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Web Design Guidelines For WSDM

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of obtaining a degree of
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To

My parents

My Husband and sons

All my Professors

All my friends

And all who supported me …

Abstract

Currently, most web development practices do not follow systematic methodologies; rather, information structuring and management is based only on developer's knowledge and practical skills. WSDM (Web Site Design Methodology) is an audience-driven methodology, developed by the WISE research group at the VUB.

WSDM is still under development. Not all phases are yet fully specified. This is also the case for the implementation design phase. This research attempts to systemize the implementation design phase of WSDM. An approach based on guidelines to support the implementation design phase will be discussed. This approach aims to establish a semi-systematic engineering step, which lead a website developer to a high quality and accessible developed website.

Acknowledgments

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Secondly, my great thanks goes to my **husband** for his care, support, and patience, to my **parents** for their support and encouragement that I could not continue without it,

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Organization

This thesis is organized in two major parts, a background and a research.

Background (chapter 1, 2)

This part presents a literature overview of web development and WSDM in order to give the reader, briefly, the basics of web development and WSDM approach and technique, which are needed to understand this thesis. Also, WSDM overview is supported with a clarification example to give a clear and general idea of web development using WSDM. This will help the reader to know several aspects about web development; What is web development, And Why do we need it.

Research (chapters 3 - 5)

This part presents the research plan and results, where ten main subphases including web design guidelines were considered as parts of the implementation design phase of WSDM. The importance and need of each subphase was discussed, in addition to the future work where new approach and future WSDM tool were argued.

Chapter One

Introduction and motivation

1.1 Introduction

Over the last few years there has been a remarkable increase in the use of the Word Wide Web (WWW) for a wide and variety of purposes. There was also a fast grow in its applications; on the one hand this led the Internet users to realize the importance and the benefits gained from a globally interconnected hypermedia system. On the other hand it causes a large number of useless, meaningless and badly designed websites on the Internet world causing unwanted additional traffic, this all because of an unorganized nor planned websites development processes.

The exponential growth of WWW applications with all their multimedia aspects such as the combination of text, hypertext, images, computer animations, video, sound, etc. have raised the necessity for formal or semiformal methodologies for developing such applications. As a website is a communication media in WWW, first impressions do count, so it must be a compelling and effective online application. This goal could be accomplished by combining a clear understanding of what contributes to an effective online presence aligned with the very best in design methodology and technical functionality.

Software engineering research has delivered methodologies (e.g. water-fall model, Spiral model, Whirlpool model…)[84] and tools that support the software development process. Being effectively supported, software developers are able to deliver quality products in a timely and cost- effective manner. A similar approach has to be followed in order to bring WWW development out of its immaturity, and research efforts form could be reused. WWW site development must be tackled by providing methodological and technological support for each phase of the development process. Conceptual modeling approaches as ORM, ER, UML [4] [8] [9] [10] [11], could be adapted for the web developments, since they are independent from implementation technology and they can be effectively supported by notations developed for other systems [1] [3]; There is a strong need for an implementation methodology and a corresponding technological support that bridges the gap between high-level design and low-level implementation.

In this thesis we argue a new approach for the implementation design phase in WSDM where a guideline technique is adopted. A list of guidelines are divided into ten categories according to the function and subject of each guideline item, each category then is considered to be a subphase in the design implementation phase of the methodology, this approach is aimed to guarantee a high quality and accessible website by following the guideline list items. These items offer the developers a ground for making decisions about crucial aspects of website design. Section 1.2 presents a short summary of common non-systematic existing websites developing strategies, which are not necessary cover all existing strategies but it describes the most common used, then definitions of general implementation design phase and implementation phase are presented in section 1.3. As in this thesis we argue the implementation design phase of WSDM, an overview of the methodology with a clarification example are presented in chapter two. In chapter three, the challenges of designing an implementation phase and the research plan that had been followed in this thesis will be argued in addition to the importance of target audience(s) characteristics during website design process. Chapter four discusses the guideline subphases. In chapter five we will conclude outlines/proposals for a future work.

1.2 Non-systematic website development strategies

In the past few years, the field of website development has uphold no standards, adhered to no rules. Too often, however, the results have been cheeky, unexpectedly unique websites that are missing many of the essential elements users have come to expect. The problem of supporting the development management of a website has been tackled in different ways. Different levels of abstraction and granularity characterize the various approaches.

Existing methods for developing websites follow different strategies, most are data driven [1]. Most of the current website development is simply based on common sense and individual skills, carried out in an unstructured and often chaotic way [3], in addition developers mostly delve directly into the implementation phase paying little or no attention to requirements acquisition and specifications, this strategy can be called *NO methodology* strategy [83] since there are no specific steps/phases that can be followed during the development process. Others and mostly used by website development companies (commercial companies) are what can be called *Secrete Methodology* strategies [83], in which only short descriptions of the main steps are mentioned.

Other strategies, which are used by individuals, can be called *"general or public methods"*[83]. Each of these methods supports its own phases, mostly some kind of rules about what the developer should consider while developing the website, however these rules are not more than written advices that can be useful for specific websites development purposes, (e.g. commercial, entertainment, etc.), or to prevent some but not all mistakes a developer may fall in. Although most of these strategies work within

phases, there are no defined steps with which a developer can practically work, therefore there is no guarantee of the ideality or the quality of the developed website.

Choosing the right website developing wise is critical for the Internet success. Websites must convey the developers' images to the world; at the same time they must serve the needs of the users, therefore the development methodology is best to be Audience-driven. In chapter two, WSDM methodology for web development, which supports Audience-driven approach, will be presented briefly; an example will be included for more clarification.

1.3 Website Implementation design & implementation phase

Implementation design phase is the phase in which the look and feel of the website is designed; in the implementation the website is constructed to be essentially complete. In literary of methodologies in software engineering, no approach has a well foundation or has clear engineering steps for the implementation phase, the reasons for that are the wide and diverse purposes and the technology/tools dependency of these implementation aspects. In web development there are several aspects to be considered, (e.g. art marketing, communications, etc.), thus the existing non-systematic web development methodologies will not end with ideal results.

The implementation of a website requires a skilled and creative management to target the needs of a specific audience(s). Implementation design process must have a strategy by which the developed website act as an easily accessible reference guide for the target audience(s).

1.4 Conclusion

The Word Wide Web is increasingly being seen as the medium of choice for distributing information. It can, at a very low cost, provide users from anywhere in the world with access to the latest information. If it is well designed, a web site can also be accessible to users with disability.

The development of a Web site that provides structured access to a large amount of information, possibly under different views, through different contexts, and possibly by teams of developers is a complex activity. In order to deliver high-quality Web applications within limited time and budget, developers should follow a well-defined development process, possibly supported by suitable tools and notations.

Chapter Two

Overview of WSDM

Since WSDM implementation design phase is the subject of discussion in this thesis, WSDM is briefly introduced in this chapter.

WSDM stands for **W**eb **S**ite **D**esign **M**ethod [1], it is an Audience-driven approach where the developed website based on the requirements of the intended audience(s). WSDM includes five related phases, as shown in Figure1 [1].

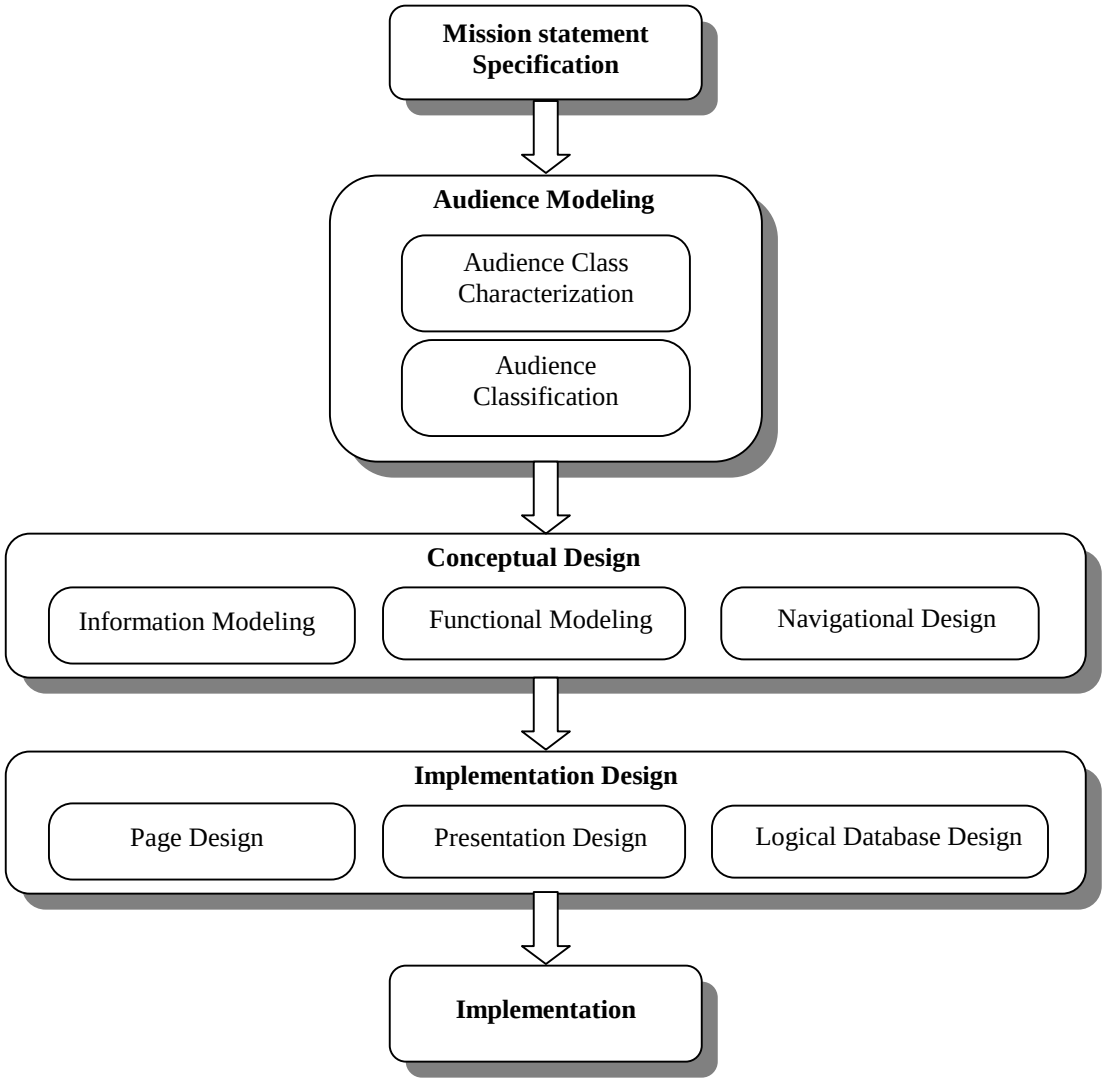

Fig (1), Overview of WSDM

In the first phase a **Mission Statement** is defined where the purpose(s) and the subject(s) of the website are specified in addition to the target audience(s). These three factors are very important to be clearly covered in the beginning, since they are the bases from which the next phase starts. For an example, in the website of the faculty of science, one of the main purposes is "to help enrolled students and satisfy their requirements", one of the subjects is " Specific academic information" and one of the target audiences is "Enrolled student".

