INTEGRATING V-MODEL INTO THE WEB DEVELOPMENT PROCESS

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ABSTRACT

In this paper we propose an approach to integrate V-Model into the web site development process. This approach is given as an extension of the Web Site Design Method (WSDM) [1]. In our approach the V-Model are integrated within the methodology throughout the phases of the web development process defined in WSDM methodology. WSDM lack for testing, therefore, we tried to make integration V-model into WSDM aiming to enhance testing phase in the web development methodology WSDM.

Keywords: *web Design , Web Methodology , WSDM , V- model .*

1. INTODUCTION AND MOTIVATION

Web applications have increased significantly over the years. Enterprises, banks, educational and training institutions, entertainment businesses and governments use large-scale Web-based systems to improve, enhance, and extend their operations and tasks.

Designing web applications not an easy task, it is not just using HTML or web development software such as Front Page or Dreamweaver and few images, menus and hyperlinks documents, etc. defiantly it is not, Web applications development process seems very complex and it meets a lot of challenging requirements. It needs more of planning, web architecture, system design, testing, quality assurance, performance, evaluation, continual update and maintenance of the systems as the requirements. Moreover, desktop applications are satisfies specific layers of user, but the web applications are designed for different types of users; so it's very important to know that the person who visits the site isn't the same person who would potentially use the product or service. This we'll add another side of complexity. Therefore, Web applications developers' needs solid web engineering methodology help in web development [2] process defined in WSDM methodology Web Engineering helps to create an infrastructure that will allow evolution and maintenance of a Web system and that will also support creativity.

A number of researchers have already recognized the lack of design methods for web sites, or more in general for web-based information systems, and have proposed methods: The older methods (*HDM[3], OOHDM[4], RMM[5])* were originally designed for hypertext or hypermedia applications and do not deal with web-specific issues. Some methods are very implementation oriented. Some have their origin in database design methods and are heavily data driven. These data-driven methods may be able to solve some maintenance problems but they do not meet the usability problems. [6]

Contrary to existing methodologies [2-4, 6], which all start and focus on data available in the organization or on the structure or data of the organization, WSDM is an audience-driven methodology. It is a powerful methodology; it starts from the requirements of the audience, documents, and models them and let them drive the structure of the web site. However, WSDM [7, 8] did not consider testing phase while developing the web site. The method could be improved if the testing phase were integrated through out the life cycle of the web development.

In this paper, we extended WSDM to integrate V-model as a model that concern with test phase within the WSDM. The idea behind was to have testing phase in WESM.

By integrating V-model into WSDM, it increases the maintainability and the effectiveness of the website. This will lead to successful web applications in general and e-business in particular.

V-model led to better validation and verification and produce a good way to satisfy user's requirements according to that WSDM is user centric approach.

The structure of V-model grantee that testing process will do exactly as real, staring from unit testing then integration, system testing and finally acceptance testing. This makes the web development more flexible and more familiar for both user and developer.

Another point V-model is flexible model which can transform from one phase to another suitable phase without any restrictions. V-model will save the time of web development, in traditional process most of development time is loosed in testing and validation this will produce also increasing in cost.

The overview of this paper will be as follows: In section 2, we will address the WSDM approach an life cycle. In section 3, illustrate how V-model integrated. In section 4 conclusions, the test levels from the V-model which associate a certain process phase with a testing phase is still relevant and will be used in this project. When the test levels from the V-model are used in parallel with development, and more importantly, when the different levels are tested simultaneously in

multiple iterations, the V-model testing method can become an effective and manageable testing process.

2. WEB SITE DESIGN METHOD (WSDM)

One of the most modern approaches for web application development .was developed in 1998 by De Troyer and Leune .It allows web sites and web applications to be developed in a systematic way[9]. WSDM uses the requirements of the intended users to drive the process of web site design. It differs significantly from other web site design methods. While other approaches take the organization's data or database as a starting point, so called data-driven approach, WSDM takes the requirements of the users of the web site as a starting point and uses this as a basis for structuring the data and the web site. This was called the user-centered approach. WSDM takes the requirements of the users of the web site as a starting point and uses this as basis for the structuring of data and the web site afterwards. WSDM gives consideration to the fact that web sites usually have different types of visitors that may have different needs. [1] .WSDM conceptual design, which is free of any implementation details, is separated from the actual implementation design, like the presentation: the grouping in pages, use of menus, static and dynamic links etc.

From the fact that each intended audience(s) has his own requirements, and each web site has different 'kinds' of users, WSDM uses the concept of Audience Class. The following example "conference papers selection process" will explain WSDM which appears in (figure 1).

