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An overview of search engine optimization techniques

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Article Info	Abstract
	SEO or search engine optimization is comprised of 3 main activities: On-Page SEO, Off-Page SEO, and Technical SEO. A person who is proficient in all these areas and can build a website implementing all these techniques Is known as an SEO specialist. Although some incorporate other activities like data analysis into the mainstream SEO workflow and they are known as SEO masters and they work on a higher level of SEO. In this article, we discuss the On-Page, Off-page, and Technical aspects of SEO. Keep in mind, by reading this article you won't become an SEO specialist. The main goal of the article is to give you a general view of the SEO workflow and what an SEO specialist does.

Introduction

SEO or search engine optimization means optimizing websites and webpages for search engines to find; in recent years though, the meaning has changed to search experience optimization which means optimizing websites and webpages to provide the best search experience for the user. Why do we need SEO. The need to be seen and reaching to more users is a must for any business these days. One approach to that would be using adds, be it on TV, social media or other websites. But the best and the most efficient way is to let the users find you through search engines like Google. The reason for this is that ads are limited, you get views based on the money you pay and there is only so much that money can buy you. But with SEO, your website is on the internet doing the advertising for you for free. In this article, we discuss some techniques that speed up this process.

fig. 1 different aspects of SEO

Parts of SEO

The processes that are used for moving your website to the top of the search results on Google are comprised of 3 main parts:

- *On-page SEO*
- *Off-page SEO*
- *Technical SEO*

Each of these techniques is used in its special conditions and has its place in the process. In this article, we discuss each of them, individually.
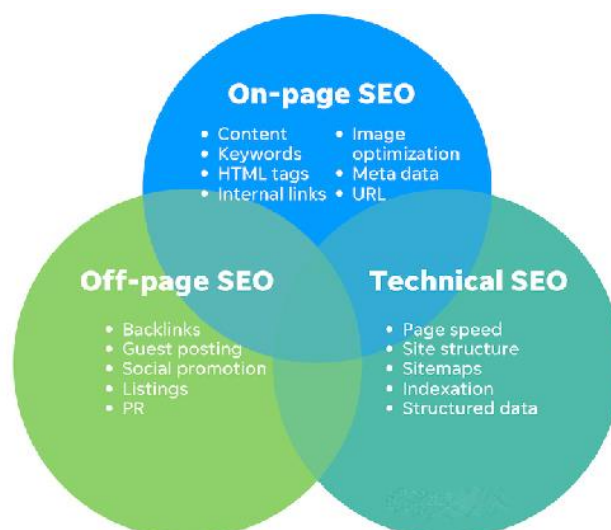
On-page SEO techniques

On-page SEO techniques include all the techniques that we use on our website. Including but not limited to finding a good keyword to optimize for, writing a good title for our content, interesting meta-titles, link building, and a well-written meta-description. We can build a roadmap for this process as follows:

1. Create a content calendar for your website

What is a content calendar? Content calendar mainly is the scheduling of when you post your content on your website. Content is the webpages on your website, which are indexed by google and are valuable for you because they can bring you more customers. There is no exact method for how you should exactly plan your content calendar but a good rule of thumb based on the type of your website would be that if you are a news outlet, you should plan for multiple posts every day, if you are a retailer, posting 4 to 5 times a week is what you are looking for, and if you are a company, 3 times a week is what most people aim for. Although these are not exact numbers and you should analyze your competitors and how trending your keywords are to build your content calendar.

2. Find a good subject

It is crucial for you to find interesting, trending keywords which are often searched by your users on the web. Keep In mind that if you are competing with big brands and popular websites try to use long titles for your early content.

3. Write good content

What are the parameters that make the content good? First and perhaps the most important one is that you should always make original content. Google uses the Panda algorithm to test and see if you have copied your content from other websites. One way to test for it yourself is to search the first 30 words of your content on google. If there are similar content and descriptions on the results google will flag your content as copied. Other tools can analyze your content for you but none are as precise as the panda algorithm used by google.

4. Writing interesting meta-titles and meta-descriptions

The first thing that the users see is your meta-title. And as such, they are critically important in the number of clicks and number of new users that come to your site. Based on analysis done on 3 websites and Search Console data, writing an interesting meta-title can increase your click-through rate by 3% to 7% (please note that you should be on the first page of search results to be seen by users).

