There are many websites on the world wide web dedicated to online communication, dating, entertainment, games, recreation, as well as work and more.

A web page (English web-page) is an information resource available on the World Wide Web, which can be viewed in a web browser. This information is usually written in HTML or XHTML format and may contain hypertext with navigational hyperlinks to other web pages. A website (English, website) is a set of web pages available on the Internet, which are united both in terms of content and navigation. Physically, the site can be located on one or several servers. A web server (English web server) is a computer connected to the Internet that receives requests for certain data, processes them and issues results using the HTTP protocol (Hyper Text Transfer Protocol) (Classification, 2021; Static, 2018; Static, 2022).

By technology, websites are divided into (Kosala, 2020; Agichetin, 2021): a static site consists of unchanging HTML pages (that is, the user views the page in the form in which it is stored on the server); the advantages of this type of site (economy of use; slight load on the server; download speed; ease of transfer to another server; ease of

creating HTML pages); the disadvantages of this type of site are: making changes to the site structure (creating a new section, adding content, etc.), requires correction on all pages; difficulty in maintaining the integrity of the site; difficulty in ensuring separation of access rights to website content; a dynamic site consists of dynamic, that is, changing pages. It is worth noting that such pages are generated "on the fly" programmatically, based on the user's request (Sun, 2018). The advantages of this type of site are: the ability to independently make changes to the site, without the help of specialists; quick display of newly entered data; ease of site administration and layout; a wide range of functionality. The disadvantages of this type of site are: heavy load on the server; difficulty in transferring to a new hosting; significant financial costs (Cooley, 2007).

A flash site is a site created on the basis of the Adobe Flash program. Most of these sites consist entirely of animation effects (including 3D), despite the fact that they are controlled by software code. Advantages of flash sites: beauty, effectiveness; dynamism Disadvantages of flash sites include: more complex execution, as a result of which the cost of a flash site may be slightly higher than when developing a regular site; "visibility" and performance of the flash site on the user's computer. Not all computers allow viewing flash sites without technical problems; difficulty in editing information on a flash site; ready-made flash site is practically not amenable to "finishing". It is easier and better to develop a new site; flash sites are much more difficult to promote in search engines.

Mixed websites are a combination of the above listed approaches to their development. By purpose, websites are divided into: sites for commercial operations (business sites) – sites that provide information about a firm or company and their services, perform the function of electronic commerce; sites that provide content (information sites) – intended for informing users, providing news, thematic sites, dictionaries, encyclopedias, etc.; sites for communication (social network sites) – interactive multi-user websites that are filled by the users of the network themselves. The site is an automated social environment that allows a group of people united by common interests to communicate; sites for providing services (service sites) – service sites that exist on the Internet, for example, search sites (Google, Bing), web forums, mail sites, online data storage (Skydrive), sites of online document circulation services (Google Docs), photo storage and processing (Picnik, ImageShack, Panoramio, Photobucket), video storage (You Tube) (Jamili, 2023).

The category of sites of commercial organizations includes a number of types of sites that are created to promote or sell goods and services. Customers of commercial sites are usually organizations and private business owners. There are several types of commercial sites: corporate site (official company site), online store, business card site with product catalog, company business card site, promo site (advertising site for products or services), landing page for selling goods or services, site for info-business. Non-commercial websites are projects that do not face challenges, the solution of which will cause an increase in the profit of the company or organization. Such web projects belong to authorities, educational institutions, social institutions, partnerships, foundations. The development of a non-commercial site serves to ensure a presence on

the Internet and is, as a rule, informative in nature. They can also be classified by service availability, physical location and purpose. According to the availability of services, websites are divided into: open – all services are available to any user; semi-open – access requires registration (usually free); closed – completely closed official sites of organizations (for example, corporate sites), personal sites of private individuals, and such sites are available to a limited circle of people, where access for new users is possible by invitation. By physical location, websites are divided into: external and internal. If a site is accessible to users from the Internet, it is considered external, whereas a site that can only be accessed by users on a local network is internal. Examples of an internal site can be the site of a private person, the corporate site of an enterprise or the site of a private person in the provider's local network. According to the purpose of creation, sites can be divided into commercial – developed for the purpose of making a profit and non-commercial – the development of which is not related to making money (Jamili, 2023).