The second phase is the **Audience Modeling** phase, which is divided into two main steps, Audience Classification where the varieties of users, who are already specified in the previous phase, are identified and classified according to their information and functional requirements, subclasses are possible, in addition the audiences classes description (information, functional and usability requirements) and the audience classes hierarchy are all specified, e.g. for a enrolled student an information requirement is "information on courses and lecturers", a functional requirements is " to be able to find all information about courses and lecturers", and "flexibility in searching the information" is a usability requirement. Figure 2 illustrates a hierarchy of enrolled student and candidate student classes and their subclasses. The other step is the audience class characterization, in which the characteristics of the different audience classes are determined, e.g. " candidate student English or Dutch speaking".

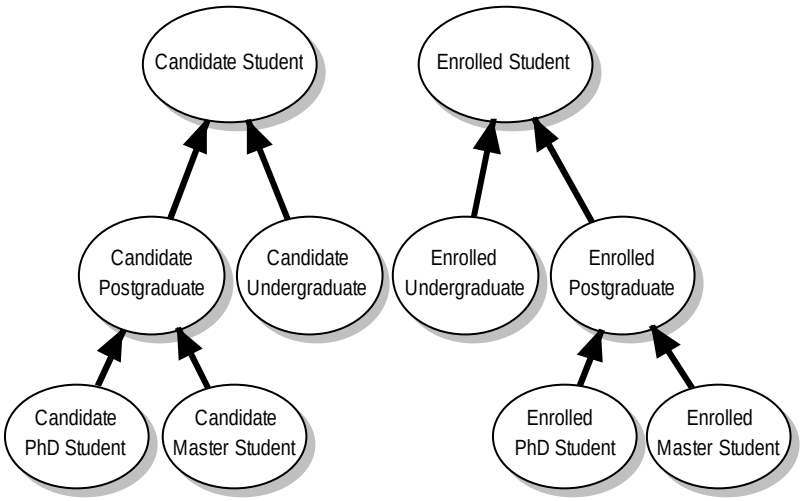

Figure (2), hierarchy of Audience classes and subclasses

In the previous two phases, a developer should have the ability to specify what content needed to be displayed and which are not, which is the advantages of the audience-driven approach. Notice that the requirements or the characteristic of the target audience need not to be disjoint.

The third phase is the **Conceptual Design**, which is also divided into two steps one is the information modeling where the information requirements of the audience classes that were specified in the previous phase are modeled into object chunks. Object chunks are designed by elaborating the information requirement into elementary information requirement and by making an object chunk for each elementary requirement. Notice that object chunks of super audience classes are also available for sub audience classes. As an example an elementary requirement for an enrolled student is to find information about lecturer in case he needed to contact him, then there should be object chunks of lecturer information as shown in figure3 [1][2].

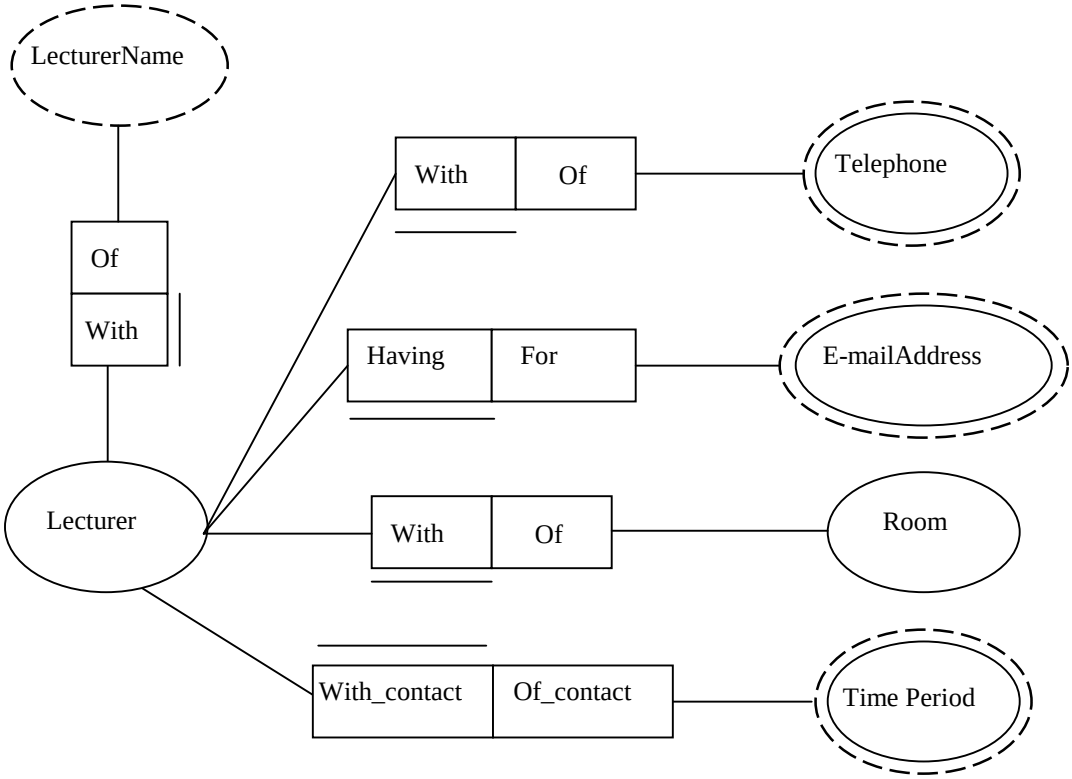

Figure (3), Information Modeling Object Chunks

The second step is the navigation design, in this step the conceptual structure of the website and a model of how it will be navigated by its target audience(s) (i.e. create navigation track for each audience class) are specified. Navigation Chunks are designed for each audience class and sub audience, and then these are merged into a Navigation Track. Figure 4 illustrates the navigation Model for audience super and sub class.

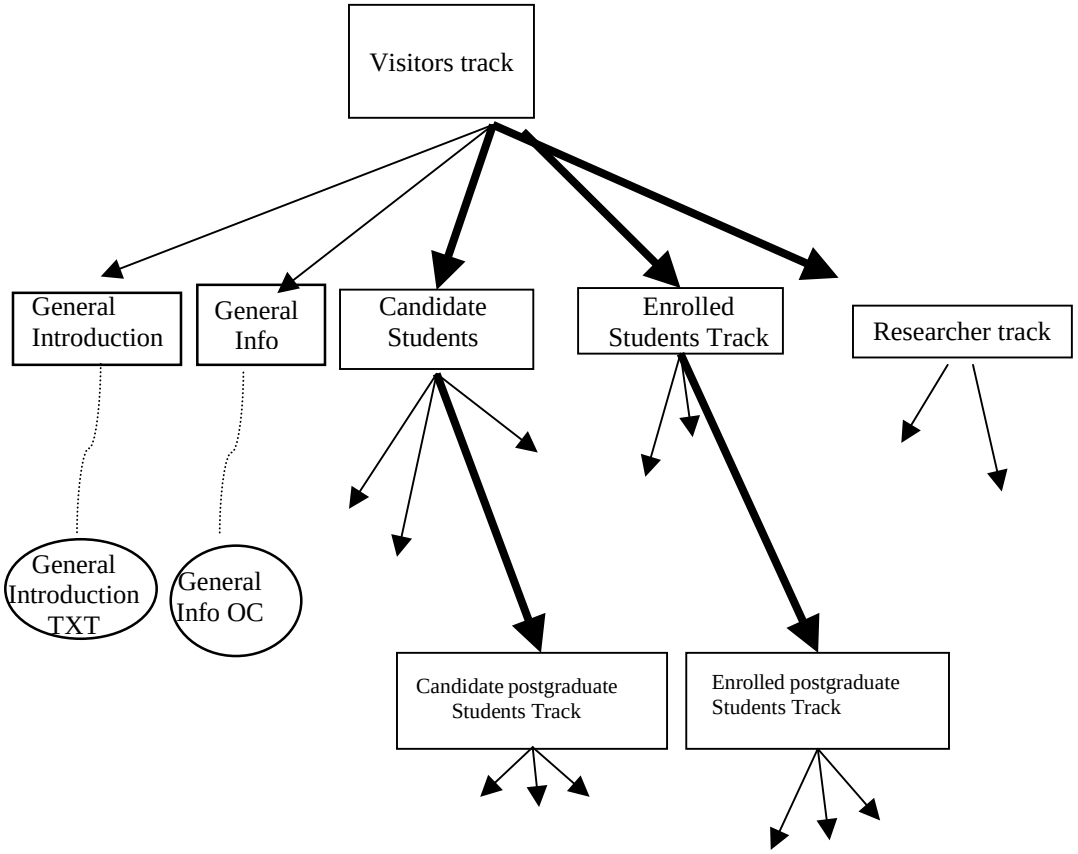

Figure 4: Navigation Model for audience super & sub classes.

The fourth phase is the Implementation Design phase, this phase contains: Page Structure Design, Presentation Design, and Logical database Design. This phase is not completely specified and will be the research assignment in this thesis.

In Page Structure Design, the structure of the website pages is designed, as shown in the example of figure 5. The last phase is the Implementation phase where the developer chooses a website environment, technology, and tool to start the construction process for what was already designed in the previous phases.

