

Comparative Study Of Web Design Methodologies

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Abstract

The power, dominance and impact of web site engineering in the twenty-first century has caused a growing need for web site technology to be narrowed down into some form of standard appreciable by a population of people who have relied on it for information. Therefore, unless these web sites meet the needs of the intended users it will not have satisfied the cause for which it was developed. All web site development should have the users, as the center focus of their designs and evaluation of the evolving designs should be against the user requirements. Unfortunately the issue of design is still not well appreciated looking at the web sites on the World Wide Web. This is partly because in the past there was no respect for methodology and people could still build sites without careful planning. Another reason is that the users were still too marveled at the rate of progress of this technology and their requirements were few and not too complex. So they were willing to settle for the visual appeal against a good structural piece, which should be the foundation. But with web explosion and competition among commercial web sites to hold the interest of the users, there has become a growing awareness in design methodologies. It is no longer aesthetics that matter but quality in the structure of the web site, that pulls any user to your web site.

1 Introduction: -

Recently Web site development is attracting significant interest among business process practitioners as flexible and low-cost solutions to distributed collaborative work. "Intranet" is a typical targeted environment for most web sites. Because of the dynamic nature of web sites, the intention behind such sites is no longer a one way interaction of disseminates information like it used to be, but also proactively interacts with users and processes their business tasks to accomplish their business goals. Thus, analysis and design of these web sites need an approach different from those for Web sites that mainly provided information uni-directionally on users' requests, such as catalog, directory, and advertisement sites.

Researchers have recognized the lack of design methods for web sites, or in general for web- based information systems. There has been a lot of work on graphical and user-interface aspects of Web site design [Nielsen, 1995; Sano, 1996]. They emphasis *visual design* of each Web page but do not provide a systematic way of designing logical structure of Web sites as a whole. There are also academic design methods for Web sites, such as OOHDM [Schwabe et al, 1996], SOHDM [Lee et al, 1998], W3DT [Bichler and Nusser, 1996] and RMM [Isakowitz et. al, 1995]. However, companies do not yet use these methods frequently.

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Chapter 2 explains some of the problems that most web sites are experiencing as a result of non-adherence to or the absence of good design methodologies. After that comes the purpose, motivation and the methodology that will be used for the comparison

Chapter 3 introduces and describes the yardstick, which is the Web Site Design Methodology (WISDOM). This methodology as well as other design factors will form the basis for my comparison.

Chapter 4 through 6 goes on to introduce and describe the other methodologies that would be compared to the WISE methodology.

Chapter 7 is the comparison proper. It touches the very important concepts of most web designs and the various ways these methods have incorporated them. It also points out some few advantages and disadvantages that may occur as a result of their presence or absence.

Chapter 8, illustrates the definition domain and the audience modeling concepts for the WSDM, the IconMatrix and the Reference methodologies using a job fair example. Then it is followed by summary of the inferences observed from the comparison.

The last chapter presents the conclusions based on the comparisons.

2 Inherent problems

This chapter presents some of the problems that plague or web sites and the consequences of these problems on our web sites. The need for a web site design methodology that has the audience interest is also emphasized.

2.1 Ad hoc Approaches and concerns

The Web has very rapidly evolved into a global environment for delivering all kinds of applications, ranging from small-scale, short-lived services to large-scale enterprise applications widely distributed across the Internet and corporate intranets. Tracking the Internet's global diffusion, and its influences and impact on society at large is a daunting task, and perhaps and almost an impossible task.

2.2 Disorganized Web

In most cases, the development approach used for Web-based systems has been ad hoc, and in practice software development for the Web lacks rigour and a systematic approach. Hardly any attention is given to development methodologies, measurement and evaluation techniques, application quality and project management. Furthermore, most current applications development and management practices heavily rely on the knowledge and experience of individual developers and their own development practices. In addition, there is lack of proper testing of Web-based systems, and documentation which is needed for 'maintenance and upgrade' of the system among other needs.

The nature and rapid growth evolution of the Web, rapid boom in Web and Web-related technologies, the commercialization of the Web, and the rush to "be on the Web" and to migrate the legacy systems to Web environments can partly be attributed to problems of Web-based system development. Also the complexity of Web-based applications has grown significantly - from information dissemination (consisting of simple text and images to image maps, forms, CGI, applets, scripts and style sheets) to online transactions, enterprise-wide planning and scheduling systems, Web-based collaborative work environments, etc. But, the complexity of Web-based systems is often deceptive.

Further, Web's legacy as an information medium rather than an application medium is another cause of the problem. Many consider Web development primarily as an authoring problem rather than an application development problem to which some of the well-known software engineering and management principles and practices could apply – of course with some changes and fine-tuning to suite to the Web environment. Web-based systems development is a process – "it is more than media manipulation and presentation creations - it includes analysis of needs, design, management, metrics, maintenance, etc

Many attributes of quality Web-based Systems such as ease of navigation, accessibility, scalability, maintainability, usability, compatibility and interoperability, security, readability, and reliability are not given due consideration during development. Many developers seem to be unaware of the real issues and challenges facing major Web-based application development and its continual maintenance.

There is a need to engender an awareness of the need for more disciplined approaches to Web-based application development, and we need to move from the current, largely ad hoc (and personal) approach to a better-disciplined approach and process. Also we need to realize that Web-based system development is not just graphic design or content development any more, and there are growing number of complex applications – intranet-based applications, transactional systems, and other e-business applications. “There is more to Web site than visual design and user interface. Web sites are becoming more like programs less like static documents”, and hence Web-based systems developments are becoming more like software projects, and less like work of art.

There is legitimate and growing concern about the ad hoc manner in which most Web-based systems are currently created and their long-term quality and integrity. More sophistication and high complexity of new Web-based applications bring in many new challenges that need to be satisfactorily addressed.

2.3 Responsibility-driven *versus* data-driven approaches

It is often said that data are more stable than functions and so data-centered approaches are to be preferred in most cases. However, one of the greatest dangers in adopting a method based too much on structured techniques is that of data-driven design. Two software engineers at Boeing (Shlaer and Cohen, 1994) conducted an experiment with internal trainees with similar backgrounds. One group was taught the data-driven Shlaer/Mellor method of object-oriented analysis - a method consciously and deeply rooted in traditional entity-relationship modeling - while the other group was instructed in the Responsibility Driven Design techniques of Wirfs-Brock *et al.* (1990).

The two groups were then asked to design a simplified control application for a brewery. The Shlaer-Mellor group produced a design wherein most of the classes represented static data stores while one class accessed these and encapsulated the control rules for most of the application: in much the same style as a main { } routine in C would do. The other group distributed the behavior much more evenly across their classes. It was seen that this latter approach produced far more reusable classes: classes that could be unplugged from the application and used whole. It also demonstrated vividly that the method you use can influence the outcome profoundly. It is our firm conviction that data-driven methods are dangerous in the hands of the average developer and especially in the hands of someone educated or experienced in the relational tradition. Furthermore, We hold that the approach taken to requirements engineering can have a huge influence.

The study by Sharble and Cohen shows convincingly that data-driven methods *do* influence the thinking of designers and that they tend to produce un-reusable classes as a consequence. The usual effects are that:

- Behavior is concentrated in controller objects that resemble main routines; this makes systems much harder to maintain due to the amount of knowledge that these controllers store about other objects;
- Other objects have few operations and are often equivalent to normalized database tables: not reflective therefore of sound object-oriented design.
[Extract from web site*]

2.4 Some Usability problems experienced by audiences of the web sites are listed:

- **Redundancy.** Information that is needlessly repeated during navigation
- **Inconsistency.** Would result to distrust by users of the site because the information is inconsistent and unreliable.
- **Incompleteness.** As a result of stale or broken link. Users are not able to find the information they need.
- Lack of clearly defined mission statement or project scope analysis.
- Lack of clearly identified target audience
Information and visual overload [Olga De Troyer et. al, 1995]
- Lost-in-hyperspace syndrome (Maurer, 1996)

There are a whole lot of methodologies and standard tools that are in vogue that provide guidelines for designing and developing web sites. The striking similarities in these sites leave me wondering why there are still no *de facto standards* for analyzing and designing web sites. Instead we have each institution clinging to a unique methodology used for developing their web sites. Some questions that need to be investigated are: -

- Is the absence of an agreed upon standard based upon commercial strategy?
- Why are the methods not similar if their outputs are in a way quite similar?
- Can these different methods be unified to form some standard as can be seen in software engineering?
- Is it more practical to say that we can only bridge up the gap between different methods because of the diverse nature and flexibility of Web Engineering?

