Software Engineering:Web Development Life Cycle

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Abstract: **Any application development can be streamlined with the help of the systematic development model. Software development is a sequential process which starts with the requirement gathering and completes with the project implementation. The flow can be modified by adding iterations and prototyping with the same. This paper is an attempt to develop a life cycle model for the web application development on the basis of System Development Life Cycle Model (SDLC). The first section of this paper describes the functionalities and various steps in Web Development Life Cycle Model. The next section describes the guidelines to be followed during the development. The final section describes the advantages and disadvantages of the same.**
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I.   INTRODUCTION

There are various types of web sites, which are present on the Internet for definite purposes and use. Each one of them has different designs such as.

- Commercial Web Design
- Organizational Web Design
- Personal Web Design
- Educational Web Design
- Entertainment Website
- News Website
- Blogging Website

 Like the different web site designs, there are different web browsers, which have different functionalities and look. Internet Explorer, Firefox, Netscape, Opera are some of the web browsers, which are used, but most popularly used web browser is Internet Explorer.

II.   BACKGROUND STUDY

Rothi and Yen (1989) provided a brief review of traditional SDLCs. In their journal article, they related how the use of traditional software-development models is numerous and often regarded as the proper and disciplined approach to the analysis and design of software applications. Examples of such models included the code and fix, waterfall, staged and phased development, transformational, spiral, and iterative models. The authors also described how traditional SDLCs have the same goal and are similar in the approach they use to achieve it.

A related article by the U.S. Department of Justice described how the primary goal of any SDLC is to deliver quality software systems (DOJ, 2000). [1][2] It further defined a quality system as one that: 1) meets or exceeds customer expectations, 2) works well with current and planned infrastructure, and 3) is inexpensive to maintain and enhance. SDLC is traditionally made up of several phases, each comprised of multiple steps. These steps typically include software concept, requirements analysis, architectural design, coding and debug, and system testing.

Osborn (1995) also discussed traditional SDLC techniques and how over time, the phases of these approaches have become enshrined in a development cycle that includes: 1) defining requirements, 2) designing a system to meet those requirements, 3) coding, and 4) testing. Each phase of the development cycle is strictly sequenced. For example, in the waterfall model, the output of all prior effort is a prerequisite for subsequent steps (e.g. all details of requirements definitions are documented before the start of design, design is complete before coding, and exhaustive testing is performed prior to release).

III.   METHODOLOGY:

This paper is following a research-based descriptive study to compare the SDLC model to prepare a web-based analysis and design model. It follows the basic framework of SDLC to prepare the complete web-based project development. This paper is an effort to make a WDLC

model, which can be adopted for any kind of web-based application development.

IV.   WEB-BASED APPLICATION

While planning to publish the web site the initial

phase towards website publication starts with planning and completes with development. The website development encompasses various complex decision-making processes. Like the System Development Life Cycle, We do have Web Development Life Cycle. The websites vary from educational to commercial and many more. Even though it functionally differs, they all follow the basic designing pattern to ensure consistency and completeness. WDLC is an organizational process of developing and maintaining Web Site.

There are five phases of the WDLC which enables the complete designing process. Each of the phases includes a set of tasks, which rely on techniques that produce specific document files for the understanding of the project. [3]
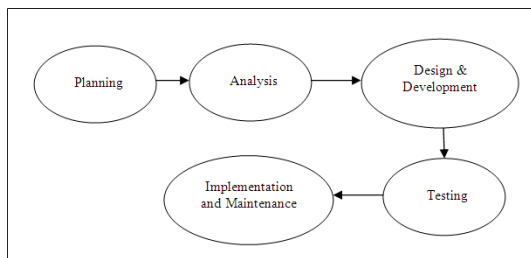
V. DIFFERENT PHASES:

Figure 1. Web Development Life Cycle Model (WDLC)

A. Phase1: Web Site Planning

The very first phase of the WDLC is the planning. The Web Site which is very important as it is the building block for the entire web site. If the planning goes wrong, then the next phases of the WDLC will also go in the wrong way. Making the good decisions about the web site's organization and the page design begins with creating a plan.