Let's consider the main stages of creating a site. The appearance of any site is unique, but in all sites you can find parts that are common in terms of functionality. On any website, the first thing we see is the main page. Special attention is paid to its development, as studies have shown that people are not able to read the information displayed on the monitor as carefully as in a magazine or book. They usually only view it superficially, for example, as an advertisement. If the main page contains exactly what the visitor is looking for, he reads it further, and if not, he goes to other sites, of which there are many on the Internet.

In the upper part of the main page, there is usually a so-called header, which is duplicated on other pages of the site. This is done on purpose, because this part is displayed in the browser window first and the visitor first of all draws his attention to it. To ensure a quick transition to the main thematic sections of the site, a site menu is created – a list of hyperlinks to its sections. The horizontal menu is usually placed in the header, and sometimes it is duplicated at the bottom of the page, the vertical menu is mostly on the left side, in the place where the visitor starts viewing it. The menu is one of the most important components of the site, the visitor constantly pays attention to it, and therefore the requirements for it are high. The menu should be visible, convenient and understandable, otherwise the user will not know how to go to the necessary section and will leave the site. Menu items should be clearly separated from each other.

Hyperlinks, placed in the text or in the form of graphic objects, provide an opportunity to go to different pages of the site or even to other sites. Sites with a large amount of information have third-level pages, and if necessary, fourth, fifth, etc. In general, there are three types of website structures – linear, tree-like, and arbitrary. Traveling through a site with a linear structure, from the main page you will go to the second page, from it to the third page, and so on. On a site with a tree-like structure, from the main page you will get to one of the second-level pages, from there to one of the third-level pages, and so on. A site with an arbitrary structure appears completely disorganized, but this is exactly the principle of its creation. Traveling through such a

site, you can go from one page to another in different ways, and the way back does not necessarily have to be the same.

The choice of structure is determined by the specifics of the tasks performed with the help of the website. Site creation can be conditionally divided into the following stages:

1. The preliminary stage of site development (at this stage general questions are raised; the general concept of the site is discussed; the goals of site creation are formed and fixed).
2. Site design stage (determining the structure of the site: menu, links, placement of modules, building a list of plug-in components, etc.).
3. Stage of site development and testing.
4. Site placement.
5. Resource development.

Let's consider the methodological aspects of developing a website in the HTML language. Hyper Text Markup Language (HTML) is a standard language designed for creating hypertext documents in the WEB environment. HTML documents can be viewed by different types of web browsers. When a document is created using HTML, the web browser can interpret the HTML to highlight the various elements of the document and process them initially. Using HTML allows you to format documents for presentation using fonts, lines, and other graphic elements.

In most cases, the author of the document strictly determines the appearance of the document. The HTML reader, based on the capabilities of the web browser, can, to some extent, control the appearance of the document (but not its content). Users of some web browsers also have the ability to adjust the size and type of font, color and other parameters that affect the display of the document. As for the automated creation of a website, a special content management system – CMS (from English Content Management System) is used to create, manage and edit the site's content. This is a software shell that allows you to easily enter and edit data – text, images, add and delete pages, that is, manage the site online, without knowledge of HTML, programming languages and other special skills.

Since you can create a site using CMS quickly and without special skills, this tool is becoming more and more popular. Currently, free CMS are popular: Wordpress, Joomla, Drupal. Among the paid CMS are Bitrix, ABO.CMS, Amiro.CMS, NetCat, UMI.CMS, Host.CMS, etc. In addition, a number of web studios use self-written universal CMS of their own development in the creation of sites. CMS Data Life Engine (DLE), which is provided by the developers as an engine for large news portals, can be noted separately. After the site is created, it needs to be placed on the Internet. Hosting (from the English host) is the allocation of space on the server's hard drive, which has a 24-hour connection to the Internet, for hosting the site. This service is provided both by Internet providers and companies specializing in the provision of hosting services. Usually, up to several thousand sites are hosted on hosting servers. Classification of websites presented in figure 3.1 (Jamili, 2023).

