

APPLYING SEO TECHNIQUES TO IMPROVE ACCESS TO A RESEARCH PROJECT WEBSITE

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Abstract — The paper describes the optimization of the research project DOSIRD UNS web site using Search Engine Optimization (SEO) techniques. The aim of this study was to better rank the website on the leading web search engines Google and Yahoo! using keywords that belong to the domain of the project. The website is developed using Drupal CMS version 7.35. On-Page, Off-Page SEO techniques and Drupal modules are used in order to achieve the better web site ranking.

I. INTRODUCTION

SEO is a methodology of strategies, techniques and tactics used to increase the amount of visitors to a website in such a way that the website will get a high ranking on the result page of a search engine. SEO is a subfield of information retrieval which deals with techniques for the representation, storage, organization, access and retrieval of information [1; 11]. If the website is better ranked in the primary results there is a bigger chance that the user will visit that website. In this way, the discoverability of the information on the website is increased. The impact of search engine optimization on online advertising market is analyzed in the paper [12]. How scholarly literature repositories should be optimized to be better ranked on the Google Scholar search engine is the main topic of the paper [13]. Analysing Google rankings through search engine optimization data is presented in the paper [14].

The aim of presented study was to better rank the website DOSIRD UNS on the leading search engines Google and Yahoo! using keywords that belong to the domain of the project. In order to achieve the aim, On-page and Off-page SEO techniques are applied and Drupal modules are used. Google Webmaster [6], Google Analytics [7], Bing Webmaster Tools [8], HubSpot [9] and AuthorityLabs [10] are used for the purpose of tracking progress.

The structure of the paper is the following one. In the second chapter the website that has been optimized with SEO techniques is presented. The third chapter describes the importance of using SEO techniques, the necessary steps before effectively applying SEO techniques, Drupal modules that are used and SEO techniques used in order to achieve a better web site ranking. The methodology used for this study is presented in the fourth chapter, and results of this study are presented in the fifth chapter. The

overview of the changes and optimization through the months April, May, June and July are presented, as are the position of the keywords on the search engines Google and Yahoo! during this period. In addition, significant data which was collected with the help of SEO tools are shown. The conclusion is given in the last chapter and it contains additional guidelines for further development.

II. DOSIRD UNS WEB SITE

The University of Novi Sad was founded on 28th of June 1960 and it represents an autonomous institution for education, science and arts. While software infrastructure for educational domain of the University of Novi Sad is well developed, there is lack of software infrastructure for science and arts. The main goal of DOSIRD UNS (Development Of Software Infrastructure for Research Domain of the University of Novi Sad) project is the development of software infrastructure for the research domain of the University of Novi Sad. The project has been started in the year 2009.

The mission of this project is the development of software infrastructure which will fulfill all local requirements prescribed by the University, government of the Autonomous province of Vojvodina and government of the Republic of Serbia. Besides that, the software infrastructure should be implemented in accordance with international well known standards and protocols belonging to the field of research domain. The goals of this project include: Development of a research information system (CRIS UNS), Development of a digital library of Ph.D. dissertations defended at the University of Novi Sad (PHD UNS), Development of an institutional repository of scientific research outputs of the University of Novi Sad, Export data to the following networks of digital libraries and institutional repositories: DARTEurope, OATD, OpenAIRE+ and Implementation of searching data through a web page and through a standardized protocol for Search/Retrieve via URL (SRU).

The web site *DOSIRD UNS* is developed using Drupal CMS (Content management System) [2], version 7.35. MySQL was used as DBMS [3] version 5.6.24. Apache [4] is used as the server, version 2.2.15 and PHP [5] version 5.3.3. The web site is available on the address <http://dosird.uns.ac.rs> and the homepage is shown in *Figure 1*.

The first faculties in Novi Sad were founded in 1974. The University of Novi Sad was founded on 20th of June 1950 and it represents an autonomous institution for education, science and arts. While software infrastructure for educational domain of the University of Novi Sad is well developed, there is lack of software infrastructure for science and arts. The main goal of this project is Development Of Software Infrastructure for Research Domain of the University of Novi Sad (DOSIRD UNS). The project has been started in 2007.

Our Mission
Our mission is development of software infrastructure.

Our Team
The project team includes professors, scientists, PhD.

