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# MODERN WEBMASTERING: THE MAGIC OF A WEBSITE



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## MODERN WEBMASTERING: THE MAGIC OF A WEBSITE

The purpose of the thesis was to build a prototype of online web development course for intermediate web programmers. The course consists of study materials covered in this thesis including the process of web design, front-end and back-end coding, Search Engine Optimization, promotion, maintenance and security of a website, and differences between Content Management Systems. The creation of a website requires much effort: a thorough analysis, development and advancement. The whole thesis combines theoretical and practical parts which explain the main aspects of website building. The course can be divided in 3 levels of study: design concept and client-side programming – HTML, CSS, JS; server-side programming – PHP, Python, Ruby, etc.; CMS, SEO; and security optimization. Emphasis is placed on the creation of sites using CMS and Search Engine Optimization. Upon the reading of this thesis, a web developer gains a holistic view of a website creation technology chain, formulates an understanding of current tendencies in technology of web development and, as a result, is able to build, publish and maintain a website on their own.

### KEYWORDS:

Web development, web design, web programming, web for business, website, modern webmastering, HTML5, CSS3, JS, PHP, CMS, WordPress, SEO, security optimization, online course web

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## LIST OF ABBREVIATIONS (OR) SYMBOLS

UI	UI stands for User Interface
CMS	CMS, which stands for Content Management System, is a software application that allows to create, publish, and moderate content on a website.
SEO	SEO, which stands for Search Engine Optimization, is a process of code, content and site structure correction in order to raise the site position in search results.
HTML	HTML, which stands for HyperText Markup Language, is the predominant markup language for web pages.
XML	XML stands for eXtended Markup Language.
RSS	RSS stands for Really Simple Syndication.
CSS	CSS, which stands for Cascade Style Sheets, is responsible for HTML elements being displayed.
JS	JS stands for JavaScript.
API	API, which stands for Application Programming Interface, is an interface that allows developers to use ready-made building blocks of code for applications.
PHP	PHP, which stands for Hypertext Preprocessor (originally Personal Home Page), is a platform-independent server-performing language of scripts.
AJAX	Asynchronous JavaScript and XML.
OOP	OOP, which stands for Object-Oriented Programming, is a programming model that is based on the “object” concept.

# 1 INTRODUCTION

Nowadays Internet technologies are improved in such way that they have a strong impact on the development of business, even very small ones. For many companies, their Internet site has become a source of additional income, even though these companies are not directly connected to network and digital technologies. It is much more convenient for companies to use an electronic money transfer system, and a huge variety of advertising on social platforms and educate their staff through online training courses, rather than spend time and material assets in the manual task processing of product promotion and personnel training.

Websites have become an essential part for any business or educational portal competitiveness and productivity, so in order to have a successful business an entrepreneur should be an innovator as well. Therefore, it is necessary for an entrepreneur to use all possible (legal) ways to achieve the goal: improve the competitiveness of the company and increase its profitability. To ensure that the website is indeed an effective business tool, it is necessary to act precisely according to set goals that can be different, i.e., direct sales, information for customers, partner search, advertising, etc.

Today, the Internet allows a company to inexpensively and quickly enter the world market, which enables this company to reach stated aims of the company in a short period of time. So the major part of this task is to have:

- A high quality content and literacy of its submission;
- Originality and aesthetic appearance of web pages, friendly user interface (UI);
- Reliability and safety of used technologies;
- Proper Internet marketing.

Learning and becoming more experienced in web development helps web developers to create appealing web sites, such as personal and e-commerce web

pages, blogs and mobile device websites, company and resume websites, etc. So as a result the websites would attract visitor's attention showing the proficiency of the company/services. In case of companies, stylish and functional web pages increase income. A presence of a resume (CV) page on the Internet complements the image of a successful worker and will be an additional point for employment.

The aim of this thesis is describe the web development process and its details and to create a prototype of an online web development course for web developers who want to improve their skills and get useful information, and for people who are interested in this topic and would like to familiarise themselves with the techniques of modern web development.

## 2 WEB DEVELOPER CAREER

There are three main web developer careers decoded (Wales 2014):

- Front-end developer, who works with a presentation layer of the page in a web browser, including web design and front-end programming, using client-side languages such as HTML, CSS and JS;
- Back-end developer, who works with an application layer of the page, that includes three parts: a server, an application and a database, using server-side languages such as PHP, Python, Ruby, etc.;
- Full stack developers usually combine cross-functional skills of both front-end and back-end parts, also called “Jacks of all trades”.

Web programming trends change and develop so rapidly that webmasters always have to improve their skills by reading various materials and specifications, articles and documents devoted to the drafting of web-sites, visiting conferences, learning new techniques and completing programming courses. Therefore, if a webmaster continuously develops coding and accompanying abilities, he or she creates more opportunities to be involved in different types of web projects. Now companies are looking for as much skilful and flexible web developer as possible, thus, they do not have to pay a few employers, if they have one full stack developer who can successfully manage work on client and server sides, including both web browser and database, and creating a complete application made on his/her own.

Several online courses are oriented in teaching how to be a full stack developer, describing how to work on both sides of programming and beginning from low-cost website-building on WordPress up to full customized CMS development with all hosting services and personalized gallery and media integration.

## 3 FRONT-END DEVELOPMENT

This chapter briefly describes the main new features and tendencies of front-end web development, including Web 2.0, design concept, HTML5, CSS3, JavaScript, and API.

### 3.1 Fundamentals

As it is already known, the main information content is placed on the World Wide Web (WWW) – information system which can be compared to a giant library. In this library, information is presented as connected to other web pages that can be accessible in any part of the world. The collection of pages united with the same topic is called a website and the place, where a website is located and maintained is called a server. In order to publish a document on the Internet, it is enough to put the document to the server that has a constant connection to the Internet and uses a special protocol of content transferring called HyperText Transfer Protocol (HTTP). On one server there can be numerous different websites and the collection of these servers builds the WWW.

#### 3.1.1 Manual coding and CMS

A website development can be implemented on a personal computer manually or using different kinds of Content Management Systems (CMS). Building a website on a platform helps a developer to save time instead of implementing routine coding, because there are ready website templates there, therefore, depending on a chosen management system, a CMS makes creation of a website quite fast and easy for everyone, even without knowledge of programming languages.

#### 3.1.2 Web 2.0

The term Web 2.0 (O'Reilly 2005) was created by Tim O'Reilly at Web 2.0 Conference in October 2004 and described in his article published on 30<sup>th</sup> of September 2005 where he described a new concept of the Web and compared

Web 1.0 with the latest version. Web 2.0 is the era when the base of the Internet is not websites, but people, their knowledge and their interactions. It cannot be called a new standard or format, this is a designation of the new stream. The definition of Web 2.0 includes determined fashion with a website design, the use of new technologies, and even client applications which are quite difficult to attribute to the web in general.

AJAX becomes a major part of these new technologies: a merger of JS and XML. It is a change of content part without a whole web page refresh. AJAX is a breakthrough in the field of web technologies, because if before there were a client and a server sides that could not interact with each other without reloading of the page, now with AJAX possibilities the line between front-end and back-end sides becomes less significant. Thus, for a person, who is into web programming, the difference between the Web 2.0 and 1.0 is a real abyss.

RSS is a simple and efficient export of hypertext technology used to create news feeds. RSS, like other Web 2.0 technologies, is based on the language of XML. That is, the news (articles, notes, posts) are no longer a part of a single site, and exist by themselves and can be used by anyone and anywhere.

Nevertheless, the technical component of the "second" Web is only the foundation, the basis of main ideas. Its basic idea is to simplify the methods of self-expression. Instead of being resource-intensive and difficult for the independent development of home pages, now there are blogs that can be created in a few minutes. As an alternative method of "engines" of large portals, Wikis have appeared.

Tags are the keywords that are attached to the units of content like photographs, posts and articles; categorization can be made by the users. These labels make it easier to search and link needed content enhancing the convenience of its users and improving usability. Tag cloud represents common tags, where more popular tags have larger font size and less popular have a smaller size.

Examples of websites that use tags:

- Twitter.com;
- Flickr.com.

A Wiki is a website in which content can be added and edited by any user, making online collaboration much simpler. While using wikis, there is no need for the users to have knowledge of HTML, FTP, etc.

Examples of websites that use wiki:

- Wikipedia.org;
- Wiki.php.net.

A blog is an Internet public diary that is updated frequently and gives its writer an opportunity to communicate with a different number of people and have an online dialogue. Blogging is the ability to quickly convey information to a broad range of people. Blogs usually use tags and RSS.

Examples of blogs:

- Techcrunch.com;
- Blogger.com.

Design consists of minimalistic and laconic, clean and simple style; logos and pictures are extremely readable and understandable. The usage of gradients, diagonals and bigger fonts builds the design clichés of this time. Now, in the vast majority of websites, the main volume of the information is located in the centre of the screen. This not only allows website visitors to see the usual placement in any web browser, but also simplifies perception through the visual lightness.