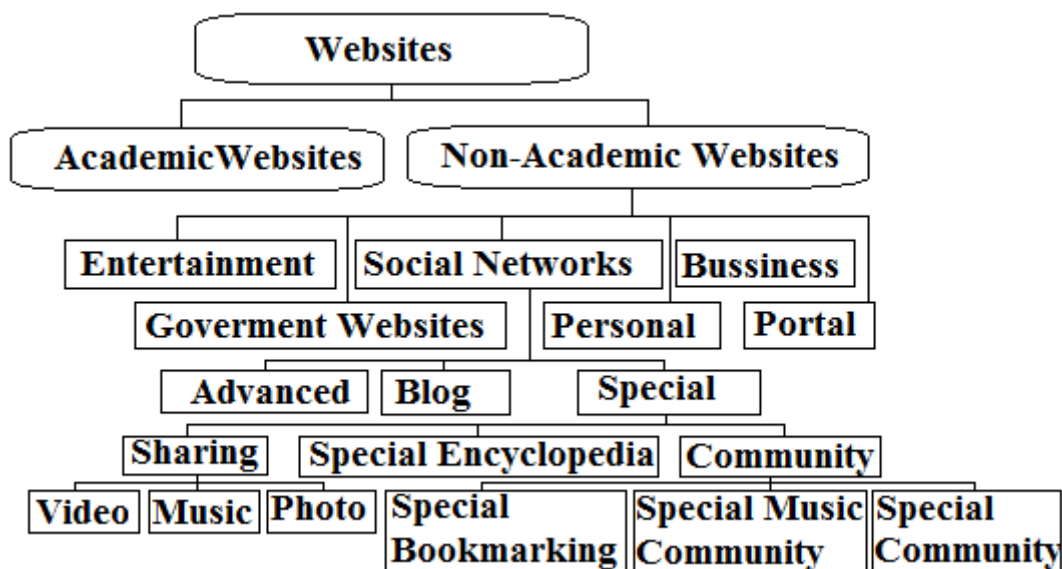


Figure 3.1 – Classification of websites

Let's consider the most frequently used concepts of backend and frontend development. In general, there are three types of web development: frontend; backend; multidisciplinary (combining both types). Frontend (client-side) – the client side, which is the user interface, that is, everything that the user interacts with when the browser loads the page. The front end includes: design, functionality (buttons, forms, widgets), layout, filling, which are available to the user. The frontend part mostly uses such web programming languages as: HTML, CSS, Java Script. HTML (from the English HyperText Markup Language) is a markup language for web pages that tells the browser exactly how to display the site and where specific parts of it should be located. All websites and applications use HTML. CSS (Cascade Style Sheet) is a code that describes the styles of web pages: design, color, line thickness, and so on, that is, it is responsible for the "cosmetic" side of sites. Java Script is an object-oriented, scripting web programming language that creates scripts and scenarios that are executed on the user's side and make a web page dynamic and interactive. A number of other elements and frameworks (Bootstrap, jQuery, SAAS, LESS, Angular, Ember, etc.) are used together with these "big three" to significantly improve performance. BACKEND (server-side) is the software and hardware part, everything that happens behind the scenes of a resource (website or program), its server side. The main task of the backend is to connect the database with the frontend, which should display the data in a user-friendly way. Conversely, everything that happens on the front-end part must be sent to the database through the back-end. The backend part uses the following programming languages: PHP, Java, Perl, Python, Ruby, Node.js, React.js and others. Backend developers write code using such popular programming languages as PHP, Ruby on Rails, Python, .NET, and others. And when some operation needs to be done, the backend code interacts with the database (using MySQL, SQL, Microsoft Access, etc.). After that, the necessary information is returned to the user in the form of front-end code (What, 2022).

Backend and frontend interaction options:

- HTTP request (sent to the server, then searches for data, embeds it in a template, and then returns it in the form of an HTML page; between receiving the request and answering it, the server searches for information in the database based on the generated request; using HTML, it is determined, what will be displayed, and CSS – how everything will look. JS is needed for special interactions);
 - use of AJAX toolkit (Asynchronous JavaScript and XML – the request is sent using JavaScript loaded in the browser. The response comes in JSON or XML format);
 - single-page applications (they load data without refreshing the web page; this is also done using AJAX or using the Ember and Angular frameworks);
 - Ember or the React library (they help to use the application both on the server and in the client. Backend and frontend interact using AJAX and HTML code (Front, 2023)).

