QUALITY CONTROL ISSUES FOR DESIGN, DEVELOPMENT AND MAINTENANCE OF WEB SITES

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Abstract

Websites have become indispensable tools for posting the information of an organization for the global population. It plays an important role in spreading information throughout the world. There are millions of web sites available which have been created by the web site designer using special markup languages called HTML (Hypertext Mark-up Language), XHTML, CSS, Javascripts, VB scripts or other advance level languages like XML, Java, ASP, JSP etc. The IT professionals who are expert in designing and developing of the web sites are involved in this business. Most of the agencies that are involved in the design and development of the web sites create the web sites on commercial basis and host to the server, which are accessed over Internet. The present paper emphasizes the various issues of quality control and regular maintenance of web sites while designing and developing the web sites for any organization / institutions/ universities .The first part of the paper highlights the basics of quality control whereas the second part of the paper describes the various issues pertaining to design, development and maintenance of web sites, steps taken for designing a quality web sites, consideration of various aspects of quality control and regular updating of web sites, quality measure to be taken in tune with the W3Consortium recommendations.

Keywords : Quality Control, World Wide Web (WWW), Web Sites, Quality Standards, Quality Assurance, Quality Test Plan, W3 Consortium.

1. Introduction

Beginning in the year 1989 at the European Center for Nuclear Research (CERN), the Internet has become popular communication medium for digital computers all over the world. The availability of personal computers at affordable price, spreading of digital communication technologies and evolution of other wireless electronic gadgets has brought the information revolution possible in the world. At present on-line access of information even from the remote areas is possible through Internet. At the same time the users thrust for information has been increasing for pinpointed, exhaustive /comprehensive information and quick information dissemination and retrievals in the areas of their specialised fields.

Today people around the globe are accessing Internet for day to day affairs such as inter-personal communication (e-mail) , search of desired information, search of jobs, access to e-journals , scholarly publications, Air/Rail Reservation, information regarding Government organisations, corporate sectors, e-commerce, academic organisations, research and development activities, military affairs , oceanography, remote sensing, biotechnology, environmental science, medical science, engineering, and what not. Now-a-days penetration of Internet is wide and reaches to almost every sector of human activities. Hence a presence in the Internet became mandatory for all organizations and all the organisations has understood the importance of their own web site or home page which would reflect all the activities of the concerned organisations. These benefits have attracted the organisations /institutions to create and host their own web pages.

The web/ home pages of the concerned organisations are either created and hosted by the expert commercial professional agencies or designed and developed by their own employees who are having know how of creating and hosting web pages. There are several agencies, which are hosting the web pages on the commercial server located at various locations in India or abroad.

The commercial organisations as per the requirement of their clientele / host organisations, design, developed, host and maintain the web sites and time to time update the information or content supplied by the parent / host organisations. The web site development and hosting agency used to take a negotiable amount and also sign AMC (Annual Maintenance Contract) for updating all inputs supplied by the host organisations.

Some organizations are designing and developing their own web sites. It has been observed that despite the effort made by the in-house expert or out side agency, most of the web sites are not updated regularly. This is the major drawback of hosting and maintaining a web site created and hosted by the organisations. At the same time the quality of content and information of the web sites are also not up to the mark.

As per few studies made by library and information professionals, it has been found that many web sites are not properly designed and updated. In order to put current information for the public, web sites must be updated and maintained properly. Some times it has also been found that some web sites or web pages are expired may be due to non-payment of hosting rent to keep web sites alive.

From the literature survey it has been found that no substantial works have been made in this area of quality control for designing and developing a web sites. Therefore the present attempt has been taken. This a theoretical and conceptual approach which has been undertaken to address the various issues pertaining to designing, developing and maintaining a web site for an organization.

2. Meaning and Definition of Quality

Before going in to detail, it is quite necessary to understand quality. The quality in simple terms may be defined as the totality of features and characteristics of a product or service that bear on its ability to satisfy customer or user needs and expectations. This definition may be also applied to a web site.

Therefore the quality is not what the planning and producing individuals may think or wishes it to be. It is exactly what exists in the mind of the customer or user when he or she receives and personally appraises the products or services. In short, the meaning of quality is directly related to *Customer or User Satisfaction*; it is still best defined as “Conformance to Customer Requirements (Hagan 1997)”.