Examples of websites with Web 2.0 design:

- Dropbox.com;
- Animoto.com.

To enable the user to see a web page on any kind of PC, mobile device, or tablet, the web page should be formatted by HyperText Markup Language (HTML) that is a collection of commands, describing the document logical structure. CSS

allows to manage the presentation of this structured content, and the usage of the programming language JS allows to create a programme on a client side and makes a website interactive and dynamic. So the coding of a web page using HTML, CSS and JS constitutes the front-end development. Any website building process starts from determining of the main goals, principal requirements, and target audience.

The first aspect a visitor of a webpage page pays attention to is the web page design. So the UI of a website in most ways affects the decision for a potential customer or visitor to leave or continue searching information on the site. Web design is a process that determines the steps of a website creation from the site structure and design of the graphical user interface (GUI) to the programming and adding the content (text, images, etc.). That is why it is important to dedicate time to the design concept.

### 3.2 The design concept

The look of a web site makes the first impression on visitors. Attractive and neat websites with appropriate presentation of information would receive a better feedback rather than a website with five different styles of fonts and colours and full of bright hard-to-read text that makes eyes cry while searching through. So having at least basic knowledge of design concepts is very useful in producing an attractive website, therefore attracting potential clients. The main criterion that a designer should keep in mind is making a user feel comfortable on a website, otherwise the user just leaves and probably never comes back, because there are many other competitive web resources.

Web developers and web designers are quite similar professions, so often are combined into one. The task of web designer includes the artistic page development as well as the implementation of the development by HTML and CSS (sometimes even writing scripts).

### 3.2.1 Idea - Sketch - Implementation

- Idea

The point of departure in creating of a web design is in determining the project idea and preferable style. Usually beginners try first to make some elements like a clipart or buttons and sometimes it leads to a beautiful layout, but in most cases, as a result, everything is messed up in web design implementation. So in that case, it is recommended to think about the idea of the layout and the whole picture of a website as a first consideration, and only after that, focus on small elements.

- Sketch

After the idea is generated, it is time to make a quick rough sketch of the future project. It does not matter whether it is drawn with a pen and paper or using graphical application; the designer locates the main blocks of information, makes a composition and an approximate page grid that includes margins and the layout of elements. At first, it may look undone and empty, but the design usually is not done in five minutes.

- Implementation

Implementation is about planning for the functionality and usability of the site and deciding where it is most convenient to place function blocks, menus and thematic sections of the blog, not skipping location of advertisements (ads), so that it is visible, but unobtrusive. After sketching is done, the next step is to implement the web design in Photoshop or other graphical editor.

There are many programs for creating a web design and among the most popular are Adobe Photoshop, Illustrator, InDesign and Dreamweaver, etc. The leader of web or mobile UI design is a raster graphics editor, Adobe Photoshop (Takakura 2010).

A modular grid consists of vertical and horizontal guides that help to reconcile individual elements of the composition, so using grids for design brings to the

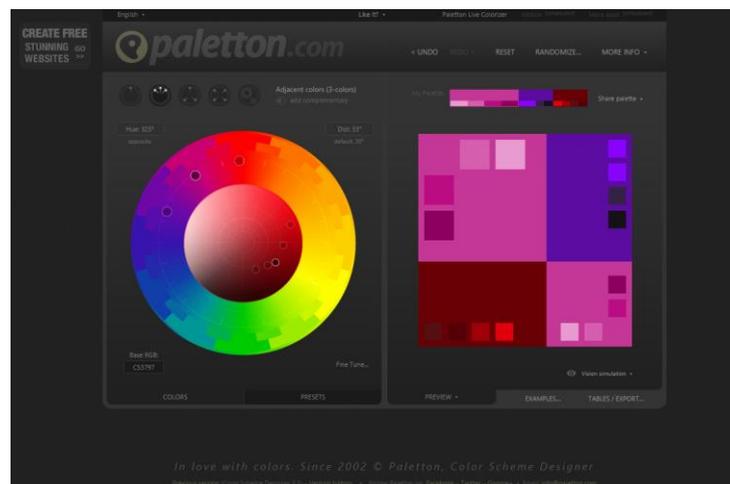
layout order, integrity and connection of all parts allowing to organize any graphic space rationally.

### 3.2.2 Theory of color

The next step after the layout has a copy in a graphic editor is to decide what colours are going to be used. There is a number of colours associations with certain styles (Chapman 2010 and Hutson 2004):

- Blue and grey – business style, responsibility and formality;
- Orange – joy and energetic mood;
- Green – the colour of the natural;
- Red – passion and aggression;
- White – purity and virtue;
- Yellow – cheerful and optimistic;
- Brown – maturity and a feeling of warmth.

Of course, it is worth considering how a certain tone is appropriate to the message that should be sent to the user. The colours on a website have to be combined with each other and constitute a completed web layout. Designers have a specific diagram showing the compliant and non-compliant colours, because not only choosing the colour, but also paying attention to shades and tints makes sense (see Picture 1).



Picture 1. Color scheme designer paletton.com

### 3.2.3 Fonts

Some web designers do not pay proper attention to fonts and refer to their selection and application extremely carelessly. In fact, any font itself is a complete object of the design. On the whole website, there should be a maximum of 3 fonts that would be combined with the topic of the site. Understanding what styles should be used on a web page is also an important point: it is inappropriate to put comic fonts on a serious site, and at the same time on the entertainment website it is better to use something cheerful. It is also not recommended to place a very small font as it may be difficult to read.

As this thesis project is developed for educational purposes, the main colors are white, blue and dark grey (main font color), in order not to disturb readers by a colorful and bright web design. The font is chosen to be sans-serif that is the most suitable for websites, scanning and fast reading, because a large amount of serif font blocks is preferable on printed papers (Hutson 2004).

### 3.3 HTML5

Any web page creation starts with HTML coding that builds the structure of the layout. Headlines, subheadings, text and pictures make an HTML document understandable for readers, and different sizes of headings create a hierarchy of data, so visitors could focus their attention on different elements.

HTML5 is not a new version of the old markup language and not even an improved option of this technology. It is a totally new concept of a website and application construction. In fact, when building a web application, HTML5 covers all three directions: structure, style and functionality (Klimenko 2014 and Gauchat 2012).



Picture 2. New HTML5 tags

New HTML5 has improvements such as (see also Picture 2):

- New tags to simplify the indexing of a website by search engines: `<section>` and `<article>`, `<aside>` and `<nav>`, `<figure>` (image with tag `<img>` and description with tag `<legend>`) and `<details>`, `<header>` and `<footer>`;
- New tags to simplify video and sound online: `<audio>` and `<video>` tags;
- Work with text: `<dialog>` and `<mark>`, `<time>` and `<meter>`;
- New attributes and elements for forms: autocomplete, placeholder, multiple (enabling to type a few values in one field), autofocus, `<datalist>`, `<progress>` and `<output>`;
- Some outdated tags, like `<font>` and `<center>` are removed. This does not mean that they will no longer work in web browsers, but the HTML validator will indicate an error;
- The ability to draw a page in real time (using Canvas element);
- Drag-and-drop option from the client desktop to the web browser;
- Web forms 2.0.

The list of all new semantic, form and media elements, input types, attribute syntax and graphic possibilities and their description can be found at W3Schools.

Finally, the HTML5 specification is designed so that if the web browser does not support this language, it can safely ignore this new unknown tags. Now there is also no problem with displaying the same text in different browsers: the HTML5 specification clearly states how to act in case of an error occurred in the syntax of the web page.

### 3.4 CSS3

The specification of CSS always has been related to the outward appearance, but the latest CSS version changes everything. CSS3 describes not only design and styles, but also different forms, movements and effects that nowadays can be reached without JS. The specification of CSS3 is divided into modules to simplify work during a markup coding.

The new features of CSS3 include:

- Simplified work with text and its presentation using properties like *text-shadow* and *text-overflow*;
- Graphical properties: *border-radius*, *box-shadow*, *border-image*, 2D/3D transformations, gradient and opacity, animation properties, new color model *rgba*;
- Background solutions: *background-size*, *background-clip*, *background-origin*, multiple background images.

CSS3 generators help to abandon manual description of button styles, corners of the blocks, shadows and gradients. Instead of writing the same code every time, there is a tool to give parameters and obtain the code. Examples of CSS3 generators include: [css3.me](http://css3.me), [css3maker.com](http://css3maker.com), [css3generator.com](http://css3generator.com).

### 3.5 JavaScript

JavaScript (JS) is the programming language of HTML and the Web (W3Schools n.d.). Originally JS has been created in order to add interactivity and behaviour to web pages, but modern JavaScript has become a general-purpose “safe” programming language which is “must know” for every skilful web developer.

JavaScript allows not only to develop applications very quickly, but also to maximize the user experience.

In HTML5 the capabilities of JS have been expanded:

- There is no need in attribute *type* inside the *script* tag anymore;
- New methods of easy access from JS code to any elements of the documents by its value *class*;
- Selectors that allow to choose elements using selectors of CSS, for example, *querySelector()* returns the first found element that is stated in brackets and *querySelectorAll()* returns all found elements;

### 3.5.1 API

API is a ready code to simplify the life of a programmer, a set of different functions, constants and classes, formats of requests that can be used in other programs (Gauchat 2012).