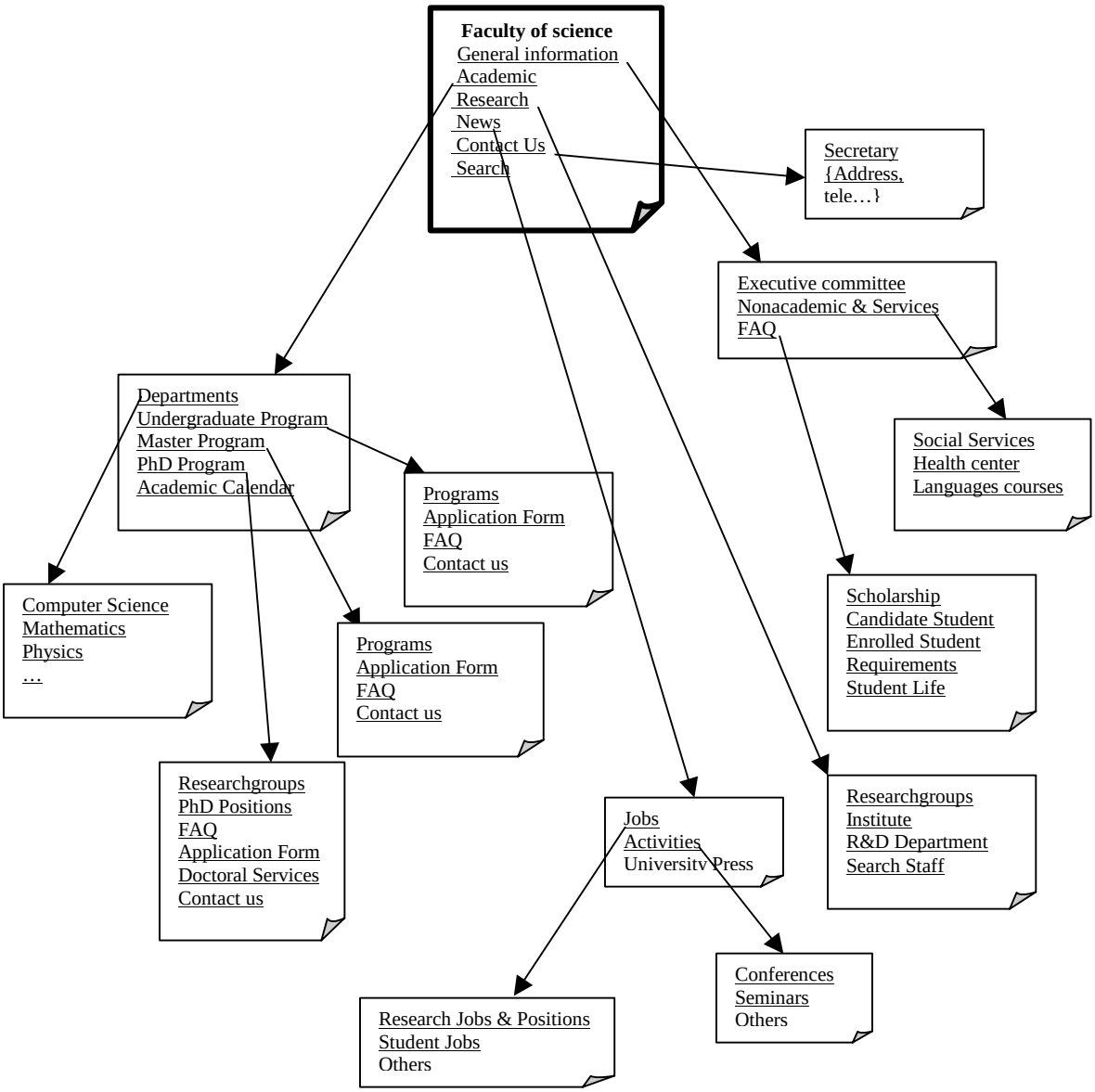

Figure 5: page structure design for the website.

Conclusion

Following WSDM methodology can develop a high quality web site, which base, as already mentioned before, on the requirements of the intended audience(s). However, leaving the implementation phase (design and construction) as an open space with no algorithm/process to follow, could affect the website idealist and quality results, specially that most of the developers focus on how to show off their skills, (i.e. using fancy colours, icons, animation…), instead of focusing the design and layout of the web site around the intended audience(s) needs and interests. Therefore, some concepts can be added to the implementation design phase, as will be discussed in the following chapter, these concepts will be as a mechanism of a large guidelines list (*guidelines technique*) with the aim to guarantee/insure the product quality, as well as to be part of the required characteristics for the future WSDM tool.

Chapter three

Research Plan

3.1 Investigations and results

Implementation phases in most software engineering methodologies lack a clear and well foundation, e.g. as in the Water-fall model the implementation phase is described in several boxes as arbitrary advices [84][85]. The difficulty of establishing a well-formed implementation phase refers to that it is tasks and technology dependency phase.

With this in mind The main goal for this research is to establish the implementation design phase of WSDM and to find out a strategy that allow us to systemize implementation level aspects in a way that can lead to well founded methodology, that treat these aspects and thus make them flexible and mostly independent to be adopted by a future WSDM case tool.

In order to establish the implementation phase for WSDM, the implementation aspects for developing websites have been investigated. Through our investigation, a large number (several hundreds) of implementation aspects were gathered and build up from many resources/work (related work websites, publications, online magazines, common sense[1] etc.) see references from [16] to [80]. A careful study and analysis has been made on these aspects and a set of general *guideline items* had been resulted. These guidelines items may not be completely comprehensive, but it supposed to comprise the main aspects that guarantee the availability of the minimum quality where the developed website is evaluated or described as a good and much more than acceptable one.

As the guidelines are considered to be appropriate solution for the gap between the conceptual level in WSDM methodology (i.e. high-level) and the implementation level (i.e. low-level), The constructed guidelines list were investigated with appropriate evaluation and common sense to guide the developers to reach and /or estimate a better quality of their developments. Each guideline item was separately studied and analysed, and it was found that each has its own functionality (i.e. support a specific value, purpose, etc. of the website accessibility), for all the guideline list items with the same functionality and subject were then gathered in subgroups, which were then categorized into ten main groups or categories (*Navigation, Usability, Interface & Style, legality, Communication & Infrastructure, Semantic, Marketing, Error, Testing, and Maintainability,*), which will be considered as subphases for WSDM implementation

[1] During surveying and visiting websites, we notice some missing requirements, whish were added in turn as new guidelines.

phase. This categorization has been done according to, firstly, the main function/subject of each subgroup, secondly, they were customized and constructed in an abstract level, which make this technique (*guidelines technique*) more independent in a way that each category/main group can be implemented by a specialist developer (e.g. group of developer can work together, each implement category/categories within his professional). Thirdly, we believe that this approach of categorization would help to study and formalize each category items independently from other categories and deal with each as a separate case study in a future work as will be shown in chapter five.

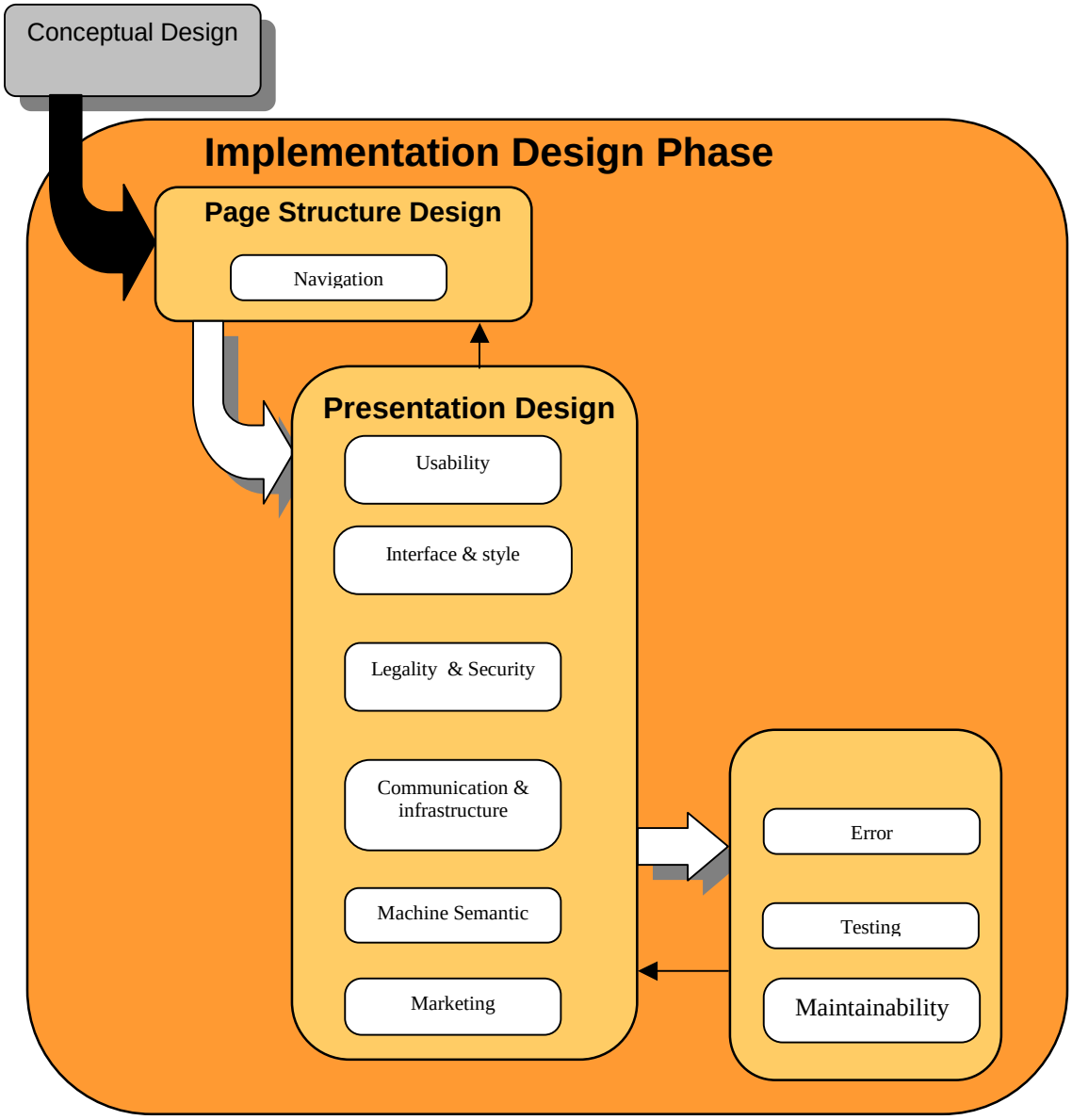

Figure 6: WSDM implementation design subphases Approach.

Instead of only applying the guidelines list at the end of the implementation design phase or in an arbitrary way, its categories were considered to be a part of it. To automate this approach we chose and assigned the suitable category/categories from the list to the appropriate step(s) in this phase as shown in figure6. This approach can be called *WSDM implementation design subphases Approach.*

As shown in figure 6, we believe that the developer will follow the ten subphases in an iterative prototyping process i.e. the developer may need to return to previous subphase to solve problems or improve his work. Clear borders/sequence between the ten subphases cannot be completely achieved. However, Navigation, Usability and Interface&Style subphases can be seen as a skeleton of the website that improve it accessibility since they allow the user to browse, navigate, learn, be familiar, etc, with the website, while Legality&Security, Communication&infrastructure, Semantic, and Marketing subphases can be seen as design scenarios related to the functionality of a website. Finally, Error, Testing and Maintainability subphases facilitate the evaluation, reliability and quality aspects.

The judgment about the importance and the relevancy for each guideline item should be determined by the developers according to the main requirements and the functionality of the website, i.e. the guideline items will not be mandatory to be considered. The basic idea of the guidelines is to be an implementation design patterns in order to remind, guide, assist, and insure such certain aspects (generally important) in the implementation level.

These guideline items list not only used for developing a website but also could be used to an early website evaluation technique, this list can formed to be used by specialist to evaluate the accessibility, reliability, usability, etc. of a website, as shown in the appendix. In other cases, which are not ours, it may be used as stated condition in a contract between a customer and a website design company.

3.2 Target audience characteristics

For a website to be successful, the developer always should be concerned about the target audience needs, and about the usability of the website. A website developer must consider that many users may be operating in contexts very different from his own, i.e. the characteristics of the target audience(s) must be seriously taken into account, for example some audiences may not be able to see, hear, move, or may not be able to process some types of information easily or at all, others may have difficulty reading or comprehending text, they may not speak or understand fluently the language in which the content is written. . They may have a text-only screen, a small screen, or a slow Internet connection, others may have an early version of a browser, a different browser entirely, a voice browser, or a different operating system. If users classes include audiences from

non-English speaking backgrounds, developer will need to consider offering selected information in a variety of languages.