2.5 The purpose of my thesis

In this paper, I have gathered different web design methodologies from various reputable companies that have a flare for systematic way to developing a web site. With these methodologies, I intend to do a comparative study to find out what their concepts are and how much they have helped in solving the problems inherent in most web sites. The

methodologies are; Web Site Design Method [WSDM], IconMatrix design methodology, Frontline Solutions, and The Reference methodologies. The entire thesis is divided up into three sections. First, is a brief description of the methodologies, followed by the comparisons, which starts by first analyzing the concepts to be discussed and the various ways each methodology has imbibed these concepts. Finally an inference and conclusions is drawn.

2.6 Motivation:

I have a natural flare for creativity. I love to see imaginative thinking being transformed to live and not just static images of paintings as seen on canvass. The Internet and especially web design became my area of interest and I could surf the Web for several hours a day to appreciate the visual effects that many sites are able to offer. My shallow quest was deepened one day when I had to build a web site in course of software engineering. And that opened my eyes to the stark reality of the fact that “*there are no standard approaches*” (like we have in software engineering e.g. possible like the waterfall model, spiral model etc.) that would guide me through a good analysis and design of web sites. Most textbooks are overly concentrated on development tools and little importance is attached to the web design principles itself especially as it affects usability. The Human Computer Interaction (HCI) was about the only field, which focuses on the User- Centered approach. But the question still is unanswered if the scope of the project goes beyond the Intranet, as we are most familiar with.

So why can't there be some form of approved standards or templates that is generally accepted as a guide to web site design and development? The need for pre-laid set of rules that ensure uniformity in the divergence of views in web site design methods is what I have set out to investigate.

2.7 Methodology Used for method Comparison

There are really no hard-knock approaches that I will use in this paper to do the comparisons of the different design methods that I investigate. However, there are certain basic concepts that these methods have followed to guarantee quality and durability of their web sites, and not just one with an enthusiastic beginning but without lasting accomplishments.

Our divergent views and different perceptions of the world also apply to web site design methods. Therefore, it is not abnormal to see things considered in one method as irrelevant and as relevant in another method. Like we could talk about visual appeal on the basis of browser capabilities, color and fonts.

A Good Remark:

For a successful comparison of two things or more, it is important to note that some very vital points and remarks are inevitable. It is good to have at the back of our minds that an effective comparison attempts to demonstrate one of three general purposes:

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- Two things thought to be different are actually similar.
- Two things thought to be similar are actually different.
- Two things, although comparable are not equal- that is, one is better than the other
(Extract from “Writing with purpose. Boston: McCrimmon, James M.”)

As stated before, an elaborate yet brief description of each phase in the various methods will be done. Then using the Web Site Design Method as my yard stick, I will elaborate and compare the various methods in a precise and concise manner based on their various concepts particularly while comparing with WSDM, I will: -

- Identify concepts/steps in WSDM that are not in the other methods
- Identify the concepts/steps in other methods that are not in WSDM
- Check if some concepts identified are maybe in other phases of the method
- If not available, what is/are the likely impact of their absence on the method

It is my intention in this thesis to examine only those concepts that could form possible criteria for my comparisons. I would like to mention that in this thesis also, there would be no form of prejudice or despise for the methodologies that would be discussed. I also want to state clearly that it is not my intention to judge any methods neither would I want to sound discriminatory even if it has appeared so; I recommend the authors of these methods to see my argument from a positive and constructive point of view. All the methods discussed in this thesis are of equal strength.

3.0 Web site Design Method (WSDM)

WSDM, pronounced **wisdom** in English simply because of the ease, will be used as my yardstick of measurement. WSDM is a method whose history started from Tilburg University in the Netherlands. Professor Olga De Troyer is the supervisor and brain behind WSDM. At present it is been used as a methodology for web site designs and more research is being done at the Vrije Universiteit Brussels to improve and refine it. You can find the site at <http://wise.vub.ac.be>.

In this thesis, WSDM will be used as our Yardstick in comparing and discussing the different web site design methods that are being considered. The methodology is notable for being **Audience Driven** and not **Database Driven, neither Organization Driven nor Technology Driven** as most methodologies are. This unique characteristic of having the **Target Audience** as its center focus is the main reason for its choice.

WSDM comprises of five main phases namely: -

- Mission Statement
- Audience Modeling
- Conceptual Modeling
- Implementation Design
- Actual Implementation

Some of these phases are further decomposed and integrated to the entire process. Below is an overview of WSDM showing each phase in its operational order from top to bottom.

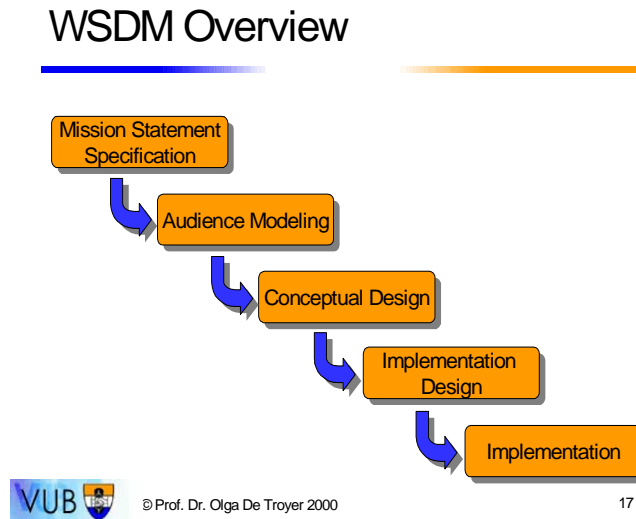


Figure 1: An Overview of WSDM

3.1 Mission statement Specification

The “*Mission Statement specification*”, is the first phase of the WSDM. It attempts to provide answers to the following questions. They are: -

- i. What is the **purpose** of the web site? Because:
 - It will help to evaluate the effectiveness of the web site later on
- ii. What is the **subject** of the web site?
 - It fulfills the stated purpose and satisfies the target audience
 - It will streamline the information content of the Web Site.
- iii. Who is the **target audience** of the web site?
 - It enlightens us on who the users of the site are and how best we can adapt the site to their needs.

Possible Demerits associated with the Mission Statement Specification

- It is void of diagrams or pictures
- Misconceptions are possible, may be due to ambivalent words and sentences.
- It could become difficult and quite daunting especially if it is voluminous.

- A much larger target audience could lead to specifications that are too broad and ambiguous.

A few practices and suggestions may consolidate the Mission Statement Specification

- The *mission statement* must be concise, and straight to the point.
-
- Decomposition principles are useful in specifying the mission statement.
- User involvement (Intranet) as well as HCI techniques are also invaluable when formulating the mission statement.

3.2 Audience Modeling

The *audience modeling* combines two sub phases to produce *the Audience Class Hierarchy*. They are: -

- Audience Classification:** Audience classes are identified by considering only the activities of the organization related to the purpose of the site and identifying the people involved; these people can now be grouped into audience classes by looking at those information and functional requirements that are similar to them.
- Audience Characterization:** Here the characteristics of the various audience classes are given. A further look at their characteristics enables us to decide whether to further group these classes into *Audience Class Variants* or not

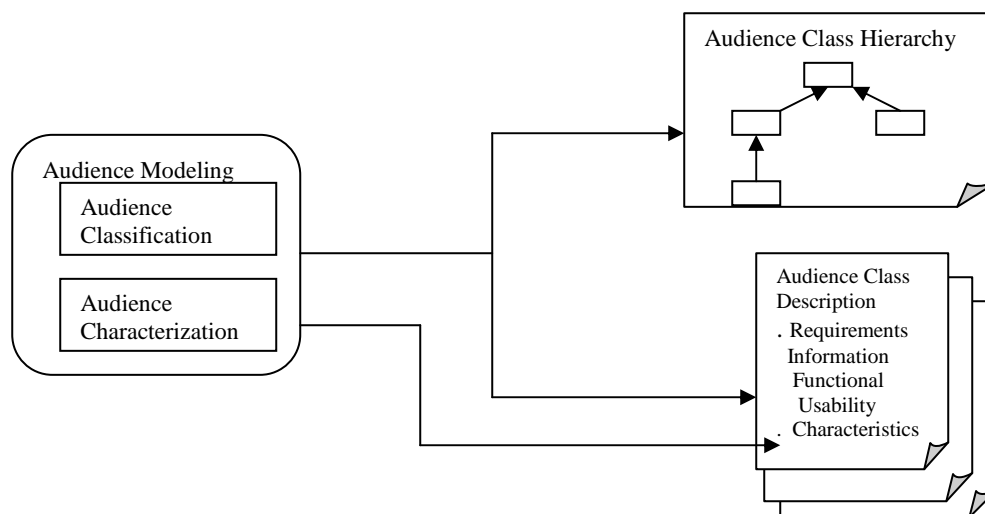


Figure 2: An Overview of the Audience Modeling Output.