- API Canvas is a manipulation of dynamic and interactive visual (graphic) part of a web page;
- API Drag and Drop is the possibility to move elements in the web application. There are seven new events that process different types of dragging: from the beginning of the move till dropping;
- API Geolocation determines the physical location of the device used by a user, based on GPS;
- API Web Storage allows to record data on a domain's hard disc and manipulate it. This API is divided into two parts: *sessionStorage* which keeps data during one particular session, *localStorage* which keeps data all the time and can be changed at any moment;
- API IndexedDB is a storage for a large amount of structured data, it is a powerful and complicated API that allows to keep and retrieve the information which is stored in the form of objects and indexed with a key. Without an index (Id), it is impossible to find and retrieve the objects inside the database;

- API Web Workers provides the possibility of code processing in the background mode without interfering the activity on a web page; with this API, JS now supports multitasking.

The list of all APIs for building websites and applications can be found at Mozilla Developer Network (MDN).

### 3.5.2 jQuery

jQuery is a free and fast JavaScript library that focuses on the interaction of JavaScript, HTML, and CSS providing cross-browser support for applications and simplifying scripting of the HTML code on a client side.

If a website is being created using CMS, there is no need to worry about including jQuery within an HTML document because in most popular CMS platforms it is already done by default. In case a website is being created from the scratch, there is a question: embed jQuery or not? Recently more and more developers prefer to use jQuery because it makes easy for them to choose elements from HTML file and process events. jQuery is also supported by old web browsers, so creation of modern websites becomes much simpler (Gauchat 2012 and Lindley 2009).

First of all, before starting to work with jQuery, the library must be downloaded from the official site [jquery.com](http://jquery.com) and the .js file should be saved in the same folder where all website data is stored. The jQuery library is embedded to a web page in the same way as any other JS files. All CSS files should be included before inserting jQuery, because it is important to ensure that all styles and images are represented correctly before jQuery is active.

The latest useful and time-saving plugins of jQuery library include:

- ReadRemaining.js which determines how long it takes to read an article on one or another website;
- jQuery Light Gallery which is fast and easy to implement gallery based on only CSS approach in resizing of multimedia;

- Sliiide which creates a sliding navigation menu simply;
- Scrollgress which is an indicator line at the top of the page that fills in as a user scrolls the page down.

### 3.5.3 AJAX

AJAX is the technology to interact with a server without reloading of the page and represents the combination of JS and XML. Therefore when using AJAX, there is no need to reload the whole web page, only specific part is refreshed, therefore user does not have to spend time for waiting and this saves Internet traffic. The benefits to server include the load reduction, less size of a website and the speed up of web page opening.

### 3.6 CSS/HTML frameworks: Bootstrap

It is a pre-requisite for a modern front-end developer to know HTML5, CSS3 and JS (at least JQuery). Every professional front-end programmer has their own experience and developments which can be kept in a framework. Many developers use popular frameworks, such as Bootstrap (BS), Foundation, Compass, and the 960 Grid System. Among all the frameworks, BS is considered as the most popular.

Bootstrap is a CSS/HTML framework for a website creation, a set of tools for markup. According to W3Schools (Bootstrap w3schools, n.d.), Bootstrap is the most popular HTML, CSS, and JavaScript framework for developing responsive, mobile-first web sites. Front-end framework Bootstrap was originally developed for twitter and was called TwitterBootstap, but nowadays it is an open-source tool for web developers.

The main benefits of the latest version of BS include (see also Picture 3):

- Wide range of application and responsive features. BS can be used in different CMS and web browsers; mobile-first approach regulates coding for phones, tablets and desktop computers;
- Ease of use and customization. For operating in BS, it is enough to have basic knowledge of CSS and HTML;
- Fast work. With a host of ready-made elements, the markup process with BS takes much less time;
- Large variety of templates. Free and paid templates are offered by developers.



Picture 3. Bootstrap features [getbootstrap.com](http://getbootstrap.com)

## 4 BACK-END DEVELOPMENT

### 4.1 Fundamentals

As it was already mentioned above in this thesis, back-end programming is the coding on a server side. It includes: the building of a site core and development of the platform, implementation of its functionality, and the creation of an administrative area. Basically, the front-end part sends information from the user to the server and the back-end part process it. The use of the back-end side to process static queries is very expensive, therefore, it is important that the number of static elements through the Back-end is minimal and most of the requests have to handle PHP pages. The quality configuration of the back-end helps to achieve a significant performance and stabilization of memory consumption system.

### 4.2 PHP

The programming language PHP resolves tasks of any difficulty and formulates the dynamic parts of a website. PHP has a huge amount of standard functions and libraries, so to learn all capabilities of it is impossible, and that is why it is important in PHP is to know the basics of the language. The fundamental syntax of PHP is very similar to JavaScript: variables and arrays, loops and conditional statements.

Popular CMS and major corporations like CBS, Cisco, Lufthansa websites (and others) were made based on the PHP language. It proves how easy, flexible, functional and fast in command processing PHP is and why it has become such a widespread scripting language. It allows to create simple applications, like a guest book, and complex applications that are able to independently react on user activities.

Work on PHP 6 started in 2005, but in 2010 the development team took a decision to cancel the release of the new PHP version in its current form because of difficulties with the implementation of Unicode support and instead PHP 5.4 was released with the same non-Unicode features. The release of the final version

PHP 7 that is based on PHPng (refactoring of PHP core, stands for PHP new generation) was scheduled for November 2015, but delayed and had a release candidate available that would be the last version before the official release scheduled for the end of November, even though the exact date was still not published at the time of the writing of this thesis. Among its new features there are:

- Improved performance. PHP 7 runs up to two times faster than PHP 5.6;
- Scalar and return type declarations;
- Null coalesce operator (`??`). If the operand is not *NULL* it returns the first operand, otherwise the last operand;
- Anonymous classes using *new class*;
- AST, stands for Abstract Syntax Tree, is an intermediate representation of code during compilation;
- Spaceship operator (`<=>`) performs combined comparing of two expressions returning values -1, 0 and 1.

### 4.3 Python

Python is an interpreted high-level programming language, suitable for a variety of tasks, dynamic, cross-platform, and object-oriented. If a programmer is just starting their way in the field of software development, Python becomes the perfect "introductory" programming language. A fast learning process allows to move from case studies to commercial projects.

- In Python it is not necessary to declare in advance the type of variable, making it easy to develop projects;
- A convenient system of functions allows with the correct approach to create the code that is understandable to other programmers, if necessary;
- A large collection of modules (standard and specific) and good support of the modularity: a programmer can write their module and use it in other programs;

- A clear and laconic syntax means, therefore, fewer mistakes in the process of coding, but, on the other hand, it transfers the most basic information and can not express complex designs;
- Cross-platform: the program written in Python will operate exactly the same way regardless of which operating system it is running on;
- Speed of development: comparing to a compiled languages like C, C++ or Java, Python increases productivity of a developer in many times, bypassing the lengthy stages of compiling and linking.

#### 4.4 Ruby

Ruby is an open-source scripting language, practical and general-purpose. Ruby is convenient, has better OOP, and the structure of the project (perhaps most importantly) is more familiar, every function and detail (strings and numbers, etc.) is made in an elegant way. Basic properties include:

- As an interpreted language: direct system calls possibility, strong support of string operations and regular expressions, the absence of compilation stages;
- OOP: everything is an object, *class* is an object and even a class of the *class* is an object, strings, numbers, true/false, NULL – are objects;
- Simple and fast programming: not necessary to declare variables, they are dynamically typed, consistent and have a logical syntax.

Rails is a framework, made for the creation of websites with databases "from scratch", good only and exclusively with Ruby.

#### 4.5 Java

Java is an OOP language with own specification and technology of web application development, is used for the creation of complex and interactive elements and interfaces concerning both websites and web applications. The source file of Java is a text file consisting of one or more descriptions of classes. The key elements of PHP are:

- Java provides its applets (compact network applications) for a wide use;
- Java is a powerful representation of OOP development, combining a simple and familiar syntax (based on C++) with a reliable and easy to use development environment;
- Java provides a rich set of object classes to programmers.

#### 4.6 MySQL

PHP programming language allows to work with databases. One of the most popular and open-source databases is MySQL. It is a flexible, fast and reliable database management system (Structured Query Language), and its application is completely suitable for different kinds of websites regardless of the complexity. Relational MySQL keeps all data in distinct tables, interconnected by indexes (id). MySQL is available for downloading from the official website [mysql.com](http://mysql.com).