After the meta-title, the next important aspect of your content is the meta-description. Meta-description should be an interesting abstract of your content and give a good impression of it.
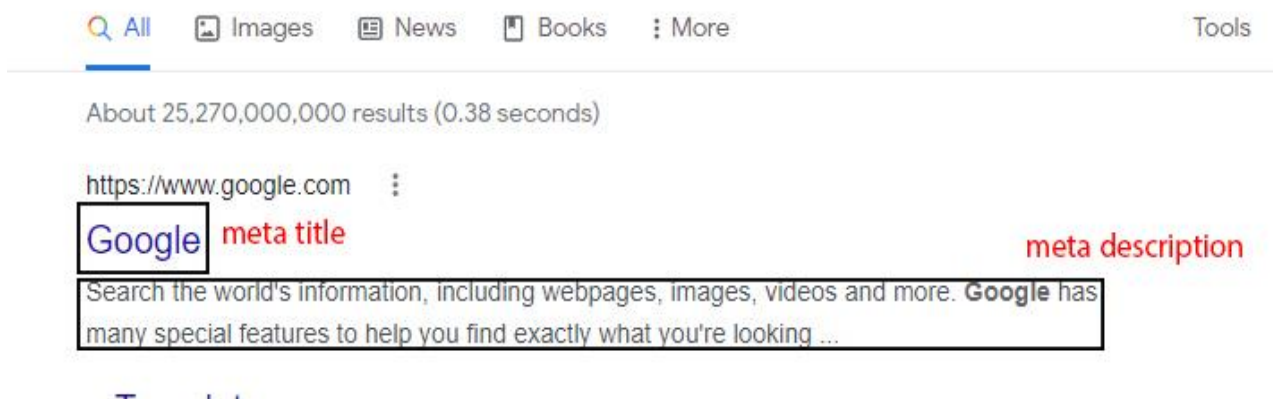

fig. 2 Meta-title and Meta-description of content

5. Writing FAQ

FAQ can be helpful for a few different reasons. One reason is that some users search for their questions. Also, this can help with users using voice search. A final reason would be that it makes your content longer.

Why would longer content be good for you? Based on statistics published by Google, 60% to 70% of users use mobile devices and because of their smaller screens, they can see fewer search results. Therefore, having longer content and naturally a longer search result there is a bigger chance for users to see your content.

6. Update your content

After you publish your content for better performance on search results you should update it from time to time. To get the best results you can aim for updating it after 2 weeks or a month. Keep in mind that you should always use original content to keep your old content updated. Also always try to add a few headings to your content. The additional headings should be distributed throughout the content meaning you should try to at least add one at the beginning, one in the middle, and one at the end of your

content.

Off-page SEO and

Off-page SEO is all the activities we use to build links to our content. It includes but is not limited to backlinks to our content and link-building. We create targeted content on other websites and link them to our content. Google indexes these links and reaches our website at the end which gives our website more credibility for search results.

fig. 3 aspects of off-page SEO

1. Basics of external link building

Before explaining external link building, you should note that external link building is a gray-hat SEO activity. If you use this technique too much not only it won't have any benefits for you it will harm your SEO results.

The main principle of proper link-building is "Be Natural". Meaning that you should always act naturally and keep it in moderation.

2. Natural behavior in link-building

To "be natural" in your link-building you should keep a few points in mind. First is to pay attention to your timing. Avoid link-building at specific times. Avoid creating a time pattern for your link-building activities, it should appear as a random and organic process. Other important points that you should pay attention to are using original content for external link building and trying to use different domains to build new links. For example, if you have created a few links from website A to your website, for the next links you should use another site like website B. this way Google adds more value to these links and your content will perform better on the search results. A few links from several different domains have more value than multiple links from a single domain.

3. Pay attention to domain authority and spam score

2 of the most important factors that you should pay attention to are the Domain authority and Spam score of websites. Domain authority is an index of a domain's credibility to Google's algorithms. It depends on a few factors like how old the domain is, how many users the website has, whether it has a lot of pages linking to it and etc. the higher the domain authority of a website linking to your website, the more value google attributes to that link.

The next factor to take note of is the Spam index of a domain. The spam score is an index that shows how many of a website's connections are of low quality and have less credibility for Google's algorithms.

Fig. domain authority and spam score

4. Pay attention to the link type (follow or no follow links)

There are 2 types of links: follow and no-follow links. Follow links are much more valuable but no-follow links have their uses too. You should use no-follow links alongside follow links for your link-building to appear organic and natural.

5. Get backlinks from different sites

Google classifies backlinks to your website into 3 categories: ad-reports which are published on websites that only the admins can publish on them like news outlets, content backlinks, which are links in the content of other websites that publish content and articles like Medium, and finally comment backlinks that come from other people's comments in places like forums and social media.

It's better that you use all these link types for your link building for it to appear more organic and bring better results for you.