But “*Quality*” is very difficult to define specially in the context of web. Does quality mean conformance to established standards, or is it “goodness”, or is it excellence or superiority, or is it reliability, or is it the relationship of cost to value, or is it craftsmanship? When we want to define the “*Quality of Web*”, it becomes very difficult to measure in the above terms. The web should be fully recognized as a distinct and full-fledged communications medium with its own distinct requirements.

The quality of a web site is different for each web site available because it is based on judgments by an individual, a statutory body or by an organisation. One of the most common measure of quality is assigning a rating. This measure is however problematic because we are often unsure of what the rating measures and how objective the measurer has been. Other measures of quality can be the availability of information, reliability of information, technology used, absence of bugs, acceptable performance, meeting goals, but again all this has issues attached.

3. Quality Control Test Plan

A simple definition in the context of quality for Web sites is that 'quality is meeting requirements'. This definition works because by creating technical specifications and requirements that describe various attributes of a Web site as well as how it should function one can set goals to achieve and have determined specific indicators of quality. Quality can then be measured by self testing various aspects of Web site and the complex relationships between all areas of the site at intervals.

A test is a tool that measures something in a formal way with the intention of finding the answer to a question. Define what is to be tested (predefined a standard of quality e.g. Images should not be bigger that 60k, the page should download in 10 seconds on a 28.8 modem etc.), from what point of view are the test will be performed, what are to be tested for, what are the limits to the test. It should be remembered that testing is not Quality Control. Firstly because it is only valuable if the standard of quality is reasonable (if the standards have holes then your testing will have limited scope) and secondly Quality Control requires further action.

The major phases of a web site need test plans, because the focus and emphasis of testing will change over time. Testing a new site in development is very different from testing a site that has been up and running for some time. Furthermore, any changes to the website code, incremental of major, require regression test plans.

A test plan is simply a high-level summary of the areas (functionality, elements, regions, etc.) that will be tested, how frequently these will be test, and where in the development or publication process the test will be performed. A test plan also needs an estimate of the duration of testing, and statement of any required resources.

Much quality control testing for a web site involves testing the site-as-a-whole because HTML and HTTP must follow certain general protocols, standards, and rules of syntax; testing for broad patterns of behavior is a good first step. Most of the following items (on this non-all-inclusive list) can be tested with automated tools.

- Functionality testing – does it function as per thee requirements in mind.
- Compatibility testing – whether it is compatible for different browsers.
- Load/performance testing – system should be tested under a range of loads and various conditions that may arise.
- Stress testing – predictions about load to the site.
- Usability testing –involve users to try out your site.
- Security testing- test the site against un-authorised access.
- Integration of unit testing – Test the site connected to any other applications such as database, search techniques etc..
- Regression testing – after every test repeat the test under different conditions.
- Link testing – Check out all the internal and external links to your site and find whether they are working properly.
- HTML Validation – Test the HTML codes.
- Reliability testing – Is the site always available online? Whether mirror site is working. Emergency situation tackling.

Many software tools are available free of cost, including those which tests pages (for HTML compliance, page size, etc), performance and load testing, etc. Testing tools may be desktop software or Web-based services. (some free tools are available from www.softwareqatest.com/qatweb1.html, www.websiteoptimization.com/services/analyze, www.validator.w3.org etc.)

Procedures to be opted for fixing the above are

- Mission statement or statement of direction – to describe the explicit goals (the purpose of the site, information architecture etc.).
- Defining audience– researching about the target audience will allow designing for them and enhancing for them, statistics can be used to do the same.
- Make sure that the right authoring tools etc. are used
- Problem tracking and reporting - Make sure that all changes/defects are reported and passed on to the appropriate person. Maintaining a log sheet of problems is essential for future reference. Document all the steps taken to resolve the problem.

Not all of these areas are easy to test with broad, automated tests. Firing up a link-checker won't tell if search function is working, or working as it is supposed to. For areas like application functionality, one must create specific, individual tests; one must devise scenarios based on expected user behavior, scenarios that describe how a user will interact with the functionality.

The development of web site is mainly a four phase task, content preparation, content mounting content maintenance and page funeral. Let us briefly check out the level of quality control required in the phases

4. Quality control during content preparation

The stage of content preparation is very similar to those used for print publications. The same amount of attention is needed for web publishing as for print publishing.