Related Links
EuroCRIS organization is responsible for development of the CERIF standard
• JNH1 Europe is a partnership of research libraries and library consortia who are working together to improve their services. [EuroCRIS](#) [JNH1 Europe](#)

Figure 1 DOSIRD UNS web site

III. BACKGROUND

This section describes the importance of using SEO techniques, the necessary steps before effectively applying SEO techniques and the Drupal modules and SEO techniques used in order to achieve a better web site ranking by web search engines.

A. The importance of using SEO techniques

1. Most users look only at the first 5 results, therefore, it is crucial for the website to rank good.
2. SEO techniques adopt to search engines and users too; therefore usage of SEO techniques also improves user experience and the usability of the website.
3. Users trust search engines, so if a website is ranked among the first results this can increase the trust in the website and its content and services too.
4. SEO is beneficial for promoting a website. If a user finds a website via a search engine, and if he/she likes the content on the website, he/she will most likely share it via social networks.
5. SEO can help a website to be in a better position than their competitors. If two websites are selling the same product, the website that is more optimized is more likely to have a larger number of visitors and thus to increase sales of products.
6. With the help of various tools, such as Google Analytics, it is possible to conclude what type of users are visiting a website, which are the most popular pages and

searched keywords and this information can be later used to improve the marketing strategy and to better create new content.

B. Steps before applying SEO techniques

1. **Identification of target audience:** Target audience is defined as a group of people who are interested in the content, product, or service that a website offers. Identification involves determining their sex, age, geographical location, financial status, education and most importantly- their needs: What do they want? What they don't have?
2. **Analysis of competing websites:** Finding out who the competitors are and which keywords they bid for. Collecting valuable information such as the competitor visibility on the search engine, the amount of their backlinks and traffic they get, the number of users on social networks and the content in their Meta tags.
3. **Research and discovery of keywords:** Finding out which words best describe the central theme of the website and its content and take into account the findings from steps 1 and 2. Create phrases and find synonyms. Use the keywords throughout SEO optimization.

C. Drupal SEO modules

Drupal offers a lot of possibilities to optimize a website for SEO. Modules used for this purpose are: Path Auto, Page Title, SEO Checklist module, Path and Global Redirect, Search 404, Metatag, XML Sitemap, Alchemy,

HubSpot and Google Analytics module, Clean URL, File Cache, Content Optimizer and SEO Compliance Checker.

D. On-page SEO optimization

On-Page SEO optimization refers to techniques applied directly on the website in order to improve its rankings on the search engine. On-Page SEO optimization can be grouped in three parts:

1. **Code optimization:** Adding and modifying the title of the website, Meta tags, alt tags, heading tags, XML sitemap and robots.txt file and optimizing the website speed.
2. **Content optimization:** Creating content which is rich with relevant keywords, density and allocation analysis of chosen keywords, avoiding content that cannot be indexed, content update frequency and content optimization for mobile devices.
3. **Link structure optimization:** URL structure and length, internal and external links, breadcrumb trail and 404 redirection.

E. Off-page SEO optimization

Unlike On-Page optimization, which is based on changing content, code and links of a website, Off-Page optimization is not visible on the website. Off-Page techniques are applied after On-Page optimization. Off-Page SEO optimization can be divided into three parts:

1. **Link building:** Outbound link quality, PageRank and Authority of the linking page, content relevancy of the linking page, anchor text.
2. **Creating and promoting content:** Social media, RSS feed, creating and updating a blog, submitting the website to directories and search engines.
3. **Website reputation:** Trust rank of the website, domain and page authority.

IV. METHODOLOGY

The experiment lasted for four months. The first two months, from April till May, were dedicated for creating the DOSIRD UNS website and applying SEO techniques. June and July were used to observe the data. The last measured progress was on July 31st.

A. Changes review

April - At the beginning of the month, with the help of Drupal CMS, the website was created. After that, the website was submitted to Google Webmaster, Google Analytics and Bing Webmaster Tools, and later HubSpot and AuthorityLabs tools were included. The XML sitemap was submitted to Google Webmaster and Bing Webmaster and the website was indexed. In the second half of the month SEO techniques were applied, first - On-Page Optimization. Keyword analysis was done. The most important keywords are: *CRIS, University of Novi Sad, digital library, PhD dissertation, scientific results*. Based on the keywords the Alt tags on the pictures, the Title tag, important Meta tags and the content were adapted and changed. Drupal modules, which were mentioned in chapter 3, were used in order to better optimize the website for this CMS. Social profiles were created and content was periodically published taking in account the content update frequency factor. Anchor texts were adjusted so that they carried semantics and contained keywords. Clean URL was used for better URL structure.

