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# Rapid Web Development Life Cycle: A Structured Methodology for Web Application Development

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**Abstract**
The World Wide Web in the form of global Internet has emerged as a global communication medium that offers a large spectrum of applications from all domains and of all dimensions. While the popularity and the advantages of the Web have given rise to enormous HTML-based applications, the procedure of development of Web applications remains ad hoc as yet. There is no predefined systematic procedure for development of such applications, and development of most of the Web applications solely relies on the level of knowledge and the amount of experience that the developers possess. This paper proposes a methodology that can necessarily contribute to the development of Web applications and the related services. The proposed herewith new methodology is the Rapid Web Development Life Cycle (RWDLC).

**Keywords**—Web, Web application, Web development, software life cycle

## I. Introduction

The term Web development has emerged of late as a global terminology relating to development of web sites for the global Internet and at the same time for an intranet as well. There can be different types of web development like: web design, web content development, client liaison, client-side/server-side scripting, web server and network security configuration, e-commerce development etc. However, in the context of web professionals, "web development" mostly encompasses the functionality like writing markup and coding those are usually considered away from the basic design aspects involved in building web sites. Web development ranges from design of simple static web pages with simple text to dynamic and more complex Internet services and applications such as electronic businesses, social network services, web content management systems etc. This helps clients to fulfill their need based on their business type, industry, user type and requirements. From proprietary to open-source solutions are available for the clients.

The number of websites is in increase exponentially. For most serious application the webpage is regarded as the basic front-end. Lately it has replaced the other front-end software and applications. Any other front-end applications if any can also be incorporated into the webpage and this gives much power to it. The HTML based frontend has advantages due to its cross platform and ubiquitous nature of the web browsers. The advantage of web delivery lies in the concept of thin client and centralized maintenance. This easily facilitates the deployment process. The e-commerce and e-governance enhances the web development and the web use. The traditional software application developers have been following the structured way of application development.

There are laid out structured software development methodologies for software developers. The software developers are successfully using the development methods which have clear demarked steps. The traditional development methods may not be appropriate for the web development due to the unique and distinct features of web applications. Mainly there are two reasons attributed to it. The first is not much structured thought is given before designing the web-pages and web applications because the programmers gives emphasis to his own individual experience and expertise without any systematic approach (Gellersen, 1999). Like any other software the web development also needs some sort of systematic approach to increase the efficiency. There are some

development methodologies used by different programmers but there is not a single one accepted by the software engineering community (Escalona et al,2002).

The main aim of this paper is to suggest a new methodology which will cater to the needs if the web-developers. The traditional software developers have been using fairly successfully the Software Development Life Cycle (SDLC). This paper exploits the SDLC and takes the SDLC to another level thereby making it suitable for the web developers.

Web sites cater to a very wide range of services. The users of the websites can be from computer illiterate to a highly qualified professional. This wide range of users and services a web site caters to makes it different from other software applications. The characteristics of Web applications in general are significantly different from various other kinds of applications, including the stakeholders and features of web applications (Escalona and Koch, 2004). The modern website design is different in the sense that they have lot of multimedia content which should be delivered seamlessly with almost in real time. A study (2001) shows the typical web development team consists of 31 % softweare engineers, 31% creative design, 20% management,9% business expert and 9% domain expert.

## II. Traditional software development

The traditional software development revolves round the SDLC. It consists of multiple steps. Other models suggested are Joint Application development Model (JAD), Rapid application development model (RAD), Prototyping etc. SDLC provides the bench mark for other software methods. The RAD, JAD and protyping are used as an adjustment to SDLC when the development time is very short(kendell 2010), (Turban 2004) (Pressman2000).

Web applications are highly complex problems consisting of many dimensions. (Mcdonald). Most of the web development has a critically short development time that makes SDLC not suitable to web development process. But the SDLC provides well defined process by which an application is conceived, developed, and maintained (1997). prototyping is generally used for projects with short development time.

## III. Rapid web development life cycle (RWDLC)

The web applications differ from other allocations in the following manner:

- The web application, pages etc must be compatible with the Transmission control Protocol (TCP)
- The webpage that is presented to the user may get contents from different servers which might be in different platforms located in different places.
- The information from different servers are accessed and processed on a web browser.
- The look and feel of the web page or application might change depending on the change in the information stored in any server.
- Multimedia content integrated with procedural programming (Pressman200)

Considering the complexity of web applications, many web application development methodologies have been proposed. Most of these web development methodologies focus on design and coding. The RWDLC which is being proposed here is specially developed keeping in mind the all necessity of web pages and applications. The proposed development method takes into consideration the different software enquiry methodologies. The RWDLC combines the advantages of SDLC and prototype methods.