Like the previous phase there are merits that abound in this phase. They are: -

- By identifying the target audience, we are sure of whom the web site is for. The audience class hierarchy can be validated using the weaving algorithm [Sven & Olga et. al, 2001]
- The various requirements are sorted out as well and taken care of.

A wrong or incomplete Audience Model may be due to the following: -

- The mission statement may be too ambiguous.
- The target audiences may be too large such that we may be less informed of their possible requirements and characteristics. Or may be completely unknown.

Consequences: -

- An error in this phase does affect the rest of the design negatively.
- Frustration due to time and effort wasted.

3.3 Conceptual Design

The **Conceptual Design Phase** comes next. It is divided into three parts that can be performed simultaneously. They are: -

- i. *Information Modeling* mainly intended for data intensive web sites; it deals with the “conceptual what” i.e. the type of information and how it is structured. *Object chunks* are made from the elementary information requirements and they are linked to form the *business object models*.
- ii. *Functional Modeling* consists of the interaction between the users and the system. For the purpose of the interaction, the functional requirements are listed according to the various audience classes based on how they are related to the system.
- iii. *Navigational Design*: Basically addresses how to navigate through the information. Each audience class is considered and the various information components external that are related to it are considered. For each elementary navigation requirement, a *navigation chunk* is built. For each class the navigation chunk are merge into *navigation tracks*; all navigational tracks constitute the navigation model.

The Integration of the Information Chunks and the Functional Chunks in the Navigational Model is what is called The **Conceptual Model** of the web site.

In this way possible redundancy is described and therefore can be controlled. It is highly intended for the data intensive web sites.

The advantages of the conceptual phase are:

- We have high-level formal description of requirements, which makes implementation less hideous.
- Defining *Information Chunks* as views, helps control possible redundancy.
- By using object models, the conceptual schema for the database is gradually evolving.
- Tracing these object chunks throughout the design process enables us to compute the impact of a change in the final web site.
- Building navigation tracks for each audience class avoids the “lost in hyperspace syndrome”.
- Linking is simplified because of easy accessibility of each component from the top of the navigation track.

3.4 Implementation Design Phase

The Implementation Design Phase is a three-phase model that comprises: -

- Page structure design*, which entails packaging information in form of chunks in the right proportions.
- Presentation Design* deals with the ‘*look and feel*’ of the web site. And may constitute a lot of literature.
- Logical Database Design* is the design of the underlying database that may be used to maintain the data in case of data intensive web sites.

The output of the implementation phase is an *Implementation Model*.

3.5 Implementation phase

The implementation phase is concerned with realizing the web site by using the design made in the previous phases. Here an implementation environment needs to be chosen.

4.0 The IconMatrix

The IconMatrix originated in 1996 from Icon Media Lab, (<http://www.iconmedialab.com>). Icon Media Lab is a professional web site development organization; therefore the relation with the customer is an important issue as well as the cost aspect. Their process is based on the Rational Unified Process® (RUP), a software engineering process that enhances productivity by focusing on best practices. As part of their effort to ensure effective e-Business solutions that would guarantee client satisfaction, the **IconMatrix** was developed into a *Template* to make designing easier. Their method follows the **User Centered approach**, and relies a lot on the **iterative method** of development.

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A few examples of web sites built for some renowned companies are: -

- <http://www.airliquideventures.com>, for Air liquide
- <http://www.aschehoug.no>, for Ashehoug
- <http://www.cidadebcp.pt>, for banco Comercial Portugues
- <http://www.bokkilden.no>, for Bokkilden
- <http://www.empireblue.com>, for Empire Blue Cross

The IconMedia lab pulled their resources and technical know-how into four major phases. Therefore the IconMatrix comprises the following: -

- Inception
- Elaboration
- Construction
- Transition

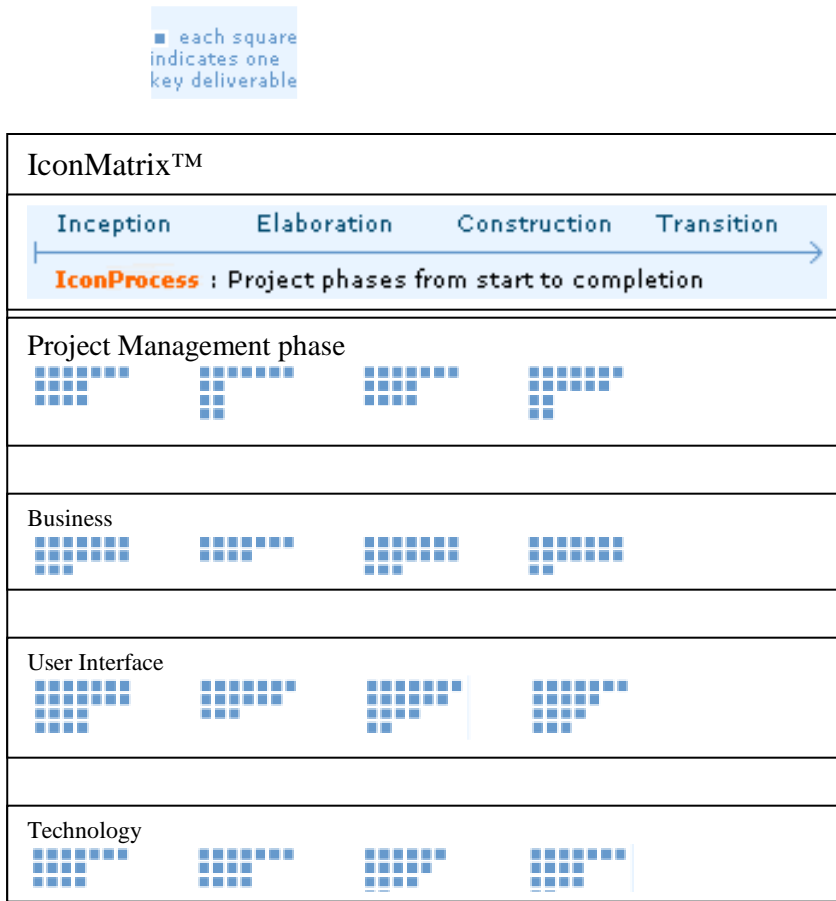


Figure 3: shows a detail overview of the IconMatrix.

- The phases occupying the columns
- And the various groups involved occupying the rows.
- Also indicated are tiny squares with each representing a key deliverable or milestone

4.1 The Inception

The Inception phase begins by establishing a comprehensive business strategy or by evaluating any existing strategy. The varying needs of a client will determine whether the strategy should include a business plan, marketing plan, and brand strategy. Using competitive analysis, enterprise analysis, user research analysis, usability benchmarks, and the client's brand strategy a vision is created for the website. This vision allows for developing a project plan outlining the scope, timing and costs of the project.

4.2 Elaboration phase

In the Elaboration phase, the focus is on the visible user experience and the not so visible but critical technical software architecture. A user interface prototype is built on which they are able to conduct usability tests early and frequently. By refining the user experience each time, a compelling user experience is designed, which is the total impression left by interacting with the system's varied attributes, visual design, features and functional behavior, content, information layout, usability, and robustness. This iterative process continues until a risk free and the most essential piece of the system is guaranteed.

4.3 Construction Phase

In the construction phase, the remaining functionality is *designed, implemented, and tested*. Deployment plans and marketing campaigns are finalized. These continue over series of iteration producing a working version of the system with increased functionality and quality, until the agreed system scope is reached.

4.4 Transition phase

This is the final phase of the IconMatrix. It involves formally launching the web site. Here also the site is monitored, evaluated and fine-tuned for optimum performance.

5.0 The Reference project methodology

The Reference was founded since 1993. Their design method for building web sites is known as *the Reference Project Methodology*. The Reference is also a commercial web site development company.

Their method is also based upon the Rational Unified Process® (RUP), which is an industry standard process that helps to tackle complex software development projects in a repeatable and predictable way. Their methodology lays much emphasis on user experience and expectations, which help them to understand what needs to be built and how to evaluate their target audience. The **User Centered approach** is their major style for web development.

A few of their web sites can be appreciated at the following URL's.