- A team is to be formed covering members from all the sections/branches of organization including the web manager, to decide contents relevant to the sections/branches of the site. The quality of the contents is to be verified at this stage, so that no unnecessary/redundant information gets included.
- Style guides for web publishing (writing style, font, page structure, picture/voice selection, page titles, acronyms, etc.).
- Content review by related content developers and supervisors.
- Consulting with web manager throughout the content preparation process, including the planning phase.
- Proof reading and copy editing (a competent individual other than the content creator should do it).
- Documenting the whole process.

5. Quality control during mounting content online

- There should be a dedicated web manager/master with all technical skills, whose responsibilities should include quality control.

- Ensuring competency. In larger organizations the technical person should bear an appreciation of content management issues, as well as the content providers an understanding of technical issues. In smaller organizations the web manager should be equally educated and experienced with online publishing as well as content management.
- There should be a clear vision, strategy and procedures in place. Examples include the desired site/document structure, navigation, writing style, target audience, technical do's and don'ts, HTML vs. PDF, etc.
- Adjusting the document structure for the requirements of the Web (break up document by chapters/ sections, adding a contact page and a cover page, create a navigation bar, etc.).
- Changing/adding content (editing into web-style writing, adding extra online content such as a discussion board or fill-in forms, adding a clear 1-2 sentence introduction, key wording for meta-tags, etc.).
- Putting content into templates and laying it out, based on in-house design and style guides.
- Testing the content (on MAC/PC platforms, Internet Explorer and Netscape, Bobby (for download speed and technical glitches), checking for dead links, etc.).

6. Quality control once the content is online

- In this stage as many people should be involved as possible: the author (project manager), supervisors, people involved in content creation, and people not involved with content creation.
- A Web site steering committee should review the online content from time to time.
- Such a committee should have similar roles in the online publishing process as an editorial board for a print publication.
- It should have sessions on a regular basis.
- Such a committee is a forum for bi-directional information exchange and in-house information flow. It raises the awareness and recognition of the Web among staff while providing valuable input and feedback to the work of Web developers.
- All key people of an organization should be invited to the Committee (e.g., Heads of Departments), but it should also be open for any interested staff member.
- Sessions of the Committee can focus on general issues (strategy, management, responsibilities, etc.) as well as document specific (detail-oriented) issues. Brainstorming sessions should provide for a wealth of ideas and comments. The viewpoint and diversity of Web users and non-Web developers can be stimulated at such meetings.
- Once the online content is accessible for the public, further corrections and adjustments should be made based on user feedback. Possible means of receiving feedback include guest books, discussion forums, Web-server log file statistical analysis, e-mails received by the Webmaster, usability tests, etc.

7. Quality control at Page funeral

This is a most important stage, which is found neglected in most web sites. When a web page expires, the online document should be changed accordingly. Content should be edited (e.g., future tense or present tense should be changed to past tense, change contact information), interactive services should be closed, remove/replace/archive documents, backup on CD-ROM, change the "last updated" note, etc.)

What points are normally overlooked while designing and maintaining a Web site

- Domain names should be easy to remember, meaningful, unique, and easy to type.
- Broken links and changed e-mails.
- Server load – too many hits on the site (on certain special occasion).
- Client side performance – pages take too long to down load (due to heavy graphics,animation etc).
- Security aspects aren't working.(login, password etc.)
- Content is out of date.
- Incompatibility with web browsers (resolution, graphics styles, font etc.).
- Interface –should be intuitive, offers choice, use predictive logic, not be obstructive, appropriate.
- HTML doesn't pass validation test.
- Graphics is missing or too large.
- Scripts do not work – CGI programs, applets, JavaScript, ActiveX etc.
- Connectivity and linking with databases.
- Accessibility of website to people with disabilities.

8. Quality Control : Issues to Consider

- The goals you set for your site will have a great deal to do with the kind of site you have. Commerce sites have distinctly different requirements than do personal home pages, or even corporate presence sites.