6. Use social media

Being active on social media is always good for you. They are natural backlinks to your website and they in and of themselves can bring new customers for you. Google studies how your users come to your website and gives more credibility to websites that have multiple points of entry for their users.

Technical SEO

Technical SEO is all the work we do on the website itself to make a better user experience. Applying these techniques requires a basic to intermediate understanding of subjects like hosting, programming, and building websites.

fig. Technical SEO

1. Increasing The website Speed

One of the most important techniques used by SEO specialists is increasing the website's speed. The first step in this process is to analyze your website using tools like page speed insight or gtmetrix. You can use the results and suggestions of this analysis to improve your website.

It is recommended that you only change your website's settings If and only if you have enough technical knowledge for doing so.

1.1 Parameters that are analyzed in site speed.

Google checks six parameters in site speed. These are the six parameters.

- Largest Contentful Paint (LCP)
- First Contentful Paint (FCP)
- First Input Delay (FID)

- Interaction to Next Paint (INP)
- Cumulative Layout Shift (CLS)
- Time to First Byte (TTFB)

1.2 Largest Contentful Paint (LCP)

The meaning of LCP is when the user enters your web page until the largest block of text or image is loaded for the user, how much time it takes to fully load. Under 2.5 seconds is a good time. Between 2.5 and 4 seconds is a time that needs to be improved. It is weak and slow for more than 4 seconds.

1.3 First Contentful Paint (FCP)

The first bytes of information that reach the user and can be seen by the user are called First Contentful Paint (FCP), which should be below 1.5 seconds.

Fig. fcp

1.4 First Input Delay (FID)

This parameter indicates how long it takes for the user to interact with your site or when the user can click on an element or link (FID), it is better to be under 20 ms.

1.5 Interaction to Next Paint (INP)

(INP) indicates that when the user clicks on a link or a part of the site, how long it takes to take the user to a new page or a new link. This measure is currently very important for Google.

Fig. inp

1.6 Cumulative Layout Shift (CLS)

Cumulative Layout Shift (CLS) or layout change shows the

amount of jumps of the site when the web page is fully loaded, for example, when the elements of the site are enlarged and reduced, it can increase the CLS.
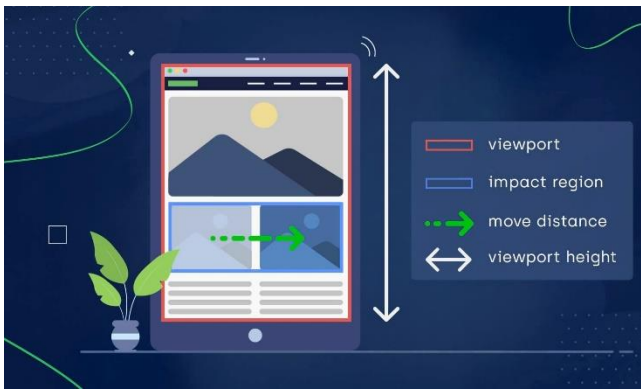

fig. CLS and moving section

1.7 Time to First Byte (TTFB)

(TTFB) indicates how long it takes for the browser to receive the first bits of information when it requests the first bits of information from the server.

2. Compress the photos

Compressing the photos on a website is something that most people forget. A big proportion of a website's size is the photos on each webpage. It's better if you use your photos in jpg or webp formats. It's also better if you first compress the photos using online tools before converting them into these formats.

3. Don't forget the Alt-Code for your photos

Alt-codes describe the photo for Google. This helps google to better understand the photos on the page. It's better to use alt-codes that are related to the page's title.
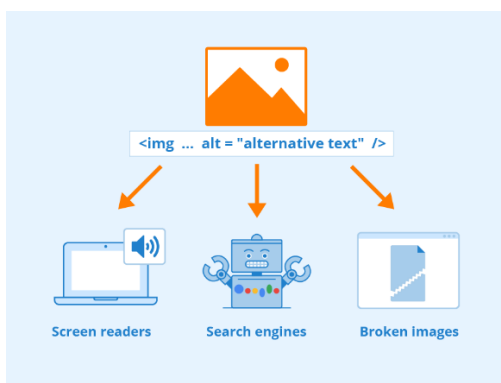

Fig. alt tags helping to google robots

4. Get SSL certification for your website

SSL is a security certification that allows users to connect to your website through the https protocol. Not only does this make your website safer, but it also prevents some browsers like Google Chrome from telling users that your website is unsafe.