- <http://www.compaq.be>, for Compaq Systems
- <http://www.cofinimmo.be>, for Cofinimmo
- <http://www.compu-mark.com>, for Compu-mark
- <http://www.confreight.be>, for Confreight
- <http://www.daneels.be>, for Daneels Group

The **Reference Project Methodology** comprises the following: -

- **Inception:** “What are your needs?”
- **Elaboration:** “Let’s investigate the scope and find a solution.”
- **Construction:** “Let’s build the solution.”
- **Transition:** “Let’s hit the market.”
- **Production:** “Let’s keep the system going”

The 5 Phases of Our Project Methodology (the overview)					
Phase	Inception	Elaboration	Construction	Transition	Production
Purpose	<i>"What are your needs?"</i>	<i>"Let's investigate the scope and define a solution"</i>	<i>"Let's build the solution"</i>	<i>"Let's hit the market"</i>	<i>"Keep the System going"</i>
Activities and Deliverables	<ul style="list-style-type: none"> . <i>Can The Reference provide the Solution?</i> 	<ul style="list-style-type: none"> . <i>S/W requirements Specification (H.L)</i> . <i>Site Concept</i> . <i>Functional Concept</i> . <i>Technical Concept</i> . <i>A Use-Case Model</i> . <i>Graphical Requirement Spec.</i> . <i>Project Management Plan</i> 	<ul style="list-style-type: none"> . <i>Development</i> . <i>Smoke Test functional</i> 	<ul style="list-style-type: none"> . <i>Internal Acceptance Test</i> . <i>Transfer to online</i> . <i>Final Online Test</i> 	<ul style="list-style-type: none"> . <i>Intensive care period.</i> . <i>Customer Support Organization</i>
Output	<i>Go/No Go for further investigation</i>	<i>Scope analysis Project Mgt. Plan Project Approval</i>	<i>Solution passes acceptance criteria</i>	<i>Go Live</i>	<i>Satisfied Customer</i>

Figure 4: The Reference Project Methodology cycle with the all the phases

5.1 The Inception

The inception phase attempts to first screen the client’s needs, then to define a project scope, on which a decision for further investigation can be based.

It constitutes of a first and fast introduction of the underlying needs in order to give an answer to the following questions:

- What are the needs?
- Can the Reference be a valuable potential partner for the underlying project?
- Is there a mutual GO for further investigation?
- A first rough budget would be made.

5.2 Elaboration phase

The Elaboration phase of the Reference Project Method is a very detailed one and it comes in two steps. These are: -

- Elaboration –1
- Elaboration –2

Elaboration –1: - In elaboration-1, the scope analysis is first investigated. It aims at analyzing the scope of the project on the very highest level to produce a project proposal that includes precise budget estimation. Normally it consists of the following components:

- a. Graphical Requirements Specification (high-level)
- b. Software Requirements Specification (high-level)
- c. Identification of the main Use-Cases

Elaboration –2: - The completion of the Project Management Plan (PMP).

The PMP is the detailed blueprint of the project and consists of the following components:

- a. Graphical requirements Specifications (low-level)
- b. Software Requirements Specifications (low-level)
- c. Elaboration of main Use-Cases
- d. Software Architecture Document (high-level)
- e. Work-Breakdown structure
- f. Final Budget

A major issue in the elaboration phase is the *Risk Assessment Plan*. This document is used through out the project life cycle.

5.3 Construction Phase

The *Construction phase* kicks off once the *Project Management Plan* has been agreed upon. The detailed design of the project is defined; the project itself is developed and tested.

The following results are expected from the construction phase: -

- Software Architecture Document
- Updated Risk Assessment Document
- The Project Developed

5.4 Transition Phase

In the *Transition Phase* the web site is launched. The Development environment goes to the Acceptance environment. Here a final online test will be executed before the project finally goes live.

6.0 Frontline Solutions

Frontline Solutions (<http://www.frontline.be>) is a new E-business Provider (ESP) that was founded in early 2000. Their key strengths are customer satisfaction, innovation, creativity quality and flexibility.

In order to achieve optimal results, they prefer to work closely together with their **clients**. Their process is very versatile, and based upon best practices and established methodologies, which combines the **data driven approach** with the wealth of **User Centered approach**.

A few samples of web sites built using their methods can be seen at the following: -

<http://www.volvo.be> for Volvo
<http://www.quintessence.be>, for Quintessence
<http://www.vandemoortele.be>, for Vandemoortele
<http://www.yucom.be>, for Yucom

The Frontline Solutions' method is embodied in 5 major phases. They are: -

- Analysis and Design
- Development
- Testing
- Implementation
- Post Production Phase (PPP)

The Frontline Solutions method takes two major phases to complete the entire process. The first major phase is the *Analysis and design phase*. The second phase is the *Development phase*, which also embodies the implementation and postproduction phases.

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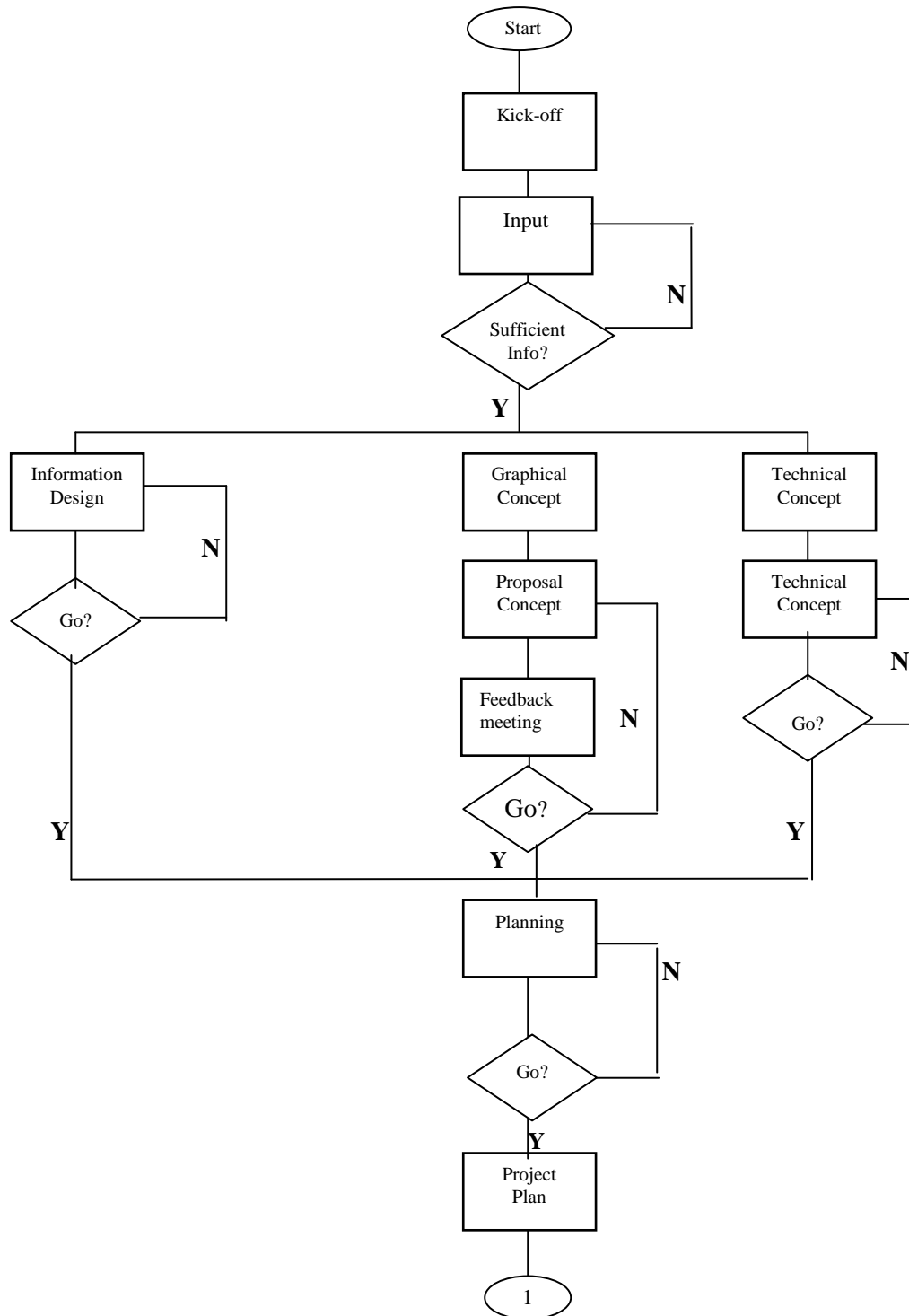


Figure 5: The Frontline Solution overview Analysis and Design

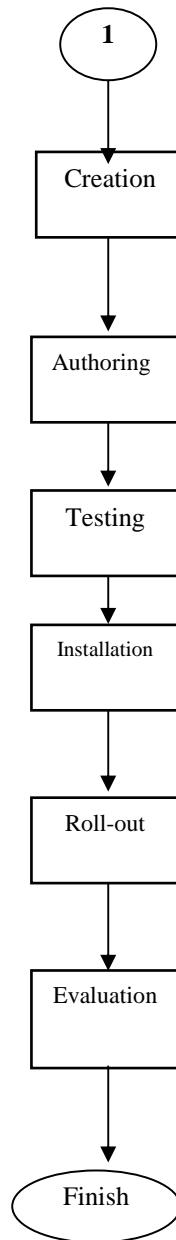


Figure 6 a simple frontline Solutions Project Overview

6.1 Analysis and Design

Of all the processes in this phase, the most relevant sub phases are going to be described.

