

SwE6343 User Interface Design and Implementation, Fall 2002
Southern Polytechnic State University
Marietta, Georgia

Design of a Web Portal for the Design-Build Approach

Final Project Report

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Abstract

This report covers the design phase of a two-semester project to develop a web portal for the design-build (DB) approach to architecture. The SWE 6343 User Interface Design and Implementation class (the SE class) performed this design project during Fall Term 2002 at Southern Polytechnic State University. The project utilized the Design-Build course in Architecture (the Architecture class) as a source of users and customers for the project. Conventional methodology of user interface (UI) design was used, including user analysis, task analysis, usability engineering, and UI-design-concept prototyping. A benchmarking method was created and tried. The Architecture class chose a web portal as the application and the target task domains of navigation, search, updating content, contact information, FAQs, and reference linking. This report covers our results of these analyses and design recommendations.

Table of Contents

1	Summary	1
2	Introduction	1
3	Methods, Assumptions, and Procedures	1
4	Results and Discussion	4
5	Conclusions	18
6	Recommendations	19
7	References	20

1 Summary

Main results emerging from the analyses show that: 1) The DB web portal must be user-friendly, pleasing, and provide comprehensive and understandable information on the DB process and education. 2) The users include students, researchers, architects, parents, developers, and project sponsors. 3) The main tasks include navigation, searching for information, updating content, and providing FAQs, reference links, contact information, and the opportunity to provide feedback. 4) Many web sites contain benchmark UI possibilities, which are described in the text of the report. 5) Major usability criteria are defined in terms of time-on-task, task completion, and user satisfaction.

Conceptual design proposals for the UI in five domains were developed and benchmarked.

2 Introduction

Architecture and construction have for a long time used a Design-Build (DB) approach both in practice and for teaching. Recently, UI courses have used the DB approach also. Prior architecture [2] and UI [5] courses have successfully used the Bauhaus approach of teaching design through building. For teaching a converged DB course, teaching techniques in both architecture and computing can be merged with those Gropius described for the Bauhaus [2, 4] to suggest these aims:

The designer should become a person of vision and of professional competence, whose task it is to coordinate the many social, technical, economic, and formal problems, which arise in connection with the building. He/she must recognize the impact of industrialization and explore the new relationships and constraints dictated by social and scientific progress.

In an age of specialization, method is more important than information. Training should be concentric rather than sectional with an emphasis on relations.

Design knowledge only comes by individual experience, where feedback on one's own work is of paramount value. Through the feedback students receive when trying to build their designs, they quickly learn to account for constraints [6]. The aim is to provide a rich and deep learning environment facilitating a student to design and build ubiquitous computing not only within human capability constraints, but also for human enjoyment, spirituality, etc.

At the start, basic design and shop practice combined should introduce the students to the elements of design and simultaneously the ideas of construction. In succeeding years, the design and construction studio should be supplemented by field experience. Construction should be taught with design, for they are directly interdependent.

Students should be taught to work in collaborative teams.

Case history studios should be studied in later years, rather than first, to avoid imitation and intimidation. Students learn to design better when first encouraged to explore, try, reflect upon, and integrate design and construction.

We will aim for these pedagogical goals as we merge together architecture and UI into a converged design through building approach. Our desire is an active learning environment that fosters exploration, discovery, and creativity.

This report covers a joint Architecture-Software Engineering project at Southern Polytechnic State University during Fall Term 2002. This project is an initial try of the converged approach. In it the SE 6343 User Interface Design and Implementation class (the SE class) will design a web portal covering DB using the Architecture 3011 Architecture Studio as the client. This report covers the results, designs, and recommendations coming from that joint project.

3 Methods, Assumptions, and Procedures

To do this user interface design project, we completed the following procedures and activities:

- Design Build web portal goal identification
- User analysis
- Task analysis and task scenario definition
- User interface benchmarking study
- Usability planning
- Development of five concept design proposals for our user-interface design

3.1 *Design Build Web Portal Goal Identification*

During August and September, 2002, the SE class and instructor had numerous informal meetings and discussions with the instructor and representatives of the Architecture class. The main focus of the informal meetings was to identify the main goal of a SE design project that the SE class could perform for the Architecture class. By mid-September we had converged on general goals for a specific domain and application (a Design-Build web portal). On October 3, 2002, we finalized these goals for the Fall 2002 Semester's work in a meeting with representatives of the Architecture class.

