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REQUIREMENT FOR OPTIMIZATION IN WEB DEVELOPMENT

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Abstract – Optimization is one of the important steps to improve the performance of the website to meet the business objectives. The problems such as delay in loading page caused by large files, unwanted images, to prevent others from embedding your assets on other websites, etc.

There are many techniques to resolve such problems faced by the websites. In this paper there are few techniques which help in improving the performance of the websites. The study of the paper will help in understanding the importance of optimization in order to captivate the users. This also helps in developing user friendly applications.

This paper mainly concentrates on optimizing the loading time, JavaScripts, file compression, code minimization, image optimization and web fonts.

Keywords – **JavaScript, Optimization, AJAX, Website.**

1. Introduction.

The Website optimization generally includes the website, editing meta tags, image tags, and optimizing other components of your website to ensure that it is accessible to a search engine and overall chances of website being indexed by the search engine will be improved. Editing the websites which includes optimizing the scripts, HTML or the CSS code for the faster loading is know as optimization. It also reduces the number of components such as images, scripts, or video components that are needed to render the webpage [5]. It is also called as the search engine optimization (SEO). The main purpose of using SEO methodology is to increase the traffic of the visitors visiting the website. By doing optimization the website can gain the highest ranking in the in search engine results page (SERP) including search engines such as Google, Bing, Yahoo [5].

The optimization issues which are faced during the optimization of a website are mentions in the section 2 of this paper.

The solution for the issues in section 2 is mentioned in section 3 of this paper.

2. Challenges during website optimization.

2.1. Loading time of the website [2].

The optimal website will hold the user for longer time and will repeat the visits to the website and make use of the website. For that loading time would be important.

The speed of the website will make the first impression of the business. It's essential to understand that the developer won't get a second chance when it comes to user experience. Low website speed is one of the most frustrating things that will turn people off about the resource. The main intention of a website is to have high return visits, low bounce rates, higher conversions, engagement, higher ranks in organic search, and better user experience which is the result of the high-performance websites.

2.2. Lengthy JavaScript code for smaller file sizes.

Lengthy JavaScript code will take more time to process it. This will impact the performance of the website. The following are the issues caused by the lengthier JavaScript code:

2.2.1. Browser limitations: Uploading the files with more than the limitations, the browser itself will not allow to upload them.

2.2.2. Server configuration issues: This comes up most frequently with PHP, but make sure that the web server is configured to handle any files at the size. The configuration issues such as Unexpected (End Of Files)EOFs on client side, HTTP streaming errors etc.

2.2.3. Memory issues: Uploading some seriously large files, then these problems will arise. This will lead to web servers to start complaining due to the memory usage required.

2.3. Redundant use of .js library.

It is not a good practice to include .js libraries in all the web pages. The .js library functions are included in the index page, same can be used to other pages in the website. When website is designed, all the pages in that website will be inter-connected. The .js library files are added to include some of the components that is used for the functioning of the website. Using .js library files in all the pages will create the problems in loading the library files twice. It is also not a good practice to load the libraries with same functionality and loading unnecessary libraries.

2.4. Not using a JavaScript content delivery network (CDN).

The JavaScript CND combination is used to improve the delivery speed of these assets such as libraries, framework, or any other static js files. They are used to shorten the distance between the client and the servers that gives the client with the requested data.

A CDN provides,

Speed: The CND will help the in improving the speed as the site's content will be served from a nearest data center.

Redundancy: When the CND's node is busy then another node is used to control the traffic.

Security: The CND will add some of the additional level of security.

2.5. Usage of CSS and JavaScript code in the middle of the code.

The libraries included in the middle of the code will take more time to load. Using a lot of JavaScript and CSS files will lead to large number of HTTP requests. This in turn results in more transaction between client and the server which will affect the optimization. These HTTP requests will create time overhead and thus affecting the website optimization.

2.6. Image size of the website [4].

The best and the vital role is played by images in the website. The attractive images and the eye-catching images attract the visitors to the website. But the negative aspect of the images is that, they are large in size. This will directly have impact on the loading time of the website and thus causing the hindrance on the client traffic in the website.

2.7. Use of web fonts [3].

Web font is popular in designing the websites. Catchy web fonts will attract the visitors towards the website. But the web fonts have the negative impact also. The web font creates some extra HTTP request to the external resources and thus increasing the web page loading time. This will decrease the loading speed of the website.

3. Optimization Techniques used for optimizing.

3.1. Optimizing loading time of the website.

The best way to reduce the loading time of a website is to apply the AJAX to the coding part. Applying AJAX will help the website fetch the data from a web server without essentially requiring the page to be refreshed. It allows the website to quickly load and fill in updated content while the viewer is still browsing through the mobile page.

When developing a website, the common mistake done is, all the contents and the included files are loaded every time when the page is opened, which leads in increasing the loading time of the page.

Consider a simple code which helps in opening the page with the minimum loading time[1].

```
$(document).ready(function () {[1]

$('a.mybutton').on('click', function(e)

{

e.preventDefault(){

$('#content').load($(this).attr('href'));

});

});
```

The above JavaScript will load the content of the page which is described with the id=”#content”. The

preventDefault() function will prevent the default action on clicking the button. This will load the content page which will be mention in the upcoming functions. This will also help in opening modals by using buttons in the page.

