ECONOMIC IMPACT OF DEVELOPING OF WEB TECHNOLOGIES

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Introduction. Today, there is a high rate of accumulation of scientific knowledge in all spheres of life, new technologies are being actively invented and old ones are being finalized. This trend has not bypassed the methods of developing all kinds of applications. Every year, new libraries, frameworks, and even entire programming languages are developed, and the methods used by programmers become obsolete five to ten years ago.

The first web pages on the Internet were static and had long loading times. The modern Internet is no longer limited to these kinds of web pages. The World Wide Web has shifted towards active user engagement as well as enhanced functionality through visually pleasing and powerful web applications. This article will discuss what is the architecture of web applications, its components, models, types.

Economic significance. In several large and developed countries, the Internet has a strong influence on economic growth rates. The Internet accounts for an average of 3.4 percent of GDP in large countries that account for 70 percent of global GDP. Internet use also has a positive long-term impact on economic growth. However, the use of the Internet needs to be made more efficient if it is to have a significant impact on a country's economic growth. Although the results of the study cannot be generalized because the study is based on a small sample due to the lack of time series data for some variables, the study opens new possibilities for other researchers as this study has important implications for future research study.

Literature review. Web application architecture is a model of interaction between the components of a web application, which are divided into two categories: user interface application components and structural components. How this interaction is planned determines the stability, performance, and security of the future web application. Web applications of different sizes and levels of complexity follow the same architectural principle, but the details may differ (Robin Nixon, 2019).

UI Application Components are links to web pages that do UI work, not development work, and therefore deal with display information panels, configuration settings, notifications, logs, and so on. These components have nothing to do with how the web application architecture works. Structural components of a web application refer to the functionality of a web application that the user interacts with. The two main structu-

ral components of a web application are the client side and the server side. The client component allows users to interact with web application features and is developed using HTML, CSS, and JavaScript. The server component includes a web application control center and a database necessary for storing information. Developed with Python, PHP, Java, NET, Ruby and other languages (Robert H'obbes, 2020).

Methodology. There are three web application development models that differ in the number of servers and databases required for a web application. This number depends on the complexity of the web application.

A feature of the "one web server and one database" model is that it uses only one server and only one database. This makes the model the most unreliable of all. If there is a problem with the server, the web application will not work. This model is not commonly used to build web applications. Nevertheless, the model is sufficient, workable for testing and closed sessions.

The "multiple web servers with one database" model is more reliable because there is a redundant server. However, if something happens to the database, the application will crash. Therefore, it is very important to ensure the security and continuous operation of the database. After one server fails, requests will be automatically redirected to a backup server, allowing the web application to continue working (Freeman A, 2019). The "multiple web servers and multiple databases" model is considered the best model for web application components because both web servers and databases have multiple replacements. You can store the same data in all available databases or evenly distribute them among themselves. However, if data is distributed, it may happen that some of it becomes inaccessible if this database fails. If the scale of the web application is large, then more than five web servers and databases are used, for which it is recommended to install load balancers. With its ability to manage and process large amounts of data, this model is a solid foundation for enterprise web application architecture.

Analysis. The type of web application architecture depends on how the application logic is distributed between the client and server sides. There are several types of web application architecture, each with its own pros and cons and serving different purposes.

Single Page Applications (SPAs) provide dynamic interaction by providing updated content to the current page, rather than downloading entirely new pages from the server each time to perform user actions. In other words, SPA provides access to all information from one HTML page. By moving the application logic to the client side and using the server side only as a data store, developers can speed up the site and lighten the load on the server. AJAX is the foundation for making pages connect and SPAs work (Cosen K, 2018). Microservices are small and lightweight services that perform a single functionality. Components of this type do not directly depend on each other. As such, they do not have to be built using the same programming language. This improves productivity and speeds up the development process.

Another type is serverless architecture. To create such a web application, developpers contact a third-party cloud infrastructure service provider for server outsourcing as well as infrastructure management. The benefit of this approach is that it allows applications to execute code logic without having to bother with infrastructure-related tasks. The serverless architecture is best suited when the development company does not want to manage or maintain the servers as well as the hardware for which they have developed the web application (Haverbeke M, 2019).

One of the major trends in web application development in recent years is the type of progressive web applications. The increase in smartphone usage has created a need to develop web applications capable of supporting mobile visibility. This type supports most modern web browsers and provides strong offline support with improved cache management. Most importantly, Progressive Web Apps can reach a very wide audience.