The RWDLC makes a new approach that will help the programmers in area of development with structured steps in unstructured environment.

Any web application has three important factors i.e coherence, complexity and legibility (2004). Coherence is the ease at which a user can navigate. Complexity is the design process involving multimedia component to satisfy the user. Legibility is the impression or perception the user gets from the website.

Ross et. al (2008) attributes three major factor i.e. scalability, modifiability, robustness for websites and applications. The rapid change of the content and architecture makes the scalability of the web application an important factor. Many Information Based web applications failed due to the lack of scalability. Most web based development methodologies doesn't give due importance to the information requirement. Information gathering and analysis is an important step in any web application as the web based products are information centric. Every few days or hours the contents of the web pages may change. This is specially done for e-commerce, e-governance and educational sites. Therefore necessary planning in the development process is necessary to make it easily modifiable.

In this process the web applications evolve fairly quickly and the main development of the websites can be divided into three categories

1. Functional Module
2. Database Module
3. Multimedia Module

Based on this the proposed RWDLC addresses the issue of web application development by dividing the development process into three distinct modules:-

1. Functional module
a. Information gathering
b. Analysis
c. Design
2. Database module
a. Information gathering
b. Analysis
c. Design
3. Multimedia module
a. Information gathering
b. Analysis
c. Design

These steps are similar to waterfall model of SDLC. However, Waterfall model is not iterative. The proposed RWDLC is an iterative model which is an hybrid of waterfall and prototype development methods. The three distinct aspects can be handled by three different programming teams making it parallel development method. This reduces the development

time dramatically. The multimedia development team can independently gather information and perform analysis in parallel with the functional area team or database development team.
Such a trifurcation of the development process makes it scalable and modifiable with less effort. Changing the graphical content changes the look and feel of the site even if the information content is the same. Such change of look and feel is successfully used in social networking sites. The three independent modules in the development process make the web application scalable, modifiable and provide robustness. The detail design steps are shown in figure1.

**Information Gathering (Functional)**
During the process the system analyst generally collects the first hand information requirement from the client through a verity of interaction sessions. The interaction with the client also provides a verity of information necessary for the functionality of the website and the web application. In this step the potential users of the websites are identified and the functional requirement of the site is finalized.

**Analysis (Functional)**
During the analysis phase the structured analytical tools like data flow diagram or the entity relationship diagrams are analyzed to understand the flow of information. These are essential for the functionality for the website. The main components of the website or the application are finalized and each programmer is given the charge to handle the different component.

**Design (Functional)**
During this phase of the RWDLC the developers start creating the prototype for each of the components on the website. In this phase the actual functionality of the web site is developed. The critical components are identified and the components and the different web application are implemented. Users may be actively involved in the design process especially for intranet applications. During the process of design the users may be allowed to taste each component and give feedback so that it may be incorporated in the design process.

**Information Gathering (Multimedia)**
The multimedia component is useful in every website. The graphical design of the website is very critical and should be designed in such a manner to appeal the users. This is especially true for e-commerce, service based and educational sites. Unless the various graphic elements are placed in an attractive manner the user is less likely to return the site. In this step information will be gathered the information that will assist to understand the right mix of multimedia content, the navigation etc.

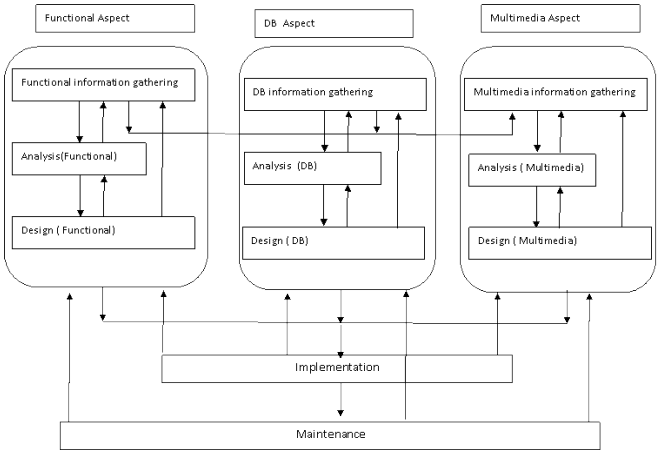


**Fig.1: RWDLC model**

**Analysis (Multimedia)**
This step involves analyzing the information acquired and documenting the needs of the website design. Analysis is done based on the color schemes, tright multimedia mix, corresponding with the color scheme of the client needs the logo and other taglines of the client. Analysis is also done based on the navigation and site ma[. This increases the users ability to find the required information (Malak et al,2010). This is also important for scalability because it will allow the programmers to create templates and implement cascading style sheets (CSS) into the site allowing for easy maintenance and updates in the future.