An important issue that needs to be considered is how developer will reach audience(s) via the web, such characteristic, if not treated appropriate, can affect the accessibility level from the user vision side therefore it is an essential demand that should be covered during the design process (i.e. the developed website essential purpose is to satisfy the target audience(s) requirements but that dose not prevent the developer in addition to reflect his vision and satisfy his own purposes or/and marketing issues) in order to attract users and satisfy their needs, it is essential to build a website that can be seen from the user point of view, this can be achieved through the developer adoption of the target audience characteristics. The developer in order to succeed in this mission he should, carefully, analyze, treat and cover the target audience characteristic during the implementation design process

Chapter Four

Website Design Guidelines

Guidelines list is not intended to be a definitive list or necessarily applicable to all situations, but they cover a lot or most of the grounds. These design guidelines will help to create a high quality, professional, and well designed website. In what follows, a detailed discussion of each subphase in the new implementation design phase approach is presented

4.1 Navigation Subphase

Before the developer starts with the implementation design phase, the last step he would do is the navigation design where the website tracks of navigation are determined. As the structure of the navigation is specified the developer need to provide tools/mechanisms that support the navigation of these tracks therefore the navigation guidelines are included within the presentation design as the first subphase.

The explosive growth of the World Wide Web is based on the facility with which one can move using hyperlinks. Thus the very essence of any website is its linking structure. Navigation around a website can be achieved in a number of ways, text, graphic buttons, image, maps and keyboard shortcuts can all be used in any number of combinations. Each of these tools may be implemented within a website as long as measures are put in place to ensure that every user can gain access to every page.

Developers should make content understandable and navigable. This includes not only making the language clear and simple, but also providing understandable mechanisms for navigating within and between pages. Providing navigation tools in pages will maximize accessibility and usability.

A consistent style of presentation on each page allows users to locate navigation mechanisms more easily but also to skip navigation mechanisms more easily to find important content. This makes navigation easier for all users. Certainty that will increase the probability that users will find information in the developed website, or avoid it when they want to. For example some structures may appear at the same place between pages such as navigation bars, the primary content of a page and advertising. A navigation mechanism creates a set of paths a user may take through the website. Providing, for example, navigation bars increases the probability that a user will reach the information he seeks at the website. It is crucial that the descriptions and site guides be accessible since people who are lost at the website will rely heavily on them. The guidelines of the

navigation category are shown in the following three tables, and they are discussed and described in detailed

1.Maintain a standard page method throughout the web site, all website pages must have the same navigation structure.
2.Put a toolbar on every page.
3.The home page footer should include the URL for the home page.
4.Links should be displayed in the default browser colors.
5.Use standard colors for visited links
6.Do not use splash pages before home page.
7.Navigation bar bottoms must be consistence (size and width).
8.Website structure is simple, with no unnecessary levels.

Consistency in the navigation structure of the website insure accessibility and easy learn ability of the website, standard structure and style also ensure easy and fast navigation. Users have come used to associate blue underlining with links. A change in the color needs to be explained to the users and even then, can cause problems. An unvisited link should be blue and a visited link should be red or purple. Although not ideal these are the standards used across the Web and should be adhered to as they are what users expect and understand.

9.Minimize the number of clicks. No more than 3 clicks from the home page.
10.Ensure that the web site is navigable from wherever the user enters the site. Show the page track from the home page.
11.Use appropriate bars and buttons. Be aware of loading time.
12.Link effectively to other internal resources.
13.Links should not open a new browser window.
14.Ensure that users can navigate the site without needing to use their browser's "Back Button".
15.Each page should contain at least one out of page link.
16.Avoid links that refer to the current page.
17.Upward navigation links at bottom of all major navigation pages.
18.Each page should have a link to the home page.
19.Upward links arranged from lowest to highest levels: left to right.
20.All major parts of the website are accessible.
21.Provide a home page for each major area of the website.
22.Using an immediate redirect: every time the user clicks *Back*, the browser returns to a page that bounces the user forward to the undesired location. Limit home pages to two screens.
23.Limit inside pages to maximum six screens.
24.Order menu bar labels by frequency use and important

For the navigation of a site to be economical in terms of time and action, the users should be able to quickly find resources relevant to their purposes and be able to access these

pages with a minimum number of ‘clicks’. Hierarchies are the primary navigation mechanism of web sites. Getting this right at the beginning may be difficult but will greatly enhance navigation. When creating a hierarchy, agencies should ensure that the number of options at each level of the hierarchy and the number of levels is appropriate. For example, users should not need to click through too many levels to get to what they want (too much depth), and they should not be overwhelmed with too many options on each page (too much breadth.) A useful rule of thumb is to ensure that users get to the information they require with no more than three clicks from the home page. Also consider that the structure does not have to fit a hierarchy as dictated by the subjects covered by the web site, but should be user focused. For example, if users are interested in particular information that logically fits within the information hierarchy a few steps below the home page, the hierarchy can be flattened to ensure that this information is available at a higher level. To Ensure that users understand where they are located in the site as some visitors to the website will enter at a level below the home page; developer should consider whether the navigation system takes this into account.

When designing navigation bars and buttons, developer should be using the same navigation bar on each page. Examples of useful navigation buttons to include are a ‘home’ button on every page below the home page, and ‘back to top’ buttons at regular intervals on a page if a lot of scrolling is required. Another useful feature: rather than having a ‘previous’ button on a page, have a ‘back to home page’ or ‘back to search page’ to help users who may have come from another site or another part of the website. Ensure links are identifiable as links, especially if they are graphics or icons. Text links should be short and to the point, and meaningful. This is particularly important for users using assistive technology. E.g. avoid ‘Click here’ (‘here’ being the link.) Text links are preferable navigation methods because they are recognized by assistive technology, accessible to users who have images turned off, and tend to be more meaningful for beginner Internet users. It may also be helpful to include link titles.

While "Back Buttons" are essential, other mechanisms should also be provided to return to previously viewed pages. Provide assistive technology users the option to skip navigation links with an appropriate method. Easy navigation is essential to allow web site viewers with all levels of computer expertise to move around the website and obtain the information they are seeking. Many users do not use the Back buttons for navigation. Therefore, a web page that contains no link out of the page presents a severe navigation problem. A link should always take the user to another page and not simply reload the exact same information. If the link is part of a menu then change its appearance to provide feedback about the current location.

25.Ensure that navigation aids are intuitive and easy to use.
26.Always use an identical URL to refer to the same page.
27.URL's should be: meaningful, lower case, persistent.
28.Links should not be embedded.

29.Links should be descriptive of what the user will find upon visiting.
30.Pages should use standard navigational icons.
31.Footer should provide logical navigational aids.
32.Make links to external pages clear.
33.Make links meaningful and predictive of the destination - DON'T use 'click here'.
34Use labels that people will recognize
35.Use alt tags with all images link.

The goal of good navigation design is for the user to be able to move in the site intuitively. While it is difficult to provide intuitive navigation for every user due to the differences between users and the subjectivity of their experience, it will be enhanced if navigation aids can be easily learned, are appropriate to the site's purpose and are easy for unfamiliar users, irregular and experienced users. Having the external site open up in a separate browser window is a method for avoiding the use of the back button to return to a web site when a user exits the site to access other resources. If this approach is adopted, provide a warning to users. Embedded links are more difficult to see than links that stand alone on a line.

Developer should choose short descriptive names and use all lower case letters aids memory, communication of the URL and reduce mistakes when typing in. Avoid special characters, however if necessary for punctuation use all hyphens or all underlines and use consistently. If different URL's are used in different links to the same page the browser will not know that they refer to the same page. The alternative links will not show up as visited even after a first link has been followed, leading to confusion for the user. The speed advantage of page caching will also be decreased. It is easier for users to learn and use web sites if the site uses consistent navigation methods, icons and graphics. Placing these in the same location on each web page also helps to make the site more navigable. Ensuring that pages have a consistent look and feel will make it easier for users to navigate each page they access, as they will have learnt how the site operates.

Presenting site menus in a logical way improves ease of navigation. Sites should have simple top-level menu hierarchy, composed of top-level site pages and services. There are a number of methods of facilitating navigation for users of assistive technology. Developer should be consistent in page-to-page design, designers can provide a jump-link to bypass a series of links on a page similar to the "back to top" used in long pages, when using multiple links close together, separate the links so the reader software can parse it correctly.

4.2 Usability Subphase

In this study usability refers to how easy and clear it to find, understand and use the information displayed on a website. Usability guidelines items are provided in order to facilitate the usability principles in a website. Usability of a website means being focused

on audiences throughout the developing process and involving them through the whole process. All the usability objectives are important for most sites, but you may emphasize different ones for different audiences and situations. For example, in a site that is aimed at members of the general public who may only visit once in a while, you should build a site where almost no learning needs to take place to use it efficiently.

Based on what users need, developer must put content into the site. As we consider information that is already specified, we think about how useful and understandable it must be. Reading from a computer screen is slower than reading from paper. Most people want to quickly scan information and read only small sections. If the information we have is in long paragraphs, we should consider revising it, break it into small chunks with many headings, cut out unnecessary words, use lists and tables so people can find information quickly and follow these same guidelines when writing new information for the website, in the following tables the most important usability guidelines is presented followed with detailed description.

36.Provide site map.
37.Provide each page with informative short text.
38.Make each page informative in own right.
39.Facilitate the rapid retrieval of information by providing a site index.
40.Strive for clear and accurate headings and link descriptions.
41.Avoid slang, jargon, and specialized meanings of familiar words, unless defined within your document.
42.Favor words that are commonly used. For example, use "begin" rather than "commence" or use "try" rather than "endeavor."
43.Every page should have a title.
44.Paragraphs should be clear and concise.
45.Support translation when appropriate.
46.Menu choices must be ordered logically into meaningful categories.
47.Support FAQ and help features.

Users go to site maps if they are lost, frustrated, or looking for specific details on a crowded site. A site map's main benefit is to give users an overview of the site's areas in a quick look by giving an entire page to a visualization of the information architecture. If designed well, this overview can include several levels of hierarchy. Page titles are very important because they provide the titles for bookmarks, and are often used in the indexing and output of search engines. In the header of each page the title should be specific to the page and informative but also concise. Words with high meaning should be used first, and linking words or propositions such as 'a' 'an', 'the' can be reduced or eliminated.

Pages might be linked externally or users come to them from search engines or recommendations. Each page should, if possible, be informative and useful when viewed in isolation. Also by providing some indication about the pages context within the site

users will be more likely to browse other pages for similar information. Particularly if a site is large there should be some method provided so that users can quickly find the information or page that they are looking for without having to follow a whole set of predefined steps. Providing shortcuts also facilitates 'expert users'.

48.Ensure that search functions and engines are effective
49.Consider providing quick search and advanced search facilities.
50.Display search results in the most useful way
51.Support spelling mistakes facility in search process.
52.Provide effective browse functions
53.Limit each paragraph to one main idea.
54.No side-to-side scrolling bar to view pages.
55.Use meaningful subheading.
56.Provide the mechanism where the user can cancel all operations if any.
57.Website must support all appropriate browsers.
58.If necessary provide online services.
59.Menu options can be accessed via keyboard commands.
60.Avoid under construction signs.

The main criteria for a search function are that it provides accurate, short and to the point results, clearly explains the search parameters used by search engine, and is easy to use.

A quick search allows users to quickly enter search terms and should allow the search to be further refined after they have seen the results. An advanced search allows users to define their initial search against specified search criteria, normally including searches on Metadata fields, and should allow users to further refine the search after they have seen the results. The specified search criteria should clearly indicate which fields are optional and which are mandatory.