- i. *Input Phase*: in this phase, all questions are formulated regarding:
 - The structure and content of the application
 - The graphical concept
 - The functional model
 - The data model
 - The technical structure

In this phase, all stakeholders are involved to ensure that consensus is reached. Furthermore, quality checks and interviews with the customers are necessary to get information first hand.

- ii. *The information design*: An elaborate analysis of the applications (site) structure and content is performed. The navigation structure is defined. The main pages are described and all their content blocks. The rest of the pages are described conceptually. (Milestone deliverable is likely)
- iii. *Graphical Concept*: The look and feel (presentation) is very important. Therefore templates of the most prominent sites are drawn and discussed with the client's approval on whether implementation should begin or not.
- iv. *Technical concepts*: comprises the following elements in their complete form: -
 - A full functionality description of the site
 - A database model
 - The Component model
 - The Security model
 - Description of the technical architecture

6.2 Developments and Implementation

Once the Analysis and Design receives approval the development of the solution starts. The following procedures are used to guarantee the quality of the development phase:

- A formal technical design document: this is the first milestone in the development phase
- Feedback loops: This involves frequent checks by the business users to ensure correctness of the developed functionality
- Methodology and Online tools: Applies best practice development techniques both on structural and coordination level.

Basically the implementation consists of **creation, Authoring** and **Testing**

6.3 Post Production and Project management

This comprises three major processes: -

- Testing: this is carried out during and after the whole process of development
- Installation: This comes after testing, but requires the user's approval before it is installed on the production server. Final tests are carried out.
- Rollout: this is where the company hands-off unless requested otherwise. Here there's an official launch of the site and the customer signs off.

7.0 Comparing the different web site methodologies.

In this chapter, the different methodologies described in the previous chapters are compared. The basis for which these design methodologies that we have seen above would be compared, focuses on the deficiencies that plague our web sites as seen on WWW. That is: those concepts that are needed to improve our web sites so that they are tailored to the needs of the different audiences.

My method for the analysis will address the following issues:

- i. *The definition domain.* This focuses on the questions if user identification and their requirements are addressed. The advantages of each approach will also be reviewed.
- ii. The Usability issues which include navigation, requirement structure and integrity.
- iii. Finally a few implementation design issues are discussed from the context of the users' needs

For most of the comparison, the IconMatrix and the Reference can be combined because they both have their methodologies based upon the Rational Unified Process (RUP). The Frontline Solutions on the other hand would be dealt with separately unless where there is a similarity in approach with the rest.

7.1 The Definition Domain

The users are the most vital components of any web site because without them the sites cannot exist or rather have no value. Therefore a wrong target audience implies that the web site is more or less useless. Therefore we will investigate the following:

7.1.1 *How does each design method identify their target audiences especially when it has exceeded the Intranet?*

- ❖ WSDM begins by specifying the mission statement, which includes declaring the *target audience*. In a more elaborate second phase (*the audience-modeling phase*), it derives the *Audience Classes* for the web site. First it examines the *activity of the organization* related to the *purpose and subject* of the web site. Each activity involves people, which are potential users of the site if they belong to the target audience of the mission statement. If necessary, the activities are decomposed in order to refine in each decomposition step the target audience.

Obtaining the Audience Classes:

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- WSDM defines an audience class as having the same (information and functional) requirements. Whenever the requirements differ a new Audience class is made. While considering the characteristics of the various audience classes the *audience variant classes* may be introduced. The audience classes form a hierarchy. The *Visitor class* is the top of this hierarchy, i.e. every other class is a sub class of this class. This class includes the passing by visitors.
 - Another way to obtain the classes and do the grouping, into sub classes; is to use the *weaving algorithm*. [Olga De Troyer et. al, 1995]. The weaving algorithm builds the audience class matrix based upon all requirements, which helps to construct the *Audience Class Hierarchy* to emerge. An advantage of using the audience class matrix is that it helps the designer to reflect on the requirements deeply thereby validating the requirements.
- ❖ The IconMatrix and Reference methodologies more often than not have interaction with their clients who already have a sparing idea of what they need. But in the absence of this they rely on two main techniques. Firstly:
- Study the domain just like is seen in WSDM. They also declare the users or target audience of the system.
 - Another method used is their *benchmarking activity*, which studies competitors' sites closely to establish certain basic facts while comparing with their standards. With this they are more informed on the likely target audiences.

By relying on UML modeling techniques they define the actors (users) and use cases (requirements). Of all their requirements, their functional requirements on the system are the most revealing. By looking for all the interactions that the actor has to make with the system and what the system in turn provides for the actor, most of the requirements are discovered. Not all these represent separate use cases; some may be modeled as variants of the same use case.

A detailed description of the flow of events helps produce the variants and use cases in more detail. The actors in this case are now used to form the classes.

The second thing they do is to organize a use case workshop where extensive guidelines are provided by the RUP for arranging a brainstorming session. Here potential users already discovered and developers work together in the session to identify more *actors and use cases*.

Defining the Audience Classes for both methodologies

- First all the actors and use cases derived are used to define the initial classes. They include: designing boundary classes, entity classes and Control classes.
- They go on to define persistent classes and define the class visibility.
- Next Operations are defined by; firstly identifying them, naming and describing these operations, defining operation visibility and defining the class operations.
- Methods, states, attributes and dependencies are then defined.
- The Associations relationships as relates to associations and aggregations are defined and subscribes-Associations between analysis classes are handled.
- Next Generalizations is defined after which use case collisions are resolved if any. The Generalization relationships in a way, help to model classes into hierarchies
- The non-functional requirements are handled on a global level and the entire results from the class design are evaluated.

- ❖ The Frontline Solutions is based on the practices of Project Management Institute (PMI). In this case, they rely on the standards (templates) related to their scope, already developed by the PMI.

Where this is inadequate or does not suit all their requirements, they create a forum that involves the ‘stakeholders’ i.e. those who are involved in the project activities, which include the clients, end-users, and team members who design and develop the project. Like every other methodology the target audiences are identified from the initial project.

All stakeholders involved formulate questions on *users and their requirements by interviews, referencing similar projects etc.* These questions are discussed and the best quality answers are agreed upon unanimously. There are no formal models or techniques used for this except that they rely a lot on the experts involved in this field to use experience, knowledge, skills, tools and techniques to project these activities in order to meet the requirements.

7.1.2 Is the reason(s) for the design clearly identified in all these methods?

Looking at the design methodologies, all the methods have about the same style for declaring the target audiences that is by carefully studying the purpose and the potential users of the system. It implies in a way that there are no special techniques for arriving at the target of the web sites. At first we have to infer from the scope at hand.

Again it is also common to all the designs that the requirements of these audiences cannot be completely identified from the first. Instead it takes continuous modeling even after the web site is developed to arrive at some of the requirement.

Some of the reasons are: -

- The needs of users are constantly changing with the ever-dynamic technology.

- Because for most public web sites the target audiences are not known completely.
- May also be that some user characteristics are too abstract to represent using our models. Like Usability requirements for handicapped users.

7.1.3 What is done by these methodologies to ensure that the target audiences at least have the minimum requirements?

In the WSDM, there is no special way to derive a complete set of user requirement. It is just a matter of concentrating on it deeply and carefully listing all the possible requirements that we can think of at that time. Any updates are made later on when the need arises or during maintenance. With all the other methodologies the extra *involvement* of the *identified audience* in their workshops or meetings where HCI techniques can then be applied are confirmatory steps toward verification and more so there are high chances that some hidden facts and suggestions may be discovered. But that still does not guarantee that that every requirement is taken care of.