3.2 *User Analysis*

Our user analysis was completed during the month of September. We employed standard methods to identify users including brainstorming and observation. Students in the Software Engineering program (the developers) worked in groups to identify those user groups that might visit the portal to look for information. We verified and refined the user lists in a meeting on 3 October 2002 with two representatives of the Architecture class. Those users were presented to representatives of the Design Build program for approval and modification. Those user groups for which the representatives identified support as required or highly desirable were identified for future investigation.

3.3 *Task Analysis and Task Scenario Definition*

Our task analysis was completed during the month of September. We employed standard methods to identify typical user tasks with web portals including brainstorming and observation. Students in the Software Engineering (SE) program (the developers) worked in groups to identify those tasks that the users would be expected to attempt through the portal. We verified and refined the task lists in a meeting on 3 October 2002 with two representatives of the Architecture class. Those tasks were presented to representatives of the Design Build (DB) program for approval and modification. Those tasks for which the representatives identified support as required or highly desirable were identified for future investigation.

3.4 *User Interface Benchmarking Study*

After verifying and refining the user and task descriptions with the representatives of the Architecture class on 3 October, 2002, we embarked on a benchmarking study to find the current best UI practices. The approach and methodology used in discovering available and appropriate options in these areas is substantially the same as that utilized in other design areas of the Design Build web portal project.

Once the user and task lists were established, the developers reviewed other web sites providing features that allowed users to accomplish those tasks that the portal site was anticipated to support. Those sites that seemed to provide the best implementations of features were selected for discussion by the class for

possible use as benchmarks in the development of the portal for functionality and usability. These candidate benchmark sites were discussed by the Software Engineering class to identify the best representative sites in terms of presentation, functionality and usability for discussion with the Design Build class. The class also developed a feedback form to collect the Architecture class's preferences for the presented sites. The SE class distributed a questionnaire to gather information regarding questions that the developers had regarding a number of aspects of the site to assist in the refinement of the feedback received from the Architecture class through the presentation.

The SE class developers met with the about fifteen members of the Architecture class to present and discuss available features and their desirability in the portal project on 4 November, 2002. Showing web sites selected as benchmarks, the Architecture class was presented with visual examples of the proposed features, allowing the class to provide responses that refined or modified the look and feel of the presented sites, improving the amount and quality of information available to the developers after the session. Those feedback and questionnaires that were returned were consolidated and provided to the Software Engineering class for use in the development of proposals for implementation of features based on the preferences of the Architecture class.

3.5 Usability Planning

The SE class worked on a usability plan throughout the term. The main focus of this plan is to identify for each user task the appropriate:

- Usability objectives
- Usability measures or metrics corresponding to each objective
- Usability criterion or engineering design point corresponding to each measure. The criterion might be different according to the user group.

The pieces of the usability plan available on 4 November were reviewed and refined with the Architecture class during the review meeting held on that day.

3.6 Development of Five Conceptual Design UI Proposals for the Web Portal

The SE class developers met with the about fifteen members of the Architecture class to present and discuss available features and their desirability in the portal project on 4 November, 2002. The feedback and questionnaires from this review meeting were used in the development of five conceptual design user-interface proposals for implementation of features based on the preferences of the Architecture class

The SE class divided into five groups as follows to work on the five UI segments:

NAVIGATION

Robert
Kelvin
Lawrence

SEARCH

Yang
Loan
Mousumi

CONTACT INFORMATION; FEEDBACK, EMAIL

Hao
Yongsheng
Hongwei

UPDATE CONTENTS

Mohammed

Roger

Satish

FAQ AND REFERENCE LINKS

Tony

Rich

Pavan

Each of these groups adapted the core SE class methodology to develop conceptual designs for their respective UI area.

4 Results and Discussion

We present the results of the following activities:

- Design Build web portal goal identification
- User analysis
- Task analysis and task scenario definition
- User interface benchmarking study
- Usability planning
- Development of five concept design proposals for our user-interface design

4.1 Design Build Web Portal Goal Identification

On October 3, 2002, the SE class discussed the goals of the DB web portal with two representatives of the Architecture class. In addition to the general goals of any web site or web portal, the representatives articulated the following specific goals:

- The portal must be User Friendly and SWANKY—Nice Skin
- It must provide all the information on the whole process of Design-Build
- It must have links to
 - Answer Questions
 - To CSE at SPSU
 - To Architecture at SPSU
 - To other schools of Architecture
 - To other DB areas
- Users (students) must be able to get the core ideas about the Design-Build Area
 - Address process
 - Conquer fears
- It must serve as a resource web site with high educational value