Web application architecture, like the Internet, is constantly evolving. Modern web application development has replaced outdated frameworks and core components. When building an application, choosing the right architecture is critical. Important parameters depend on this choice - the speed of the web application, reliability and security, as well as how it responds. The ideal web application architecture should enable efficient and easy development and maintenance of web applications (HUMED. A, 2017).

The history of the web industry development started from a very first site called "info.cern.ch" was created in 1990 by Tim Berners-Lee (Al-Tibbi W.H., 2019). The British scientist had laid the foundation for Web technologies by presenting the latest information transfer technology at that time – WoldWideWeb. He had developed the principles for the functioning and the installation of browsers and servers. In addition, Tim Berners-Lee had invented the technical means – the HTTP data transfer protocol, the HTML hypertext markup language, the URL system of web addresses. Later, HTML got support for 16 colors, the ability to insert images, and present information in the form of HTML tables. This was followed by the emergence of the first browsers to support these features: Mosaic in 1993, NetScape in 1994. However, due to the use of only HTML features in website development, work at that time was carried out mainly in primitive text editors.

In 1995, HTML was supplemented with Javascript, which allowed developers to add pop-up windows and other reactions to user actions on their sites. In the same year, the PHP scripting language (Personal Home Page) appears, which simplifies the creation of basic pages with scripting. A big step in the development of sites was the release of the FrontPage HTML editor, which works on the principle of WYSIWYG (What You SeeIs What You Get) and allows anyone to create their own website at home. The best connection of this editor was made with the Windows browser - Internet Explorer, released in the same year (Votinov M.V., 2017). The following year, 1996, the development of the web industry did not stop and was marked by two high-profile debuts - CSS

and Macromedia Flash (currently Adobe Flash). Thanks to CSS, working with styles during website development has become more convenient and systematized, and Flash has become the main means of creating animation for many years. By 1997, web development began to overtake the technical capabilities of that time, so the main event of the year was the announcement of HTML 4, which heavily used CSS style sheets. In addition, Macromedia released Dreamweaver as an alternative to FrontPage. In 1998, CSS2 was released, which enabled developers to use block formatting, work with sound, create styles on a page-by-page basis, and generate site content. It is worth noting that this version of CSS is still used to create websites, but not as actively as the later released CSS3.

After several quiet years in the web industry, in 2003 a new stage in website building began. This year, Facebook and MySpace were launched, which introduced a new trend in website design. Simplicity and functionality came to the fore during development, Flash animation became an almost mandatory element on every site, which required any developer to have the skills to work with it. In the same year, the release of WordPress took place, which simplified the creation of not only blogs, but also quite complex news resources. By 2005, the web industry was already actively using the capabilities of 2D and 3D applications, so a new development tool was released - Unity, which is necessary for creating browser games and introducing 2D and 3D to the site. We can also note another competitor to WordPress and Drupal, introduced this year - CMS Joomla! In 2006, a CSS-based metalanguage, Sass, was released, designed to increase the abstraction level of CSS code and simplify cascading style sheet files. It is still supported. Since 2007, web design has changed its course towards mobile devices, because it was in that year that the iPhone 1 and the Safari mobile browser were introduced to the general public. By 2008, web designers were starting to get used to the need to work for different screen sizes, so grids came into vogue in development, and later there were dedicated CSS frameworks that standardized and made it easier to work with individual elements. Influenced by Sass, Alexis Celier creates his own style language LESS in Ruby. Many novice developers are quickly becoming interested in the language because of its simplicity and versatility, and, most importantly, because of the ability to work with the TwitterBootstrap framework.

Over time, the web industry sets certain standards. Firstly, a good site must be adaptive, that is, the site must have several versions of adjustment to the screen of a user who visits Internet pages not only from a PC, but also from phones and tablets. Secondly, after Microsoft began to produce products designed in a flat metro style, flat design, or, in other words, flat design, became popular. Such a design helped web designers not only create concise and beautiful sites, but also make them adaptive through vector graphics and reducing the number of elements. But not everyone agreed with the trend towards simplification in web development, so parallax design appeared as an

alternative, which created a 3D effect on the site using different speeds of movement of the site elements when scrolling. In 2014, a new version of the HTML 5 language standard was published, which simplified the work with sound and audio. This ended the use of Adobe Flash, which was discontinued in 2021. It is worth noting that it also became possible to store data locally in users' browsers and fully manage the visit history, work with geolocation information and databases became available.