Benefits of MySQL databases:

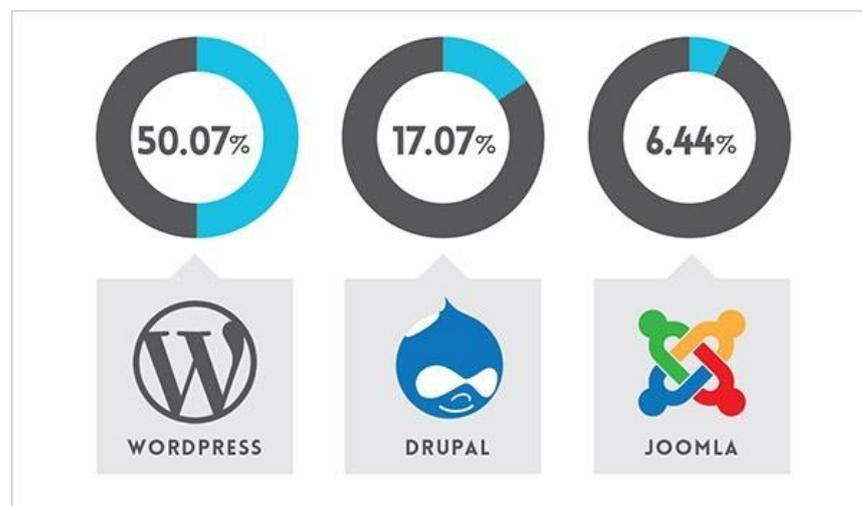
- High-speed performance;
- Security: host-based verification;
- Free license: Under GPL (General Public Licence);
- Reliability: stable package;
- Colossal community and support;
- Portability: versions for kinds of operation systems and works on many platforms.

MySQL can be installed and work with different local servers like MAMP (Mac OS X), WampServer, XAMPP, Apache or Denwer (the choice of local web server is made according to Operation System used).

## 5 CONTENT MANAGEMENT SYSTEM

The necessity to create a Content Management System (CMS) was caused by the increasing complexity of the design and maintenance of websites. CMS is called the core of a website and an effective tool that simplifies the content management issues and resolves a routine tasks like administration, publishing, and modification. The usage of this platform allows to focus on the semantic content of the published information, instead of its design and coding.

Usually on a website, the information changes more frequently rather than the layout, so the principle of CMS is in division of the content and the design into two independent components, which greatly facilitates the application of any changes to the site and filling a new template is much easier. Ready-made modules and plugins compose and build the website like a constructor and can be chosen by a web developer. Convenient user friendly interface for modifying the content makes it easy for the user with no special coding knowledge to work with the information on web pages. For a professional web developer using CMS is also very practical, because with knowledge of markup and scripting languages, there are more possibilities to modify the modules structure and create an individual design and functionality. According to the rating of building platforms in 2015 by [www.opensourcecms.com](http://www.opensourcecms.com) (see Picture 4) the most popular CMS is WordPress.



Picture 4. Most popular CMS in 2015

## 5.1 WordPress

Wordpress (WP) is the most commonly used Content Management System that is free and accessible. Initially this platform was created for development of blogs, but nowadays it has become a general-purpose CMS for implementing both static and dynamic websites. It attracts by its flexibility, simplicity, gathered community, great range of plugins and detailed documentation.

There are two options for creating a website using WordPress:

- To register an account on [wordpress.com](https://wordpress.com) and to host a website there for free, or
- To download the copy of the latest version of WordPress from [wordpress.org](https://wordpress.org) for the installation of own hosting.

Young webmasters are often confused by these two products. At first glance, these appear to be the same, but in fact, they are very contrasting, although the transition from one to another is quite simple and fast. Below are discussed the benefits and drawbacks between WordPress.com and WordPress.org, so a web developer can decide which of the two products is the most appropriate.

### 5.1.1 WordPress.com

It is a free hosting service that lets a user to conveniently create and host WordPress website or blog without additional consideration of the hosting payment, the domain name, etc. There is also no need to download and install any files and programs. WordPress.com is a commercial product launched in 2005, whose co-creator is Matt Mullenweg, the owner of Automattic company. Now WordPress.com is managed by The WordPress Foundation.

The benefits of [wordpress.com](https://wordpress.com) are:

- It is a free service;
- It is easy to use, no programming knowledge is required;
- It has a selection of more than 200 templates;

- Security and maintenance (automatic backups and updates, spam protection) are performed by the hosting service;
- It offers technical support.

And the drawbacks:

- Users cannot upload their own plugins;
- There are no modification of the PHP code on a website;
- There is a limited selection of templates (additional payment for editing or for premium ones) and plugins;
- There is a charge for own domain, working with audio and video files, increasing disk space (if needed more than 3GB), disabling advertising;
- There is no FTP (File Transfer Protocol) access.

#### 5.1.2 WordPress.org

On wordpress.org, a web developer can get a free copy of WordPress and install it on own hosting: locally or in the cloud. It was developed as a Content Management System that is a set of files with a program code, in 2003 and licensed under the GPL (General Public License). That means that users can apply any modifications to the system as many as they want, and even change the whole system and create own fork of WP.

The benefits of wordpress.org are:

- It is free to download and use;
- A web developer has a full control of the website with all features;
- Installation of desired templates and creation of new with CSS and PHP is available;
- Installation of plugins gives a possibility for functionality expanding;
- Modification of all files as well as PHP code allows to create a custom code.

### Drawbacks:

- Independent choice and payment of the hosting service and the domain name takes time and obligates understanding of SEO basics;
- More technical knowledge is required;
- Backups, upgrades and other security issues are the responsibility of the website owner.

According to Picture 5, wordpress.org has lower costs and the full control of the website comparing to wordpress.com that has certain restrictions. However, we need to take into account that with own software all managing and control should be performed by the owner and knowledge of programming languages is required. In case a beginner webmaster needs to create the website quickly and understand how WP works, the easiest way is to start from a hosting service, but if developer is not afraid to install the script on his/her own and work on it the best choice to download the software and create a self-hosted website, that is much more challenging and helps to develop programming skills.



Picture 5. Costs and control. Wordpress.org vs. Wordpress.com

## 5.2 Drupal

Drupal is another popular CMS with thousands of different modules expanding system functionality. Although, in order to create a sterling website on Drupal platform, it is not enough to know only a front-end (client) side technique, but also a back-end (server) side one. Besides, Drupal loads the server quite much, but in this case it is possible to resolve loads by various methods of caching. Drupal is the most suitable CMS for complex websites with high requirements for customization, scalability and content organization.

## 5.3 Joomla

Joomla is one of the most powerful open-source CMS and becomes a compromise between user-friendly WordPress and programming Drupal. This building platform allows to create simple one-page websites, informative forums, online magazines and shops, and complex corporative portals, etc. This CMS has several components that work regardless of the application and is fairly balanced and could probably provide all that a webmaster can imagine for needs and projects, and even more.

## 5.4 Choosing a CMS

WordPress is:

- The best choice for a beginner;
- Perfect for blogs and not complex websites;
- Simply integrated with social networks and has great possibilities for SEO and.

Drupal is:

- Suitable for a web developer with good programming skills;
- The most appropriate for powerful and complicated serious projects;
- Flexible and reliable with a high quality of modules.

Joomla is:

- For experienced web developer working with CMS;
- Appropriate to fairly complex websites as portals, online shops and social networks;
- Is able to handle more specific tasks with a vast array of components and modules;
- Easy to create user-defined functions and big potential for moderation.

The WordPress Content Management System was chosen for this project in order to show how it is suitable for blogs and websites with no complicated functionality. So the software was downloaded and installed to the local server. In case of website development and capability increase, it can be transferred to Joomla by manual import or using online migration tools for a reasonable price.

## 6 SEARCH ENGINE OPTIMIZATION

### 6.1 Internet marketing

The development of an effective website cannot be held without Internet marketing that deals with the selected segment of the audience and its preferences, studies the competition situation and marks the number of advantages and disadvantages and offers options of how it can be improved. With a proper range of activities, brand awareness increases and a company, service or product acquires its loyal customers. So the evolution of a website is based on developed information and valuable promotion. Currently, Internet marketing is a discrete activity that is related to e-business.

For a long time advertising in social networks has been a very effective tool of promotion with a rapid spread of information and wide coverage of participated audience (global market) in a short period of time (implementing white hat website optimization, that means following the rules). Lately this kind of possibility to introduce the business approach becomes the main, and traditional methods of public relations in some areas of goods and services are slowly but surely losing their ground. Among other benefits of this approach is needlessness in investing large material resources, although some services require additional expenses.

The basic types of marketing in the Internet, also known as online marketing include:

- SEO: a website promotion in search engines for the needs of interest, optimization and indexing;
- Search Engine Marketing (SEM): advertising via Google Adwords/ Google Adsense Advertising, Yahoo Search Marketing;
- Context advertising: ads that appear among the search results (or above) or in areas with a high enough attendance according to key request and region, or even time of a day;
- Social media marketing: advertising in social networks of all kinds of videos, applications, photos and posts, which do not contain direct

advertising, but indirectly mention about product/service or company, for example, Facebook, Twitter, YouTube, Flickr, LinkedIn, etc.;

- Direct marketing: distribution of new products/services or events via SMS and e-mail, often applied to registered users and potential clients who subscribed to the news.