Following is the steps which have to be carried out in the planning phase of WDLC.

1. Identify the Web site's goals or objectives

Each web site has some or the other purpose for which it has been designed. Most likely gaining profit, brand, sales are some of the goals of the web site but with this, other goals are also there. The proper identification of the goals and objectives of the web site lead to the correct plan.

2. Understand who will use the Web site

After the determination of the business objectives for the site, the next critical steps identify the site's target audiences, determine why these audiences might want to visit the site and identify any technological constraints they might experience when viewing the site.

3. Understand what Web technologies you will use

The technological constraints are important to achieve the user's satisfaction. The versions of the web browser, high-speed broadband Internet connections, highest monitor resolution, etc. are the technical constraints. It would be wiser instead to plan and design for visitors who might be working under the most common technological constraints. [4]

4. Identify the content owners and authors

After planning the goals and objectives, understanding the audiences and technologies to be used, one has to focus on the owners and authors which are building the web site. Their participation in each phase of WDLC is very important.

5. Decide what and where information will go on the Web site

The planning phase also tells us which information will be put on the web site and where it has to be put. The contents of the web site are important for the success of the web site as good contents increases the quality of the web site. [5]

B. Phase2: Web Site Analysis

It is a set of activity in which the analyst gathers the information requirements of the users, analyses them systematically in the form of functionality of the application system, the input data requirement and their sources, the output data and their presentation requirements.

The system analyst gathers data about the performance expectations of the users such as expected response time the total turn-around time, etc.

There are following steps which are carried out in analysis phase of WDLC

1. Identify the tasks users need to complete

In this phase, the user requirements are considered, and accordingly, the functions are identified. With the help of gathered data, the different tasks are defined to get the proper output.

2. Consider the processes required to support Web site features

After identifying all the tasks, one has to focus on all the tasks that are the basis for the development of the web site. The processes required to support web site features are identification site map, determination of the structure of the web site, finalizing the contents to be placed on the web page, etc.

3. One of the more important phases in the WDLC

As analysis of any Process is very important to guarantee that the proposed system possesses all the required qualities and data for which users are looking for. If the analysis phase went wrong, then one cannot guarantee the quality and the output of the desired system and that's the reason the analysis is one of the important phases of the WDLC.

C. Phase3: Web Page Design and Development

It involves preparing the blue print of the web site. It prepares various diagrammatic representations of the logical and physical artifacts to be developed during the development stages to follow. The major artifacts include data models, process models and presentation model. Finally, the system design is documented. This involves programming and testing individual programs based on the design document. [6]

The developers are responsible for programming, and they also create text data sets for inputs and verify that the program generates the expected output for these input's data sets. The individual programs are also reviewed to ensure that they meet programming standard as expected by the users. This is the only phase where the conceptual web site is first translated into a useful and attractive web site.

The purpose of the web site design is also considered in this phase. For example

- Academicians publish to inform students
- Businesses publish to advertise products or to give support
- Organizations publish to keep members informed
- Individuals publish to share hobbies and knowledge

The Web Site Organization is one of the important decisions which are taken in this phase. It includes

- Linear Web site layout
- Hierarchical Web site layout
- Webbed Web site layout
- Narrow Web site layout
- Deep Web site layout

Any one of these layouts is considered while designing the web site.

D. Phase 4: Web Site Testing

It is to demonstrate to the development team members that the web site works exactly to meet the user expectation of information requirements as well as the performance expectation. It involves planning the testing, creating the text data, executing text runs, matching the text results with the expected results, analyzing the differences fixing the bugs and testing

the bug fixing repeatedly until a satisfactory number of mismatches are removed.

