

Development Features Web-Applications

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Abstract: The article provides overview of two Web-applications classifications (generalized and with emphasis on business services). The main advantages of using Web-applications are given. The stages of modern Web-applications development are considered, main tasks that arise during development are formulated and ways of their solution are described. An important step is to build information architecture of Web application. The paper highlights key features of Web-applications.

Keywords—internet; views; web-applications; development; features

1. INTRODUCTION

The Internet has penetrated into all spheres of life and is rapidly gaining momentum [1]-[3]. The Internet allows person to access information anytime and anywhere [4]-[7]. In this case, various methods and approaches that are used in various areas of research [8]-[19] can be used.

Web-applications are modern information systems that provide some information services on Internet, Web-applications are interactive and usually allow users to interact with different elements, for example, to buy goods and before receiving public services online etc. (Fig. 1).



Figure 1: Web-application for buying various goods

The benefits of Web applications include: Web-applications are not demanding on resources and do not impose any requirements on hardware platform; Web-applications do not require subscription or purchase of licenses; user can manipulate data, but with limited access; free access at any time and in any place where there is access to Internet; no compatibility issues, as all users access same Web-application; Web applications are not installed on hard

disk, so there are no volume requirements; Network security, as programs process requests through secure HTTPS data transfer protocol. The entry point is protected by centralized configuration. User data is stored on cloud server, protected from loss even if hard drive is damaged.

So, Web-applications allow businesses to streamline their operations, increase efficiency, and reduce costs.

Since impact of global computer network Internet on modern world has no analogues, and Web-applications have wide scope and are easily accessible from any place, features topic of their development is relevant.

2. RELATED WORK

You can Web-application create in almost any field, and all of them can benefit both customers and businesses, so a lot of work is devoted to process of developing Web-applications.

For example, in [20], authors consider such varieties of Web-applications as Native App, PWA and Standard Web App, comparing them according to such characteristics as: Installation, Updates, Size, Offline access, User experience, Push notification and Discoverability. The work also describes characteristics of Progressive Web Apps. Various strategies for Web-application development methodologies are analyzed in [21]. The authors paid special attention to Agile methods, object-oriented, based on UML.

There are number of programming languages and technologies for Web development, both client-side and server-side: CSS/HTML, PHP, SQL, JavaScript, Python. For example, in work [22], authors revealed issues related to development of Web-applications with Python.

Web applications have complex structure, and frameworks are often used to write original program code more efficiently and quickly. Hypertext Preprocessor (PHP) Web application frameworks are discussed in [23]. The authors also described use of Ajax technology. The development of Web-application in PHP is given in [24]. In paper, authors describe in detail Management selection and recruitment system (Class

Diagram, Main Menu, authorization, Test Attempt). The PHP CodeIgniter application workflow is shown.

The main criteria for comparing frameworks are described in [25]. According to selected criteria, authors compared Django, Rails, Spring and Laravel frameworks. The choice of framework depends on requirements of application being created.

Rigorous security in Web-applications is critical to success on Internet, so Web application security is also focus [26]. The authors examine architecture of Web-applications and analyze widespread security vulnerabilities. These vulnerabilities include insufficient transport layer protection, information leakage, cross-site scripting, and SQL injections. In [26] analyzes tools that are used to scan for these widespread vulnerabilities in Web-applications.

3. TYPES OF WEB-APPLICATIONS

Web applications allow you to create documents and images, share information and work on projects regardless of location or device. When running Web-application in same way as in normal system, user enters and receives information, works with windows and menus, saves data on server and receives reports. Consider key types of Web-applications (Table 1).