## 6.2 Setting up a website online

In order to publish a website, domain name and hosting must be obtained. The process of choosing a domain name is not complicated, but requires time to research in order to find the most gainful and relevant; it should be done properly.

### 6.2.1 Domain name

The domain name is like a business card making a website catchy, unique, and memorable. There are different types of domains: top level (TLD) - .com, .net, .fi, .org; second level (SLD) – google.com, wordpress.org; third level (subdomain) - en.wikipedia.org, and so on. Finding an appropriate domain name is not so trouble-free, because it should be available and not registered before and refer to the website subject. The simpler and clearer it is, the better.

Having an own domain name is much more attractive rather than having a long someone else's service website included (i.e. freesubdomain.freehosting.com). If a website is a personal web page, the best domain name for it is the combination of first name and last name, like a blog of Alistair Lane [www.alistairlane.com](http://www.alistairlane.com). For a corporate website, it is better to register the domain name with a company name, ideally if company name identifies the category of business.

### 6.2.2 Hosting

The quality of a website work depends on hosting. In cases of bad hosting, the page loading and functionality can be very slow and have other problems. Nowadays, some hosting companies offer quality service including the installation of WP or Joomla in one click, considerably simplifying the process;

however, at some hosting services, the web developer installs the platform manually.

A good hosting service should provide reliable work and support to a website. Trusting obscure hosting companies that offer cheap web hosting and domain names is not reasonable, because at any time, the website can go down with no reason or even worse: the company is deceived about domain registration, etc. Large hosting companies have a definite plus: the 24/7 technical support of users, which is especially important for the beginner webmaster, they also value a good reputation.

Free hosting is usually selected by unexperienced website owners who want to understand how much they need a web-based resource and whether they are prepared to invest funds in it.

Reasons for opting for a paid hosting service include:

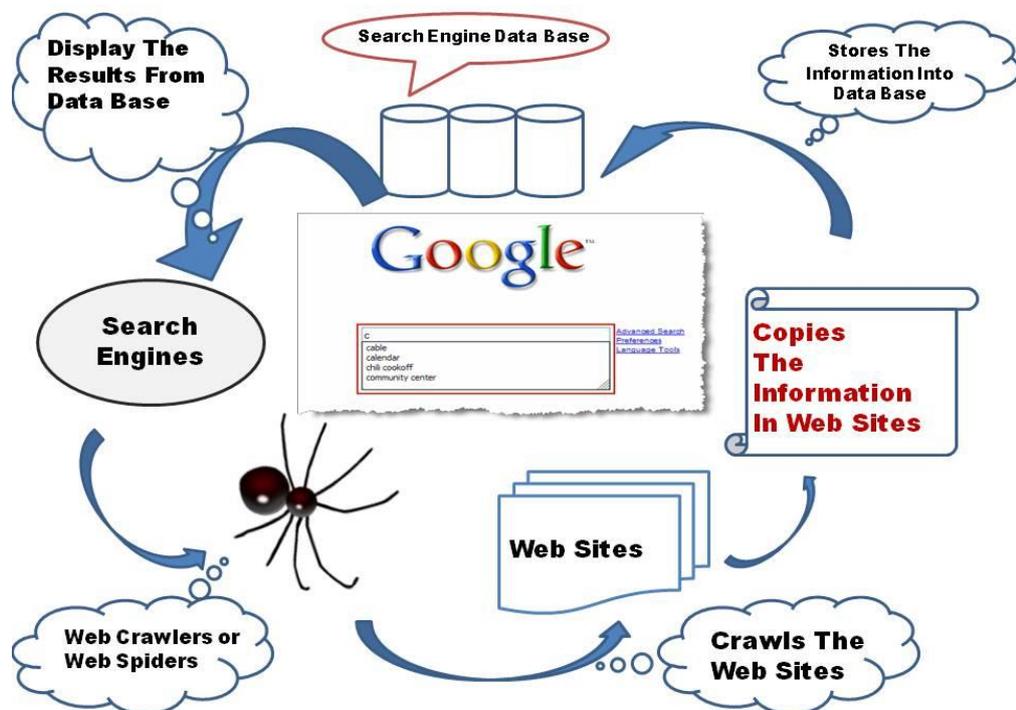
- Learning what is a paid hosting and how to use it on practice;
- Using full functionality for implementing own ideas, because free hosting has limited capabilities;
- SEO is easier for the 2<sup>nd</sup> level domain name, and using free hosting is the 3<sup>rd</sup> level;
- Internet Service Provider (ISP) responsibility for the performance and resiliency of a website, guaranty and technical support;
- Freedom from hosting advertising, only if it is a part of promotion chosen by a website owner.

### 6.3 Search engines

The main task of a search engine is to look for information and present it to the user. To help the user find the needed information on the Internet in the structure of the search engine, search engines utilize several complex software components:

1. Spider – uploads to the database all found web pages;

2. Search Engine Results page (SERP) – returns search results from the database in a web browser;
3. Database – stores all data, downloaded and analysed web pages by a Spider program;
4. Crawler – is a program that automatically visits all links on a web page in order to find to web documents, after finding sends a request to Spider for downloading (see picture 6);
5. Indexer – is the most essential and important element of a search engine that deconstruct the page into parts and then analyses them (including headers and style elements, text and links).



Picture 6. How a search engine works

Search algorithms of any search engine are singular (although some engines combine algorithms) and constantly improving, and seeking for the same phrase in different engines usually returns different dissimilar results. That is why a SEO consultant should have an individual approach to various search engines. Databases are frequently updated, and as the more often it is done, the newer and most actual information can be shown in the results page. Assessors are the

controllers of search engine robots, manually search for web pages and exclude irrelevant websites. It is a long routine work, but they correct the mistakes of machines, identify the perpetrators of the black hat website optimization methods, and react to signals of violations received from Internet users.

Characteristics of search engines consist of three parts: 1. Information gathering is a process when search engine loads, scans the web page and all hyperlinks, then visits these internal links located on a website and reads web pages content. After this process is finished, the search engine *knows* about a particular website and its pages. 2. Indexing is a process of compilation of all words on a site and the extraction of keywords and useful information from meta tags and content. Then the collected data is saved for the following showing for a public view in search results. 3. Ranking is the result of search engine calculation considering content and links on a web resource in order to determine the sequence of displaying the website with a query request of ones or another keywords.

### 6.3.1 Dealing with search engines

Search engines regularly indicate the large amount of pages on a website as a sign of exclusiveness although other factors of quality are more important, such as relevance. The priority for search engines is to present the relevant web pages corresponding to request of a user, and it is formulated by over 200 factors. The fundamental elements impacting on search engines, increasing website rank are (see also picture 7):

- Domain name. It represents the service and products of a website or a company/person name;
- Title: `<title>Website title</title>`. If the request coincides with the title phrase, or title phrase contains a few words of the query, that particular page will be higher in results among others;
- Meta description: `<meta name="description" content="Short website description">`. The text description is shown in the search results under the website title;

- Keywords in *meta* tag: `<meta name="keywords" content="HTML,CSS,JavaScript">`. Words or/and phrases determining the topic and content of a web page or an article, used by search engines to provide relevant search results;
- Proper usage of headers (`<h1>`, `<h2>`, `<h3>`), styles (`<b>`, `<i>`), important text (`<strong>`), internal and external links (`<link>`), attributes (`alt` of `<img>` tag);
- HTML5 tags have impact on Search Engine Optimization, because of segmentation of a web page: `<header>`, `<nav>`, `<section>`, `<article>`, `<aside>` and `<footer>`.

And factors that decrease a website rank are:

- Technologies that search machine defines as spam (i.e. hiding text on a site);
- Reoptimization and over-optimization;
- Too long URLs (Uniform Resource Locator, address of a website) and its diversion;
- Keyword stuff of content and meta tags;
- Buy and exchange links;
- JavaScript applied for a navigation, text in graphic, using frames and flash, overusing plugins.



Picture 7. Basic elements of SEO clockworkscave.com

Indexing of a website by a search engine can be implemented in two ways. The first is to visit the main page and following by links from there to discover all other pages. For a quicker index there is a second option: sitemap.xml file. The file is created in a few steps: to create this file and include a list of links on all web pages, upload it to a website and give its reference to search engines. This is the best option for more accurate index of website web pages.

Among the important documents for search engine indexing, there is a file called robots.txt that includes a list of instructions (directives) for search robots and should be located in the website root. In this file web developers can specify what web pages or sections should be indexed and what should not (useful in case of paid content, special pages, archives, and dynamic websites).

Registering a new website in search engines is very simple. To do this, a webmaster should go to the section of each search engine's webmaster tools and add the website URL in the certain place of the main page of its website. The following sections will review the webmaster tools of the most popular search engines: Google and Bing.

## 6.4 Google

Google holds a leading position among all search engines and provides a useful tool set for SEO. This is the reason why English language-oriented websites are focused mainly on Google in promotion and optimization. Google prefers to work with older websites, so there is a reason to finish details during the process of SEO, having done the main page and the major sections of the website. A good advice is to regularly add new content and update the website.