5. Correctly redirect your domain

Google separately indexes your domain on http and HTTPS. Therefore, you should redirect them to one domain so only one of them gets the website's credibility. You need these two pieces of code to redirect your domain

```
RewriteEngine On
RewriteCond %{HTTPS} off
RewriteRule ^(.*)$
https://%{HTTP_HOST}%{REQUEST_URI} [L,R=301]
```

```
RewriteEngine on
RewriteCond %{HTTP_HOST} ^www.example.com [NC]
RewriteRule ^(.*)$ http://example.com/$1 [L,R=301,NC]
```

First part for redirect http to https and The second part for redirect www to non www

6. Check the robot's file

The robot file is a file that guides Google's bots. It tells them where on the site they should go and where they shouldn't. it's better if you restrict access to admin, feed, and some pages that have no purpose or are redundant.

7. Check your site map

The site map is another important part of your website. It acts as a map of your site pages for Google's bots.

8. Hardcode your site's language

Always indicate what language your site uses in the HTML code so google knows what is the main language of your website.

9. Check the site's internal links

Sometimes internal links of your website can break during the building process or when you redesign your site. Because of that you should always be checking your internal links and fixing the broken ones.

10. Optimize your website for mobile

According to statistics published by Google, 70% to 80% of a website's users use mobile devices to access the website. As a result, you should always optimize your user experience on mobile devices. Not only will this result in a better user experience, but it will also improve your performance on search results.
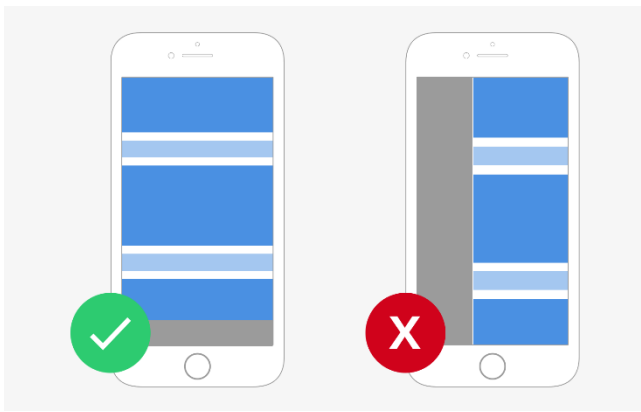
Fig. mobile usability

11. Check canonical tags

If you have two similar pages, you should use the canonical tag to tell Google which of the two pages is your home page and Google will rank your home page. Also, the presence of the canonical tag is necessary for each page.

Conclusion

we discussed that for a website to perform well on search results it should use SEO techniques in 3 aspects of On-Page, Off-Page, and Technical SEO. It is important to note that becoming an SEO specialist and implementing SEO techniques on your website is a specialized field and requires years and years of work.

References

[1] D. Tapscott and A. Tapscott. Blockchain revolution: how the technology behind bitcoin is changing money, business, and the world. Penguin, 2016.

[2] V. Buterin. A next-generation smart contract and decentralized application platform. Ethereum White Paper, 1-36, 2014.

[3] E. Castronova. Synthetic worlds: The business and culture of online games. University of Chicago Press, 2005.
[4] J. Gubbi, R. Buyya, S. Marusic, and M. Palaniswami. Internet of Things (IoT): A vision, architectural elements, and future directions. Future generation computer systems, 29(7), 1645- 1660, 2013.

[5] L. Atzori, A. Iera, and G. Morabito. The internet of things: A survey. Computer networks, 54(15), 2787-2805, 2010.

[6] M. Swan. Blockchain: blueprint for a new economy. O'Reilly Media, Inc., 2015.

[7] W. Mougayar. The business blockchain: promise, practice, and application of the next internet technology. John Wiley & Sons, 2016.

[8] M. Crosby, P. Pattanayak, S. Verma, and V. Kalyanaraman. Blockchain technology: Beyond bitcoin. Applied Innovation, 2(6- 10), 71-81, 2016.

[9] R. Böhme, N. Christin, B. Edelman, and T. Moore. Bitcoin: Economics, technology, and governance. Journal of Economic Perspectives, 29(2), 213-238, 2015. [10] Z. Zheng, S. Xie, H. Dai, X. Chen, and H. Wang. Blockchain challenges and opportunities: A survey. International Journal of Web and Grid Services, 14(4), 352-375, 2018. [11] O. Vermesan, P. Friess, and P. Guillemin (Eds.). Internet of things: Converging technologies for smart environments and integrated ecosystems (Vol. 163). River Publishers, 2013. [12] C. Stöcker and T. J. Lampoltshammer. Legal aspects of the blockchain. Journal of Information Security and Applications, 42, 54-61, 2018.