Table 1: Types of Web Applications

Type	Features	Example
Single-page interactive application – Single Page Application (SPA)	In SPA, user who switches between tabs remains on same page. Spa performance due to fact that only necessary parts of content are loaded and updated.	Gmail
Multi Page Application (MPA)	Data exchange is slower than in SPA.	AliExpress (Fig. 1), Amazon.
Progressive Web Apps (PWAs)	Created and improved with help of modern APIs, provide advanced features. Such applications are reliable; easy to install and update, network independent. The basis of PWA is Service Worker (proxy	Web Board (Fig. 2); Web application for visualization of GPS tracks (Fig. 3); BPM Techno (Real-time BPM counter) (Fig. 4).

	layer between frontend and backend located in browser).	
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Figure 2: Web Board



Figure 3: Online GPS Tracking Tools | Tools Required | MyGPS.ae



Figure 4: BPM Techno

Table 1 lists three basic kinds of Web-applications. You can also separate Web applications in business (Fig. 5).

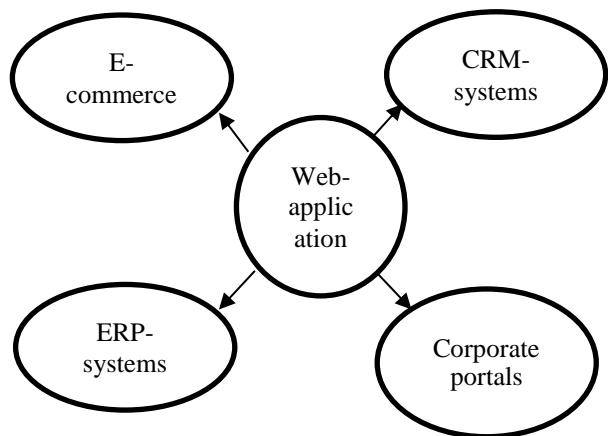


Figure 5: Web-applications in business

The basic functionality of SPA allows:

- high speed. Since SPA doesn't update entire page, but only necessary part, it significantly improves speed of work.
- high speed development. Ready-made libraries and frameworks provide powerful tools for developing Web-applications. The project can work in parallel back-end and front-end developers. Thanks to clear separation they will not interfere with each other.

- poor SEO optimization. SPA works on basis of JavaScript and downloads information on request from client part. Search engines can hardly simulate this behavior. Because most of pages are simply not available for scanning by search bots;

- low level of security. JavaScript has low level of security, but if you use modern frameworks, they can make your Web-application secure. But you should pay attention that using jQuery can significantly reduce security of project.

The basic functionality of MPA allows:

- simple SEO optimization. The architecture of MPA allows you to easily optimize every page for search engines. A developer can add meta tags for any page.
- easy development. Typically, developing multi-page application requires smaller stack of technologies.
- many solutions. Using MPA you can find suitable boxed solution.

The basic functionality of PWAs allows:

- improve quality of work with clients,

- facilitate work with documents,
- improve communication between company's divisions,
- conduct PR-events of any complexity.

E-commerce system – for ordering and selling goods without intermediaries. Examples of e-commerce can be marketplaces, online catalogs, online stores.

The development of e-commerce Web-application requires setting up control panel for content managers, online payment gateways, external analytical solutions, etc.

Often, these applications consist of extensive databases containing information about inventory, potential customers, and information about online transactions.

CRM-systems – for ordering and selling goods. CRM-systems – to track entire sales operation of company, namely, specific sales department; you can make appointments and track history of interaction with all customers.

The basic functionality of CRM allows:

- marketing optimization – system accumulates information about target audience, helps to better understand needs of customers and set up targeted advertising campaigns based on accurate data;
- increased loyalty – saves history of interactions with each client and helps managers to make offers on time and provide personalized service;
- improved coordination – improves communication between departments and monitors how employees perform key indicators. The system will help to transfer team to remote location without loss of productivity.

ERP-systems – tracking not only sales department but also all resources and divisions of company.

Corporate portals – organizational social module for solving problems of quickly informing all employees of company or corporate training, and you can also monitor employees (HR-module).

Such Web-applications are responsible for extracting details from different sources, such as emails, forums and search engines, and presenting them in uniform manner.

Corporate Portals come in three ways: The first is exclusively internal – the so-called "intrasite". Its main task is to form single internal information space of company. The second type is external web portal. It is usually created to organize two-way communication with customers, advertising and PR of company.