4.2 User Analysis

Our user analysis was done on a user population containing users who were interested in DB education. Users initially identified included:

- Students—both current and potential student of programs emphasizing DB
- Researchers—professionals interested in the DB area as a research domain
- Architects—current practitioners who want further information on DB
- Parents—parents of both current and potential student of programs emphasizing DB
- Developer—developers and builders of both buildings and web sites
- Project sponsors—potential sponsors of the DB web portal or DB projects

After our meeting with two representatives of the Architecture class on October 3, 2002, all user groups were affirmed as being important. Further comments about users made in this review include:

- Users come from 3rd year DB, Architecture, SPSU, other schools, e.g., Georgia Tech, etc.
- Developers→ Includes Construction Developers
- Sponsors→ Foundations; Corporations/Project Sponsors
- Language – multilingual (Future)
- Frequency of usage—As needed by the user

- General knowledge of computers—Experienced (Main Aim)
- Used to access information
- Expert look for Specifics; Novices look for overview
- Not looking for drop-out ratio or links to specific math classes.
- Links to SPSU/GT Arch/GT GVU

4.3 Task Analysis and Task Scenario Definition

Our initial task analysis identified the following tasks:

- Search information—search the contents of the web portal or web for specific targets
- Update content—update the content or links on the portal
- Guest book—register as a user or visitor of the portal
- Reference link—follow a hyper-link to desirable contents
- Discussion board—interact with other users of the portal in electronic discussion
- Contact information—contact the web portal producers and editors
- Newsletters—read a newsletter on the web portal concerning design-build
- Feedback form—provide the web portal producers with feedback

After our meeting with two representatives of the Architecture class on October 3, 2002, selected tasks were affirmed as being important, including:

- Search information
- Update content (each year and status of project)
- Contact information (School of Arch.)
- Feedback form
- Email and FAQ
- Reference link

Consequent to this meeting, the SE class followed the input of the Architecture class and dropped the following tasks from development of the initial web portal:

- Guest Book—Worth considering
- Newsletter—Worth considering
- Area Services—Worth considering
- Searching the Design Guideline—Worth considering

Further comments about users, tasks, and usability made about the DB web portal in the October 3, 2002 review include:

4.3.1 User Friendly/Usability Objectives

- Easy to navigate/Easy to find info/Needs to be better than current Arch site.
- Criterion for easy to find info—Must be able to find information in 2 minutes.
- Must provide information in an organized fashion using categories—Utilize menu bar

4.3.2 Benchmark in HCI—Precedent Analysis in Architecture

- What does the competition have?
- What can we borrow?
- What can we make better?

- We need to identify Design-Build Sites and sites with similar functions and features.
- We will evaluate these sites in a Jury Process using heuristics.
- We need heuristics and criteria from Architecture, especially for SWANK.
- Sites: Kansas or Arkansas; Architectural Record; Portman's web site

4.4 User Interface Benchmarking

On November 4, 2002, about ten representatives of the SE class met with the whole Architecture class to review the benchmarked UI designs they had identified. Table 1 shows the feedback obtained from the Architecture class during the review meeting on the benchmarks the SE class showed them. Table 2 shows a summary of the benchmarks identified and presented along with their advantages and disadvantages.

Table 1--Benchmark Feedback from the Architecture class on 11/4/02

Update content:

	Should use:	Should Not
www.monde.com.au/monde/admin/intro.html	7	0
www.editworkspro.com	2	4
www.nfotech.com	5	0
www.autotrader.com	6	2

FAQ Reference Links

	Should use:	Should Not
Uncategorized FAQs		
http://www.ucc.ie/xml/faq.xml	2	4
http://www.dbia.org/fr_sitemap.html	4	5
Categorized FAQs		
http://www.enrollment.gatech.edu/help/	4	2
MS Help	6	1
Common Reference Link is plain old vanilla reference link		
www.spsu.edu	2	4
Preformatted search on Google		
Search Google for "Design Build"	4	1
MS Office "Paperclip" – a.k.a., Office Assistant Dear Joe	0	6

Table 1—Benchmark Feedback (continued)