- One major advantage that IconMatrix and the Reference design methodologies have over the WSDM method is in the area of *class modeling*. The actors and use case models are more detailed, with a more standard way of representation. They are consequently transformed into object-oriented designs using Rational Rose and UML tools used.
- The class designs in IconMatrix and Reference methodologies ensures the following: -
 - That the class provides use case behaviour the use case realizations require but behaviour is still a salient issue in WSDM.
 - It handles non-functional requirements related to the classes, which is a way to also find the functional requirement.
- The class hierarchy development as seen in WSDM is very informal and a little too general, we cannot actually determine in-depth the kind of relationship that each class has with themselves and other classes. In other words it is still an issue modeling *behaviour* here. For now unless UML techniques are applied, the concepts of *Association*, *Aggregation*, *Classification*, *Dependencies* etc, may still be unresolved. With *Associations*, we also can determine the *multiplicity* of the relationship
- Again UML provides possibilities of modeling classes that are inanimate, which would be of great importance because with advancement of technology, there is a possibility that the users may grow into artificial users as seen in artificial intelligence.
- Of all these classes seen in the other models, the WSDM has a unique class that takes care of visitors who are unavoidably present in all web sites even when they are unwelcome.
- For each concept of UML used, the relationships can be designed in three different ways. (Conceptual, Specification, Implementation)

After the identification of the target audiences we have to ensure that the web site reflects their requirements and nothing short of this. Again it is not enough to provide these needs without structuring the web site in such a way that the users have no difficulties navigating through the web site and finding information without the problems of usability.

The site structure and content is very important to say the least. It is important that information is structured so that it is meaningful to the user. A structure that makes sense to the user will definitely differ from the structure used internally by the data provider. Again different user groups may need different user interfaces, the information content the user needs and at what level of detail is also of importance. This explains why the style of *grouping users into classes*, is invaluable.

7.1.4 How are these requirements modeled in each design?

- ❖ The WSDM is very generous with this aspect. The Conceptual phase is quite elaborate on this. As seen earlier, it is divided into two sub-phases. The first part is the information-modeling phase. This is the concept that addresses the requirement modeling issue. The other phase is the Navigation phase has quite some advantages of which ensuring that usability problems are eschewed.

The *information modeling here results in several different conceptual schemes*. And starts by modeling the information requirements of the different audience classes by means of *chunks*.

First the information requirements are elaborated into elementary information requirements. Secondly, for each elementary information requirement an *object chunk* is made. (Chen, 1976; Haplin, 1995; Rumbaugh et al., 1991)

Then the object chunks of one class are composed into an *audience object model* (AOM)

Applying the inheritance concept, we propose that object chunks for super audience classes are also available for sub audience classes.

Finally the objects are linked together to produce one single object model called the *Business Object Model (BOM)*.

Note that this BOM can become the basis of an underlying *database*.

- ❖ The IconMatrix and the Reference methodologies take advantage of the detailed UML model that they have used for the analysis to structure the information requirement. The information architect together with the database designer is faced with an open choice of modeling technique. They may decide to use E-R (Chen, 1976), the Object Role Model (ORM, Haplin, 1995; Wintraecken, 1990;

De Troyer, 1996), or OO methods like OMT (Rumbaugh et al., 1991) depending on the complexity of the initial model derived and documented in the *vision document*.

They look for an information architecture that is resilient, able to meet current requirement and can accommodate changes. With the class diagrams already intact, they start to establish the type of relationship that is most appropriate between these classes. For example they can say whether the relationship between two classes is either an *association, aggregation or inheritance relationship*. Their *roles* can be determined as well as their *cardinality/multiplicity*, which are symbols indicating the number of instances of one class linked to *one* instance of the other class. With that complete, they resume again by analyzing the behaviour of these classes; using *Object diagrams*, which are also closely linked to class diagrams. *They are used to test the accuracy of these class diagrams* which they call component candidate classes. Each primary requirement is detailed in the form of *attributes*. The attributes in this case belong to each component candidate classes in the model. They form the basis of an underlying the database.

- ❖ The Frontline Solutions has no special means for arriving at their information design. They are simply discovered from in-depth analysis of the target audience. The most essential requirements that is the elementary requirements are the ones that are retained. The user interaction with the system showing the data flow is represented using a Data Flow Diagram (DFD). First all, the scenario is represented conceptually in a context diagram. It is a top level diagram also known as level 0 data flow diagram, which only consists of a single process node that generalizes the function of the entire system in relationship to external entities (Users). Next comes the first level DFD showing the main processes within the system. Each of these processes can be broken into further processes until you reach pseudocode. For clarity the data flow may be nested into layers. With the DFD complete, the entities (external) are objects outside the system, with which the system communicates. They are in most cases the users of the system. Therefore detailed information requirements are made on these entities and a more technical model would transform them into a *logical database model*.

Generally speaking, the information requirement that drives the database design may not be any different in all the methodologies except that the IconMatrix and the Reference Solutions have adopted extra valuable measures from object oriented modeling technique, which are very valuable as stated below:

- The use of *object diagrams* that guarantee the correctness of the classes.
- Other UML concepts like associations and aggregation or composition, which help define the strength of the relationship that exists amongst these classes.
- The accuracy of the class diagrams and their relationships may help model an almost perfect database.

Frontline Solutions however, are more disposed to DFD, which are also very useful data modeling techniques that ensure accuracy in modeling the data flow in a system. The only difference with this technique as opposed to the use of classes is that they represent the actors or users are the external entities, which in some cases might be a file or storage of some sort.

One major difference between the Frontline Solutions design methodology and the others is that there is usually one conceptual schema unlike the others that can be treated separately as individual conceptual schema, which can still be joined into one single schema. Such leverage enhances and makes designing a lot easier.

7.2 Usability issues

Just like in databases, all web sites deserve some structure to avoid problems of maintenance, inconsistency, redundancy, incompleteness and obsolescence. No doubt web sites are all about information:

7.2.1 *how does each design methodology handle maintenance of the ever-enormous information our web sites have to offer?*

The WSDM, The Reference and the IconMatrix all have some bond and commonality with their method as seen in the way they have been able to structure the web sites by the Audience class concepts. With this grouping, each audience class can be associated with a Navigation Track. Despite the ease and advantages the audience classes bring, it is still possible that some problems may occur. This is as a result of improper or insufficient design and could also be as a result of poor presentation design skills. Like it is seen in web sites suffering from visual overload.

Some of the usability problems as seen previously are solved using the concept of audience class grouping. They have therefore ensured that the structure of the web sites is up held through the following:

- **Information overload** is avoided because we have only information relevant to the *target audiences* being considered by identifying these users and modeling them into classes, there is no room for irrelevant information
- **Inconsistency** problems are eliminated through mapping of information to the audience classes and making sure they are the requirements that they deserve.
- **Redundancy** is avoided because the class structures help to generalize certain common requirements instead of having each user have their own requirements thereby causing unnecessary repetitions.

- **Incompleteness** is a two-sided problem. It could be as a result of lack of enough information during requirement analysis or as a result of a broken link. The problem associated with insufficiency of information is only minimized. With this kind of style maintenance is made easy and visible when there is need for an update in the requirement.

After all the above has been taken care of, there are still even more serious problems caused by Navigation.

7.2.2 *How are these problems solved in the different web site design methods?*

- ❖ WSDM also takes care of this in its conceptual design. The navigation design is being developed indirectly as the *audience classes* begin to emerge. For each audience class a navigation track is created to show how the members from the different audience classes are able to navigate through the site. A navigation structure is described in terms of *tracks, components* and *links*. Most importantly are the links because they are used to model the structure of the web site as well as to indicate the need for navigation. A simple way of mapping the audience class hierarchy into navigation tracks using a simple one-to-one mapping.
- ❖ Looking at the IconMatrix and the Reference methodologies it should be clear at this stage in the design, that there is already a prototype built to profile users. This also helps to validate certain unclear issues such as user requirements. Guided by some of the results obtained from this test, the information architect develops a conceptual and detailed site map to define the sites structure. Other UML concepts are really handy here. The use of *Sequence Diagrams, Activity Diagrams and Collaboration Diagrams*. The *Sequence diagrams* describe interactions among classes in terms of an exchange of messages over a period of time. With an activity diagram, they are able to illustrate the dynamic nature of the system by modeling the flow of control from activity to activity. Typically the activity diagram is used to model workflow or business processes and internal operation. The complexity of the system may demand that a *collaboration diagram* is used. In this case it describes interactions among objects in terms of sequenced messages. With the collaboration diagrams they are able to represent a combination of information taken from class, sequence, and use case diagrams describing both the *static structure and dynamic behavior* of a system. When all these are set, they have a navigation model that show each candidate class and the sequence of activities that it undergoes with the consequent transitions. With this more or less a *navigation model* is made and prototyped. Together with the established *usability benchmark*, which first studies the features, content and usability applications of the competitive environment and how they attempt to resolve some of these usability problems? A usability plan is arranged and series

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of usability tests are conducted on identified users. Any defects or observations in the user's experiences are documented for correction. The usability of the application is improved through a series of iteration until the best quality interface prototype is produced.