2.1 Mission statement phase

This phase determines, the purpose, subject and intended users are specified, and declares the target audience. By this, WSDM ensures that the designer clearly establishes the borders of the design. The Mission Statement must answer the following questions:

1. *What is the purpose of the web site?*

2. *What is the subject?*

3. *Who are the target audiences?*

2.2 Audience modeling phase

It gives us already a general indication of the audiences involved in the site. The users identified in the mission statement are taken as a starting point and classified into different audience classes based on their information and functional requirements. The audience classes are built as hierarchy.

It consists out of two sub-phases, Audience Classification and Audience Class Characterization.

2.2.1 Audience Classification

Step 1 we are going to consider the activities of the organization related to the purpose of the web site.
Step 2 for each activity we have to:

1. *Identify the people who are involved in the activity.*

2. *Restrict them to the target audience. So only consider those people which belong to the target audience formulated in the mission statement.*

3. *Divide them into audience classes based on different information or functional requirements.*

4. *Decompose the activity if possible.*

5. *Repeat Step 2 until no new audience classes are found.*

6. *If decomposition of activities doesn't result into any new audience classes it should be stopped, because it is not useful anymore.*
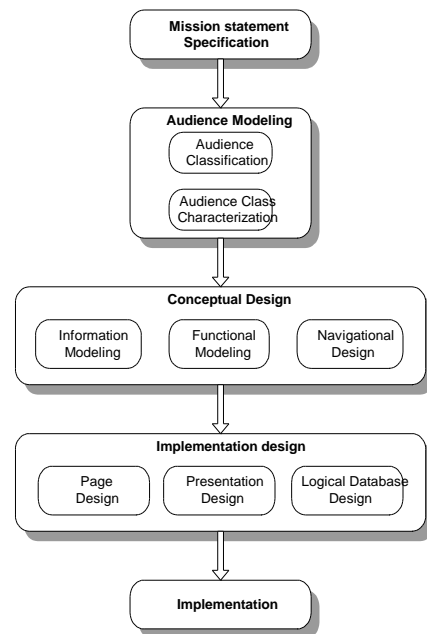

Figure 1: WSDM Approach overview

For each audience we must determine the Functional Requirements and information Requirements. In WSDM, the Audience Classes form a hierarchy. All identified classes are sub-classes of the top Audience Class Visitor .The requirements of the Audience Class Visitor are those that are common to all Audience Classes.

2.2.2 Audience Class Characterization

Members of one audience class may diverge in how the information should be presented to them. In this step of the Audience Modeling phase a set of characteristics per Audience Class is specified. Some examples of these user characteristics are: level of experience with web sites in general, frequency of use, language issues, education abilities, age, income, and lifestyle.

If we can distinguish, within one Audience Class, groups of members with different characteristics, we can introduce audience class variants.

2.3 Conceptual Design phase

The Conceptual Design we describe the (conceptual) structure of the web site and model how the members

from different audience classes will be able to navigate through the site.

The goal of the Conceptual Design phase is to turn the requirements we identified in the Audience Modeling phase into high level, formal description which can be used later on to generate effective web sites consists of two sub phases task modeling and navigational design.

2.3.1 Task modeling

The user requirements, which were informally specified in the previous phase, are elaborated. For each requirement, a task model is specified using hierarchical task.

WSDM uses the *Concurrent Task Tree* technique [9] for its task modeling because it allows not only to hierarchically decompose a task in subtasks but also to specify temporal relationships between different subtasks.

1. *Define a task for this requirement.*

2. *Elaborate the task into more detail (if necessary).*

3. *Decompose the task into elementary tasks (using Concurrent Task Tree).*

4. *For each elementary task make an Object Chunk that models the information and/or functionality required by this task.*

2.3.2 Navigational design

The conceptual structure of the website is built. A navigational model consists of nodes, grouping information and/or functionality (elementary tasks) that logically belong together. Links between those nodes specify navigation paths (Tracks).

For each individual Audience Class; Such a Navigation Track reflects the information, functional and navigational requirements we described in previous steps. Tracks are composed of components that represent units of information or functionality, and links that connect those components. In addition, links can be conditional depending on the logical true of a condition.

A Navigation Model is described in terms of tracks, components and links. Components represent units of information or functionality. Components are connected by means of links. Links are used to model the structure of the web site as well as to indicate the need for navigation. We can put conditions on links to indicate that the availability of the link is dependent on the truth-value of the condition.

2.4 Implementation Design phase

The goal of this phase is providing the conceptual design, with necessary implementation aspects. [1], the implementation design consists of three sub phases.