Currently, the development of flat design ideas, minimalism, parallax effects, and a primary focus on usability continues. Summarized information on the development of website development technologies is presented in table 1.

Table 1. Development of website development technologies

Years	Priority Development Tools	Basic development tools	Design Features
1990-1994	HTML	Text editor	Using the maximum possibilities of web design, differrent text and background colors
1995	HTML 3.0. JavaScript, PHP	Text editor, FrontPage	
1996	HTML 3.0. JavaScript, PHP, CSS, Macromedia Flash		
1997	HTML4. JavaScript, PHP. CSS, Macromedia Flash	Text editor, FrontPage. Dreamweaver	
1998	HTML4. JavaScript, PHP. CSS2, Macromedia Flash		
2000-2005		Text editor. FrontPage. Dreamweaver. WordPress, Drupal	Focus on simplicity and functionnality, the presence of flash-animation
2005-2006	HTML4. JavaScript, PHP. CSS2, Adobe Flash	Text editor. FrontPage. Dreamweaver. WordPress, Drupal, Unity, CMS Joomla!, Saas	Focus on simplicity and functionality, the presence of flash-animation. Implementing Responsiveness
2007	HTML4, JavaScript, PHP. CSS2, Adobe Flash. Less	Текстовый редактор, FrontPage. Dreamweaver. WordPress, Drupal, Unity, CMS Joomla!, Saas, фреймворки CSS	
2010-2013	HTML4, JavaScript, PHP. CSS2, Adobe Flash. Less	Text editor, FrontPage. Dreamweaver. WordPress, Drupal, Unity, CMS Joomla!, Saas, frameworks of CSS, JavaScnpt-frameworks	Focus on adaptability, flat design, use of parallax design
2014-2021	HTML4, JavaScript, PHP. CSS2, Adobe Flash. Less	Text editor, FrontPage. Dreamweaver. WordPress, Drupal, Unity, CMS Joomla!, Saas, frameworks of CSS, JavaScnpt-frameworks, block website builders	Focus on adaptability, flat design, use of parallax design

Scientific novelty. Currently there is a huge amount of increase of information technology usage. It plays a significance role on any type of enterprise. Basically, any type of business can be implemented by electronic commerce. Today, corporate and industry web portals are not a static set of informative data but are full-fledged collaboration tools for many users around the world. E-commerce provides the right climate for the increase of production and efficiency by supporting the computer and software industries, the technological industry, and other associated industries, such as electronic storage media, networks, and communications, which are the infrastructure for e-commerce.Various studies and research papers indicate that the development of electronic commerce is positively correlated with an increase in GDP and Net Exports. A research paper done by Sixun Liu used the time series data to construct the regression equation and measure the correlation between Log GDP growth and increase in ECommerce, controlling for other variables. The results have shown a 5% statistical significance and according to the OLS regression there is a causal effect capturing the increase in GDP. Charts 1, 2 represent the growth of GDP and Net-Export of Armenia during the years when internet and e-commerce is being used more and more.

Chart 1. GDP & Internet Users in Armenia per year

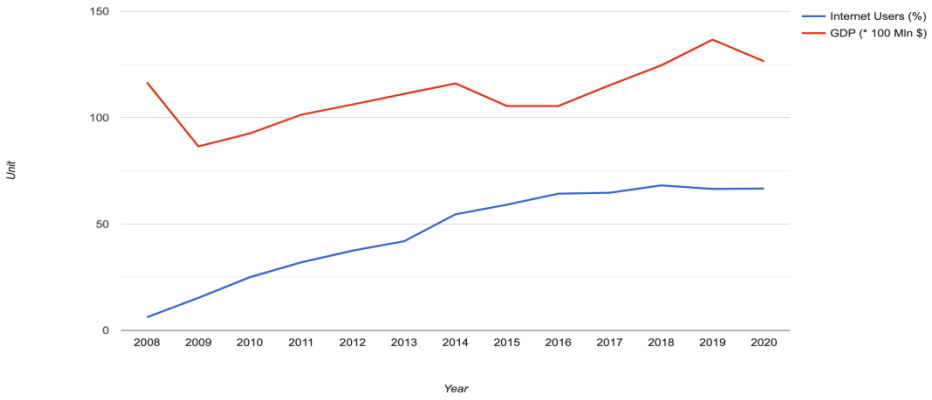
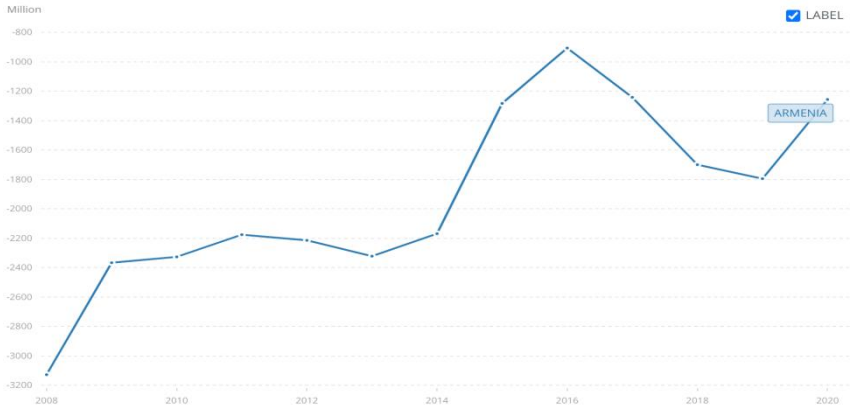