Good practices for the information displayed on a results page include providing information about total number of successful search results, displaying ten results per page as a default, but providing the facility for users to choose for more or fewer results per page, displaying enough descriptive information to enable the user to understand if the result is worth pursuing. This might involve displaying the URL, giving the title of the resource, and providing a short description, or the search terms in context (often referred to as ‘key words in context’). Allowing users to do another simple or advanced search, by ensuring both options are provided (usually located at bottom of search results page) and implementing a relevancy system such as a percentage that indicates the relevancy of the document to the search terms, etc.

Developer should consider providing browse trees for users to browse high-level categories and sub-categories of information. As users often scan the initial page to see if the information the site contains is relevant to their requirements, the browse categories should be relevant to user requirements. People don't care, and it gives a 'half dressed' impression. If the website content is good then users will be happy.

61.State the topic of the sentence or paragraph at the beginning of the sentence or paragraph.
62.Use headings, lists, and consistent structure.
63.Provide a text-only index or site map of your site.
64.Minimize the number of hyperlinks that appear in a single line of text - one hyperlink is best; consider using vertical lists for links wherever possible.
65.Use active rather than passive verbs.
66.Avoid complex sentence structures.
67.The title and top level heading for a page should be the same.
68.The home page footer should include the 'mail to' or comment button, which points to someone conversant with the content of the page.
69.Use colour to draw attention to important items
70.Short paragraphs with a title for each paragraph.
71.Every page needs a headline and a title.
72.Design all pages to fit a 15-inch screen
73.Bottom of every page must have top of page and home page link.
74.Support using one term or word to describe any item
75.Avoid frames.

This will help both people who are skimming visually, but also people who use speech synthesizers. "Skimming" with speech currently, means that the user jumps from heading to heading, or paragraph to paragraph and listens to just enough words to determine whether the current chunk of information (heading, paragraph, link, etc.) interests them. If the main idea of the paragraph is in the middle or at the end, speech users may have to listen to most of the document before finding what they want. Depending on what the user is looking for and how much they know about the topic, search features may also help users to locate content more quickly.

Frames utility is dubious at best. They are an advanced design feature. Frames have very serious problems, users can't bookmark pages within the website.

4.3 Interface & Style Subphase

The guidelines discuss accessibility issues and provide accessible design solutions for some problems that may face users with certain disabilities. Some users may not be able to see images, others may use text-based browsers that do not support images, while others may have turned off support for images (e.g., due to a slow Internet connection). The guidelines do not suggest avoiding images as a way to improve accessibility. Instead, they explain that providing a text equivalent of the image will make it accessible.

76.Every non-text element shall be provided via "alt" (alternative text attribute), "longdesc" (long description tag) or in element content.
77.Maintain a standard page layout throughout the web site.

78.Use plain backgrounds and simple layouts to improve the readability of text
79.Make sure that all copy is easy to read and that background images do not distract or make the copy impossible to read.
80.Keep site consistent, don't have different color backgrounds for every page.
81.Remember yellow copy and white copy are hard to read and not printable.
82.Do not use all CAPITALs.
83.Use only a limited number of carefully chosen fonts
84.Avoid defining very specific fonts as some users may not have them loaded on their machines.
85.Always provide the pixel size for graphics and the width of columns
86.Choose text and background colors to provide maximum contrast.
87.Provide information of row and column headers.
88.Ensure that text can always be clearly read at any location against the background.

The "alt" text tag provides a title or descriptive phrase about the image it accompanies. This is essential for users of reader software who are vision impaired and it is valuable for users of graphical browsers who have "load images" turned off. The "longdesc" tag can be essential when an image conveys important information such as what about the image represents a discovery if the image is a science result image. On average it takes approximately 10% longer to read a block of text composed entirely of uppercase letters. Also it is regarded by some as rude because it is SHOUTING!

This allows the browser to reserve space for all of the content quickly. Whole page rendering times will improve and the user will have access to the important text information provided at the top of the page without waiting for all page elements to finish downloading. By the time they are ready for the graphic etc. there is a chance it will have loaded completely.

89.Avoid cheap graphics.
90.Avoid animated gifs.
91.Do not use interlaced or progressive images.
92.Avoid Dropshadows.
93.Avoid blinking text.
94.Avoid the unnecessary use of icons, graphics and photographs.
95.Contrast the foreground and background colors.
96.Do not abbreviate dates; for example.
97.Keep the number of colors in your images to a minimum.
98.Design your background image at the lowest color depth and resolution you can.
99.Avoid/Limit using image maps.
100.Provide text transcriptions of all video clips.
101.Give a written description of any critical information that is contained in

audio files contained on your website.
102.Only white, or light colors, for background.
103.Dark backgrounds can be used on home page only.
104.Avoid red and blue togather.
105.use color to show relationships and differences.
106.avoid peige or brown pictures.
107.use the same color(s) to in group related elements.

Using row and column headers becomes crucial when a table is larger than two columns or two rows. Without the headers, assistive technology such as reader software can only recite the table contents with no reference to what that column or row pertains to.

Contrast of text and background colors is very important for individuals vision. Poor quality icons and images give the impression of low quality to the whole website. Developers should not use images on the website until they completely understand graphics. they must especially understand antialiasing, and must use software that can perform this optimization. If they aren't using high quality graphics, they should avoid them all together. On the positive side animated gifs can be attention catching and amusing, but often they are irritating and inelegant.
Interlaces or progressive images take longer to download, and with modern, higher speed modems, loading a low resolution version of the image isn't as important as when modems were slow. droposhadows makes text hard to read. choosing a nice font leads banner text to be easily legible. Any visual feature that obscures text should be used carefully and deliberately. Blinking text is anoying method to draw attention,instead developer can use a more professional method, such as color, position, size, or a clever graphical element.

Two or three different fonts is probably the limit, any more and the page can appear messy and unstructured. fonts consistently can be used to reinforce the relative importance of headings etc.

Developer should avoid defining very specific fonts, as some users may not have them loaded on their machines. For each font definition provide alternatives and a default. e.g. font-family: Arial, Helvetica, sans-serif. For smaller text sans-serif fonts may be preferable to aid legibility since serif fonts can become unresolvable due to the relatively low resolution of most monitors. However, many users find serif fonts more pleasant to read. An informed choice must be made.

4.4 Legality and security

There are an increasing number of sites on the web providing primary and secondary legal information. These sites can be originated from variety of developers (e.g. organizations, companies, educational institutions, or individuals). Users of websites will

have varying levels of knowledge of the law. It is essential that legal web sites be of high quality. Best practice guidelines for legal websites is to promote the development of quality legal sites and to provide guidance to legal website developers. They may also be used as a tool to evaluate
existing legal web sites. Each guideline contains a recommendation, reasons for the recommendation[17]. Following table contains legality and security guidelines.[17]

108.Developer is responsible for the information on a site to be clearly indicated on all pages of the site. Full contact details are provided including address, phone, fax and email.
109.The currency of the information is clear.
110.The jurisdiction to which any information relates is clear.
111.Where appropriate, users are directed to other quality sites and sources that contain related information.
112.Expert in the area checks legal content.
113.Permission is obtained to use content sourced from other providers.
114.The source of the content is acknowledged on the site.
115.Links are not made to other sites by framing them within the original site, unless permission has been obtained.
116.For sites where links to primary legislation and case law are considered useful use the correct form of citation.
117.Display copyrights statement when appropriate.
118.When necessary provide ID and password strategy.
119.Provide quick assistant if user forget ID or passwords.

Authority can be implied when the information comes from a recognized organization, such as a government department or community legal center. When the information comes from an individual or less well known organization, stating the credentials of contributing developer will assist users in judging authority. This can be achieved simply by including qualifications or position held with the developer's name. Sometimes search engines take users directly to pages within a site. Providing authorship details on every page ensures users can ascertain the organization or person responsible for the information.

Users should be able to check whether the information on a site is up-to-date and likely to reflect current law. Therefore, providing an indication of the currency of the information is essential for a quality legal site. Many users are unaware of the concept of jurisdiction and do not realize that the law can differ from State to State. Some sites give either no, or at best doubtful, jurisdiction details resulting in users being misinformed.

Links that have been evaluated for their relevance increase the probability of users finding the information they are looking for. The addition of notations to these links assists users to judge whether the link may be relevant for their needs. Providing referral information directs people to sources of area they are investigating. It also emphasizes

that the web itself is not the only source for information, and that it has limitations when legally private information are required.

Using unacknowledged content from other sources may breach copyright. It also makes it difficult for users to assess the content based on authorship.
With a framed link, the external site to which the link has been created is viewed in a frame within the original site. The URL of the external site does not appear in the location box. Framing outside sites in this way can cause users to assume that the information within the frame belongs to the original site. This implies ownership of the information and may have copyright implications. It also makes it difficult for users to make decisions about the authorship of the information.

Information Privacy is the interest that individuals have in knowing about, and controlling, or at least constraining, the handling of personal information about themselves, including its collection, storage, dissemination and use. [17] Unauthorized private information must be completely avoided. Be aware of copyright laws. Pages must not contain copyrighted images or text unless permission for their use has been obtained. Department pages should contain copyright information if the information is original and is not to be used without permission.

Security is defined as protections against unauthorized use of, access to or disclosure of personal information**,** including measures designed to prevent, to detect and to enable investigation of unauthorized use, access and disclosure; and assurance of the appropriateness of information-handling procedures in achieving those aims**.** [17]

4.5 Communication & Infrastructure Subphase

Even websites with high-end users need to consider download times: it has been found that many of users access websites from home computers in the evening because they are too busy to surf the web during working hours. Bandwidth is getting worse, not better, as the Internet adds users faster than the infrastructure can keep up. Following table includes the most important guidelines the helps to achieve the best solution.

120.The main page, including graphics, must be under 50kb in size and the maximum time to download is 20 seconds for a 28.8 modem.
121.Avoid flashing or blinking elements with a frequency greater than 2Hz or lower than 55Hz
122.Use page space sensibly to maximise visual information.
123.Applicatons must tack an accesptable amount of time to retrieve data.
124.Applicatons must tack an accesptable amount of time to access data.
125.Design low reselution screens preferably 600*480 resoluation.
126.Design for a range of technical capabilities and access to a range of software.
127.Allow instulation in user-specified directory or disk.
128.Allow user to cancel setup any time.

129.Allow run with all OS
130.Allow user to download files in user-specified directory/filename.
131.Warn users about large sizes.
132.Split large documents into multible pages with a table of contents.
133.Provide alternative compressed files for download.
134.Each page should download quickly.
135.Be aware of used hyperlinks not to cause large pages to be downloaded.
136.Provide printer friendly version for printing pages that contain many graphics.
137.It is better to build a page with less that 50kb/page size.
138.Be aware of the chaching time to be appropriate.
139.Try to use in mirror server (websites) technique.
140.Include bios of people who were visiting the website.
141.Use plug-ins when needed.

Slow response times are the worst offender against web usability in the survey of the original "top-ten" mistakes, major sites had a truly horrifying 84% violation score with respect to the response time rule. [18]

Bloated graphic design was the original offender in the response time area. Some sites still have too many graphics or too big graphics; or they use applets where plain or Dynamic HTML would have done the trick.