2.4.1 Site Structure Design

This phase help in deciding how the nodes defined in the navigation model; it is grouped into pages. Note that in this phase we define abstract pages; each abstract page possibly gives rise to multiple concrete page instances in the actual implementation.

2.4.2 Presentation Design

This sub phase gives the 'look and feel' of the web site and the layout of the individual pages.

WSDM provides three different sets of modeling concepts to describe the layout of a page. Each set provides a different level of abstraction.

- *Primitive presentation concepts*: There are two kinds of such primitives, positioning elements and multimedia elements (Audio, Email, Image, Integer, String and Video).

- *High-level presentation concepts*: express more high-level presentation concepts like lists, menus and sections, logos, banners, breadcrumbs, etc. These concepts are defined on top of the primitive presentation concepts.

- *Template concepts*: are defined on top of the primitive presentation concepts and meant to define templates that will be used for different types of pages.

2.4.3 Style and Template Design

During this sub phase, the designer specifies templates that will be used for different types of pages. Templates will be used for different types of pages to define the general layout of a page and website style (fonts, colors, graphics, etc). A template is defined as the combination of the following elements: footer, header, right- and left-sidebar, content-pane and editable region.

WSDM supports the most commonly found types of templates, and it currently uses style sheets.

2.4.4 Page Design

In the Page Design sub phase the designer describes where the information on a page should be positioned and how it should be laid out. It is also decided how and where the links (defined in the navigational design) should be presented. The template defined for the page is taken as a starting point.

2.5 Implementation Phase

All the information collected so far is taken as input and a website in the chosen

Implementation environment is automatically generated. It is consists of realizing the physical web site. First we have to choose an implementation environment (HTML, XML,...) and then we can convert the result of the Implementation Design to the chosen environment. This can be automated depending on the complexity of the model and the availability of usable tools.

3. INTEGRATING V-Model INTO – WSDM- APPROACH

The V-model was originally developed from the waterfall software process model.

The four main process phase's *requirements*, *specification*, *design* and *implementation* have a corresponding *verification* and *validation testing* phase.

WSDM is a new methodology for web development rather than it is user-centered approach. It seems incomplete and lacks for "Testing Phase" after implementation phase. Testing is important phase in order to validate and verify user's requirements because WDSM is user-centered approach.

Doing type of integration between V-model and WSDM, will make WDSM more flexible and satisfy more for user requirements.

The development process of web will do using WSDM. But testing process will do using V-model.

We observe that WSDM go with the same phases of V-model begin with requirements analysis and finished with implementation or coding. After coding phase we can use V-model to adding testing phase.
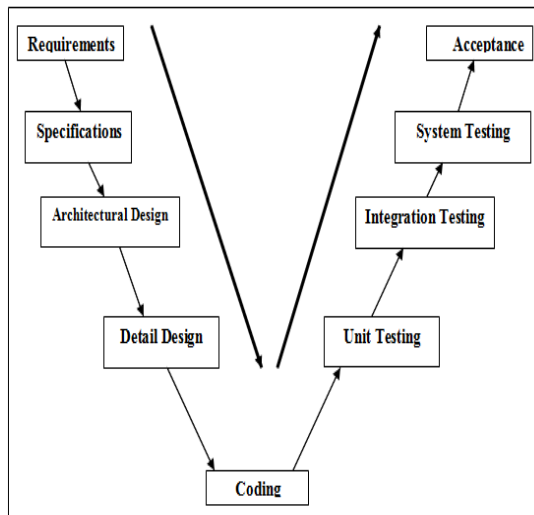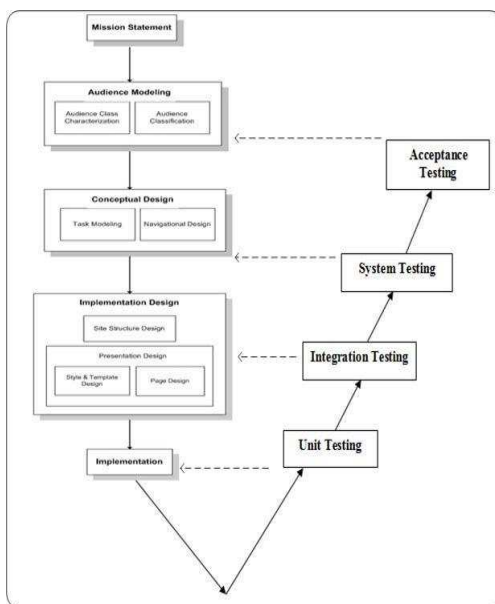

Figure 2: V-model Phases

Figure 3: Integration between V-model Phases and WSDM

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Each phase before coding is also available in WSDM, Likewise each phase in the left side of V-model is compatible with WSDM's phases, and the integration will begin from the right side of V-model as shown above. The integration process will discuss in the following 4 points.