### 6.4.1 Google Sandbox

On the way of becoming available in Google search results a website meets an obstacle called Google Sandbox – a set of filters applied to “young” websites that do not allow to improve their position in the rankings artificially (hyperlink spam, cheat members of community and attendance counters, fake “likes”).

Inbound links (backlinking) on a website help GoogleBot (the main spider of Google) to discover it and send to Google Sandbox. A website can stay under impact of these filters usually around from 2 to 12 months, but in case of not proper developing of the online resource, this time can grow significantly.

The exit from Google Sandbox depends on the increase of a search traffic. To make this process shorter, there are universal methods such as: placing external links to the site from various thematic verified resources and sharing a website in several social platforms. It is essential to constantly perform a website updating, that is adding new information, posts, and pictures.

#### 6.4.2 Google PageRank

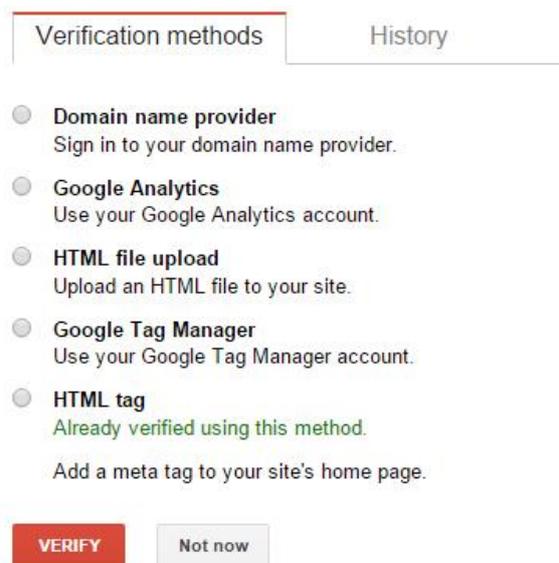
Another key moment in Google search engine is the parameter Google PageRank (PR). PR reflects the weight and quality of the inbound links to a website from other web pages, and based on this information, PR composes the rate of a website. The weight of the link depends on the quality and strength of its resource, for instance, the link from google.com is more significant rather than it will be from a third level domain name. The fundamental factor in determining of PR is the amount of relevant and subject appropriate websites that have links to a particular website. In addition, the major purpose of use is to quickly conclude the website authority and its competitiveness levels (among other similar topics websites in ratings). The measurement of PageRank value has two scales: Actual PageRank (APR) and Toolbar PageRank (TPR). The first one involves the algorithm and a rate given to each web page based on it and the second one is an approximate value of APR and updates not so often (once in a few months), so it can be hard to orient on this Toolbar because of possibly obsolete data. It has a scale from 0 to 10, so young websites usually have ratings about 2-4 after Sandbox and popular promoted resources have 5-7.

Google Webmaster Tools represent the diagnostics and statistics of the website indexing, allow to send a sitemap and receive feedback. To work with Google Webmaster tools, a web developer should have a registered account (e-mail) and only after that there is access to a webmaster panel.

### 6.4.3 Google Webmaster Tools

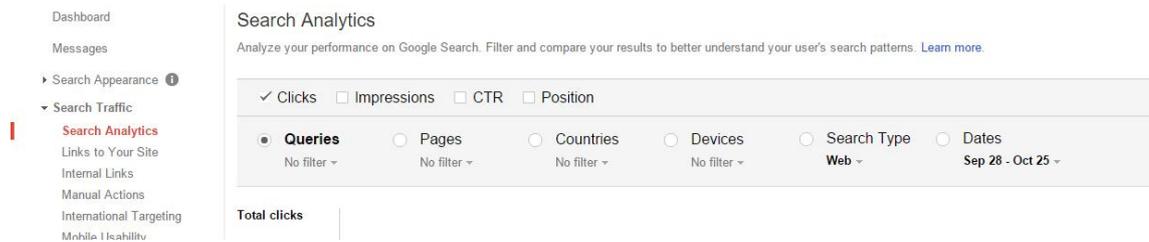
After the domain name is chosen and/or bought, the website is uploaded to the hosting and it is already in Google Sandbox the owner should sign in to Google Webmaster tools and on a dashboard add the website (add a property). The next step is to verify uploaded web site. According to Search Console Help it can be done in a few ways (see also Picture 8):

1. Add a *meta* tag to the main page;
2. Upload an HTML file to the server providing required name;
3. Add a new DNS (Domain Name System) record through domain name provider;
4. Add the Google Analytics code that is used on a website.



Picture 8. Methods of a website verification using Google Webmaster Tools

Afterwards, if everything is done according to instructions and a web resource is verified, the user should see the main page of Search Console with a list of messages and a current status that includes: crawl errors (site and URL errors), search analytics (see Picture 9) and sitemaps tabs. All tools are accessible from the left sidebar navigation.



Picture 9. Search Analytics tab in Search console

The next step is to upload the file `sitemap.xml` to the server that will increase indexing of website pages by a search engine robot. The sitemap can be created by a web developer itself in any text editor (according to the rules of structuring), generated on CMS or at the [www.xml-sitemaps.com](http://www.xml-sitemaps.com) website. In Google Webmaster Tools, it is done by clicking in the dropdown menu Crawl item and in the new menu choosing Sitemaps, pushing the button "Add/test sitemap", setting the path to the sitemap location and then clicking "Test sitemap" or "Submit sitemap". If any changes are applied to a structure of the online resource, the sitemap should be regenerated and sent again, so Googlebot could update the information in its database.

File `robots.txt` can be added, edited and checked for errors and warnings at menu item Crawl – robots.txt Tester. The operability and activity check of this file can also be analysed there. Web pages hyperlinks of a website that a webmaster wants to check whether they are available for the Crawler or blocked can be inserted in the field below robots.txt editor. Different robots can be chosen: Googlebot (the main one), Googlebot-News, Googlebot-Image, Googlebot-Video, Googlebot-Mobile, Mediapartners-Google and Adsbot-Google. In case a web developer wants to permanently delete a certain URL, catalogue, web page cache or the whole website from Google indexing, it can be made at menu item Google Index – Remove URLs.

#### 6.4.4 Google Analytics

Google Analytics is a multi-functional tool set for tracking attendance of various characteristics of web resources, collecting and analyzing data from distinct devices and digital media, detailed statistics of website visitors. The principle of

work is based on inserting of asynchronous JavaScript tracking code into a website which consists of instructions about what kind of interactions should attention be paid to and what type of data should be collected. Then, all the gathered information is sent to the server of Google Analytics. The next step is to process all data according to user's configuration (application of desired filters, included and excluded data) and to update the custom Google Analytics reports (see Picture 10).



Picture 10. Google Analytics Overview

The information-gathering algorithm takes into account three elements: audience, session, and interaction. Visitors are distinguished into two groups: those who are for the first time visiting the website, and returning. Information about visitors includes:

- Amount of users visited a web portal (a period of time can be selected);
- Demographic: Language, country and city;
- System: Browser, Operating System and Service Provider;
- Mobile: Operating System, Service Provider and Screen Resolution.

Each interaction is associated with a specific session and each session in turn, with a particular visitor. For instance, if the session is short and ends after the user visits the main page and leaves a website in a few seconds, then Google Analytics registers it as one interaction. And in another session if a user visits a few pages, gives a feedback, watches a video and buys something – that leads to the registration of four interactions.

Acquisition section is the report of all the user traffic: search results, social networks, AdWords and other. The high failure rate of the page is a definite signal

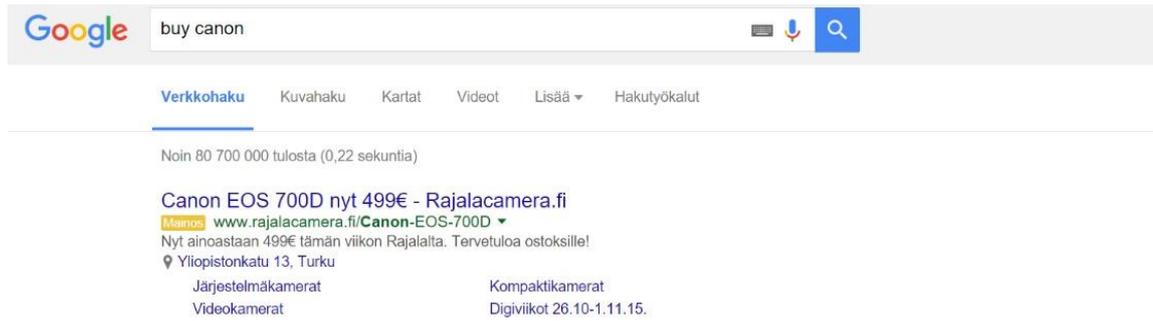
that improvements are necessary to be made. Behaviour section displays the way of user's interaction with a website that is information about which pages are visited and average time of viewing, including site content, speed and search graphics. The conversions section is about setting up the goals and determining how well a website meets its aims and objectives. This category also includes statistics of e-commerce: product and sales performance to determine the status of the online business and its opportunities.

