

## Design Evaluation of Commercial Websites of India

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**Abstract**— Design of the commercial websites is a crucial and important factor that should be considered for improving its effectiveness, efficiency and satisfaction w.r.t services to citizens [1]. In this study the effectiveness of various design parameters (such as page size, composition, download time etc.) on commercial website will be analyzed by taking into considerations different website development standards recommended for them. The aim of this study is to analyze different commercial Website by testing their existing design with the help of design evaluation tool developed for the purpose to understand their deviations from the standards and to evaluate their performance with respect to the parameters considered by the tool. The results indicated that there is an urgent need to improve the design features of commercial websites in order to be more effective and user-centric. The authors took 20 commercial websites of India, analyze their different parameters and on the basis of analysis show their overall compliance with the standards and guidelines. With the help of the results obtained a graphical analysis of the websites is made by the authors that determine the effect of these parameters on the efficiency and accessibility of the commercial websites.

**Keywords**—Website design, Webpage size, HTML, CSS, Website Evaluation, Website Standards, Website Guidelines, Page Loading Speed.

### I. INTRODUCTION

As internet usage is growing daily the people around the globe are coming closer. With the advent of World Wide Web as a vast phenomenon, it has surprisingly brought the world closer making it a smaller piece to live in for its user. The number of citizens seeking information and services online are increasing rapidly in almost every country of the world. The customers expect commercial websites to save their money and time. The responsibility of the organizations is to design websites that are easy to use and are accessible to each and every type of citizen. Implementing the simple principle of having website that works well and doesn't confuse the user or get him frustrated, will help to reduce the abandonment of the website by visitors. But during the development process errors creep into the design of websites either implicitly or explicitly [2].

Evaluation is a systematic determination of a subject's merit, worth and significance, using criteria governed by a set of standards. Design, organization and ease of use are important considerations. Web sites can provide useful sources of information; but if they are slow to load and/or difficult to navigate, search or read, then their contribution or usefulness will be diminished. An effective web design is one in which your users are able to find information quickly and in a logical fashion.

Do they visit the content you want them to visit? Are they looking in the right places of your web page? Are you able to keep your user's attention, or do they just leave quickly? It's not just about the content either. If your design loads slowly – or if moving from one section to another takes a long time – it affects the user's experience. These things can be the make-or-break factors between a user clicking on a link to find more information, or the back button to find it elsewhere.

a) *Few things to consider in website design [3]:*

- Is important information being *seen* by the user ?
- Are the navigation and action items intuitive ?
- Is the user being *directed* to sections in a logical manner?
- Does the web page load *quickly* enough to not turn away the user?

Based on the above reasons a detailed study of commercial websites of India was made with the help of Website Design Evaluator tools created for the purpose based on various standards set by W3C (World Wide Web Consortium). The tool calculates the size of individual elements and sums up each type of web page component. Based on these page characteristics the script then offers advice on how to improve page load time. The tool incorporates the latest best practices for web page size guidelines and trends, and web site optimization techniques into its recommendations.

## II. METHODOLOGY

Website Design Evaluator is a tool developed by us to help the web designer to analyse the performance of a web page on the basis of various webpage design parameters. It evaluates design of Webpages by analysing their various parameters. A website is associated with various design parameters such as browser compatibility, size of website, color combination used, technologies used, number of hyperlinks in the webpage, etc. These parameters provide different meanings in different design contexts e.g. the color combination used parameter provides information regarding the various colors used for the design of the website. Since Webpages are accessed by a large group of globally distributed people with different kinds of requirements and disabilities, Web pages are hard to design [4]. Another major reason they are hard to design is because there are so many different browsers that can be used to view them. You've got your basics IE, Firefox, Opera, and Safari, oh, and now Chrome. Then you've got cell phones and PDAs as well as gaming systems, printers, text browsers, screen readers, and so on. And most of these browsers have multiple versions with different attributes as well. Therefore, the webpage developers and designers must take into account the various issues related to the user. Website Design Evaluator will be of great use to the designers as it will provide them with a handful of information regarding a webpage's design. It will help them in shaping their websites as according to the standards provided so that it can be accessible to maximum of the users meaningfully.

A large number of online tools for website evaluation are already available but all these tools are restricted to a few number of parameters usually one or two. Website Design Evaluator is the only tool comprised of nine parameters with most of the parameters which were not yet evaluated online.

Each module checks individually the websites on the bases of different rules appended inside the parameter. All these parameters are based on parsing various components of a website like HTML, CSS etc. The objective of this tool is to find out the flaws that creep into the design of a web page either implicitly or explicitly during its development process. Since we know that the performance of a website is most affected by the way it is designed, it must be designed in accordance with the standards provided by concerned authorities so that it can gain a better popularity [4] [5]. Until now a number of online tool are available that describe various design issues but all these tools are incorporated with various flaws. Website Design Evaluator tries to overcome all these problems that are faced by these tools. All the modules of Website Design Evaluator act independently to provide statistic features of the website. The tool is based on the principle in which a webpage is parsed for various attributes from the webpage's html file downloaded with the help of http request/response methods invoked by the different modules of the tool [6]. Two parsers an html parser and a CSS parser are used by all the modules of this tool to derive the context related data by parsing the tags of the html file downloaded from website's

server. All what this tool requires is the URL of the website that is to be checked for various design issues.

The various parameters that are part of this tool related to a website's design are:

- ✓ Browser Compatibility.
- ✓ Technology Used.
- ✓ Web Site size.
- ✓ Color Combination.
- ✓ Website Security.
- ✓ Page Loading Speed.
- ✓ Site Map.
- ✓ No. of hyperlinks.
- ✓ Feedback.

A total of about 20 websites from the commercial portal of India were analyzed by the authors for the following parameters [7]. Based on the results collected from the tool a graphical analysis of the sites was made that helped to determine their deviations from the guidelines provided.

### Browser Compatibility:

Browser compatibility or cross browser compatibility module is most important for web site design. Assume that you develop a site on some browser and deliver it to client who is using different browser and you find that the site is not working synonymous to your browser. So while developing web site browser compatibility is the major issue which should be taken into consideration. Today there are number of browsers being used. As the number of browsers increases the compatibility issue becomes more important to be taken into consideration during the design of a website [5][6]. There are number of compatibility issues in web site design it is quite a cumbersome to evaluate all the issues for a website. So we took some of the common issues like resolution of web page, ActiveX control, Image used in web page, blinking of element in web page, html tag used in web page. These parameter supports are compared with most commonly used browsers like chrome, Mozilla Firefox, Safari, IE 7 and IE8. The considered web page is checked for these parameters and if page contains it, the result shows whether the parameter is compatible with the browser or not.