When the AJAX is used, there should be a URL. The file which is called using that URL inside the AJAX code must also include all the database files. The Ajax will not automatically include the database files.

3.2. Optimizing length of the code.

Optimizing the length of the code will reduce the loading time and will improve the performance of the website. This can be done by including the AJAX code. The data is sent by the id and called them by id using the AJAX.

The below example is used for form submission with image and the file. This code will send both files and form data together. This will help in minimizing the code length. The process it involves will improve the loading time of the page. The form submission will take less time. The URL of the file must be included for which the form id is being submitted.

```
$("#emp").submit(function(e)[1]        {
e.preventDefault();
var fd= new FormData();
fd.append('photo',$('#emp photo')[0].files[0]);
fd.append('resume',$('#emp resume')[0].files[0]);
var data = $("#emp").serializeArray();
$.each(data, function(i, field)
{
fd.append(field.name, field.value);
});
$.ajax({
type:'POST',
url:'addemployee.php',
data: fd,
processData: false,
contentType: false,
success:function(msg){
$('#content').load('addemployee.php');
alert(msg);
}
});
});
```

3.3. Optimizing .js library files.

It is important to a web developer to load the libraries which is required for that particular website.

Consider the below example in which both .js library files load similar components but they are different versions.

```
<script
src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/
1.14.0/umd/popper.min.js"integrity="sha384-
cs/chFZiN24E4KMATLdqdvsezGxaGsi4hLGOzlXw
p5UZB1LY//20VyM2taTB4QvJ"
crossorigin="anonymous"></script>[1]
```

Now there is no need to use the library such as,

<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.2.0/jquery.min.js"></script> [1]

3.4. Optimizing with the help of JavaScript CND libraries.

The CND libraries will provide the speed, redundancy and security to the website. These CND libraries will help in reducing the complexity of the codes in the programs.

Consider the library mentioned below,

<script src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.14.0/umd/popper.min.js"integrity="sha384-cs/chFZiN24E4KMATLdqdvsezGxaGsi4hLGOzlXwp5UZB1LY//20VyM2taTB4QvJ" crossorigin="anonymous"></script> [1]

This library is used if bootstrap is used in the project.

3.5. Optimization of JavaScript and CSS files.

To optimize the JavaScript and CSS files include two most important aspect, that is to move all the JavaScript and CSS codes to the top of you code.

If a file is created only for the JavaScript codes and the CSS files then the overall HTTP requests are reduced.

3.6. Optimizing images in the website.

The best way to manage image file is to compress them and reduce their clarity. The best tools for compressing images are ImageOptim, JPEGmini, or Kraken.

The below JavaScript function is the example for resizing the image. It fill increase and decrease the size of image file.

```
function zoomin(){ [4]

var myImg = document.getElementById("destinationfile");

 var currWidth = myImg.clientWidth;

if(currWidth == 500){

alert("Maximum zoom-in level reached.");

} else{

myImg.style.width = (currWidth + 50) + "px";

}

}

function zoomout(){ [4]

var myImg = document.getElementById("destinationfile");

 var currWidth = myImg.clientWidth;

if(currWidth == 50){

alert("Maximum zoom-out level reached.");

 } else{

myImg.style.width = (currWidth - 50) + "px";

}

}
```

3.7. Optimizing web fonts.

Web font problem can be solved by using the fonts which are needed for the website and by choosing the needed styles. By using modern formats WOFF2 for

modern browsers will absolutely increase the performance of the website.

Different versions of WOFF2 format[3]:

https://www.w3.org/TR/2018/REC-WOFF2-20180301/

https://www.w3.org/TR/WOFF2/

https://www.w3.org/TR/2018/PR-WOFF2-20180111/

https://w3c.github.io/woff/woff2/

4. Conclusion.

The critical parameters for website traffic are website's success, loading time, visibility and usability. The web developers have to focus mainly on these parameters. To attain this we require simple yet effective optimization approach. This will also attract the visitors, increasing the traffic and the revenue.

In our work we have proposed the optimization techniques for the challenges during website optimization.

- The main challenge is the loading time of the website. This problem can be solved by using AJAX for coding. Using AJAX will help in preventing the unnecessary loading of the files every time.
- Length of the JavaScript code will affect the process time and cause memory issues and browser limitations. This can be optimized using the AJAX code. The AJAX code will send the data by id and call them by id.
- Redundant use of the JavaScript libraries will cause the problems loading them twice. So using these libraries in the index page once will work for all the pages.
- Using CND libraries will provide the speed, redundancy and security to the website. These CND libraries will help in reducing the complexity of the codes in the programs.
- Including the CSS and JavaScript in the middle of the code will increase the loading time of the website. Therefore, moving all the JavaScript and CSS codes to the top of you code will solve this problem.
- Including images in the website will increase the loading time of the website. Therefore, image optimization in very important. Resizing the image will solve this problem.
- Using web font will increase the loading speed of the website. Therefore, using modern formats WOFF2 for modern browsers will absolutely increase the performance of the website.

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