Contact & Feedback		
	Should use:	Should Not
Site 1: http://cs.nmu.edu/~benchmark/	8	0
Site 2: http://www.benchmark-estimating.com.au/feedback.html	3	3
Site 3: http://www.arch.uiuc.edu/elvin/index.html	1	4
Site 4: http://architecture.spsu.edu/	1	9
Search		
	Should use:	Should Not
Search scope		
• Search within the web site and Powered by google (e.g. architecture)	7	2
• Search beyond the web site (e.g. architecture project)	4	2
Search content	4	0
Advance search (e.g. studio 804)	1	6
Search help	2	3
Navigation		
	Should use:	Should Not
http://www.saud.ku.edu/generated_pages/index.html	5	2
http://www.delta.com/home/index.jsp	8	1
http://www.altavista.com/		
http://www.caltech.edu/		
http://www.k-state.edu/		
http://www.buffalo.edu/		

Table 2—Summary of Benchmarked User Interfaces for the DB Web Portal

Tasks	Compare Sites	Positive	negative
Search information	www.asce.org/distance www.fminet.com/ www.codelabtech.com www.dbia.org (Design-Build Institute--has searchable database, but results hard to read; no hit list or reference or order to list) www.spsu.edu only simple search first www.google.com “forgiving” www.ericowenmoss.com	<ul style="list-style-type: none"> • Specifying search scope • Search help (hint) • Site map • Tolerant • Powered by Google • Search box resides in every web pages • drop down list of selections 	<ul style="list-style-type: none"> • Search link (redundant) • Hard to find search box • Search function is so limited that user must enter precise info to get the result
Update content	www.greystonenet.com/nc_adult/t_modules.html www.monde.com.au/monde/admin/intro.html -- Content management system (requires login)	<ul style="list-style-type: none"> • CASE1 Moderated/ reviewed/ edited -- Expert/Jury process • CASE2 Anyone can update siteFlypage.com/presentation 	
Contact information Feedback form Email and FAQ	www.automatedlogic.com www.3com.com/index2.html (contacts on bottom of page, requires a scroll) www.nationalgeographic.org http://Loohooloo.mit.edu http://Wnt.cc.utexas.edu/~architecture/arch/ http://Architecture.spsu.edu www.delta.com www.irs.gov www.williamcarpenter.com www.google.com www.greatbuildings.com http://library.nevada.edu/arch www.rotoark.com www.arch.auburn.edu www.archinect.com	<ul style="list-style-type: none"> • Links to contacts—same place on every page • Good categorization • Good site map • contact as pop-up • well organized and category content, contact information, and FAQ • SWANK • Robust • folder navigation 	<ul style="list-style-type: none"> • mail link using mail client on browser machine • Use mail client versus form • hard to see what it is all about • poor navigation • important stuff below the fold
Reference link	www.architecture.com (Reference links)		

4.5 Usability Planning

Over the course of their work and meetings with the Architecture class, the SE class identified the following sets of usability criteria in the five key task areas:

4.5.1 Task: Update Content Criteria:

- Should take no more than 3hrs to update content.
- Maximum photo file size should not exceed 75KB.
- Maximum total file size (text + photo) should not exceed 90 KB.
- Maximum photo pop up size should be 50% of total screen size.
- The site will be updated every month.
- A Feedback form will be used to gather information.
- A Content Management System will be utilized.

4.5.2 Task: FAQ & Reference Link Criteria:

- FAQs
 - Preference for Categorized FAQs (Ga. Tech) or MS Help type interface
- Reference Links
 - All links must clearly identify purpose/target location
 - Preference for Preformatted search (Google) and “common” links
 - Four Preformatted links were identified
 - Education AND Design/Build
 - Design/Build
 - Architecture Schools
 - Urban Re-development

4.5.3 Task: Contact & Feedback Criteria:

- Feedback fields should be kept to minimum, less than precedence 2 (Est)
- The response time after the user submit form should be less than 3 seconds and a message will tell the user if it succeed or not
- Availability 24/7

4.5.4 Task: Search Criteria:

- Search response time in 15 seconds.
- Max 3 mouse clicks
- Availability 24/7
- Target information found on the first page should be 50%

4.5.5 Task: Navigation Criteria:

- No more than 5 mouse clicks to get to a page.
- Page must be printable or offer printer friendly option
- Links at the top of every page

4.6 Development of Five Concept Design Proposals for Our User-Interface Design

The detailed results from the five concept designs are contained in the five reports in the appendix. In this section, we cover the highlights as presented in our presentation slides for the final jury meeting held on December 3, 2002.

4.6.1 Navigation- Robert Combs, Kelvin Sigler, Lawrence Thomas

An overview

- Prior jury results on navigation
- Possibilities
- Our recommended proposal

Navigation

- A roadmap of the web site.
- Lets the user know where they are in the site...and where they might can go.
- Should be easy to get around the site.
- It should also be easy for the user to understand how the site is laid out.