By analyzing the resultant table we can reconstruct our web page by taking the entire compatibility issues into consideration. For example, if your web page resolution is fixed in pixels, it will create issues if user views the web page on different resolution. Similarly if the page uses tags which are not universally supported, the data inside such tags is not rendered properly by the browser. In gist this module helps the designer to design a website that meets all the cross browser compatibility issues [8].

### Technology used:

This module gives you the brief description of technology being used to develop the web page.

It contains two parts:

- i) Client Side Technology, and
- ii) Server Side Technology.

Client Side technology: This resultant part tells us the technology like HTML, CSS, JavaScript, and Ajax Used by the site. It firstly tells you what version of html is used in

writing the web page. For example page may be written in HTML 5, HTML 4.01 strict, HTML 4.01 transitional, HTML4.01 frameset, or XHTML 1.0 strict, XHTML 1.0 transitional, XHTML 1.0 Frameset, XHTML 1.1. Secondly, it tells whether web page uses CSS for designing or not. Thirdly, it tells us about the use of JavaScript and finally the use of Ajax control. Now a day's developers mostly use Ajax control for decreasing the load of server and increasing interactivity.

**Server Side Technology:** This part gives us the information like Server name, Protocol Version, Content Type, Powered By, Method Used.

**Server name:** This shows you the server on which the site resides. It has been observed that some secure site does not reveal its server name to browser, in such cases value of server name appear to be `HIDDEN`.

**Protocol Version:** This value gives us the http version used by server to send data to the client (Browser).

**Content Type:** The MIME type of this content. For example Content-Type: `text/html`; `Charset=utf-8`.

**Content Encoding:** It determines the type of encoding used on the data. For example, Content-Encoding: `gzip`.

**Powered-By:** specifies the technology (e.g. ASP.NET, PHP, JBoss) supporting the web application (version details are often in X-Run-time, X-Version, or X-Asp Net-Version). For example, X-Powered-By: `PHP/5.4.0`

**Method Used:** Tells us the type of method used to transfer the data. For example, Method: `GET`.

#### **Website Size:**

This module gives the total size of the components of the webpage. A webpage is composed of many different things like html, CSS, static images, CSS images, java script etc. The size of component modules is calculated with the help of http request/response method invoked by the functions. The links of different files that are components of a webpage are obtained by parsing the html/CSS file. The URL of the site that is to be analyzed for its total size is entered by the user [9]. An online request generated is sent to the server of the site to obtain the html file of the website [10] [11]. The different tags of the so obtained html file are parsed with the parsers designed for the purpose to obtain the links of various files like CSS, images, java script etc. The size of these files is then calculated with the help of links so obtained with the help of http request/response method.

#### **Color combination used:**

While developing web page we should keep in mind, type of users who get connected to it. In such a large number of users there are some people who are unable to differentiate between some colors, such persons are color blind. If while developing webpage we use such colors, we discard such people from using that web page. So in process of development of site, color should be chosen carefully.

Color blindness is of different type, in this module we took three most common types of color blindness and check their visibility against different elements used in web page. The

three common type of color blindness are Protanopia, Deuteranopia, and Tritanopia.

Protanopia is a severe type of color vision deficiency caused by the complete absence of red retinal photoreceptors. It is a form of dichromatism in which the subject can only perceive light wavelengths from 400 to 650nm, instead of the usual 700nm. Pure reds cannot be seen, instead appearing black; purple colors cannot be distinguished from blues; more orange-tinted reds may appear as very dim yellows, and all orange-yellow-green shades of too long a wavelength to stimulate the blue receptors appear as a similar yellow hue [04] [12].

Deuteranopia is a color vision deficiency in which the green retinal photoreceptors are absent, moderately affecting red-green hue discrimination. It is a form of dichromatism in which there are only two cone pigments present.

Tritanopia is a very rare color vision disturbance in which there are only two cone pigments present and a total absence of blue retinal receptors. It is related to Chromosome "7".

This parameter parse all the elements of web page evaluate their background and foreground color and then test their visibility against Protanopia, Deuteranopia, and Tritanopia persons.

#### **Website Security:**

This parameter checks whether your site is secure or not. While requesting a web page from server, a connection is established between browser and server. The connection will be either public or secure. Secure connection uses a digital certificate technology. This module provides you information in two parts. Firstly it gives you information about certificate provided to your site and secondly it gives you technical information about connection between client (browser) and server.

**Certificate:** How do you know that you are dealing with the right person or rather the right website? Well, someone has taken great length (if they are serious) to ensure that the web site owners are who they claim to be. This someone, you have to implicitly trust: you have his/her certificate loaded in your browser (a root Certificate). A certificate contains information about the owner of the certificate, like e-mail address, owner's name, certificate usage, duration of validity, resource location or Distinguished Name (DN) which includes the Common Name (CN) (web site address or e-mail address depending of the usage) and the certificate ID of the person who certifies (signs) this information. It contains also the public key and finally a hash to ensure that the certificate has not been tampered with [13] [14] [15]. As you made the choice to trust the person who signs this certificate, therefore you also trust this certificate. This is a certificate trust tree or certificate path. Usually your browser or application has already loaded the root certificate of well-known Certification Authorities (CA) or root CA Certificates. The CA maintains a list of all signed certificates as well as a list of revoked certificates.

The first part of this module provide you information of certificate like, Serial no., Issued by , Issued To, Validation. Serial Number: Used to uniquely identify the certificate.

Issued by: Entity that verifies the information and issues the certificate.

Issued To: Entity to which the certificate has been issued.

Validation: The date the certificate is first valid from and date to which the certificate is valid.

The second part contains information about connection created between browser and server for a web page. It include Signature algorithm, Encryption Algorithm, Key Exchange Algorithm, Secure Socket Layer Protocol used, and Message authentication Algorithm.

Signature Algorithm: Certificates and CRLs conforming to [RFC 3280] may be signed with any public key signature algorithm. The certificate or CRL indicates the algorithm through an algorithm identifier which appears in the signature Algorithm field within the Certificate or Certificate List. It is an algorithm used to create a Signature. The signature is used to verify that it came from the issuer.