The growth in web-based applications, e-commerce, and personalization often means that each page view must be computed on the fly. As a result, the experienced delay in loading the page is determined not simply by the download delay but also by the server performance. Sometimes building a page also involves connections to back-end mainframes or database servers, slowing down the process even further.

Users don't care why response times are slow. All they know is that the site doesn't offer good service, slow response times often translate directly into a reduced level of trust and they always cause a loss of traffic as users take their business elsewhere. So developer must invest in a fast server and review the system architecture and code quality to optimize response times.

Grouping, proximity, continuity and uniformity can all aid recognition and meaning. Use the space available on the page to add visual structure by grouping like elements etc.

If there is a substantial delay in rendering the whole page (grater than 10 seconds) the most informative and important items become visible and are meaningful while the rest of the page loads.

1.6 Marketing Subphase

Most of the time a website developer do not get the number of visitors he had anticipated. The following table lists a number of guidelines that should allow achieving this goal and stimulating traffic.

142. Register the website with the most appropriate search engines and ensure the appropriate key words are reflective of the website purpose, content and service descriptions.
143. Links on other related sites
144. Promote the website using traditional media
145. Develop a free service
146. Request reciprocal links
147. Issue news releases.
148. Capture visitor e-mail addresses and request permission to send updates.
149. Publish an e-mail newsletter.
150. Install a signature in the e-mail program.
151. Insert a competition on the website.
152. Consider purchasing banner advertisements on an appropriate site.
153. Buy a text advertisement in an e-mail newsletter
154. Ask users to bookmark your site.
155. Ask users to email your site to friends.
156. Promote the website in Mailing Lists and News Groups.
157. Show counter for number of visit of the website (when appropriate).

Search Engine registration is very complex and professional assistance should be considered to ensure your website is listed to maximize the visits to your site.

If the developer belong to any related purpose associations that feature online directories ask for a link back to the website. Even if he has to pay something for a link it may bring additional targeted traffic his way.

Continue to use traditional advertising methods that are effective but be sure to also include the website address in any display and classified adverts. This will also provide further information for the advertisement viewers on the website purpose area. Try catching readers attention by a short article or advert and then refer them to the website for more information. New marketing and advertising methods can also be used to display the website including direct mail, postcards, and television.

In addition to drawing people to the website to learn about its services, it is quite another to offer a free product or service through it. This can be an expensive exercise to develop free resources but it can bring increased traffic to the website. Make sure however that this free service is closely related to the purpose of the website and its services

Developer can search the Internet and find complementary websites to his own. Then request a reciprocal link to his website especially to the free service if he offer one. Find news for the event (such as launching the free service) and send news releases to print and web periodicals. Within the website response form include a check box where the visitor can give their permission to e-mail updates about products and services. This removes any danger of the developer e-mails becoming 'Spam'. Publishing a weekly, monthly or quarterly newsletter is one of the best ways to keep in touch with the prospects, generate trust, develop brand awareness and build future business.

Any e-mails generated from the website can include a signature and sign off which normally appears as name, address, phone & fax number, website address and e-mail. This ensures the e-mail to look professional and receivers know who the message has been sent from. Users like getting something free and one way to do this is to promote some sort of competition once again this can increase traffic to the website.

Developer may choose sites that seem to attract the kind of users he would like to visit his website. Also he can check out the click through rate but be sure to investigate the return on investment with this choice of advertising. Small advertisements in established e-mail newsletters can also increase traffic to the website by clicking on the URL and also tend to bring more targeted visitors to it. Provide a graphic on the front page of the website or at least ask visitors to bookmark it.

The Internet offers thousands of very targeted mailing lists and news groups made up of people with very specialized interests, (e.g. Use Google Groups, yahoo groups) to find appropriate sources. Developer(s) should not bother with news groups constituted of pure "Spam." Instead, he must find groups where a dialog is taking place. He should not use aggressive marketing and overtly plug his product or service, even if there are some who are doing so. Rather, he can add to the discussion in a helpful way and let the "signature" at the end of the e-mail message do the marketing instead of him. People will gradually get to know and trust the developer and visit his website. Certainly not all ways to promote the website marketing, but cover most of the ground. Developer(s) to effectively market his website he need to spend some time adapting these strategies. Right now.

4.7 Semantic Subphase

E.g. search engines, Semantic Web, Dublin Core Metadata.

The Internet has tens of millions of sites at this point; growth is exponential and bibliographic control does not exist. To find the proverbial needle in this immense haystack (or tiny fly in the Web), user may use two basic approaches: a search engine or a subject guide such as Yahoo, Google, etc. Subject guides are fine for browsing general topics, but for specific information user uses a search engine. The output can be greatly improved by spending time learning the nuances of several search tools. Their on-line help pages have in-depth information.

Search engines do keyword searches against a database, but various factors influence the results from each. Size of the database, frequency of update, search capability and design, and speed may lead to amazingly different results [81]. There are also metasearch sites or metacrawlers that send searches to several search engines. Since metasearch engines do not allow for input of many search variables, their best use is to find hits on obscure items or to see if something is on the Internet. Some of the best-known ones are Dogpile, Mamma, Metacrawler, and SavvySearch.

In the following table the most important guidelines that will help agents when accessing the websites.

158. List the most important terms in a keywords meta-tag together with all common synonyms (even ones not included in the body text).
159. Use Dublin Core metadata complying to describe the site.
160. Put different title on each page.
161. Ensure that the html <title> tag accurately describes the site
162. Use the <meta name= "description"> field to provide a brief description of the site's purpose and content.
163. Ensure that the HTML code is verified.

Wise choices of keywords have a direct impact on the website's ranking in the search engines. The better website ranks, the more likely it will has audience visiting. There are other ways to gather traffic, but developer cannot ignore the major search engines. They index the website in various ways, but developer choice of keywords will have an impact in all of them, even those that do not use Meta tags for keywords and descriptions.

Metadata describes a site's content in a structured way. Metadata is not visible to web users, but provides the potential for a search engine to carry out targeted searches. For example, use of the word 'copyright' in the subject Meta tag allows users to search for sites on copyright. Otherwise all sites with the word 'copyright' anywhere in a site will be retrieved. The use of recognized metadata standards facilitates effective searching and the development of gateway sites.

Following Dublin Core [82] meta tags as standard terminology and structure for a metadata about an information object, will help the machine to understand the content of the website, notice that every web page is an information object and these information objects need a metadata such as in Dublin Core to describe them. Dublin Core meta tags could be attached in the header of each web page such as title, discretion, author, version format, keywords, etc. Dublin Core advice the provided keywords under its tag to be a controlled vocabulary, which means that the used keywords are standard terminology in e.g. library of congress, ontologies, etc.

As standardized in Dublin Core meta tags, different titles for each page will helps search engines to present a good search results. Considering that easy title support also easy bookmark for the home page. A descriptive title increases the likelihood of a site being

found because search engines to rank sites often use the words in the title field. A descriptive title also helps the user choose whether a site is relevant from a list of results.

This will further increase a site's chances of being found and may also be included in the list of results returned by the search engine, which assists users to decide which sites in a list of results may be relevant to their needs.

We may need to define specific Meta information about information element inside the content in the web page; appropriate technology for this purpose can be found in the research of semantic web. [16] gives a general overview for semantic web technology. This thesis does not provide an implementation items for such technology since it is new and not standardized yet.

The correctness of HTML syntax help the agents that crawl web pages to pars them correctly, therefore the correctness of HTML syntax improve the accessibility and thus the machine semantic. HTML syntax can be validated using software that detects errors. Theses tools summarize any problems encountered. Editing and correcting non-slandered code will enable a range of browsers/crawlers to pars or view a website.

4.8 Error Subphase

As users surf the Net, they will undoubtedly find that at times they cannot access certain websites or browsing them. Whatever the reason was an error message should be provided to describe what cause this error and what action is necessary. Unfortunately, most of existing messages are cryptic and baffle most users. In the following table some guidelines concerns error.

164.Error messages must be written in clear and understandable language.
165.Information and error messages must be correctly spelled.
166.Unnecessary warnings must not appear.
167.Error messages must describe what cause of the problem.
168.Error messages must describe what action is necessary.
169.Error messages must provide clear exit point.
170.sound can be used to alert error.
171.The system must warn users if they are about to make a potentially serious error.
172.The system must prevent users from making errors whenever possible.

Also some common problems and its solutions are presented in the following, where developer can provide description of the problem and it solution on the web page when needed. The statements are written as how it should appear in the website (user speech form).

Problem1: There is something wrong with the address you entered. You may not be authorized to access the web page, or maybe it is no longer exists.

Solution1: Check the address carefully, especially if the address is long. Make sure that the slashes are correct (they should be forward slashes) and that all the names are properly spelled. Web addresses are case sensitive, so check that the names are capitalized in your entry as they are in the original reference to the website.

Problem2: You can't access a website because you're not on the guest list, your password is invalid or you have entered your password incorrectly.
Solution2: If you think you have authorization, try typing your password again. Remember that passwords are case sensitive.

Problem3: Either the web page no longer exists on the server or it is nowhere to be found.
Solution3: Check the address carefully and try entering it again. You might also see if the site has a search engine. If so, use it to hunt for the document. (It's not uncommon for pages to change their addresses when a website is redesigned.) To get to the home page of the site, delete everything after the domain name and hit the Enter or Return key. For example, if the address is: http://www.vub.ac.be/english/html/email.htm, remove English/html/email.htm.

Problem4: Your Internet service provider (ISP) or your Internet connection may be down.
Solution4: Take a stretch, wait a few minutes and try again. If you still have no luck, phone your ISP or system administrator.

Problem5: Your web browser may not be able to decipher the online form you want to access. There may also be a technical error in the form.
Solution5: Consider sending a message to the site's Webmaster, providing any technical information you can, such as the browser and version you use.

Problem6: You don't have permission to access the page or your password is incorrect.
Solution6: Try retyping your password if you think you should have access.

Problem7: DNS stands for the Domain Name System, which is the system that looks up the name of a website, finds a corresponding number (similar to a phone number), and then directs your request to the appropriate web server on the Internet. When the lookup fails, the host server can't be located.
Solution7: Try clicking on the Reload or Refresh button on your browser toolbar. If this doesn't work, check the address and enter it again. If all else fails, try again later.

Problem8: The site has no web pages on it.
Solution8: Check the address and enter it again. If you get the same error message, try again later.

Problem9: The web server is down.
Solution9: Try clicking on the Reload or Refresh button. If this doesn't work, try again later.

Problem10: The web server is down, the site may have moved, or you've been disconnected from the Net.
Solution10: Try clicking on the Reload or Refresh button and check to see that you are still online. If this fails, try using a search engine to find the site. It may have a new address.

Problem11: The web server is busy.
Solution11: Try again in a while.

Problem12: The web server is down or you've been disconnected from the Net.
Solution12: Try clicking on the Reload or Refresh button and check to see that you are still online.

Problem13: The web server is out-of-business or you may have entered the address incorrectly.
Solution13: Check the address and try typing it again.

Problem 14: in search if nil results are obtained, give the user options to pursue, such as:

Solution14: Your search XXXX did not match any documents: Suggestions - Make sure all works are spelt correctly; Try using different words; Try using more general words.

Other possible problems are:

15.Email address without live 'mailto' URL.

16.No indication of bottom of page.

17.Wrong date, or time of the availability of the data.