Prior Jury Results

- Wanted us to keep it simple.
- Preferred categories to be at the top of the web site.
- Did not want to have to scroll down the page.
- Did not want it to be cluttered with useless information.

The possibilities?

- http://www.saud.ku.edu/generated_pages/index.html
- <http://www.k-state.edu/>
- <http://www.buffalo.edu/>

The Proposal--A site that is:

- Simple.
- Consistent
- Easy to follow
- Let's you know where you are.
- Let's you know where you can go.
- <http://www.delta.com/>

4.6.2 Exploring Search for DB Portal--Loan Huynh, Yang Lu, Mousumi Dutta

An Overview

- Looking closely at Google
- Selecting search contents
- Recommendations

Implementing A Search System

- Gather
 - Breath-first search
 - Depth-first search
- Indexer
 - Primary index
 - Inverted index
 - Full text index
- Search
 - Search language
 - Search engine
- Retrieval
 - Direct retrieval
 - Client-server retrieval

Looking closely at Google

- Ignoring common words
- PageRank
- Free usage for universities and educational institutions.
- Advantages and disadvantages of using Google

Selecting Search Contents

- Frequently using keywords
- Keywords locations
- Tile tags
- Meta tags
- Meta links
- Page titles
- First paragraphs

Recommendations

- Search scope

- Indexing
- Page titles
- Meta tags
- Descriptive text
- Search system usability plan
- Prototype

Search System Usability Plan

- Conceptual Design Proposal
- Benchmarks
- Usability objectives
- Measures and metrics
- Criteria
- Evaluation methods