Web sites should be tested at various stages of the WDLC for reviewing the Web page's

- Content
- Functionality
- Usability
- Correctness

Usability of the web site is the measure of how well the Web page allows a user to accomplish goals

Testing involves the following checks
- Validation
  - ✓ Validate the HTML
  - ✓ Validate the CSS
  - ✓ Check for broken links
- Flexibility
  - ✓ Try varying window sizes
  - ✓ Try varying font sizes
- Speed
  - ✓ Access the site via a modem
  - ✓ Check image size specifications
- Test for accessibility
- Browser independence
  - ✓ Try different browsers
  - ✓ Check printed pages
  - ✓ Switch JavaScript off
  - ✓ Switch plug-ins off
  - ✓ Switch images off
- Other checks
  - ✓ Check non-reliance on mailto
  - ✓ Check no orphan pages
  - ✓ Check sensible page titles

E. Phase 5: Web Site Implementation and Maintenance

It involves installing the web site on the computer system conducting data preparations (Servers, DBMS, etc.) parallel running and going live as core activities. This is the stage where the web site is first come in contact with the users, and the users get a chance to work on it for the first time. Moreover, it involves the most important step of user acceptance testing, which marks the technical and commercial milestone of the WDLC.

It involves maintaining the web site always up to date to ensure that it is in the line with current information requirements considering even the latest changes in the same. It helps keep the web site up to date thereby ensuring the user's high return on their investment at the operational level of the business. The developer analyses the changes in the light of the latest changes in the design identifies the new changes in the design, verify quickly that it works as expected.

Implementation phase involves the following activities.

- Publishing of Web pages to a Web server
- Determine who is responsible for updates to the Web page.
- Limit the ability of certain users to update the Web page
- Web site monitoring
- Utilize *logs* to keep track of Web site usage and statistics

There are 10 guidelines which are considered during these phases of the WDLC

Guideline 1**:** Website Objectives

The main objective for the website creation needs to be identified and validated to provide desired output.

Guideline 2**:** Site Map

The physical appearance as well as the modularized structure of whole website should be prepared. This can be used as a blue print for further development.

Guideline 3**:** Requirement Gathering

Include all customer needs along with their requirements parameters. As more specific the requirements are, more concise the development process would be.

Guideline 4**:** Verification

The collected requirements and the design parameters need to be verified against intellectual property law in order to avoid the privacy conflicts at the end of the website launch.

Guideline 5**:** Design

Website must be unequable and free from ambiguity with simple good design where mass people can easily follow the content.

Guideline 6**:** Shortcuts

Provide navigational aids that help the readers move quickly through the site to get the necessary information they want.

Guideline 7**:** Unification

Once the structure is made, then the website can be compared against the similar functional sites to provide a unique application experience to the customer.

Guideline 8**:** Multilinguistic

The additional features can be included to provide technical support to disabled customers with multilingual capabilities.

Guideline 9: Testing

The created web application should be published after applying various levels of testing. The testing ensures that the final system is as per the objectives specified in the beginning.

Guideline 10: Maintenance

Continuous updation is required to maintain the accuracy and quality of the website. This can also provide up-to date information to the customer.

VI. ADVANTAGES:

1. This is a simplified model which can be adopted for simple web applications.
2. This model can be easily adopted for the web pages like static information searching, retrieving and application downloads.
3. This is a skeletal approach which can be enhanced by including iteration and prototyping for advanced web applications.
4. This model can be used to develop the initial prototyping or to prepare the test modules which can be implemented on any web page designs.

VII. DISADVANTAGES:

1. This is basic model which will not support complex web development process.
2. This doesn't support collaborative web page development.
3. This model will only process in a sequential manner.

VIII. CONCLUSION

This paper produces a step-by-step web development life cycle model for the complete web-based application development. Even though the agile models are introduced the basic SDLC model provides a skeletal structure for the software development. This WDLC provides a basic structure which also encompasses various guidelines to meet the requirements with the final product. This can be adopted by any type of web application development process. This can also be modified by including prototyping and iterative structure to improve the quality.

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