The third option, most relevant in our time. It's such mixed type. The demand for such corporate portals arises when successful company works with wide range of customers and at the same time has many remote employees, many branches or many secondees.

Thus, classic corporate portals of third type are information web systems of media and software development companies.

Web-applications – programs that can be opened using any browser. Today, such applications are used in all spheres of life.

4. FEATURES OF WEB-APPLICATION DEVELOPMENT

Despite fact that technological progress does not stand still place, development of Web-applications still remains problematic, as programmers face a number of questions at stage of their creation.

Developing Web-applications involves several steps and can be quite long and time-consuming process.

Stages of web-application development:

1. Creating UI/UX design – intuitive program interface is created (without programming stages). Visualization elements are created in design of Web-application to implement:

- user registration;
- login to system;
- search for "goods";
- placement of "goods";
- order of "goods";
- navigation;
- creation of profile;
- payments.

2. Backend development – creation of internal part, that is, invisible to client structure (database, server, business logic). The key step that determines entire operation of Web-application. At this stage, you perform:

- authorization with client authentication at login;
- servicing of external interface requests,
- creation, reading, updating of data.

3. Frontend development – external interface part is created in programming languages HTML, CSS, JavaScript, Ajax. The most popular framework Angular, React JS, Vue JS are used – coded modules can reduce development time.

4. Testing Web-application:

- interface testing (checking communication, connection to database, work of links between pages);
- performance check (data transfer rate, rendering, processing of user input; work under heavy load; work at different Internet speeds);
- UI Testing to check convenience of user interface, as well as operation of server with internal part of system;

- product is tested on different browsers and devices – compatibility;

- checking weaknesses and vulnerabilities – security.

5. Hosting and deploying Web-application.

In either case, it all starts with choosing content of Web application.

Then you need to solve some issues in design of structure and graphical representation, followed by development of components.

During assembly and verification of structure, it is necessary to resolve issues related to checking for compliance with integrity constraint.

And as a result, providing identification.

It can be noted that all problems are interrelated and can be solved with help of concepts of World Wide Web (WWW) databases –world's largest multilingual repository of information in electronic form [27]-[29], as well as by building and researching Web models [30], which are oriented graphs, nodes of which are pages, and arcs are connections between Web pages (Fig. 6).

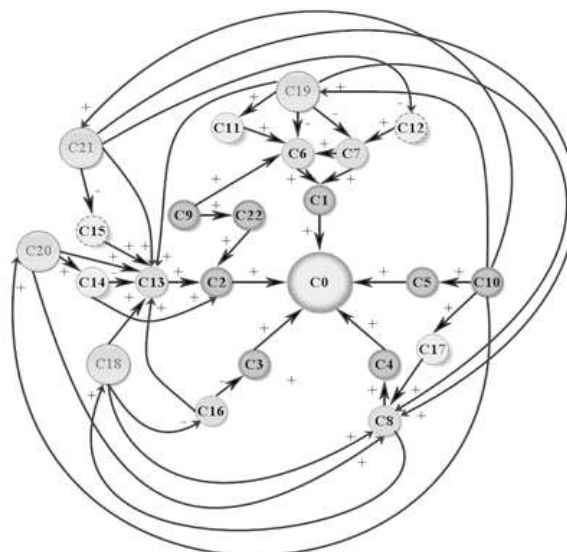


Figure 6: Example of graph mode

To apply database technologies to create Web-applications, you can use methods to explicitly represent their structure. This will allow you to create applications designed for different groups of users, update them, optimize and modernize them.

The solution to these problems can be method of building network information systems designed and implemented within boundaries of Web-development, which in its capabilities is close to modern expert systems:

- existing database, implemented as hypertext;

- existing interface that allows user to interact with system in language close to human (browser as a dialogue monitor, dialogue scripts – in form of HTML documents);

- existence of automated replenishment means and modification of hypertext structures.