Encryption Algorithm: Algorithm used to encrypt data before transferring it to the server. For Example Rc4. The RC algorithms are a set of symmetric-key encryption algorithms invented by Ron Rivest. The "RC" may stand for either Rivest's cipher or, more informally, Ron's code.

Key-Exchange-Algo: Key exchange (also known as "key establishment") is any method in cryptography by which cryptographic keys are exchanged between users, allowing use of a cryptographic algorithm. For example, In cryptography, PKCS #1 is the first of a family of standards called Public-Key Cryptography Standards (PKCS), published by RSA Laboratories. It provides the basic definitions of and recommendations for implementing the RSA algorithm for public-key cryptography.

Message-Authentication-Algo: A MAC algorithm, sometimes called a keyed (cryptographic) hash function (however, cryptographic hash function is only one of the possible ways to generate MACs), accepts as input a secret key and an arbitrary-length message to be authenticated, and outputs a MAC (sometimes known as a tag). The MAC value protects both a message's data integrity as well as its authenticity, by allowing verifiers (who also possess the secret key) to detect any changes to the message content.

Secure Socket Layer Protocol: It provides us with the type and version of SSL protocol used.

#### Page Loading Speed:

This parameter checks the page loading time of a website on different connection rates and determines the downloading times. It calculates the speed of the current connection by taking the average of the bytes received over a period of time. This speed is then used to calculate the load times on current connection [16]. The page loading time on other connection rates such as 14.4kb/s, 28.8kb/s etc are calculated by dividing the size of the webpage of URL under consideration by the byte rate speed of the connection for which load time is to be calculated.

#### Sitemap:

The sitemap of a website is determined by parsing the html file of the website for the tag containing the sitemap keyword. All the tags of the file are parsed out into an array from which they are analyzed one by one to determine whether they contain the substring sitemap. If the substring is found it means that a valid sitemap is present in the site else it does not exist.

#### Number of Hyperlinks:

There are two things that are analyzed through this module. One is the number of hyperlinks contained in the website and another is to find number active and broken links in the site. The total number links is determined by counting the total number of anchor tags from the html file of the site. The number of active and broken links is determined by requesting the status code of each of the hyperlink with the help of http request/response method [17]. The obtained status code of each link is matched with the status codes provided by the standards organizations such as 404 for broken links to determine whether it broken or active.

#### Feedback:

The criteria used to find whether a site provides a feedback or not is same as used for finding site map. Feedback of a website is also determined by parsing the html file of the website for the tag containing the feedback keyword. All the tags of the file are parsed out into an array from which they are analyzed one by one to determine whether they contain the substring feedback. If the substring is found it means that the site provides a feedback option to obtain user feedbacks else it does not exist.

### III. RESULTS AND DISCUSSION

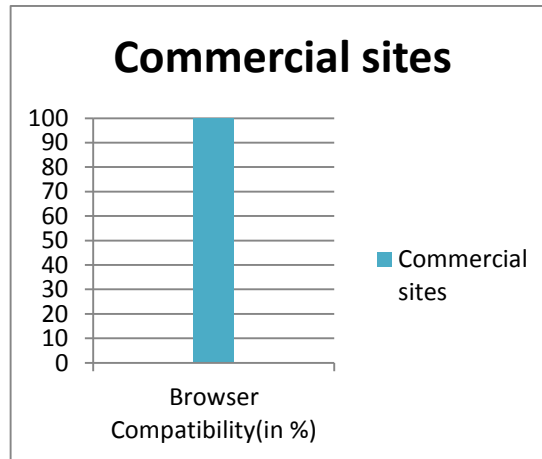
On testing and analyzing about 20 e-commerce sites on Webpage Analyzer tool the statistics obtained for various parameters are listed in the table 1 given below:

Table 1

S.No.	Websites	S.No.	Websites
1.	<a href="http://www.bsnl.co.in">www.bsnl.co.in</a>	11.	<a href="http://www.marutisuzuki.com">www.marutisuzuki.com</a>
2.	<a href="http://www.onlinesbi.com">www.onlinesbi.com</a>	12.	<a href="http://www.britannia.co.in">www.britannia.co.in</a>
3.	<a href="http://www.airtel.in">www.airtel.in</a>	13.	<a href="http://www.pg.com">www.pg.com</a>
4.	<a href="http://www.india.philips.com">www.india.philips.com</a>	14.	<a href="http://www.colgatepalmolive.com">www.colgatepalmolive.com</a>

5.	<a href="http://www.libertyshoes.com">www.libertyshoes.com</a>	15.	<a href="http://www.hindwarehomes.com">www.hindwarehomes.com</a>
6.	<a href="http://www.bata.in">www.bata.in</a>	16.	<a href="http://www.pepejeans.com">www.pepejeans.com</a>
7.	<a href="http://www.hp.com">www.hp.com</a>	17.	<a href="http://www.ashokleyland.com">www.ashokleyland.com</a>
8.	<a href="http://www.tata.in">www.tata.in</a>	18.	<a href="http://www.dabur.com">www.dabur.com</a>
9.	<a href="http://www.godrej.com">www.godrej.com</a>	19.	<a href="http://www.pepsico.com">www.pepsico.com</a>
10.	<a href="http://www.hul.co.in">www.hul.co.in</a>	20.	<a href="http://www.coca-cola.com">www.coca-cola.com</a>

**Graphical Analysis for Browser Compatibility:**



**Fig.1 Percentage for Browser Compatibility**

**Description:**

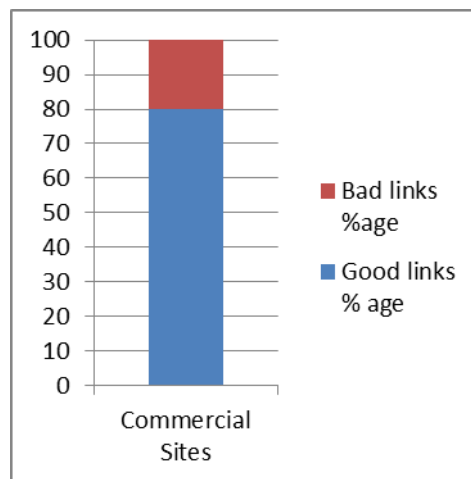
The different categories of websites were tested by taking into consideration the following parameters:

- (1) Blinking (2) ActiveX Controls (3) Resolution (4) Images (5) HTML Tags Error

**Conclusion:** Based on the analysis from the above graph in Fig.1 the commercial websites have maximum support in

percentage for various types of commonly used browsers such as chrome, explorer, opera etc. as these websites follow the maximum of standards as far as browser compatibility parameter is concerned as prescribed in W3C guidelines document UAAG 2.0 .