1. *Unit Testing:* The unit testing is performed on the units while the programmer is coding them. We can consider unit as methods, classes that it is the bias of building system, testing them by tracing the code and discover faults then correct it. Testing also can include the reused methods and classes with its methods, or the Scripting codes that we use to enhance the capability of the system.

2. *Integration Testing:* In integration testing the separate reused methods, classes with its methods and scripting codes will be tested together to expose faults in the interfaces and in the interaction between integrated components. Tracing here does in logic way, tracing which, methods call others and which classes inherits other classes. Integration testing also includes the integration of pages and tracing the links between web pages and check that navigation go correctly.

3. *System Testing:* System testing will compare the system specifications against the actual system. These means that we need to compare the system results with the mission statement goals we put it first. Mission Statement has one goal, testing process must be guarantee that the website satisfy the audience requirements and reach to the goal that we put in mission statement phase. System Testing has feedbacks from audience by using the website in order to inhance performance and expose faults.

4. *User Acceptance Testing* :This is the final phase of testing, we carry the website to the real user's environment by upload it and hosting then test it using real data .the goal is to decide whether a system satisfies its acceptance criteria or not.

4. CONCLUSION

In this paper we presented an approach for integrating testing evaluation –V model - for web engineering, as a contribution to WSDM methodology. This approach helps to do testing an evaluation for website during web development process life cycle. This approach shows a flexible, reusable, and easy way of building and testing web site that takes into consideration all the needs of the customer as well as all of the enterprise rules and policies.

REFERENCES

[1] *Thomas Appelmans , Web Globalization and WSDM Methodology of Web Design*, Graduation thesis , WISE - Web & Information System Engineering Department of Applied Computer Science, Vrije Universiteit Brussel , Belgium , Academic Year 2003 .

[2] *Plessers, P., Casteleyn, S., Yesilada, Y., De Troyer, O., Stevens, R., Harper, S., and Goble, C.* 2005. Accessibility: *a Web Engineering approach.* In *Proceedings of the 14th international Conference on World Wide Web* (Chiba, Japan, May 10 - 14, 2005). WWW '05. ACM, New York, NY.

[3] *San Murugesan , Athula Ginige , Web Engineering: Introduction and Perspectives* , Chapter I , 2005, Idea Group Inc. , page (1-30) .

[4] *Daniel Schwabe, Luiselena Esmeraldo, Gustavo Rossi, Fernando Lyardet, "Engineering Web Applications for Reuse,"* IEEE MultiMedia, vol. 08, no. 1, pp. 20-31, Jan-Mar, 2001.

[5] *Lorna Uden, "Design Process for Web Applications," IEEE MultiMedia*, vol. 09, no. 4, pp. 47-55, Oct-Dec, 2002.

[6] *O. M. F. De Troyer and C. J. Leune ," WSDM: A User Centered Design Method for Web Sites"* , Tilburg University, Infolab, P.O. Box 90153, 5000 LE, Tilburg, The Netherlands , Published in Computer Networks and ISDN systems, Proceedings of the 7th International World Wide Web Conference, Elsevier, pp. 85 - 94, 1998.

[7] *Fuccella, J. 1997." Using user centered design methods to create and design usable Web sites*". In *Proceedings of the 15th Annual international Conference on Computer Documentation* (Salt Lake City, Utah, United States, October 19 - 22, 1997)

[8] *De Troyer, O.: "Audience-driven web design", In Information modelling in*

the new millennium", Eds. Matt Rossi & Keng Siau, IDEA GroupPublishing, ISBN 1-878289-77-2 (2001)

[9] *De Troyer, O., Casteleyn, S.: "The Conference Review System with WSDM"*, First International Workshop on Web-Oriented Software Technology, IWWOST'01,
http://www.dsic.upv.es/~west2001/iwwost01/), Eds. Oscar Pastor, Valencia (University of Technology), Spain.

[10] *Najjar, J.: "Business Rules & WSDM Methodology of Web Design", Wise Laboratory*, VUB, Brussels (2002).

[11] *Paterno, F. Model-Based Design and Evaluation of Interactive Applications, eds. Ray, P., Thomas, P., Kuljis, J., Springer-Verlag Londen Berlin Heidelberg*, ISBN 1-85233-155-0, 2000.