**Design** (**Multimedia**)
The multimedia designers use the documentation of the analysis phase to design prototype of the multimedia design and can be is approved from the client. The navigation part also has to be taken care in this step as modern websites and applications use graphical menu and navigation methods. This adds functionality to the multimedia design process. After the prototype a working model may be created which can be used in the actual system later.

**Information gathering (DB)**
Most modern websites use database to store information and some cases the user is allowed to insert update and even delete obsolete data in the tables. Therefore database operations and efficient database is the key to any modern websites. Most intensive websites use multimedia databases to enhance the efficiency of websites. It is necessary for the scalability of the database. The information to this step may not necessarily be collected from the client. The information gathering of the functional phase and the information gathering of the multimedia phase may provide the necessary information for this phase. The data administrator plays a key role in this process as they overview the business, legal and ethical issues within the organization that impact on the data requirements. The data requirements document is used to agree requirements with users. To make sure that it is easily understood, it should not be overly formal or highly encoded.

**Analysis (DB)**

Data analysis begins with the statement of data requirements and then produces a conceptual data model. The aim of analysis is to obtain a detailed description of the data that will suit user requirements so that both high and low level properties of data and their use are dealt with. The conceptual data model provides a shared, formal representation of what is being communicated between clients and developers during database development – it is focused on the data in a database, irrespective of the eventual use of that data in user processes or implementation of the data in specific computer environments. The conceptual data model then is a formal representation of what data a database should contain and the constraints the data must satisfy.

**Design (DB)**

Database design is business driven. The process may start with a conceptual data model and produces a specification of a logical schema. Depending on the need and requirement multimedia database or the relational database is chosen as common Database system. The output of the design stage is a detailed relational specification, the logical schema, of all the tables and constraints needed to satisfy the description of the data in the conceptual data model. It is during the design activity that choices are made as to which tables are most appropriate for representing the data in a database.

## IV. Implementation

This implementation of RWDLC is simple and straightforward. The key activity in the implementation phase is to deploy the new system in its target environment. The main phases of the implementation phases are:

- Acquisition of necessary Hardware and software
- Conversion
- User training
- documentation

The hardware and the relevant software required for running the system must be made fully operational before implementation. During this phase, the developed programs and databases are loaded onto the target server The conversion is also one of the most critical and expensive activities. The data from the old system needs to be converted to operate in the new format of the new system. The database needs to be setup with security and recovery procedures fully defined. As this is a new modified approach meant for the rapid website and web service it is necessary for the users to get acquainted to and use this model for web service and web portal development. The user training mainly comprises of different steps the user is required to take for sustainable and easy implementation of the system. Main topics of such type of training are:

- The ways to execute the different scripts and packages
- Data entry modification and backup of data.
- The different How to process the data (processing details)
- Changing the user interface and the graphics,
- To take out the reports

The RWDLC is an iterative development methodology. This allows the users to work with the developers until the development process is complete. During the implementation phase if any anomaly or problem is found during the design process the user can go directly to the suitable module where the problem exist and can make necessary modification. This is the major advantage of the RWDLC. The users while in the process of the designing can be able to get to see the end result even though it is not completed in every respect. This is another advantage of the RWDLC. Different components can be developed and implemented in the actual server to see the success of the implementation.The user can make necessary experiment with the user interface and other components so that he can compare the actual result with the expected result thus fine tuning the application to the perfection.

**v. Maintenance**

Maintenance may include modifications to existing programs, updating the style sheet to give the website a different look, or anything that might need to be done to the website once it has been implemented. The RWDLC is an iterative process, particularly during functional phases of development. Once the website has been designed there is little need to perform the graphical phases of the RWDLC until a re-design of the website is needed. For each new application or component added to the website after it has been designed, the systems analyst can start on phase two of the RWDLC. For a website redesign, only phase one will need to be completed because a redesign will change the layout and look of a website but not the functionality.

## VI. Conclusion

The RWDLC model provides a flexible, iterative development model keeping in mind the recent trends of the website and web application development. The RWDLC provides a structured approach to the web application development. Each step of the RWDLC is clearly demarcated and becomes independent from other steps. This model can be easily adopted for web development applications.

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