Google Analytics is a free and powerful mechanism of web analytics that reveals unlimited opportunities for improvement and optimization of an online resource. This service has many more functions than were described above, and there are enough resource materials on each page to help navigate in the diversity of reports.

#### 6.4.5 Google AdWords

Google AdWords is an effective and technological service of context advertising with a wide range of instruments that can be useful on any stage of a website development and existence. Its principle of performance is relatively uncomplicated, because of its intuitive and convenient user interface and system flexibility. AdWords allows to formulate an accurate target and a budget. The principle of service work is simple: on the page of search results among URLs, there are promotional and thematic ads that registered in Google network (see Picture 11). Features are (Kim 2014):

- Simple management of shopping campaigns;
- Possibility of fast involving of target audience;
- Flexible settings of a budget;
- Choice of platforms for advertisements displaying;
- Callout extensions allow to add specific trading and product attributes.



Picture 11. Example of AdWords context advertising

Google AdWords has a service Keywords planner that builds a list of keywords of a website understanding of its goals and objectives and helps to make up an advertisement for a visitor. So when a potential client requests for information of the same field system, AdWords shows that particular website among all search results. It is a good possibility for a new product or service to be promoted because of exact hit of the target audience.

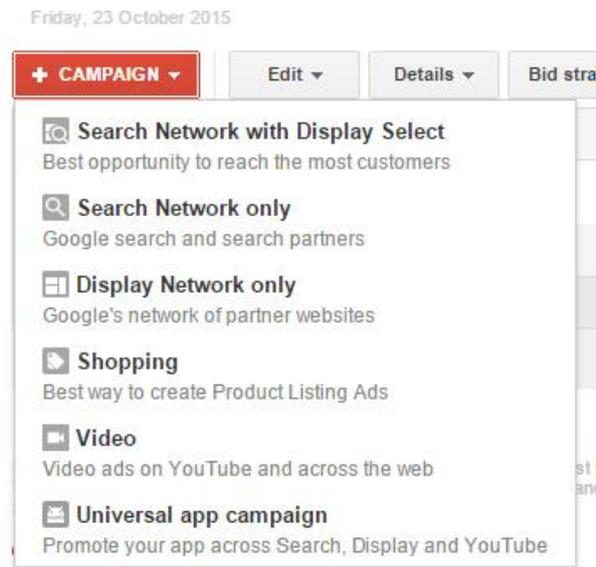
Placing advertisements using Google AdWords is a useful option for marketing. If a user is looking for something particular, it means that the target is already determined, so the owner of an online resource gets highly potential clients through commercials. That saves time for both customer and product/service seller. The flexibility of AdWords allows to modify existing advertisements and moderate the withdrawn budget for the certain campaign. The most interesting aspect is that a web developer pays not for placement of advertising but for real clients who click the link and explore a website.

Creating a new campaign consists of the following steps:

1. Choosing the type of campaign (see picture 12);
2. Determining the target audience, locations and language;
3. Establishing a default bid, that is the maximum cost that can be paid for cost-per-click option;
4. Establishing a budget per day;
5. Adding additional extensions like location, sitelinks and call information;
6. Creating the actual advertisement: headline, a few description lines and a displaying URL (including an individual URL for mobile) that will lead a

customer to a particular web page (with a preview and advertising extensions like product image and office address);

7. Providing a selection of keywords and key phrases using a tool of keyword suggestion;
8. Administrating a billing process.



Picture 12. Types of campaigns of Google AdWords

#### 6.4.6 Google My Business

Google My Business is a free service for small and medium business companies. It allows owners to manage information about their company or products/service and keep it actual at the same time through 3 Google services: Google Search, Google+ and Google Maps (see picture 13). Features of Google My Business are:

- Information and media management in real time using a web browser or applications developed for Android and iOS;
- Statistics of views and clicks, reviews and comments about business;
- Integration with Google Analytics account;
- Through Google Maps a potential customer can make a route to company's office.



Picture 13. Example of Google My Business free service

After adding contact details and working hours of the company to the page in social network Google+, address and additional information of the company will automatically be displayed on Google Maps and in Google Search.

To create a web page, the owner should login with a Google account and choose the appropriate type of company at [www.google.com/business](http://www.google.com/business): Storefront (shop, restaurant, etc.), Service area (delivery, photography) or Brand (music band, sport team). On the displayed webpage in search field the user types a name of the company, and if Google does not find it then simply to make a new one adding a business name, country, city and address, mobile phone and a category of company (field).

## 6.5 Bing

Bing is a search engine and its owner is Microsoft. In the global Internet market, Bing gives a big way to Google, but confidently keeps a second rank among search engines. According to search engine market share in October 2015 the situation was: Google – 69.24%, Bing – 12.26% and Yahoo – 9.19% that works based on Bing engine so the percent goes to Microsoft (NetMarketShare 2015).

### 6.5.1 Bing Webmaster Tools

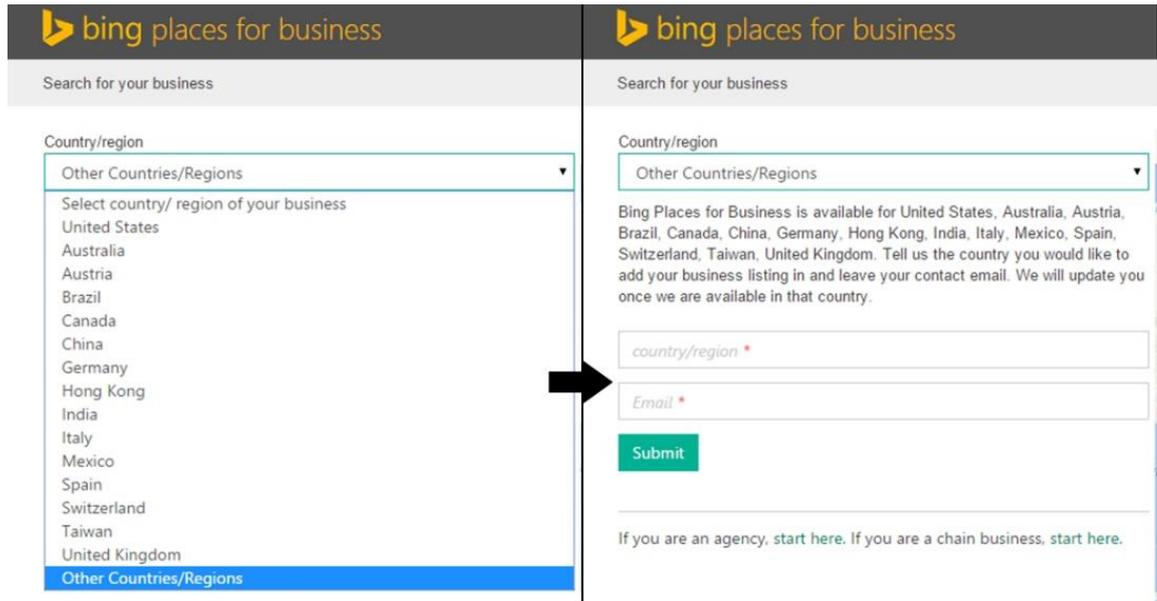
Like Google, the search engine Bing also has webmaster's tools that have a similar system of work and analogical utilities. First of all, these tools are needed to help a search robot to determine what web pages of a website it should visit initially. Other features are the analysis service of external links for any website, keywords statistics and checking the basic rules of SEO-optimization. File

sitemaps.xml helps to manage the indexing as much as possible useful pages. A sign in can be done through Windows Live ID or Outlook accounts, as a result, Bing Webmaster page is opened and there is a possibility to add a website URL for indexing. The following page is about filling information about the online resource: sitemap file, owner's and company's data. At the end of the registration process, Webmaster requests for a verification of ownership that can be completed in three different ways: placing a BingSiteAuth.xml file on a website, pasting a meta tag to a web page or adding a CNAME (Canonical Name) record in DNS with a certain name and value verify.bing.com. Bing Webmaster features:

- Information about amount of web pages indexed by Bing, any errors found;
- Control of Bing's Crawl including the choice of best time for a website indexing;
- Social networks integration;
- Statistic graphics of clicks, transitions and mostly used keywords;
- In website settings: sitemaps, manual adding URLs for indexing;
- Search optimization with Reports and Data, Diagnostics and Tools.

### 6.5.2 Bing Places

Bing Places is a service of adding business listings into Bing Search Engine Result pages (SERP). Registering a company in Bing Places automatically adds it to Bing Maps with a physical address if provided. The principle is the same as in Google Places maintenance. The main difference is that Bing Places is available for a certain amount of countries, and if business is located outside of those regions, there is only one option: to fill a form consisting of country of business and email, and wait until this utility is accessible (see Picture 14).