**Graphical Analysis for No. of Hyperlinks:**



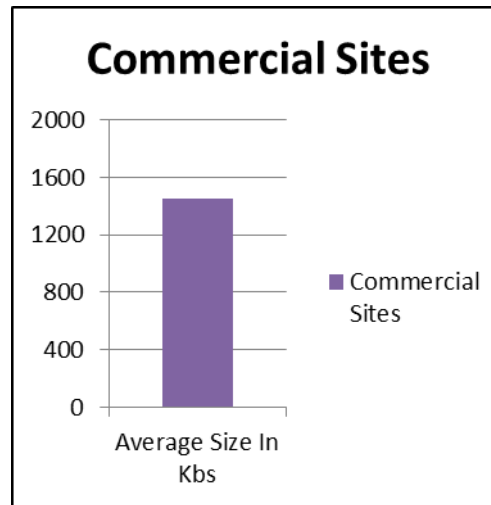
**Fig.2 %age for Good and Bad links**

**Description:**

The websites are tested by taking into consideration the total number of links which includes the number of good and bad links. The percentages of good and bad links are depicted in each category separately.

**Conclusion:** Based on the analysis from the above graph in Fig.2 the commercial sites possess good and bad links in the

80:20 ratios that means out of 10 hyperlinks present on a webpage of a commercial website there are possibly 2 hyperlinks that lead to error page [18]. Hence it can be concluded that commercial websites don't properly follow the standards as far as no. of hyperlinks parameter is concerned prescribed in W3C guidelines document WCAG 2.0.

**Graphical Analysis for Website Size:****Fig.3 Average size for different categories of sites****Description:**

The size of different categories of websites was tested by taking into consideration the html used, CSS used, JavaScript used, CSS images used and static image used. The total size of the page is calculated with the addition of all the sizes of above parameters. According to the standards [19] it has been recommended that total page size should not be more than 100 kbs so that it can be optimal for various internet connections. The graph in Fig.3 shows the average size of commercial websites.

**Conclusion:** Based on the analysis from the above graph in Fig.3 it can be analysed that commercial websites don't follow as per the standards as far as website size parameter is

concerned. Today, the aim is still to confine the sites less than 100 kbps, as that would equate to a rough download time of 30 seconds on a dial-up connection [20]. The 100kB limit is still a great rule of thumb. Broadband is commonplace now, and yes, many pages are substantially over that. But dialup is still in use, mobile phones are being used more often (and are not as fast as desktop browsers), and people usually get broadband so they can get the same stuff faster, not so you can stuff pages with more pictures. Another important factor is that Google is now using page speeds in its search ranking algorithms. Hence it can be concluded from the above graph that maximum of commercial websites totally diverge from the standards as far as website size limit is concerned [21].

**Analysis based on different categories of websites separately for Website Size parameter:** Statistics taken from Website Design Evaluator for Website Size parameter for different categories of websites taken from Sample Data table of 1:

**Table 2**

S.No.	website	Commercial sites(in kbs)	S.No.	website	Commercial sites(in kbs)
1.	<a href="http://www.bsnl.co.in">www.bsnl.co.in</a>	87.91	11.	<a href="http://www.marutisuzuki.com">www.marutisuzuki.com</a>	1238.85
2.	<a href="http://www.onlinesbi.com">www.onlinesbi.com</a>	57.45	12.	<a href="http://www.britannia.co.in">www.britannia.co.in</a>	363.69
3.	<a href="http://www.airtel.in">www.airtel.in</a>	99.78	13.	<a href="http://www.pg.com">www.pg.com</a>	52.7
4.	<a href="http://www.india.philips.com">www.india.philips.com</a>	263.54	14.	<a href="http://www.colgatepalmolive.com">www.colgatepalmolive.com</a>	104.21
5.	<a href="http://www.libertyshoes.com">www.libertyshoes.com</a>	535.68	15.	<a href="http://www.hindwarehomes.com">www.hindwarehomes.com</a>	759.63
6.	<a href="http://www.bata.in">www.bata.in</a>	1539.123	16.	<a href="http://www.pepejeans.com">www.pepejeans.com</a>	235.65
7.	<a href="http://www.hp.com">www.hp.com</a>	855.704	17.	<a href="http://www.ashokleyland.com">www.ashokleyland.com</a>	75.05

8.	<a href="http://www.tata.in">www.tata.in</a>	127.31	18.	<a href="http://www.dabur.com">www.dabur.com</a>	2529.8
9.	<a href="http://www.godrej.com">www.godrej.com</a>	612.46	19.	<a href="http://www.pepsico.com">www.pepsico.com</a>	3104.26
10.	<a href="http://www.hul.co.in">www.hul.co.in</a>	503.47	20.	<a href="http://www.coca-cola.com">www.coca-cola.com</a>	122.62

Graph showing deviation of Commercial sites from the standards:

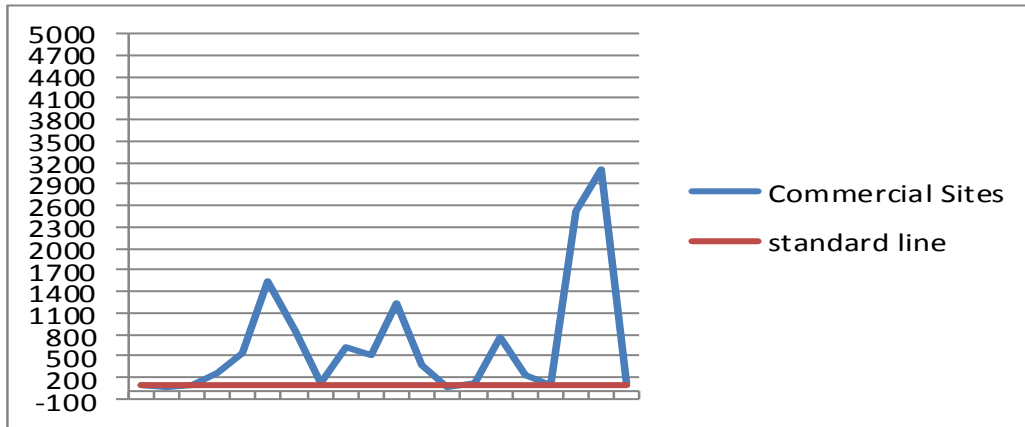


Fig. 4

Percentage Graph for Commercial websites:

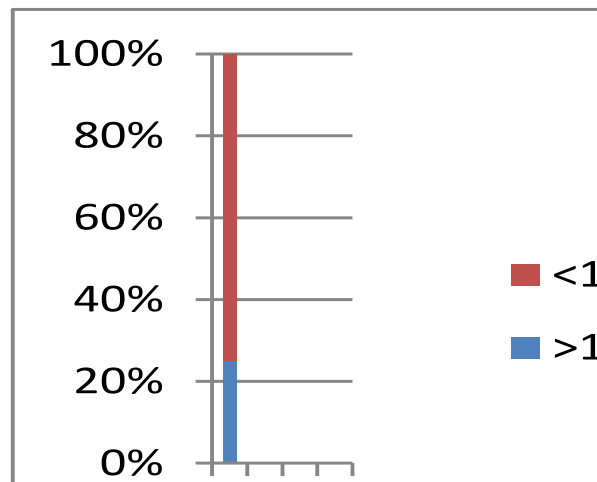
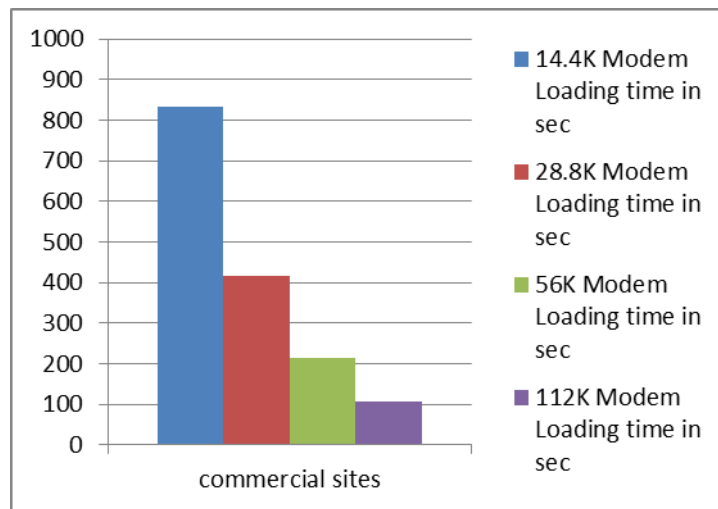


Fig. 5

The testing of all the commercial sites was done by using the website design evaluator tool which was developed to calculate the size of parameters like html, CSS, CSS images, js and static images. It has been observed that 25 percent of commercial sites are with less than or equal to 100kb rest all

does not follow the standard of having a size less than the recommended size of 100kb thus affecting the page loading speed which is very important factor as far as the users are concerned.

**Graphical Analysis for Page loading Speed:**



**Fig. 6**

**Conclusion:** Based on the analysis from the above graph it can be concluded that with the increase in modem speeds the time loading speed of commercial sites decrease linearly but as per the standards and the size of commercial websites these

sites don't compliance as far as page loading speed parameter is concerned prescribed in W3C and as prescribed in analysis performed in [22].

**Analysis based on different categories of websites separately for Page Loading Speed parameter:**

Statistics taken from Website Design Evaluator for Page Loading Speed parameter for different categories of websites taken from Sample Data table 1:

**Table 3**

S. No.	websites	Commercial Sites (time in sec.)				S. No.	websites	Commercial Sites (time in sec.)			
		14.4k	28.8k	56k	112k			14.4k	28.8k	56k	112k
1.	<a href="http://www.bsnl.co.in">www.bsnl.co.in</a>	6.1	3.05	1.53	0.79	11.	<a href="http://www.marutisuzuki.com">www.marutisuzuki.com</a>	86.03	43.01	21.5	10.77
2.	<a href="http://www.onlinesbi.com">www.onlinesbi.com</a>	3.99	1.99	0.997	0.498	12.	<a href="http://www.britannia.co.in">www.britannia.co.in</a>	25.26	12.62	6.31	3.16
3.	<a href="http://www.airtel.in">www.airtel.in</a>	6.92	3.46	1.73	0.87	13.	<a href="http://www.pg.com">www.pg.com</a>	3.66	1.83	0.91	0.47
4.	<a href="http://www.india.philips.com">www.india.philips.com</a>	18.3	9.15	4.57	2.29	14.	<a href="http://www.colgatepalmolive.com">www.colgatepalmolive.com</a>	7.24	3.62	1.81	0.91
5.	<a href="http://www.libertyshoes.com">www.libertyshoes.com</a>	37.2	18.6	9.3	4.65	15.	<a href="http://www.hindwarehomes.com">www.hindwarehomes.com</a>	52.75	26.37	13.18	6.61
6.	<a href="http://www.bata.in">www.bata.in</a>	106.8	53.44	26.72	13.38	16.	<a href="http://www.pepejeans.com">www.pepejeans.com</a>	16.36	8.18	4.09	2.1
7.	<a href="http://www.hp.com">www.hp.com</a>	59.42	29.71	14.85	7.44	17.	<a href="http://www.ashokleyland.com">www.ashokleyland.com</a>	5.21	2.6	1.3	0.71
8.	<a href="http://www.tata.in">www.tata.in</a>	8.84	4.42	2.21	1.13	18.	<a href="http://www.dabur.com">www.dabur.com</a>	175.6	87.84	43.92	22
9.	<a href="http://www.godrej.com">www.godrej.com</a>	42.53	21.26	10.63	5.35	19.	<a href="http://www.pepsico.com">www.pepsico.com</a>	215.5	107.7	53.89	27.01
10.	<a href="http://www.hul.co.in">www.hul.co.in</a>	34.96	17.48	8.74	4.39	20.	<a href="http://www.coca-cola.com">www.coca-cola.com</a>	8.52	4.25	2.13	1.064



Graph showing deviation of Commercial sites from the standards:

Graphical Analysis for Technology:

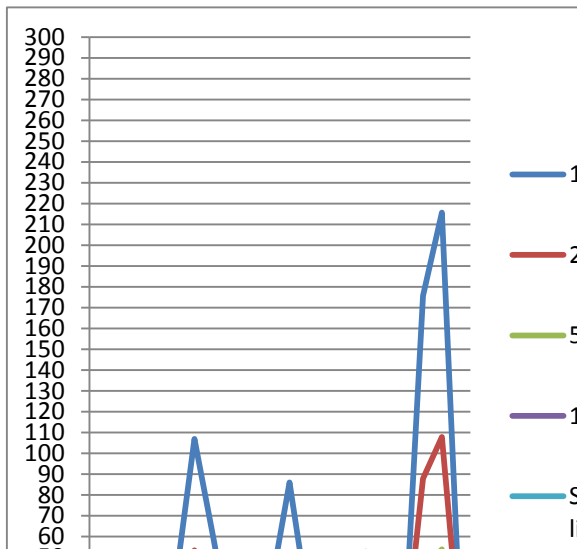


Fig. 7

Percentage Graph for Commercial websites:

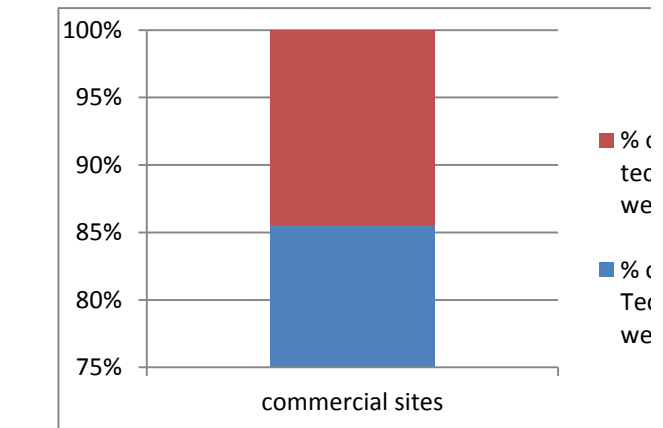


Fig. 9

Conclusion:

Based on the analysis from the above graph the category with maximum percentage for technologically well websites is commercial and the category with average sites as far as technology is concerned is government which means that out of the five different categories of websites employed for analysis the commercial sites follow the maximum of standards as far as technology parameter is concerned prescribed in W3C guideline document WAI-ARIA 1.0.

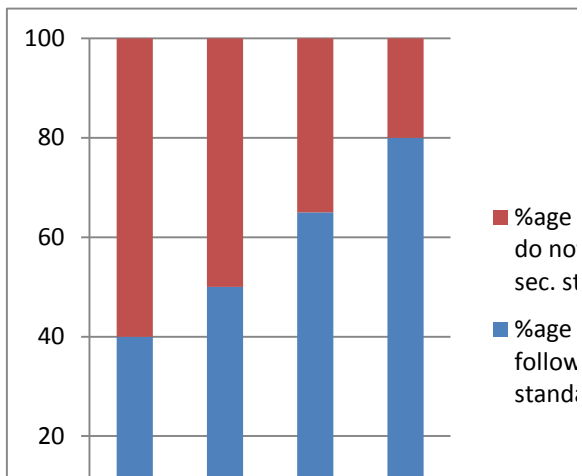


Fig.8

The testing of all the commercial sites was done by using the website design evaluator tool which was developed to calculate the page loading time of websites on various types of commonly used modem speeds. It has been observed that on average 58.75 percent of commercial sites are with less than or equal to 9.8 seconds load time which means rest all does not follow the standard of having a page loading time less than or equal to the recommended [23] loading time of 9.8 seconds.

**Analysis based on different categories of websites separately for Technology Used parameter:** Statistics taken from Website Design Evaluator for Technology Used parameter for different categories of websites taken from Sample Data table 1:

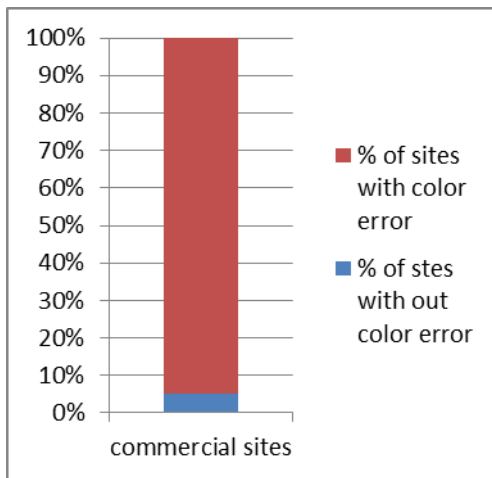
Table 4

S.No.	Client side technology				Server side technology				
1.	XHTML 1.0 Transitional	CASCADING STYLE SHEET	JAVA SCRIPT	AJAX control	APACHE/2.2.21 (UNIX) MOD_SSL/2.2.21 OPENSSL/0.9.7L MOD_JK/1.2.32 PHP/5.3.8	1.1	TEXT/HTML; CHARSET=UTF-8	HIDDEN	GET
2.	XHTML 1.0 Transitional	CASDADING STYLE SHEET	JAVA SCRIPT	--	HIDDEN	1.1	TEXT/HTML	HIDDEN	GET
3.	XHTML 1.0 Transitional	CASDADING STYLE SHEET	JAVA SCRIPT	AJAX control	IBM_HTTP_SERVER	1.1	TEXT/HTML; CHARSET=UTF-8	SERVLET/3.0	GET
4.	XHTML 1.0 Transitional	CASDADING STYLE SHEET	JAVA SCRIPT	--	APACHE	1.1	TEXT/HTML	HIDDEN	GET
5.	XHTML 1.0 Transitional	CASDADING STYLE SHEET	JAVA SCRIPT	AJAX control	MICROSOFT-IIS/7.5	1.1	TEXT/HTML; CHARSET=UTF-8	ASP.NET 2.0.50727	GET
6.	HTML 5	CASCADING STYLE SHEET	JAVA SCRIPT	AJAX control	APACHE/2.2.14 (UNIX) MOD_SSL/2.2.14 OPENSSL/0.9.8E- FIPS-RHEL5 DAV/2 PHP/5.2.17 MOD_JK/1.2.30	1.1	TEXT/HTML; CHARSET=UTF-8	SERVLET 2.4; JBOSS-4.0.2 (BUILD: CVSTAG=JBOSS_4_0_2 DATE=200505022023)/TOMCAT- 5.5	GET
7.	XHTML 1.0 Transitional	CASCADING STYLE SHEET	JAVA SCRIPT	AJAX control	APACHE	1.1	TEXT/HTML	HIDDEN	GET
8.	XHTML 1.0 Transitional	CASCADING STYLE SHEET	JAVA SCRIPT	AJAX control	MICROSOFT-IIS/6.0	1.1	TEXT/HTML	ASP.NET	GET
9.	HTML	CASCADING STYLE SHEET	JAVA SCRIPT	- -	APACHE/2.2.3 (RED HAT)	1.1	TEXT/HTML; CHARSET=UTF-8	PHP/5.3.21	GET
10.	HTML 5	CASCADING STYLE SHEET	JAVA SCRIPT	AJAX control	MICROSOFT-IIS/7.0	1.1	TEXT/HTML; CHARSET=UTF-8	ASP.NET 2.0.50727	GET
11.	XHTML 1.0 Transitional	CASCADING STYLE SHEET	JAVA SCRIPT	AJAX control	MICROSOFT-IIS/7.5	1.1	TEXT/HTML; CHARSET=UTF-8	ASP.NET 4.0.30319	GET
12.	HTML	CASCADING STYLE SHEET	JAVA SCRIPT	AJAX control	MICROSOFT-IIS/7.5	1.1	TEXT/HTML	ASP.NET	GET
13.	HTML	CASCADING STYLE SHEET	JAVA SCRIPT	- -	HIDDEN	1.1	TEXT/HTML;CHARSET=ISO- 8859-1	HIDDEN	GET
14.	HTML	CASCADING STYLE SHEET	JAVA SCRIPT	- -	HIDDEN	1.1	TEXT/HTML; CHARSET=UTF-8	HIDDEN	GET
15.	XHTML 1.0 Transitional	CASCADING STYLE SHEET	JAVA SCRIPT	AJAX control	MICROSOFT-IIS/7.5	1.1	TEXT/HTML; CHARSET=UTF-8	ASP.NET 2.0.50727	GET
16.	HTML 5	CASCADING STYLE SHEET	JAVA SCRIPT	AJAX control	APACHE/2.2.15 (UNIX) MOD_SSL/2.2.15 OPENSSL/0.9.8E- FIPS-RHEL5 PHP/5.3.9 MOD_JK/1.2.31	1.1	TEXT/HTML; CHARSET=UTF-8	HIDDEN	GET
17.	HTML	CASCADING STYLE SHEET	JAVA SCRIPT	AJAX control	APACHE	1.1	TEXT/HTML; CHARSET=UTF-8	PHP/5.3.9	GET

18.	XHTML 1.0 Transitional	CASCADING STYLE SHEET	JAVA SCRIPT	AJAX control	MICROSOFT-IIS/6.0	1.1	TEXT/HTML; CHARSET=UTF-8	ASP.NET 2.0.50727	GET
19.	HTML	CASCADING STYLE SHEET	JAVA SCRIPT	AJAX control	MICROSOFT-IIS/7.5	1.1	TEXT/HTML; CHARSET=UTF-8	ASP.NET 4.0.30319	GET
20.	XHTML 1.1	CASCADING STYLE SHEET	JAVA SCRIPT	--	IBM_HTTP_SERVER	1.1	TEXT/HTML; CHARSET=UTF-8	HIDDEN	GET

**Commercial sites:** The testing of all the commercial sites was done by using the website design evaluator tool which was developed to determine both the client and server side technologies used by the websites. By taking the current technologies as benchmark as recommended by the W3C, it has been observed that 77 percent of the commercial sites taken are technically upto the standards as per recommended in the standards provided by W3C.

**Graphical Analysis for Color Combination:**



**Fig.9**

**Conclusion:** Based on the analysis from the above graph maximum percentage of commercial sites have color combination problems which means that these websites follow least of standards as far as color combination parameter is concerned prescribed in W3C guidelines given in WCAG 2.0 in guideline 1.4(Distinguishable).

**Analysis based on different categories of websites separately for Color Check parameter:** Statistics taken from Website Design Evaluator for Color Check parameter for different categories of websites taken from Sample Data table 1:

**Table 5**

S.No.	Commercial sites		
	Portanopia	Deuteranopia	Tritanopia
1.	No	No	No
2.	No	No	No
3.	No	No	No
4.	No	No	No
5.	No	No	No
6.	No	No	No
7.	No	No	No
8.	No	No	No
9.	No	No	No
10.	No	No	No
11.	No	No	No
12.	No	No	No
13.	Yes	Yes	Yes
14.	No	No	No
15.	No	No	No
16.	No	No	No
17.	No	No	No
18.	No	No	No
19.	No	No	No
20.	No	No	No

Percentage Graph for Commercial websites:

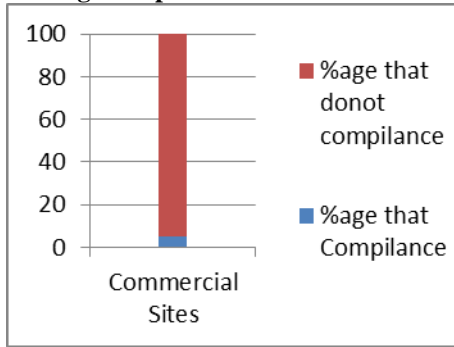


Fig. 10

Graphical Analysis for security:

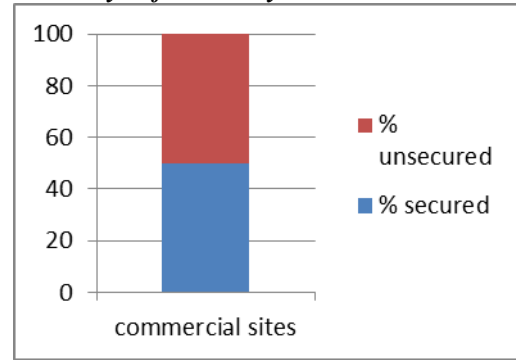


Fig. 11

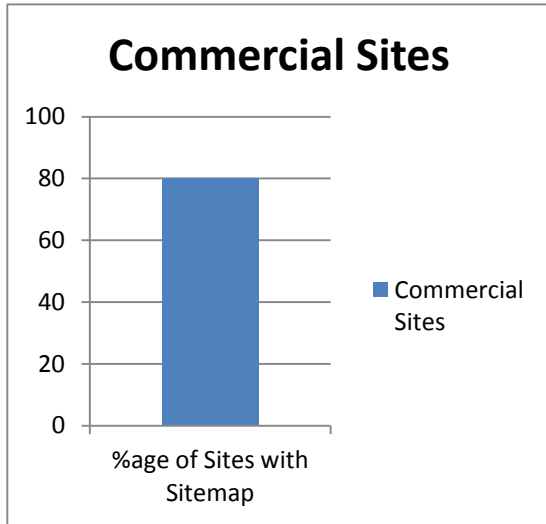
The testing of all the commercial sites was done by using the website design evaluator tool which was developed to determine the colour combination error of websites for various types of commonly found colour visibility problems among the users. It has been observed that on average 05 percent of commercial sites are having colour combinations as per recommended in the standards provided by W3C while rest of all commercial sites are not completely feasible to users with some sort of feasibility disorder.

**Conclusion:** Based on the analysis from the above graph it is clear that only 50% of commercial sites possess security features that are well up to the standards as far as security parameter is concerned prescribed in W3C guideline document WSC-UIG 1.0.

S.No.	Certificate Information				Connection Features				
	S.No.	Issued by	Issued to	Validation	Signature algo	Encryption algo	Key exchange algo	SSL protocol	MAA (Message authentication algorithm)
1.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
2.	071FD8D71067E0DB23CA6448E1FB12A7	CN=VeriSign Class 3 Extended Validation SSL SGC CA, OU=Terms of use at https://www.verisign.com/rpa (c)06, OU=VeriSign Trust Network, O="VeriSign, Inc.", C=US	CN=www.onlinesbi.com, OU=Terms of use at www.verisign.com/rpa (c)05, OU=INTERNET BANKING DEPARTMENT, O=STATE BANK OF INDIA, L=MUMBAI,S=MAHARASHTRA, C=IN, SERIALNUMBER=Government Entity, OID.2.5.4.15=Government Entity,OID.1.3.6.1.4.1.311.60.2.1.3=IN	1/24/2012 7:00:00 PM to 3/25/2014 6:59:59 PM	sha1RSA	Rc4_128	RSA-PKCS1-KeyEx	TLS 1	Md5_128
3.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
4.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
5.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
6.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
7.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
8.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

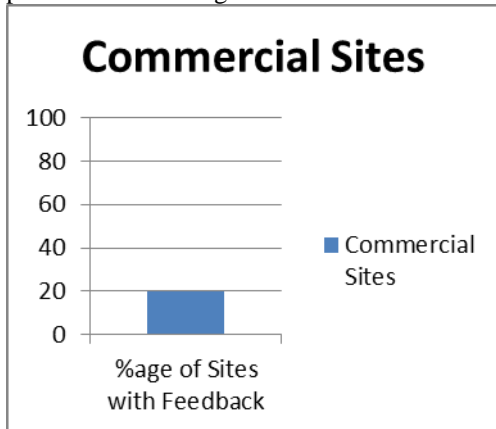
9.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
10.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
11.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
12.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
13.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
14.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
15.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
16.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
17.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
18.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
19.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
20.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Graphical Analysis for SiteMap:



**Conclusion**

Based on the results taken from the above chart it is observed that very less percentage of commercial sites provide feedback option for customers which means that commercial sites follow the least of standards as far as sitemap parameter is concerned prescribed in W3C guideline document WCAG 2.0. guidelines in priority 2 checkpoints 13.3.



Graphical Analysis for Feedback parameter:-

#### IV. FUTURE SCOPE

Web development and designing discipline is an ongoing process and has just started gaining attention of researchers, developers, academics, and other major players in Web-based system implementation such as customers and their contract administrators. It needs to evolve and mature to effectively handle the new, unique challenges posed by Web-based system development. We need to study and evaluate current approaches and practices, guidelines and standards and develop new methods and techniques to address the challenges of developing Web-based systems. The more standardized your website will be the less are the chances for the users to move on to your competitor.

In future more number of parameters will be added to the system to help the designers to create page that are more efficient, user centric and follow the standards provided by concerned organizations in a more appropriate way. The parameters that are under consideration to be included in the tool are like e.g. operating system compatibility, audio-visual aids used, search policy used, instant query etc. All these features are under consideration and will be included in the tool to make this tool a solution for maximum number of webpage design issues.

Operating system compatibility parameter will help to determine the operating systems on which a particular site will be able to run correctly with all the elements/features that are included in its design. The commonly employed operating system like windows vista, windows XP, windows 7, windows 8 etc will be used to check compatibility problems that occur due to design issues.

Audio-visual aids used parameter will be included in order to determine the necessary elements (e.g. magnifiers, screen readers etc.) included in the design of a web page for the people with different kind of disabilities. It will help to find out whether these elements are added as according to the standard provided by the W3C or not [24].

Search policy parameter will help to analyse whether the site is providing search facility or not. It will also determine is it according to the standards as set by W3C if provided.

Instant query means on the fly answer to the questions that are raised in one's mind during accessing the information provided by the site. This parameter is included during the design of a website. Including this parameter in the tool will help to determine whether site is having this property or not.

In addition to the above mentioned parameters that can be included in Website Design Evaluator to help designers/developers to design pages better, there will be

other features that will be provided by the concerned standards organization in future that can be also included in the tool to make it more users centric and efficient.

#### V. CONCLUSION

Testing of e-government portal of India was conducted to analyse the performance and user-centricity. Highly accessible government websites all over the India were selected for this study. The online tool web analyser was used as it provides a detailed analysis of the site tested and the areas that need to be improved. The results indicates that websites has a serious accessibility problem. There is an urgent need to improve the total size, minimize the number of external objects, size of images used etc. to make e-government websites to be more effective, highly user-centric and easy accessible for the citizens.

#### ACKNOWLEDGMENT

This paper is the outcome of study done during previous few years and will be helpful to students that are new to the field as this will provide them with nut shell information regarding this ever expanding field. It is also going to help with larger perspective to the people in the field of academia, research and web developers/designers to a greater extent.

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