The internal link structure was optimized so that the crawler can access every page. In the theme the Breadcrumb trail was activated allowing easier navigation and module Search 404 was used for eventual 404 situations, improving the user experience.

May – The speed of the website was tested with Google Page Speed Insights, and optimized using Leverage Browser Caching, Specify a Vary: Accept-Encoding header and FileCache module. Robots.txt file was adjusted by adding new rules. After On-Page optimization, Off-Page optimization was started. The website was referenced on the website of Chair of Informatics, Faculty of Technical Sciences, on the website of the University of Novi Sad, on the Drupal website and on the CRIS UNS website. Using Google Link Checker the links on the website were checked and adjusted to use less redirects and the broken links were fixed too. With the tool HTML checker, the code of the website was adjusted and the issues were fixed. RSS Feed was added which was linked on the News page.

June and July – During this period new content, in the form of dissertations from the University of Novi Sad, were periodically placed on the News page and that content was then promoted on social networks. The theme of the website was adjusted for mobile devices using the responsive theme approach.

V. RESULTS

This section presents achieved results by the application of SEO techniques.

A. Keywords positions

To track the keyword positions a web browser was used with a cleared history and an anonymous profile (The user is not logged in and there are no cookies) so that the results can be as objective as possible. HubSpot and AuthorityLabs tools were used for tracking the keyword positions. Since there are a lot of variations only a few combinations of the keywords were selected that will be monitored. For Google search engine (*Table 1*) the measuring was performed three times per month (May, June, July), for each month on the first day, approximately in the middle and at the end of the month. For Yahoo! search engine (*Table 2*) the measuring was performed twice every month, once at the beginning of the month and once at the end. Both Google and Yahoo! show 10 results per page.

From the tables it can be concluded that the rankings were drastically improved during May and later on there were only minor fluctuations for one or two positions, which is normal. The keyword combination with the most competition was “PhD dissertation digital library”, especially on the Google search engine, where it achieved the worst ranking, taking into account the rest of the results. Unlike this, on the Yahoo! search engine these keywords ranked in second place. This can be explained by the fact that on Google there are more websites competing for these keywords than on Yahoo! and that these two search engines use different algorithms for ranking the results. Yahoo! Algorithm is more focused on analyzing the content of a website, while Google's algorithm is more complex, and it takes into account more factors like link popularity, social signals, content relevance and quality.

Table 1 The ranking results of the keywords on the Google search engine

Keyword/Date	1.5	21.5	1.6	19.6	30.6	1.7	31.7
university of novi sad phd dissertation	3 rd page	2	1	1	1	2	1
university of novi sad digital library phd dissertation cris	2 nd page	2	1	1	1	1	1
phd dissertation digital library	2 nd page	1	1	2	1	1	1
university of novi sad digital library cris	5 th page	43	22	20	17	17	41
university of novi sad phd dissertation cris	2	1	2	1	2	2	1
university of novi sad phd dissertation cris	3	2	1	1	1	2	1
university of novi sad digital library scientific results	1	1	1	1	1	1	1
phd dissertation digital library cris	2 nd page	2	2	1	1	2	1

Table 2 The ranking results of the keywords on the Yahoo! search engine

Keyword/Date	1.5	21.5	1.6	30.6	1.7	31.7
university of novi sad phd dissertation	1	2	1	1	3	1
university of novi sad digital library phd dissertation cris	4	1	1	2	2	2
phd dissertation digital library	4	2	2	1	2	1
university of novi sad digital library cris	10	2	3	2	2	2
university of novi sad digital library cris	1	1	1	1	1	1
university of novi sad phd dissertation cris	5	2	2	1	1	1
university of novi sad digital library scientific results	1	1	1	1	1	1
phd dissertation digital library cris	8	5	3	2	3	1

B. SEO tools data

Table 3 shows how the users discovered DOSIRD UNS website between April and July.

Table 3 Acquisition

Parameter/Month	April	May	June	July	Whole period
Direct	78	94	96	35	303
Organic	40	43	42	22	147
Social	28	33	20	6	75
Referral	17	21	1	4	55
Total sessions	163	191	159	67	580

The dominant way was through direct traffic (when a user types the URL directly in the address bar), then organic (when a user searched for a query on the search engine and clicked on the website link which was listed in the results), then social (when users come to the website via social networks), and last, referral (when users came to the website because they clicked on a backlink). Table 4 shows the total number of users who visited the website and the total number of pages viewed within sessions per month. A session is a group of interactions that take place on a website within a given time frame.