4.9 Testing Subphase

Testing at the early stages of website design can help determine the most appropriate look and feel for the web site. Testing close to web site launch can help to identify any issues that could cause problems for users. Testing at a later stage can identify areas that work particularly well, areas that need improvement, and feed into evaluations of the entire project.

In general, testing early in developmental stages is most efficient, as changes can be made for relatively low cost. Examine the site with an analytical eye, encourage feedback, and keep aware of developments in web site design.

Testing is a time consuming but a critical process in product development. Testing is used to prove that there is no error in a program. User testing can help to ensure that the developed website is relevant and is structured logically, testing websites throughout the process of creating the website is the key to success, "Test early, test often". Website testing at various stages can produce valuable insights. Testing while the design is still on paper has a number of advantages since issues can be identified while they can still be corrected cheaply (perhaps by just redrawing the screen roughly on paper). Users may feel freer to comment on something that looks as though it isn't finished yet. Developer will however need to ensure that the site is sufficiently complete for any test to be meaningful.

This section present questioner guidelines for testing websites to determine accessibility issues. These tests should highlight major access issues, and be valuable in reducing a number of accessibility limits. However, some of these testing scenarios only replicate conditions caused by a disability; they do not simulate the full experience a user with a disability might have. In real-life settings, developed website pages may be less usable than the developer expected. To be sure of the strategies recommends that developers observe users with different disabilities as they that the website is easy to use, developer can go through the website and ask himself the questions in the lists below. Then, show the site to someone who has never seen it before. Ask that person the answers to the same questions. With “NO” answer, developer should check out which related guideline(s) was (were) missed, and try to fix the problem.

Question.	Yes	No
173.Can visitors find information easily?		
174.Is the navigation clear and consistent throughout the site?		
175.Does the back button always take them back to the preceding page?		
176.Do the pages load quickly (10 to 20 seconds) on standard modem connections?		
177.Can visitors easily find out who runs the site?		
178.Can visitors easily find an email address to contact if they have difficulties using the site?		
179.Are the most important elements of the website visible without scrolling up and down or from side to side on screens set to 600 x 800 size?		
180.Can visitors bookmark individual pages?		
181.Does the site look good and work from different browsers?		
182.Do the website have alternate text tags under graphics?		
183.Do all links match titles of the pages to which they refer?		
184.Are all internal and external links checked and verified?		
185.Are Text links retain the standard colors: Blue for unvisited, red/purple for visited.		
186.Is Page titles are concise and meaningful and would make appropriate labels for bookmarks?		

187.Is the location of the page being viewed is indicated clearly.		
188.Are Error messages are written in clear, understandable language and indicate how to resolve the problem.		
189. Is a search facility is provided?		
190. Are Complicated backgrounds are avoided?		
191.Are Pages still works for text only browsers?		
192.Does the website work in variety of computers and screens?		
193.Are all information needed by the target audience is available?		
194.Is the website fulfilling its purpose?		
195.Does site has a domain name that is easy to spell, pronounce and remember.		
196.Does site utilizes a simple and intuitive navigation method.		
197.Are pages consistent so that user's can predict where important page element will occur?		
198.Do pictures have meaningful alternative descriptions provided via the <ALT> tag and <LONGDESC> tag where necessary?		
199.Are Links on a current page do not link to the page itself?		
200.Does the company logo provide a link to the home page?		
201.Can users find contact name, address, and fax number?		
202.Does the help functions as designed?		
203.Should additional help be provided?		
204.Is the use of icons consistent throughout the application?		

When the developer testing his website for accessibility, he can, undoubtedly, add more things to this questioner. But using this list as a guide should give the developer a nice snapshot of his website's functionality and whether or not it's pleasing the target audience.

4.10 Maintainability Subphase

Website maintenance is the process of correcting, adapting and perfecting the content and software at the website. Frequently it is a different person who performs these maintenance tasks, and the original authors and developers may not even be available. Projects should focus on reducing maintenance costs by clever design.

Websites need to be maintained as well as developed. Designers of websites need to consider how easy the site will be to add onto and to maintain during its lifetime. One issue involved in maintaining a website is how easy it is to port the site from one server to another. Using relative links within the site make porting easy. Other issues include appropriate chunking of information presented in the site so that sections that need updating frequently can be easily replaced. Organizing a site so that new information can easily be added at the appropriate levels is also important. In the following tables guidelines items that will help in keeping the website maintained.

205.Change the contents of our site using browser-based editors (without editing HTML).
206.Review the changes internally. Other staff can view the changes with their Web browsers. The internal site appears exactly as it will to the public once published. (Even the search engine works.)
207.Publish the approved changes to the public site.
208.Updating the Site Map to track changes.
209.Indexing the Search system's index database.
210.Updating the labels on the Side Menu.
211.Finding "broken" links, both local and off-site.
212.Finding spelling errors.
213.Use relative rather than absolute links
214.Establish conventions for updating content
215.Use consistent file-naming and directory-structure conventions
216.Avoid placing information that will change often in graphics
217.Highlight the updated information or use graphic to show new material.
218.Include the email address of the person responsible for maintaining the site so that errors may be reported.
219.Include the date last updated date.
220.Ensure information is kept current. A web page loses credibility when its "last maintained" date is not recent.
221.Making backups of previously published versions of the site.
222.Redirect web pages instead of just deleting them.

Website expansion can be accommodated in the original design by careful consideration of the categories used. Care should also be taken when designing images and icons for use on websites. If it is important to the user that the information be timely, a "last updated" message should appear on all pages in the website. The contact person along with their e-mail should also appear if a viewer has a question about the information. If information is updated periodically, it is a good idea to post the update schedule.

Old information is often good information and can be useful to readers. Even when new information is more valuable than old information, there is almost always some value to the old stuff, and it is very cheap to keep it online. Archives are also necessary as the only way to eliminate linkrot and thus encourage other sites to link to the website. In addition anytime a page moves, developer break any incoming links from other sites.
Users can bookmark any page of the website, developer should not just delete an old page, but redirect them to the best new location for that old information.
Web publishing is not a one-time task. Developer should keep all pages up to date. This is not the most exciting aspect of Web publishing, but it is what will distinguish the website pages from others. It will also keep users coming back

In practice, maintenance is a cheap way of enhancing the content on developed website since many old pages keep their relevance and should be linked into the new pages. Of

course, some pages are better off being removed completely from the server after their expiration date.

4.11 Conclusion

A developer need to follow up this large number of guidelines in order to accomplish a high quality accessible website, but still a disadvantage of using such a large guidelines approach is the time consuming for the website developers, therefore these items can be seen as concrete raw material /infrastructure/ requirements for developing and formalizing the implementation design phase for WSDM.

Chapter five

Conclusion and Future Work

5. 1 Conclusion

In order to establish a well-formed and systemized implementation design phase in WSDM, in this thesis, we introduced and argued a guideline technique that will be a ground for later formalization, where a list of guideline items was constructed and investigated. It is not intended to be a definitive list or necessarily applicable to all situations, but it covers a lot or most of the grounds. As the guideline items are considered to be appropriate solution for the gap between the conceptual level in WSDM methodology (i.e. high-level) and the implementation level (i.e. low-level), each guideline item was studied and investigated separately, then these guidelines items where gathered in subgroups and categorized into ten main categories according to the guideline items functionality and purpose; these ten categories are (Navigation, Usability, Interface&Style, legality, Communication &Infrastructure, Semantic, Marketing, Error, Testing, and Maintainability,).

A WSDM implementation design subphases approach was presented, in which a guideline ten categories were treated as a subphases in the implementation design phase of WSDM, each subphase supports its own guideline items that accomplish a specific main facility. Developer should follow these guideline items in order to assure the website accessibility and functionality. A clear border between the ten subphases cannot be completely achieved therefore working with them can be in an iterative prototyping process, where a developer may need to return to previous subphases,

In addition, we argued the importance of the user characteristics, where the developer should take them into account while developing a website since they may, if ignored in one-way or another, affect the accessibility of the developed website. Then the ten subphases guideline items were discussed in detailed, where we showed their importance and need.

These guideline items are not only for web design purpose, but also they can be used as an evaluation items as shown in the appendix, or they may also used as basic conditions in a contract between owner and website developing company.

5.2 Future work

Future WSDM Tool/Methodology

The main goal for this research was to find out a strategy that allow us to formalise implementation level aspects in a way that can lead to general formalization methodology that treats these aspects and thus make them flexible and independent as possible to be adopted by a future WSDM case tool, but for the time limitation of a master thesis this can be considered as a future work.

As the resulted guideline items categories are now mostly independent, each can be investigated to find out a methodology that can implement each in systematic engineering steps, a formalizing strategy in addition will be investigated for each guideline category in order to build a general formalizing methodology for all the ten categories. We will make a survey for all web design tools so that we can know what shortage, and/or problems these tools may have, and investigate a future WSDM tool that support HTML and (some of) the guideline items. As an example the future tool, can support a guideline item as ("The main page, including graphics, must be under 50kb in size") by calculating the size of the current page, and alerting the developer when exceeding this size. Furthermore each (when appropriate) guideline item can be split into more specific subitem, which in turn can well-heeled the formalizing aspects.

Topic Classes Approach

A disadvantage of using such a large guidelines approach is the time consuming for the website developers. In order to avoid such disadvantage, a new approach will be investigated, it can be better to customize the guideline ten categories in a way that avoid the developer from going through all the guideline items list. This can be accomplish by proposing new categories, which can be called (topic classes), each represent one of the most popular topics of website development (i.e. topics for which most of the websites are developed. e.g. marketing, education…), each class will contain a group of guideline items related according to its topic.

The developer then can qualify the needed class/classes according to two main topics, the purpose of the website (already specified in the Mission Statement phase of WSDM methodology) and the Functional & Usability requirements of the target audience. (Set in the Audience Modeling phase of the methodology). In addition to the selected topic class/classes items, the Characteristics of the target audience, (specified in the Audience Modeling phase) should be considered while implementing the website.

As a suggested mean to automate this approach, guideline items of each class could be stored in a database identified by its topic class, so that the developer can get a report

about all the items of the specified class/classes, and satisfies his developments according to these guideline items.

Although this approach can solve time problem, topic classes are not completely comprehensive, therefore a developer may not find a topic class that matches one (or more) of the website purposes or the target audience requirements, hence the guideline list will not achieve the goal or play the role it was already built for, which leads us to the question that must be answered, can we make a survey that guarantee covering all existing websites topics?

Appendix

In the following table all the guideline items can be used for a websites evaluation process, it is not proposed in this thesis, but a basic evaluation can be achieved by deciding the evaluation rank for each item, considering its weight of importance, etc.