Let's consider the history of the development of PHP (Hypertext Preprocessor), which appeared in order to track information about visitors to your site who are familiar with its resume. One of the strengths of PHP was the ability to extend the core with additional modules, which led to the rapid development of PHP. The new version is based on an experimental branch of PHP, which was originally called phpng (PHP Next Generation – the next generation), and was created with an emphasis on improving performance and reducing memory consumption. The new version adds control of passed types for data, as well as new operators. Today, PHP is a powerful cross-platform set of tools that are located on the server and are aimed at processing the code embedded in the HTML page, which makes it possible to process scripts not by the visitor's browser, but by the server. Let's analyze the main capabilities of the Russian People's Republic. Let's start by defining what exactly PHP is. We will describe it with the following three characteristics: PHP is a hypertext (HTML) preprocessor; PHP is a server-side programming language; PHP is a scripting, interpreted programming language. Let's consider each of the definitions and find out in which tasks PHP will be useful. The main task of PHP is to "add life" to HTML pages. Usually, HTML pages are static, which means that every time this page is accessed, the browser will show it to any user in an unchanged form. Almost always, users come to the site for information that is constantly changing, and it is necessary to display its current state (PHP, 2023).

PHP allows you to modify a web page on the server just before it is sent to the browser. Let's see how it works. PHP is able to execute code – so-called scripts (a script is a program that is located on the server side and is launched in response to a request from the browser). During execution, PHP can modify or dynamically generate any HTML code that is the result of script execution. The server then sends this code to the browser. At the same time, the browser does not know how this page was created – statically created by the developer, or dynamically created with the participation of PHP. This is not important, because the browser always works only with what it received from the server.

Because PHP is an object-oriented programming language, it allows you to create classes and objects. Objects in PHP are a data type. Objects allow you to store in variables a set of properties and their values, as well as built-in functions. This makes

objects similar in structure to associative arrays. But there is still a difference from arrays, and at the same time it is quite important – objects can have an internal state. Objects can have separate values, each under its own key. These values are called object properties. The value of an object property can be of any type: number, string, array, other object. But, unlike an array, objects do not have the ability, and even do not allow adding new values to themselves. That is, the object always has a finite number of its properties and methods. You can change the values of existing properties, but you can't change or delete them. To create a new object, you must first create its class description. A class is like a drawing of an object. A class describes what an object is made of. Also, objects can have functions within themselves – they are called object methods. Methods can access any properties of the object, read and write data there. A normal PHP script is a set of expressions. Each expression begins with a new line and ends with a semicolon. An expression is an instruction that helps you perform one action, such as adding two numbers or displaying information on the screen.

MySQL is a compact, multi-threaded database server. MySQL is characterized by high speed, stability and ease of use. MySQL was developed by TsX for internal use. MySQL server is used in web programming to store information in tables and is very popular. So, it is safe to say that MySQL is an integral part of PHP. With the help of PHP, it is possible to connect to the server and extract data, and in this way the dynamics of the site is carried out. Special built-in functions for working with MySQL allow you to easily and efficiently work with this DBMS: perform any queries, read and write data, and handle errors. The script that connects to the database, executes the query and displays the result will consist of just a few lines. To work with MySQL, it is not necessary to install and configure anything additionally; everything you need is already included with PHP standard delivery (Working, 2022).

Mysqli (MySQL Improved) is a PHP extension that adds full MySQL database support to the language. This extension supports many features of modern versions of MySQL. A typical process of working with a DBMS in a PHP script consists of several steps: establish a connection to the DBMS server, passing the necessary parameters: address, login, password; make sure that the connection was successful: the DBMS server is available, the login and password are correct; form the correct SQL query (for example, to read data from a table); verify that the request was completed successfully; get the result from the DBMS in the form of an array of records; use the received records in your script (for example, show them in the form of a table). Before starting to work with data inside MySQL, you need to open a connection with the DBMS server. In PHP, this is done using the standard `mysqli_connect()` function. The function returns the result – the connection resource. This resource is used for all subsequent MySQL operations. But in order to connect to the server, you need to know at least three parameters: the address of the DBMS server; login; password. If you use the configuration with the standard MySQL installation procedure or use OpenServer, then the server address will be localhost, and the login will be root. When using OpenServer, the password for connecting is the empty string and when installing MySQL independently, the password is set in one of the steps of the installation wizard (Working, 2022).

The first thing to do after connecting to the DBMS is to check that it was successful. This check is necessary to exclude an error when connecting to the database. Incorrect connections, misconfiguration or high load will cause MySQL to refuse new connections. All these situations will lead to the inability to connect, so the programmer must check the success of the connection to the server before performing the following actions. The connection to MySQL is established once in the script, and then used for all requests to the database. The result of the `mysqli_connect ()` function will be a value of a special type – a resource. If the connection to MySQL failed, the `mysqli_connect ()` function will return a logical value of type `false` instead of a resource. It is a good practice to always check the value of the result of the execution of this function and compare it to `false`.