Table 4 Number of users per month

Parameter/Month	April	May	June	July	Whole period
Users	69	98	105	50	322
No. of viewed pages	1.296	1.069	642	182	3.189

On the site <http://tools.pingdom.com/fpt> the speed of a website page can be checked. Figure 2 shows the results of speed optimization for a page of DOSIRD UNS project.

The first score of 77/100 is without any optimization, measured on May 1st. A score of 87/100 is achieved when Drupal caching and File Cache module were used, measured on May 7th. A score of 96/100 is achieved when using Leverage Browser Caching for images, CSS and JS and using GZip compression with the measure date on May 12. The other pages of the website have similar success and a significant increase in page speed loading.



Figure 2 The speed of DOSIRD UNS website

On the site <http://www.seoreviewtools.com/website-authority-checker/> the authority of a website and a page can be checked. Figure 3 shows the authority of the domain *dosird.uns.ac.rs* and the page authority of CRIS UNS page measured on May 5th. As it can be seen, the page authority is only 1 and the domain authority is 58. Figure 4 shows the same test measured on July 31st. One can see an increase, with the page authority now 30 and the domain authority now 61. It should be kept in mind that the domain authority has a much slower increase.

Figure 3 Domain and page authority on May 5thFigure 4 Domain and page authority on July 31st

VI. CONCLUSION

With many changes in the search engine algorithm, today the most important thing is creating interesting, informative and high quality content that users will want to read and share. Search engines want the most adequate and relevant content for the best ranking, and because of this, SEO has become more oriented towards optimizing content for the users and less for the search engines. How the algorithm of a search engine changes so does SEO change and adapt. SEO is a long term process. A website cannot be optimized and leaved as it is. This can be seen from the results, as the number of user sessions declined slowly if there wasn't created new, interesting content that will attract new users and motivate old ones to come back. SEO can make a huge difference, especially if the website is intended to sell products or services and there is high competition.

Further improvements should include the following:

1. Off-Page SEO optimization must be worked on, especially it should be put an emphasis on building links from relevant sources.
2. A separate blog should be created where new and interesting content will be created, rather than the creation of new content relying only on the News page.
3. When a quality blog is created, this would improve the aspects of social media too, which also needs more work.
4. It would be useful to add a forum to the DOSIRD UNS website where users could discuss the dissertations. This would allow a creation of a community of users, and most importantly, an exchange of knowledge and experience.

5. The theme should be changed to have a more modern design. Today One Page websites are popular, where all the key information like About Us, Team, News, statistics are shown on one big scrollable page.

REFERENCES

- [1] Ivanović, Dragan & Milosavljević, Branko. *Upravljanje digitalnim dokumentima*. Univerzitet u Novom Sadu, 2015.
- [2] Drupal CMS, <https://www.drupal.org/>
- [3] MySQL, <https://www.mysql.com/>
- [4] Apache server, <http://httpd.apache.org/>
- [5] PHP, <https://secure.php.net/>
- [6] Google Webmaster, <https://www.google.com/webmasters/>
- [7] Google Analytics, <http://www.google.com/analytics/>
- [8] Bing Webmaster tools, <http://www.bing.com/toolbox/webmaster>
- [9] HubSpot, <http://www.hubspot.com/>
- [10] AuthorityLabs, <http://authoritylabs.com/>
- [11] Kent, Peter. *Search engine optimization for dummies*. John Wiley & Sons, 2012.
- [12] Xing, Bo, and Zhangxi Lin. The impact of search engine optimization on online advertising market. In *Proceedings of the 8th international conference on Electronic commerce: The new e-commerce: innovations for conquering current barriers, obstacles and limitations to conducting successful business on the internet*, pp. 519-529. ACM, 2006.
- [13] Beel, Jöran, Bela Gipp, and Erik Wilde. Academic Search Engine Optimization (aseo) Optimizing Scholarly Literature for Google Scholar & Co. *Journal of scholarly publishing* 41, no. 2 (2009): 176-190.
- [14] Evans, Michael P. Analysing Google rankings through search engine optimization data. *Internet research* 17, no. 1 (2007): 21-37.