Evaluation item	Evaluation Rank
1.Maintain a standard page method throughout the web site, all website pages must have the same navigation structure.	
2.Put a toolbar on every page.	
3.The home page footer should include the URL for the home page.	
4.Links should be displayed in the default browser colors.	
5.Use standard colors for visited links	
6.Do not use splash pages before home page.	
7.Navigation bar bottoms must be consistence (size and width).	
8.Website structure is simple, with no unnecessary levels	
9.Minimize the number of clicks. No more than 3 clicks from the homepage.	
10.Ensure that the web site is navigable from wherever the user enters the site. Show the page track from the home page.	
11.Use appropriate bars and buttons. Be aware of loading time.	
12.Link effectively to other internal resources.	
13.Links should not open a new browser window.	
14.Ensure that users can navigate the site without needing to use their browser's "Back Button".	
15.Each page should contain at least one out of page link.	
16.Avoid links that refer to the current page.	
17.Upward navigation links at bottom of all major navigation pages.	
18.Each page should have a link to the home page.	
19.Upward links arranged from lowest to highest levels: left to right.	
20.All major parts of the website are accessible.	
21.Provide a home page for each major area of the website.	
22.Using an immediate redirect: every time the user clicks *Back*, the browser returns to a page that bounces the user forward to the undesired location. Limit home pages to two screens.	
23.Limit inside pages to maximum six screens.	
24.Order menu bar labels by frequency use and important	
25.Ensure that navigation aids are intuitive and easy to use.	
26.Always use an identical URL to refer to the same page.	
27.URL's should be: meaningful, lower case, persistent.	
28.Links should not be embedded.	
29.Links should be descriptive of what the user will find upon visiting.	
30.Pages should use standard navigational icons.	
31.Footer should provide logical navigational aids.	
32.Make links to external pages clear.	

33.Make links meaningful and predictive of the destination - DON'T use 'click here'.	
34Use labels that people will recognize	
35.Use alt tags with all images link.	
36.Provide site map.	
37.Provide each page with informative short text.	
38.Make each page informative in own right.	
39.Facilitate the rapid retrieval of information by providing a site index.	
40.Strive for clear and accurate headings and link descriptions.	
41.Avoid slang, jargon, and specialized meanings of familiar words, unless defined within your document.	
42.Favor words that are commonly used. For example, use "begin" rather than "commence" or use "try" rather than "endeavor."	
43.Every page should have a title.	
44.Paragraphs should be clear and concise.	
45.Support translation when appropriate.	
46.Menu choices must be ordered logically into meaningful categories.	
47.Support FAQ and help features.	
48.Ensure that search functions and engines are effective	
49.Consider providing quick search and advanced search facilities.	
50.Display search results in the most useful way	
51.Support spelling mistakes facility in search process.	
52.Provide effective browse functions	
53.Limit each paragraph to one main idea.	
54.No side-to-side scrolling bar to view pages.	
55.Use meaningful subheading.	
56.Provide the mechanism where the user can cancel all operations if any.	
57.Website must support all appropriate browsers.	
58.If necessary provide online services.	
59.Menu options can be accessed via keyboard commands.	
60.Avoid under construction signs.	
61.State the topic of the sentence or paragraph at the beginning of the sentence or paragraph.	
62.Use headings, lists, and consistent structure.	
63.Provide a text-only index or site map of your site.	
64.Minimize the number of hyperlinks that appear in a single line of text - one hyperlink is best; consider using vertical lists for links wherever possible.	
65.Use active rather than passive verbs.	
66.Avoid complex sentence structures.	
67.The title and top level heading for a page should be the same.	
68.The home page footer should include the 'mail to' or comment button, which points to someone conversant with the content of the page.	
69.Use colour to draw attention to important items	
70.Short paragraphs with a title for each paragraph.	
71.Every page needs a headline and a title.	
72.Design all pages to fit a 15-inch screen	

73.Bottom of every page must have top of page and home page link.	
74.Support using one term or word to describe any item	
75.Avoid frames.	
76.Every non-text element shall be provided via "alt" (alternative text attribute), "longdesc" (long description tag) or in element content.	
77.Maintain a standard page layout throughout the web site.	
78.Use plain backgrounds and simple layouts to improve the readability of text	
79.Make sure that all copy is easy to read and that background images do not distract or make the copy impossible to read.	
80.Keep site consistent, don't have different color backgrounds for every page.	
81.Remember yellow copy and white copy are hard to read and not printable.	
82.Do not use all CAPITALs.	
83.Use only a limited number of carefully chosen fonts	
84.Avoid defining very specific fonts as some users may not have them loaded on their machines.	
85.Always provide the pixel size for graphics and the width of columns	
86.Choose text and background colors to provide maximum contrast.	
87.Provide information of row and column headers.	
88.Ensure that text can always be clearly read at any location against the background.	
89.Avoid cheap graphics.	
90.Avoid animated gifs.	
91.Do not use interlaced or progressive images.	
92.Avoid Dropshadows.	
93.Avoid blinking text.	
94.Avoid the unnecessary use of icons, graphics and photographs.	
95.Contrast the foreground and background colors.	
96.Do not abbreviate dates; for example.	
97.Keep the number of colors in your images to a minimum.	
98.Design your background image at the lowest color depth and resolution you can.	
99.Avoid/Limit using image maps.	
100.Provide text transcriptions of all video clips.	
101.Give a written description of any critical information that is contained in audio files contained on your website.	
102.Only white, or light colors, for background.	
103.Dark backgrounds can be used on home page only.	
104.Avoid red and blue togather.	
105.use color to show relationships and differences.	
106.avoid peige or brown pictures.	
107.use the same color(s) to in group related elements.	
108.Developer is responsible for the information on a site to be clearly indicated on all pages of the site. Full contact details are provided	

including address, phone, fax and email.	
109.The currency of the information is clear.	
110.The jurisdiction to which any information relates is clear.	
111.Where appropriate, users are directed to other quality sites and sources that contain related information.	
112.Expert in the area checks legal content.	
113.Permission is obtained to use content sourced from other providers.	
114.The source of the content is acknowledged on the site.	
115.Links are not made to other sites by framing them within the original site, unless permission has been obtained.	
116.For sites where links to primary legislation and case law are considered useful use the correct form of citation.	
117.Display copyrights statement when appropriate.	
118.When necessary provide ID and password strategy.	
119.Provide quick assistant if user forget ID or passwords.	
120.The main page, including graphics, must be under 50kb in size and the maximum time to download is 20 seconds for a 28.8 modem.	
121.Avoid flashing or blinking elements with a frequency greater than 2Hz or lower than 55Hz	
122.Use page space sensibly to maximise visual information.	
123.Applicatons must tack an accesptable amount of time to retrieve data.	
124.Applicatons must tack an accesptable amount of time to access data.	
125.Design low reselution screens preferably 600*480 resoluation.	
126.Design for a range of technical capabilities and access to a range of software.	
127.Allow instulation in user-specified directory or disk.	
128.Allow user to cancel setup any time.	
129.Allow run with all OS	
130.Allow user to download files in user-specified directory/filename.	
131.Warn users about large sizes.	
132.Split large documents into multible pages with a table of contents.	
133.Provide alternative compressed files for download.	
134.Each page should download quickly.	
135.Be aware of used hyperlinks not to cause large pages to be downloaded.	
136.Provide printer friendly version for printing pages that contain many graphics.	
137.It is better to build a page with less that 50kb/page size.	
138.Be aware of the chaching time to be appropriate.	
139.Try to use in mirror server (websites) technique.	
140.Include bios of people who were visiting the website.	
141.Use plug-ins when needed.	
142.Register the website with the most appropriate search engines and ensure the appropriate key words are reflective of the website purpose, content and service descriptions.	
143.Links on other related sites	
144.Promote the website using traditional media	
145.Develop a free service	

146.Request reciprocal links	
147.Issue news releases.	
148.Capture visitor e-mail addresses and request permission to send updates.	
149.Publish an e-mail newsletter.	
150.Install a signature in the e-mail program.	
151.Insert a competition on the website.	
152.Consider purchasing banner advertisements on an appropriate site.	
153.Buy a text advertisement in an e-mail newsletter	
154.Ask users to bookmark your site.	
155.Ask users to email your site to friends.	
156.Promote the website in Mailing Lists and News Groups.	
157.Show counter for number of visit of the website (when appropriate).	
158.List the most important terms in a keywords meta-tag together with all common synonyms (even ones not included in the body text).	
159.Use Dublin Core metadata complying to describe the site.	
160.Put different title on each page.	
161.Ensure that the html <title> tag accurately describes the site	
162.Use the <meta name= "description"> field to provide a brief description of the site's purpose and content.	
163.Ensure that the HTML code is verified.	
164.Error messages must be written in clear and understandable language.	
165.Information and error messages must be correctly spelled.	
166.Unnecessary warnings must not appear.	
167.Error messages must describe what cause of the problem.	
168.Error messages must describe what action is necessary.	
169.Error messages must provide clear exit point.	
170.sound can be used to alert error.	
171.The system must warn users if they are about to make a potentially serious error.	
172.The system must prevent users from making errors whenever possible.	
173.Can visitors find information easily?	
174.Is the navigation clear and consistent throughout the site?	
175.Does the back button always take them back to the preceding page?	
176.Do the pages load quickly (10 to 20 seconds) on standard modem connections?	
177.Can visitors easily find out who runs the site?	
178.Can visitors easily find an email address to contact if they have difficulties using the site?	
179.Are the most important elements of the website visible without scrolling up and down or from side to side on screens set to 600 x 800 size?	
180.Can visitors bookmark individual pages?	
181.Does the site look good and work from different browsers?	
182.Do the website have alternate text tags under graphics?	
183.Do all links match titles of the pages to which they refer?	
184.Are all internal and external links checked and verified?	
185.Are Text links retain the standard colors: Blue for unvisited, red/purple for visited.	

186.Is Page titles are concise and meaningful and would make appropriate labels for bookmarks?	
187.Is the location of the page being viewed is indicated clearly.	
188.Are Error messages are written in clear, understandable language and indicate how to resolve the problem.	
189. Is a search facility is provided?	
190. Are Complicated backgrounds are avoided?	
191.Are Pages still works for text only browsers?	
192.Does the website work in variety of computers and screens?	
193.Are all information needed by the target audience is available?	
194.Is the website fulfilling its purpose?	
195.Does site has a domain name that is easy to spell, pronounce and remember.	
196.Does site utilizes a simple and intuitive navigation method.	
197.Are pages consistent so that user's can predict where important page element will occur?	
198.Do pictures have meaningful alternative descriptions provided via the <ALT> tag and <LONGDESC> tag where necessary?	
199.Are Links on a current page do not link to the page itself?	
200.Does the company logo provide a link to the home page?	
201.Can users find contact name, address, and fax number?	
202.Does the help functions as designed?	
203.Should additional help be provided?	
204.Is the use of icons consistent throughout the application?	
205.Change the contents of our site using browser-based editors (without editing HTML).	
206.Review the changes internally. Other staff can view the changes with their Web browsers. The internal site appears exactly as it will to the public once published. (Even the search engine works.)	
207.Publish the approved changes to the public site.	
208.Updating the Site Map to track changes.	
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210.Updating the labels on the Side Menu.	
211.Finding "broken" links, both local and off-site.	
212.Finding spelling errors.	
213.Use relative rather than absolute links	
214.Establish conventions for updating content	
215.Use consistent file-naming and directory-structure conventions	
216.Avoid placing information that will change often in graphics	
217.Highlight the updated information or use graphic to show new material.	
218.Include the email address of the person responsible for maintaining the site so that errors may be reported.	
219.Include the date last updated date.	
220.Ensure information is kept current. A web page loses credibility when its "last maintained" date is not recent.	
221.Making backups of previously published versions of the site.	
222.Redirect web pages instead of just deleting them.	

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Related: see http://www.jarrar.info/suba/

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