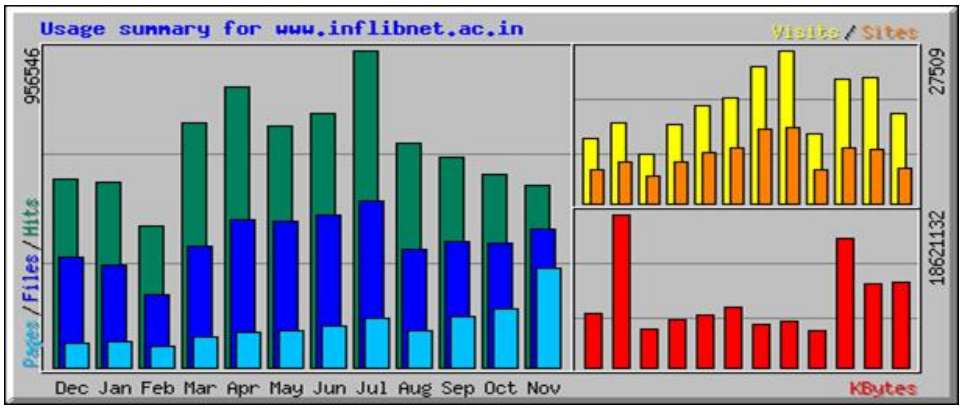
- Quality control can be difficult when you find that your testing resources limited or overextended. You will often find it impossible to test everything, or to verify every link, or to read every page for deviations from the style guide. You must develop some consistent test cases to check the major problem areas, automating tests if reasonable, and you must develop feel for your site — as trite as that sounds —

- Testing and creating test cases is always a learning experience. As you test and refine your test cases you will find a balance between not enough testing and just plain overkill, and between extremely detailed test cases and simple spot checks. It is not sure, whether there is a best way to do "quality control" (besides focusing on quality assurance) since every web site is different, but a target of zero defects is always a good thing; the trick is in revising the test cases to continually pinpoint any problem areas.

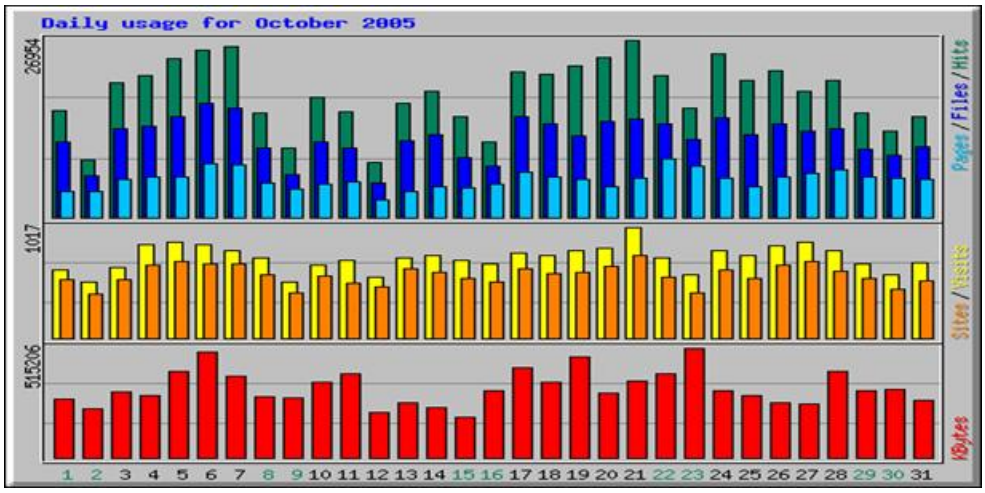
- The quality control process has the major shortcoming of being reactive to problems. Quality control sets the standards for the web site and tests for web components that fall below those standards, but does nothing to improve the quality of web components. The strictest testing of the output will not necessarily improve the quality of the input — the "Q*uality Assurance"* process meets this challenge.

9. Web-server log file statistical analysis

Number of visits to a web site and downloads from the site justifies the content and quality of a web site. Ultimate aim of any web site is to make it more acceptable for the requester and watch and solve the issues related to the poor response to the site. It is important to monitor the important statistics related to the web site once a site is hosted. Web Log file is a useful tool for analyzing the acceptability and statistics of a web site. Statistical analysis of the web site will be done on the following parameters such as visits per day, number of hits, download statistics, most frequently visited page, error generated on accessing scripts etc. *The Webalizer* is a free web server log file analysis program which produces highly detailed, easily configurable usage reports in HTML format, for viewing with a standard web browser. Following web log analysis of www.inflibnet.ac.in shows the summary of the web site on graphical form which include number of hits, pages visited, downloads etc. for the year 2005(till Nov). It also give more report on the frequently visited machines, community, countries, response code, hourly usage statistics, Top URL visited etc. Frequent analysis of these parameter will enhance the quality of the web site for more user interactions.