Chart 2. Net Export history in Armenia



Conclusions. More than 30 years have passed since the creation of the first site, over the years the web industry has come a long way from one-page simple sites written only using HTML to multi-page complex sites that integrate not only audio and video, but also 3D capabilities. All this became possible only thanks to the intensive development of web site development technologies. In the 21st century, the Internet industry is thriving. Organizations that use the Internet in business, namely, to sell their goods or services, interact with consumers and suppliers, grow faster economically, increasing their production potential. The growth of organizations promotes GDP. About 10 years ago China accounted for less than one percent of the global e-commerce market; today its share is 42%. Since Chinese industry is one of the leaders all over the world, the impact of e-commerce is strongly visible. This is a good example of E-commerce impact on economy as well.

References:

1. Sozdaem dinamicheskie web-sayti s pomoshju PHP, MySQL, JavaScript i CSS / Robin Nikson. – SPB: Piter 2019.
2. Hobbes' Internet Timeline by Robert H'obbes' Zakon. URL: https://www.zakon.org/robert/internet/timeline/ (date: 05.03.2022).
3. Web-razrabotka. URL: https://ru.wikipedia.org/wiki/Веб-разработка (date of application: 05.03.2022)
4. Frimen A. ASP.NET Core MVC 2 s primerami na C# dlja professianlov, 2019.
5. Kouzen K. Sovremennij Java: recepty programmirovanija, 2018.
6. Xaverbeke M. Vyrajitelnyj JavaScript. Sovremennoe web-programmirovanie, 2019.
7. HUMED. A. Progressive Web Apps, 2017.
8. Al-Tibbi V.X. Ispolzovanie web-vizualizacii codesys v3.5 dlja udalennogo upravlenija texnologicheskimi objektami / V.X. Al-Tibbi, A.A. Adamyan // Nauchnoe obozrenie. Pedagogicheskie nauki, 2019, - №1 P.7-10.
9. Votinov M.V. Osobennosti postroenija web-prilojenij, informacionnogo obespechenija system avtomaticheskogo upravlenija. / M.V. Votinov / Vestnik AGTU, 2017. - №3 – P.40-17.
10. Panelnij programmiruemij logicheskij kotroller OWEN SPK207, 2009 // http://www.owen.ru/catalog/panelnij_programmiruemij_logicheskij_kontroller_ovov_spk207/92622374 (date of application: 05.03.2022)

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Since the variety of technologies in 2022 is unusually large, for each developer the question arises of determining the priority direction in work. The relevance of this article is due to this need. Thus, the main purpose of this work is to consider the development of Web technologies and the industry. The article discusses a common area, in 2022, the web, since modern information technologies largely affect the daily life of any person. IT is used to create electronic markets by transferring all payments made to the information sphere, where payments can be tracked and controlled. Also, the development of information technology affects the creation of additional jobs and the retraining of existing personnel, which is directly related to the reduction of unemployment, information technology has expanded opportunities in the medical, educational, law enforcement fields, which has improved the activities of each institution. This topic became popular also since the development of web technologies, the range of professions related to the development of websites is expanding, while studying computer science and information technology in this area, the article provides a history of the development of the web industry and the stages of transformation web technologies.