- ❖ The Frontline Solution may not have a clear-cut model with which the Navigation model is built. But with a DFD they can determine what each entity (user) does in terms of interaction with the processes (system). A sequence of activities is drawn from each entity's interaction with the system and a path; this path constitutes the order of interactions and can be taken for the *navigation model*. The navigation structure is now defined by describing the main pages together with their content blocks. The main pages here are those pages common to all the target audiences while the other pages are described conceptually. A prototype is built and usability testing is carried out to ascertain the quality and ease of use.

Out of all the methodologies the WSDM seem to be the one that has the strongest flare for the navigation design. On the other hand, a good thing to be noted in all of them is the fact that each has a way of ensuring that the navigation design, which takes care of navigation through the web sites, is provided for, without much difficulty. All the techniques proper to these design methodologies serve their purpose in various ways and may not have any serious shortcomings.

The weaving algorithm of WSDM is quite an ingenious technique, which not only satisfies the mapping of classes unto navigation tracks, but also allows checks on consistencies and detection of ambiguities. In addition, it forces the designer to formulate with some degree of precision the requirements of the users.

The only problem I envisage using this technique may be that of complexity with highly data intensive web sites. The UML concepts like the *activity diagrams* used by the IconMatrix and the Reference methodologies also are a credit because they are already standards that are used to illustrate and breakdown complexities inherent with system interactions.

With the sequence diagram a measure of the interaction as a function of time helps with the design implementation especially when thought of in the area of efficiency.

The early practical application of these navigation models may be a good idea to test its viability as well as to help detect flaws like broken links or impediments that were invisible at design time.

Finally the problems associated with 'lost in hyperspace syndrome' may be a solved issue if the navigation is right, there would be no broken links or incomplete information. It should be noted however, that the navigation model might only be correct for as long as the requirements of the users don't change. The advantage with of a navigation model is experienced in maintenance because it is quite visible.

7.3 *Implementation Design Phase*

We see that most design methodologies have to implement or at least produce prototypes early enough in the development process. This is to help sample the users of the website so as to give designers a better understanding of the users needs through feedback and how much improvement needs to be made to the system. As a result of this, we hardly see any of these commercially oriented design methodologies that have an *Implementation Design phase*.

The WSDM design methodology has an *implementation design phase*, which comprises concepts that can never be overlooked. They include the *Page Structure, Presentation Design and the Logical Database model*. Each one of these sub phases plays its own role in the design and would tantamount to the actual implementation design. It should be noted that despite the lack of implementation phase as a unit in the other methodologies, the sub concepts are all considered one time or the other in all of them.

7.3.1 **Page Design concept**

This is a very important concept of any design methodology because it represents the sites itself as a unit as well as individual components or pages. Most designs produce pages according to the navigation designs that they have made. The page structure need not be one-to-one with components of the navigation model. And every design should have an effective *homepage* because it serves as the starting point of any web site mainly because of the simple fact that it comes at the top of any hierarchy. A few design principles for a good home page are: -

- It should contain a clear overview of the content.
- The important information should fit on the screen, to prevent frequent scrolling.
- All page links must be complete and unbroken
- Minimize the number of clicks needed to reach final content.
- Provide links on each page to a list of the local contents, a site map and a home.
- Include navigational buttons at both top and bottom of the page

7.3.2 **The Presentation Design**

Web site design is a failure if it does not take care about the ‘look and feel’ of their web sites. In fact, aside from the structure of a site, it is the presentation of that site that actually captures the eyes of the users and makes them want to visit your sites. All the design methodologies discussed are very wary of the ‘visual appeal’ but the problem with

most developers is the tendency to implement the sites in such a way that does not suit the design, which can cause problems of *visual overload*.

Without any doubt the need for a design is important because we are predisposed to the eventual look and feel of the site and may have some suggestions as to what can be done to improve them.

Apart from the WSDM, all other methods are involved with first prototyping the designs and finally adjusting it to suit the taste of the users which may not fit in all the time as a result of varying user characteristics and desires.

Some advantages that accrue from the use of prototyping are: -

- It forces answers on how the usability of the GUI need to be.
- It gives the user a right to choose
- Style guides, user objects and tasks are liable to be revised
- The GUI occurs in iterations which involves design, prototyping and evaluation
- Consistency through standards: - consistent look and feel makes a system easier to learn and use. [Olga, 2002]

Grouping of users into various classes helps make the presentation design a lot easy because it takes into consideration the requirements of the group and as such would be able to present their page designs by considering their characteristics and behaviour.

A few useful principles of a good presentation design are as follows: -

- Use of index page/web map
- Use context and information cues
- Use navigation cues.
- Make text easy to read and provide support for text only browsers
- Support different browser environments
- Design for efficiency, e.g. minimizing download time and use of meaningful graphics

7.3.3 Logical Database Design

This is the actual design of the database and needs to be a full-fledged database. Most database designs are a result of the conceptual schema. Apart from the rules and constraints that guide the logical design, there aren't many problems here. One major consideration of any database design is the issues of maintainability, which must be highly esteemed because it drives most dynamic web sites. Therefore it must be efficient.

8.0 illustration: Designing a web site for a job fair using the various methodologies in my thesis: -

To strategize on how to bring commercial organizations in contact with almost graduating students for the purpose of job promotion by affording them the opportunity to enlighten and inform the students on their institutions through presentations, advertisements using posters and giving URLs of their sites.

To promote a successful job fair, by providing all activities necessary information about the day. (The companies present, presentations given, the schedule of the presentations, the available infrastructure, room sizes allocated to every participant, poster sizes, refreshment if available, direction to venue and who is responsible). To enable Participants to register on-line.

Finally, to draw attention and attract more students to participate in the job fair by organizing a lottery contest in which a portable computer is to be won, and convince them about the impact of the day by making available information on the previous job fairs.

The WSDM methodology: -

- i. Purpose: Attract more students and companies to participate in the job fair.
- ii. Target Audience: Company and almost graduate student
- iii. Subject: Job fair.

The IconMatrix and the Reference methodologies: -

- i. Purpose: Attract more students and companies to participate in the job fair
- ii. Actors: Students and Companies
- iii. System is Job fair.

WSDM:

High-level requirements for the audience classes

Visitors

Information requirements

General information about the Job fair

Graduating Students/Higher Grade Students

Functional requirements:

Register for Job fair

Attend job fair

Give suggestions on how best the job fair can be improved

Send emails to student union or companies (questioning or suggestions)

Information requirements:

All information about the job fair

Available information on Student registration

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List of companies participating and information available on them
Information on Presentation schedules

Company representative

Functional requirements:

- Register for job fair
- Pay for a slot or format
- Provide information about company
- Provide information on presentation topics where necessary
- Make available the company's logo and URL
- Send mail to secretary before deadline
- Inform secretary of format interested in

Information requirements:

- All information on the job fair
- All information on registration deadline
- All information about the previous job fairs
- Information on whether his registration has been approved or not with his ID
- Information on available infrastructure
- Information on participating formats

The IconMatrix and the Reference methodologies: -

The requirements are the same for the two methodologies as WSDM methodology.

Audience Modeling:

WSDM:

	1	2	3	4	5	6	7	8
1 Register for Job fair	y	y	y	y	n	n	n	n
2 Attend job fair	y	y	y	y	n	n	n	n
3 Give suggestions	y	y	y	y	n	n	n	n
4 Send emails	y	y	y	y	n	n	n	n
5 Pay for a slot	n	y	y	y	y	y	y	y
6 Provide info on company	n	y	y	y	y	y	y	y
7 Provide info on topics	n	y	y	y	y	y	y	y
8 Inform sec of slot	n	y	y	y	y	y	y	y

Figure 7: weaving Algorithm

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Column1 is for users who can register and attend job fair etc

Columns 2,3,4 are users who have all the privileges.

Columns 5,6,7,8 show all users, who may do all other things except register for job, attend fair, give suggestions, and send emails. They belong to the same audience class hierarchy.

From the weaving algorithm column2 is a subset of column 1 and a subset of columns 5,6,7,8

Columns one belong to student, 2,3 and 4 are registered users and the rest are for companies.