The image shows two side-by-side screenshots of the Bing Places for Business registration interface. The left screenshot shows a dropdown menu for 'Country/region' with the following options: Other Countries/Regions, United States, Australia, Austria, Brazil, Canada, China, Germany, Hong Kong, India, Italy, Mexico, Spain, Switzerland, Taiwan, United Kingdom, and Other Countries/Regions. The right screenshot shows the same form with a message: 'Bing Places for Business is available for United States, Australia, Austria, Brazil, Canada, China, Germany, Hong Kong, India, Italy, Mexico, Spain, Switzerland, Taiwan, United Kingdom. Tell us the country you would like to add your business listing in and leave your contact email. We will update you once we are available in that country.' Below the message are input fields for 'country/region \*' and 'Email \*', and a 'Submit' button. A black arrow points from the 'Other Countries/Regions' option in the left dropdown to the 'country/region \*' input field in the right form.

bing places for business

Search for your business

Country/region

Other Countries/Regions

Select country/ region of your business

United States

Australia

Austria

Brazil

Canada

China

Germany

Hong Kong

India

Italy

Mexico

Spain

Switzerland

Taiwan

United Kingdom

Other Countries/Regions

bing places for business

Search for your business

Country/region

Other Countries/Regions

Bing Places for Business is available for United States, Australia, Austria, Brazil, Canada, China, Germany, Hong Kong, India, Italy, Mexico, Spain, Switzerland, Taiwan, United Kingdom. Tell us the country you would like to add your business listing in and leave your contact email. We will update you once we are available in that country.

country/region \*

Email \*

Submit

If you are an agency, [start here](#). If you are a chain business, [start here](#).

Picture 14. Bing Places service is available only in certain countries/regions

## 7 SECURITY OPTIMIZATION

At some point, the owner of any kind of a valuable website encounters security and protection issues, so website security optimization is a critical part of the online project development. It is an endorsement of protective measures from attacks against a web resource like various viruses, DDoS (Distributed Denial of Service) attacks and hacking which are performed using software and scripting vulnerabilities and defenceless access control. Security optimization can be performed in the development stage or during a full functioning ready-made website, and it includes code integrity, website administration, password and overloading safety.

The basic principles of security optimization are:

- Keeping up-to-date software, modules, scripts, CMS, Firewall, antivirus program, FTP-client, and back-up files resolves bugs and vulnerabilities;
- Usage of nonstandard strong passwords and logins, regular update and not using AutoSaving feature help to protect access to files;
- Accurate choice of people accessing to the administrator panel decreases the risk of system breaking;
- The best solution for password protection is to keep it in a password manager system, but not on a FTP-client;
- Control of traffic, form and comment fields reduces spam and dangerous scripts;
- Integration with Webmasters helps to monitor and alarm about the occurrence of malware activity;
- SSL (Secure Socket Layer) technology establishes secured connection between client browsers and servers. The information transaction is encrypted and performed over an HTTPS channel. To use this option of a website, a data protection SSL Certificate is required.

## 8 WEB-DEV.COM PROJECT

This thesis project work consists of a web-dev.com website implementation based on WordPress CMS. This website represents an easy and reasonably quick way of blog and static web page creation, which can be used as a resource for online courses of some particular program. In this case it is a prototype of online web development course that includes informative and useful articles about client side and server side development, optimization, promotion and security directions.

Implementation:

1. Install a local server Denwer: run the program and open a web page *localhost*, in phpMyAdmin create a database for a project, add a user with all global privileges and set the password;
2. Download the copy of WordPress from Wordpress.org and unpack all files into a new project's folder on Denwer's virtual disk.
3. In the file *wp-config-sample* define database, user, password and localhost (see picture 15) and save as *wp-config.php*;

```

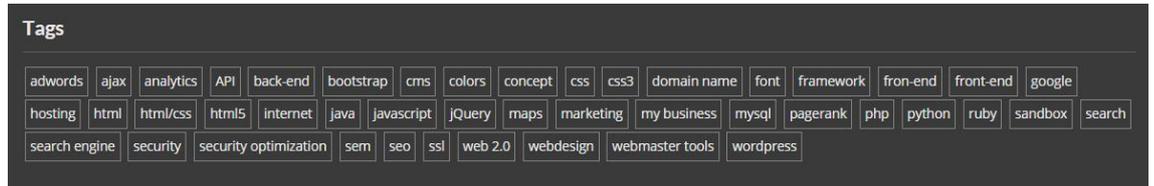
20
21 // ** MySQL settings - You can get this info from your web host ** //
22 /** The name of the database for WordPress */
23 define('DB_NAME', 'web-dev.com');
24
25 /** MySQL database username */
26 define('DB_USER', 'web-dev.com');
27
28 /** MySQL database password */
29 define('DB_PASSWORD', '0123');
30
31 /** MySQL hostname */
32 define('DB_HOST', 'localhost');
33
34 /** Database Charset to use in creating database tables. */
35 define('DB_CHARSET', 'utf8');
36
37 /** The Database Collate type. Don't change this if in doubt. */
38 define('DB_COLLATE', '');
39

```

Picture 15. Setting up wp-config-sample.php file

4. Open a new website web-dev.com in a web browser;
5. Install WordPress following instructions and filling the fields;

6. On the Dashboard choose the theme and apply it as a website template, Flat Responsive theme is activated;
7. Customize a website look changing headers and footers, colours and styles and adding widgets to top, bottom and side bars. Tag cloud widget has been added to the bottom widget position (see picture 16);



Picture 16. Tag cloud widget

8. Add new categories observing hierarchy (similar to the thesis content);
9. Add posts noting all categories and appropriate tags and publish;
10. Customize the main menu: create a custom menu and include Home page and categories Front-end Development, Back-end Development, CMS, SEO and Security (see picture 17);



Picture 17. Web-dev.com navigation menu

11. In order that the articles from categories were displayed settings of Permalinks should be changed to a Post name view like:  
<http://web-dev.com/sample-post/>  
 After saving changes, by clicking in the menu on suitable topic (category), a web page opens with all articles from that particular category;
12. The website is ready for use.

## 9 CONCLUSION

The role of Internet resources in a daily life has increased considerably over the past decade and continues to grow involving not only business campaigns but also a variety of blogs and developing educational web portals. The existence of a company website in the modern world builds a wide range of business expanding possibilities, like attraction of new clients and regular customers' service, presentation of new products and services description. For educational purposes, web portals allow people from all over the world to study and improve own skills.

The aim of this thesis was to introduce the latest trends in the world of website building and its new techniques in modern implementation of websites and web applications, as well as Search Engine Optimization instructions including maintenance and promotion and other key phases in the development of a worthwhile resource. The prototype of a web portal for online web development course represents the main aspects of work with a server (in this case a local server Denwer was used as an example) and WordPress Content Management System.

This thesis reveals that a web development area is not only about coding and knowing tags and functions but it involves different kinds of processes, such as web design creation, client-side and server-side programming, development planning for advancement and promotion of a website likewise its security optimization. For large companies, online resources can be implemented by a few people specialized in particular fields: web designer, programmer, SEO consultant, but if a site is held by a young web developer or a small business company, it is useful to have a picture of all procedures of website implementation.

In the future development this online course can be improved in a way of adding a database of study materials implemented with an individual sign in (a database of participating students) and interactive tests and quizzes. As already mentioned, as soon as website has enough complex functionality it can be

migrated to Joomla CMS that has more capabilities for improvements and development.

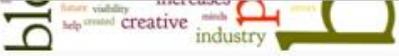
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## Appendix 2. Web-dev.com article



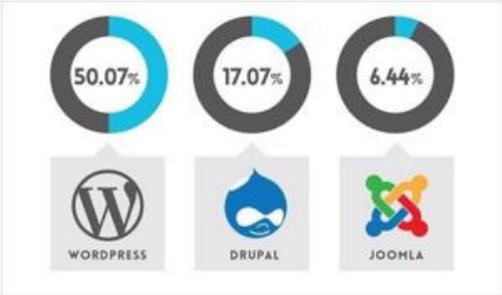
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### Content Management System

November 9, 2015 • admin

The necessity to create CMS was caused by the increasing complexity of the design and maintenance of websites. Content Management System is called the core of a website and an effective tool that simplifies the content management issues and resolves a routine tasks like administration, publishing, and modification. Using this platform allows to focus on the semantic content of the published information, rather than its design and coding.

Usually on a website the information changes more frequently rather than the layout, so the principle of CMS is in division of the content and the design into two independent components, which greatly facilitates the application of any changes to the site and filling a new template would be much easier. Combined ready modules and plugins, that are chosen by a web developer, compose and build the website like a constructor; convenient user friendly interface for modifying the content makes it easy for the user with no special knowledge of coding to be able to work with the information on web pages. For a professional web developer using CMS is also very practical, because with knowledge of markup and scripting languages there are more possibilities to modify the modules structure and create an individual design and functionality. According to the rating of building platforms in 2015 by [www.opensourcecms.com](http://www.opensourcecms.com):



Platform	Percentage
WordPress	50.07%
Drupal	17.07%
Joomla	6.44%

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