Statistics related to the Month of October 2005 for www.inflibnet.ac.in by webalyzer

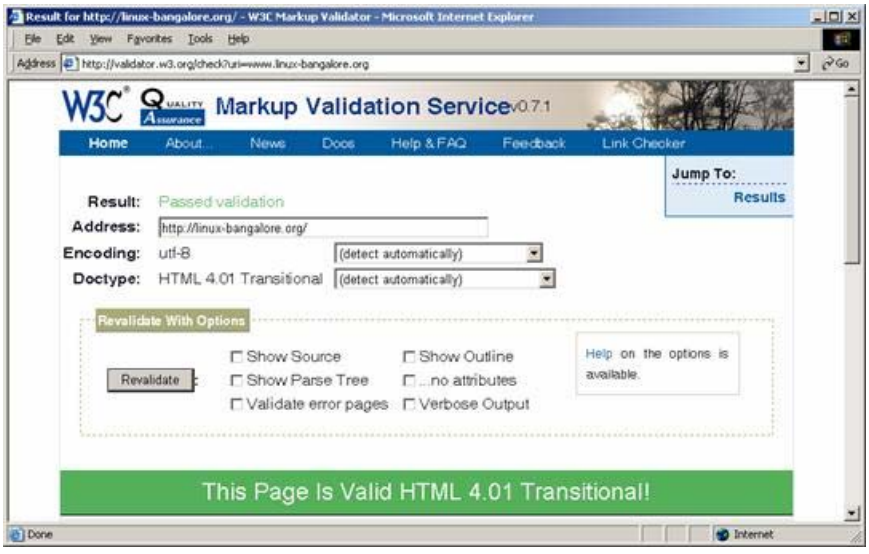


10. Ranking of the site

Ranking of the site is one of the criteria to judge, how useful the web site is for the academic community. Though there is no authenticate agency for ranking the site, there are free services available which ranks the site periodically. This may be treated as a bench mark for the acceptability of the web site. One such service is www.ranking.com. Ranking.com has performed market research upon a statistically geographically and demographically significant number of Internet surfers. By recording these surfers' website visits, Ranking.com calculates the ranking for the top 900,000 (growing every month) most visited web site and provides these results to surfers absolutely FREE for all its services. www.inflibnet.ac.in is ranked as 229th web site in the country(on 31st Dec 2005) and 1,29,701 ranks in world among top Nine Lakhs web sites.

11. Adhering to Web Standards recommended by W3 Consortium

The World Wide Web Consortium (W3C) is an international consortium where Member organizations and the public work together to develop Web standards. W3C's mission is: *'To lead the World Wide Web to its* full potential by developing protocols and guidelines that ensure long-term growth for the Web'. W3C primarily pursues its mission through the creation of Web standards and guidelines. Since 1994, W3C has published more than ninety such standards, called W3C Recommendations. It is also advisable to follow these guidelines to ensure quality of the web site. As part of the Quality Assurance , W3 has come out with lot of open source, free software for Validation of the code. W3C develops many more software tools and Few examples are Markup Validator, XHTML validator, CSS Validator, Link checker, XML Schema validation, RDF validation service etc. W3C Markup Validation Service, a free service that checks Web documents in formats like HTML and XHTML for conformance to W3C Recommendations and other standards. These services available are on line. It may be noted that even many IT companies web sites are not passing this validation test as on date. Folowing shows an example of online validation test performed for HTML4.01 validation.



To show your readers that you have taken the care to create an interoperable Web page using W3 recommendation, you may display the following icon on any page that validates .

12. Acknowledgement

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7. Derek Sisson.1999. "philosophe.com : a thoughtful approach to web site quality". qa@philosophe.com. (visited on 21-12-2005)

Suggested websites for further consultation:

- Understanding Quality: URL: <http://www.philosophe.com/qa/quality.html>
- Testing Without A Formal Test Plan
- URL: <http://www.philosophe.com/testing/without_testplans.html>
- Software QA and Testing Resource Centre URL: <http://www.softwareqatest.com/qafaq2.html>
- Web Site Test Tools URL: <http://www.softwareqatest.com/qaweb1.html>
- W3C Quality Assurance URL: <http://www.w3.org/2001/06tips/>
- Web Watch Benchmarking Articles
- URL: <http://www.ukoln.ac.uk/web-focus/webwatch/articles/#latest>

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