Student < registered user

Companies < registered user.

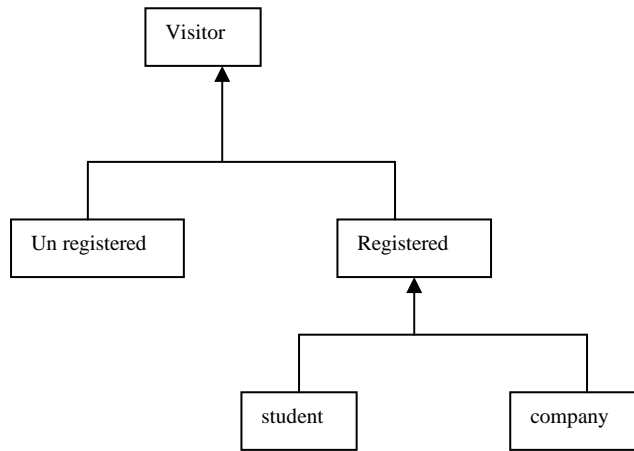


Fig 8: complete user hierarchy

From the above, we see five types of user classes showing the final user hierarchy. With this the navigational tracks are a easy to map unto

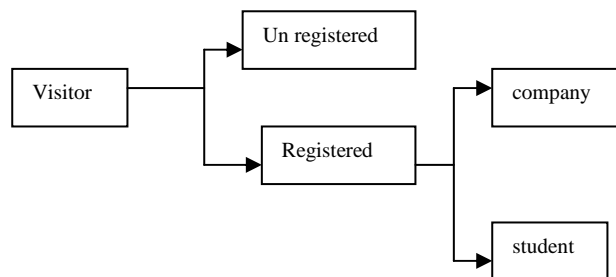


Fig 9: Simple navigation track

The IconMatrix and the Reference Methodologies

While concentrating mainly on the functional requirements classes are built.

What are the functions similar to both classes i.e. students and companies:-

- Register for Job fair
- Attend job fair

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- Give suggestions
- Send emails

We look for those functions unique to each class.

Student: - None

Company: - Pay for a slot, provide info on company, provide info on topics, Inform sec of slot.

The class diagrams will look thus:-

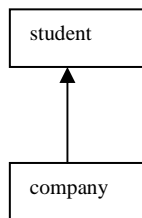


Fig 10: class diagram of the relationship

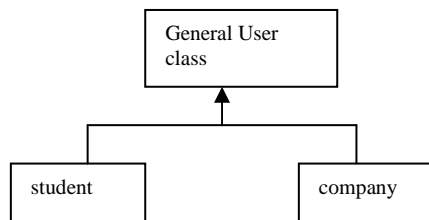


Fig 11: more reasonable class diagram of the relationship

The general user class contains all the attributes and functions that are common to both. With each class containing unique functional requirements that make them special classes. In this case, only the company has special functions.

Looking at the classes above we can see that classification can be done in terms of similarities in their requirements. Therefore using this concept, the company class becomes a subclass of the student class because it has its own unique functions and those of the student's as well. In reality this will cause problems during implementation especially if the requirement of the student changes. This implies that the company class also must inherit those functions, or else it ceases to be a subclass relationship. A better option is that of fig 11. With this design we can modify any of the classes without an effect on the other. This is a maintenance measure.

A few things are different between the classes of the different methods. They are

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- A visitor class, which represents the bulk of users who, may eventually be legitimate users or just passers by. That may not be taken care of in the case of the model using UML.
- It is most likely that most of these stringent requirements like security classes are enforced only at implementation time. Whereas it is considered at design time in WSDM using the ‘weaving algorithm’.

Using sequence diagrams or activity diagrams we can model navigation in the IconMatrix and Reference Methodology

Basing my sequence diagram on the most vital interactions

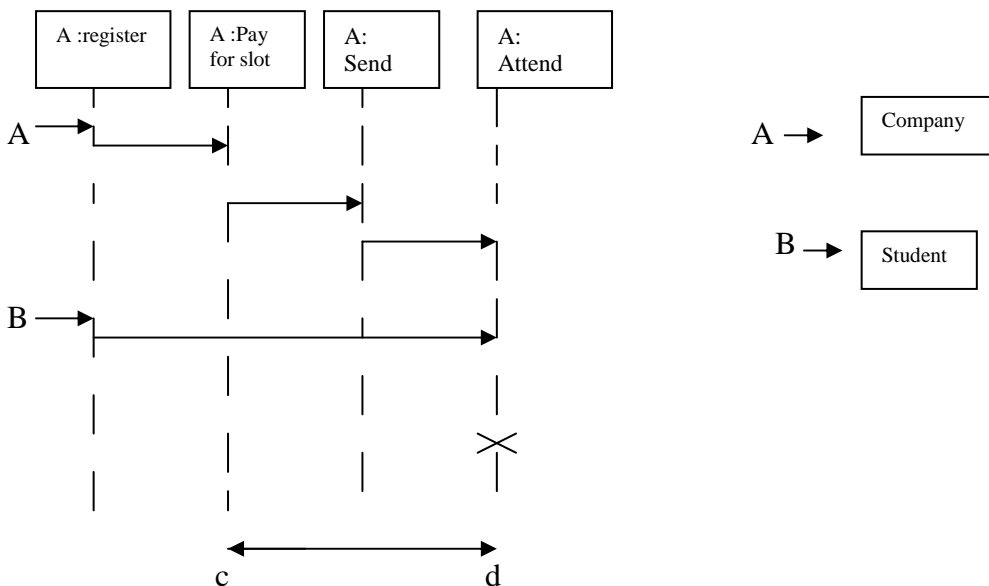


Fig 12: Sequence Diagram

In summary the sequence diagram shows the basic interactions that will occur between the objects and the system in the correct sequence. However, between the registration time and the end of the interaction (c&d) there should be some other dialogues like send emails to student body? . These dialogues are conditional and also not mandatory. But they are provided for during implementation. But with WSDM the design has virtually every requirement for the implementation and that makes it very valuable. Because: -

- i. There is only a little chance that you will omit any important requirements.
- ii. You have a comprehensive design document to work with.
- iii. Accuracy is ensured
- iv. Re-usability is encouraged and multi- presentations are possible

The interaction sequence represents navigation while the objects show the pages of the web sites that are navigable.

An advantage of the sequence diagram over just mere weaving algorithm is that most of the interactions are time bound. This can be a very vital factor while building web sites.

8.1 Inference:

The need for a web design methodology can never be over-emphasized as seen from the various concepts that have been discussed above. The reason why there may never be unison in the way web sites are developed is because of the varying models and tools that aid development and the need to measure the output of each web site with the different types of users who obviously have different characteristics. Secondly part of web engineering is more like an art than it is a science and a lot of practical is involved. That is why as seen in the comparison most methodologies use the user-centered approach because of the difficulty to rely on informal and qualitative evaluation which sometimes leaves ones predictions uncertain. The WSDM methodology also does use this especially when the users can be identified but the only difference is that it discontinues its usage of the HCI, unlike with the other methodologies that first identifies the target and employs them when they are prototyping.

Another major observation is that most of the companies are all commercially inclined. A lot of factors affect the design process as a result of this. In some cases client involvement could be adverse especially where customer satisfaction is paramount. This may compromise some ethics of good web site.

However, involving the target audience can be beneficial to all web site designs, because it enhances the site design and development. It also helps narrow the scope down and gives the leverage of using HCI techniques.

9.0 Conclusion:

In the beginning of the thesis, I presented the general problems that have plagued our web sites. For example, the ad hoc manner in which web sites are built. Also there are the usability problems that occur as a result. The awareness and growth of web design methodology as well as the twist in their approaches to a design that would reckon with the users of the sites instead of the more data driven approach or organization driven approach was also mentioned. In the absence of a standard design methodology and the quest for one, I have discussed several design methodologies in this thesis. A description of each methodology was given, starting with the Web Site Design Method (WSDM), which has introduced a new different approach from the others because of its *Audience Driven style*.

Other methodologies discussed alongside WSDM were IconMatrix, Frontline Solutions and the Reference design methodologies. My comparisons were based on the WSDM concepts and I can fairly safely deduce that apart from a few differences with the WSDM virtually all the methodologies are similar in their approach.

Finally, all the methodologies have so far proven very useful and promising and it should be noted also that these methodologies are always under review, improved and updated, when the need arises. I must not fail to encourage and applaud the efforts of their authors. They have done magnificent jobs that will definitely bring awareness of Web design methodologies to our indifferent world of deceptive attitude towards web development.

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