When user interacts directly with application, carrier of output rules is specialist who works with system. Otherwise, if user interacts with application through information retrieval systems, then presence of specialist is not required, therefore, list of above problems can be specified by task of building expert systems Internet / Intranet.

So, in process of creating Web-applications, it is customary to distinguish two components – Web-design and Web-programming. There is no clear boundary between them. Most often, Web-design is understood as development of Web-page static part in HTML language, and Web-programming refers to development of extensions for Web server.

In modern world, along with development of markup language capabilities, HTML document format, which is most often used to create Web sites, intensively developing technologies based on Extensible Markup Language (XML) [31]. It is worth noting that use of XML technologies opens up new opportunities in automation of website design, allowing not only to provide information, but also to store it in structured form.

Document Type Definition (DTD) declarations in XML allow you to describe structural features of documents. In this case, structure of document is sequence of elements within presence of hierarchy (Fig. 7) [32, 33].

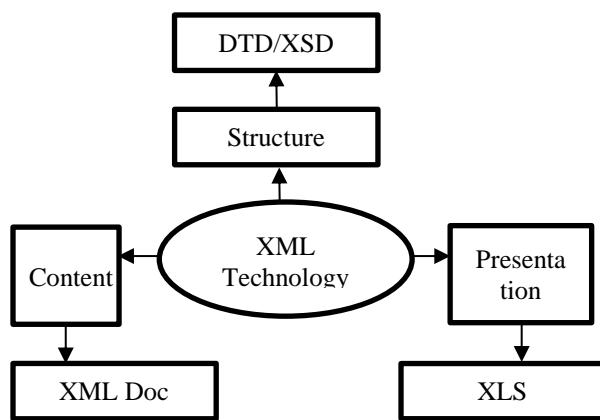


Figure 7: DTD diagram for structuring XML documents

More advanced tools for describing other properties provide schema definition language specifications for documents [32].

So, all of these problems are solved by simple steps (described above).

It is much more difficult when programmer has to work with dynamic pages that are defined by data entered by users.

Trends in development of Web-development demonstrate that number of these pages is growing, and therefore, there are problems with identification of sites and automation of processes of their creation.

Also added are problems of user interface intellectualization, use of human language to form requests for searching for information on Internet / Intranet (Intranet – internal network that belongs to individual, organization or large public institution), evaluating search results [34], [35].

Using this data, you can control integrity of XML documents structure, create its display in one of existing data models (relational, object, etc.), work with unstructured information using database methods.

For example, when you create site in XML environment, you can use xml language (DTD) tools directly to shape its structure, as well as hyperlinks and pointers that link documents or fragments of documents or fragments of documents. You can use the XLink and XPointer languages to declare tools.

Obviously, development of automation tools for building sites based on HTML documents does not contribute to solving above problems, and attempts to distribute results to XML structures are limited. Conversely, creating methods and tools for working with more common XML documents will solve problems of automating construction of sites using format languages. In this regard, in our time, programmers develop methods for solving formed tasks, design necessary data structures and software tools, form information and logical models of processes of creating Web-applications, consider use of XML structures to support unstructured resources.

Thus, key features in development of Web-applications include:

- quick and easy user registration;
- compatibility – cross-platform;
- security.

5. CONCLUSION

The article begins with overview of two Web applications classifications (generalized and with emphasis on business services). As result, capabilities of these applications are defined and examples are given.

The main benefits of using Web applications are also listed.

Thus, this article discusses stages of development of Web-applications, formulates main tasks that arise during development and describes ways to solve them.

During review of problems in development of Web-applications, we note that initially it is necessary to analyze goals of project and functions that will be offered to user.

You should pay attention to choice of development tools, because use of incorrect tools can lead to unreasonable increase in cost of Web-application.

An important step is to build information architecture of Web-application.

After all materials of Web-application and its structure are prepared, it is necessary to determine design of navigation and pages themselves.

As result, we can highlight key features of such applications: cross-platform; they must have quick and simple registration that allows user to create account in short time; security.

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