First of all, after setting up the connection, it is highly desirable to explicitly set the encoding that will be used when exchanging data with MySQL. If this is not done, then instead of entries with values written in Cyrillic, you can get a sequence of question marks. During an active connection and having defined the encoding, you can execute your first SQL queries. You already know how to write correct SQL commands and execute them through the console or visual interface of the MySQL client. The same requests can be sent without changes from a PHP script. Several built-in functions of the language will help in this: reading information (`SELECT`); modification (`UPDATE`, `INSERT`, `DELETE`). When executing requests from the PHP environment, requests from the second group return only the result of their execution: success or error. Requests of the first group return a special result resource upon successful execution. It, in turn, can be converted into an associative array (if one record is required) or into a two-dimensional array (if a list of records is required).

PHP has low dynamic typing: this means that variable types are determined at runtime, different types can be used together, and implicit conversions are performed automatically. Such typification is both a minus and a plus. On the one hand, the code is simple, flexible, it is more readable and easier to write, but on the other hand, there is a high probability of errors, and you can find them after starting the program. Among the advantages are: PHP is free, and its code is in the public domain; PHP is compatible with almost all modern servers; PHP is flexible and gives many possibilities and freedoms; many libraries, databases and frameworks have been created for PHP; simple and elegant system of classes and objects; simple syntax. Among the cons: to work with PHP, you need to know at least HTML, and preferably CSS. Knowledge of JavaScript will also come in handy; the simplicity and flexibility of PHP also has a downside – it's very easy to write bad code, it's easy to make a mistake, and it's hard to find an error. This makes code very difficult to maintain; due to the simplicity of the language and the large number of developers, the code is often of low quality and does not provide protection; PHP is not the most productive programming language: for example, its biggest competitor is Javascript because it is faster; there is no clear system in the names of functions of the standard library – some have abbreviations, some do not.

So, comparing PHP and Javascript, we can draw the following conclusion:

1. Frontend vs Backend. PHP is most often used for backend development (on the server side), and JavaScript is used for frontend development on the user side. That is why there are pages, the server part of which is written in PHP, and the user part is written in JavaScript.

2. Application. JavaScript is used for multi-threaded and web applications, game servers, browsers and much more, PHP is a language almost exclusively for web development.

3. Speed. As we discussed earlier, PHP is slower than JavaScript.

4. There is no database support in standard JavaScript, and work on PHP is very closely related to this.

5. Security. Because PHP runs on the server, its code is less accessible and more secure than JavaScript code that sits on the surface. However, there are tools (Security Analyzer) that help make JavaScript more secure.

6. Complexity. PHP is easier. For the same task in JavaScript, it usually takes longer to understand and write more code than in PHP.

To create the server part of the site, you need to have skills in working with programming languages. It can be almost any language, but now PHP is most often used in web development. It is a general-purpose language, but it is suitable for creating websites in most cases. PHP is an object-oriented programming language that allows you to create classes and objects. We looked at what RNP objects are and how they differ from arrays, learned about their anatomy, properties, methods and life cycle, identified the advantages and disadvantages of RNP. We looked at the work of PHP and MySQL, learned that MySQL is a compact multi-threaded database server, characterized by high speed, stability and ease of use.

Also, to develop the server part, you need to understand databases. MySQL is a compact multi-threaded database server, characterized by high speed, stability and ease of use. Special built-in functions for working with MySQL allow you to easily and efficiently work with this DBMS: perform any queries, read and write data, and handle errors. So, it is safe to say that MySQL is an integral part of PHP. With the help of PHP, it is possible to connect to the server and extract data, and in this way the dynamics of the site is carried out. Most often, the improvement of the website is a possible expansion of functionality. It is also possible to refine the site interface in order to further increase its informativeness, attractiveness and convenience. Backend and frontend are important elements for creating a website. Backend is the engine of the site, because it is responsible for its functioning. Frontend is the face of the site, because the design and presentation of information in an accessible form is exactly what is needed to interest customers. It is also necessary to follow the stages of website development and decide on the purpose of the future project. If you carry out all stages of development, decide on the purpose of your site, its type and appearance, then your development will be successful.