4.6.3 Contact, feedback, and email -- Yongsheng Gu, Hao Hu, Hongwei Tao

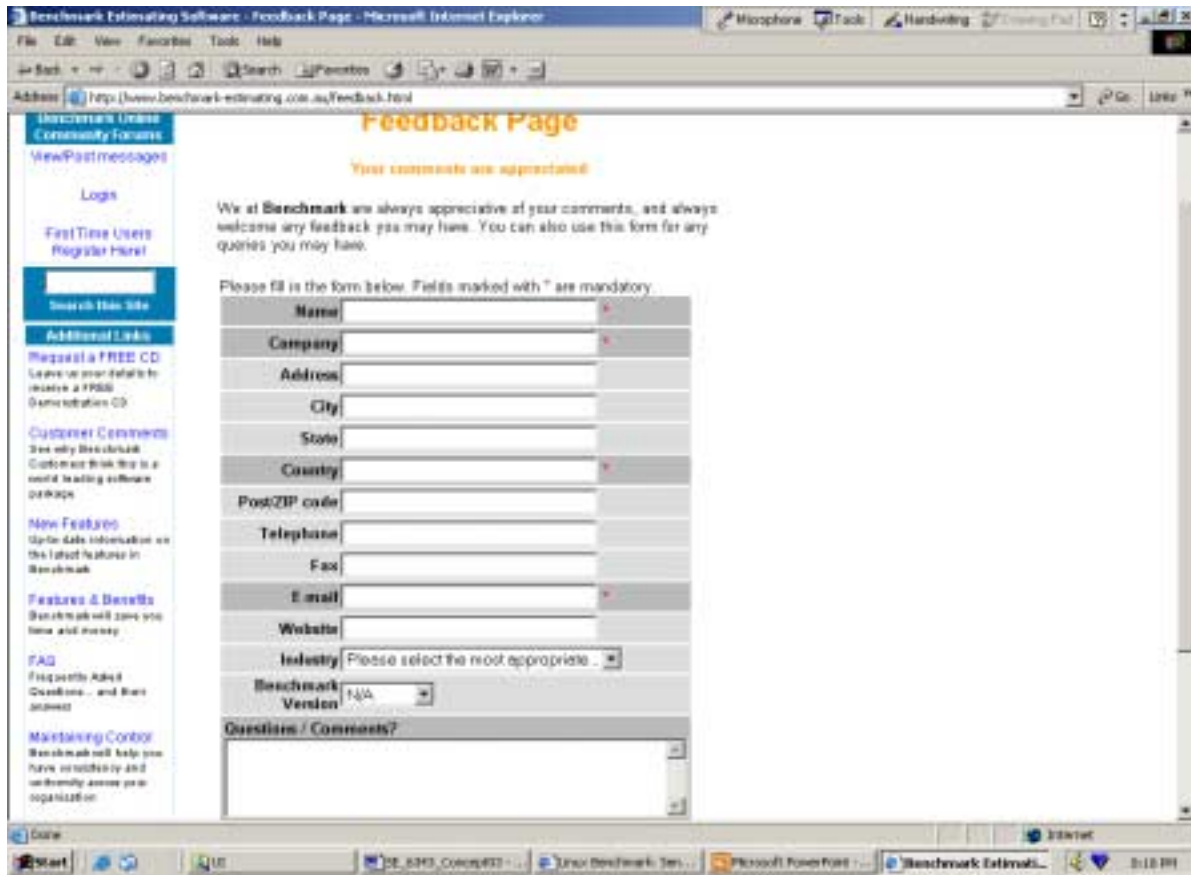
An Overview

- Precedents Comparison
- Recommendation

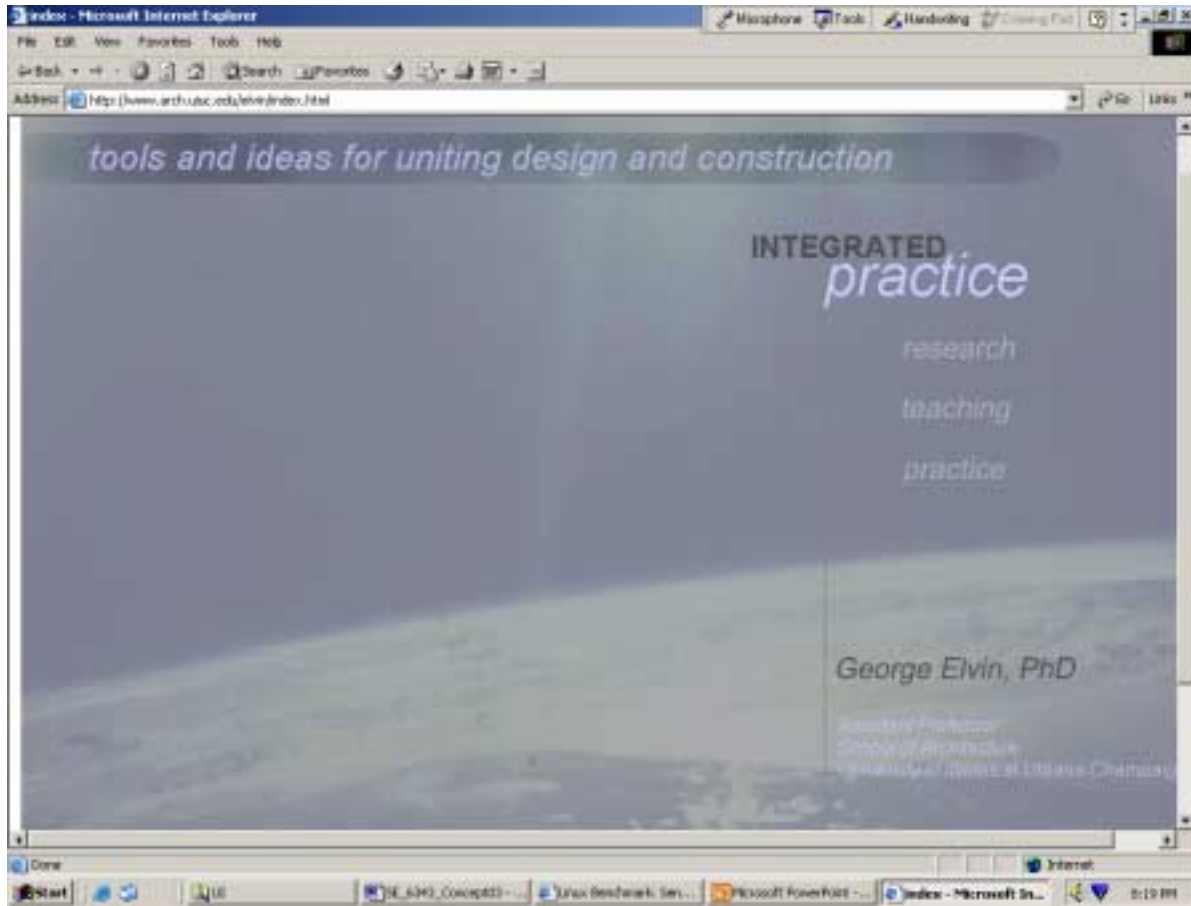
Precedent 1 -- <http://cs.nmu.edu/~benchmark/>



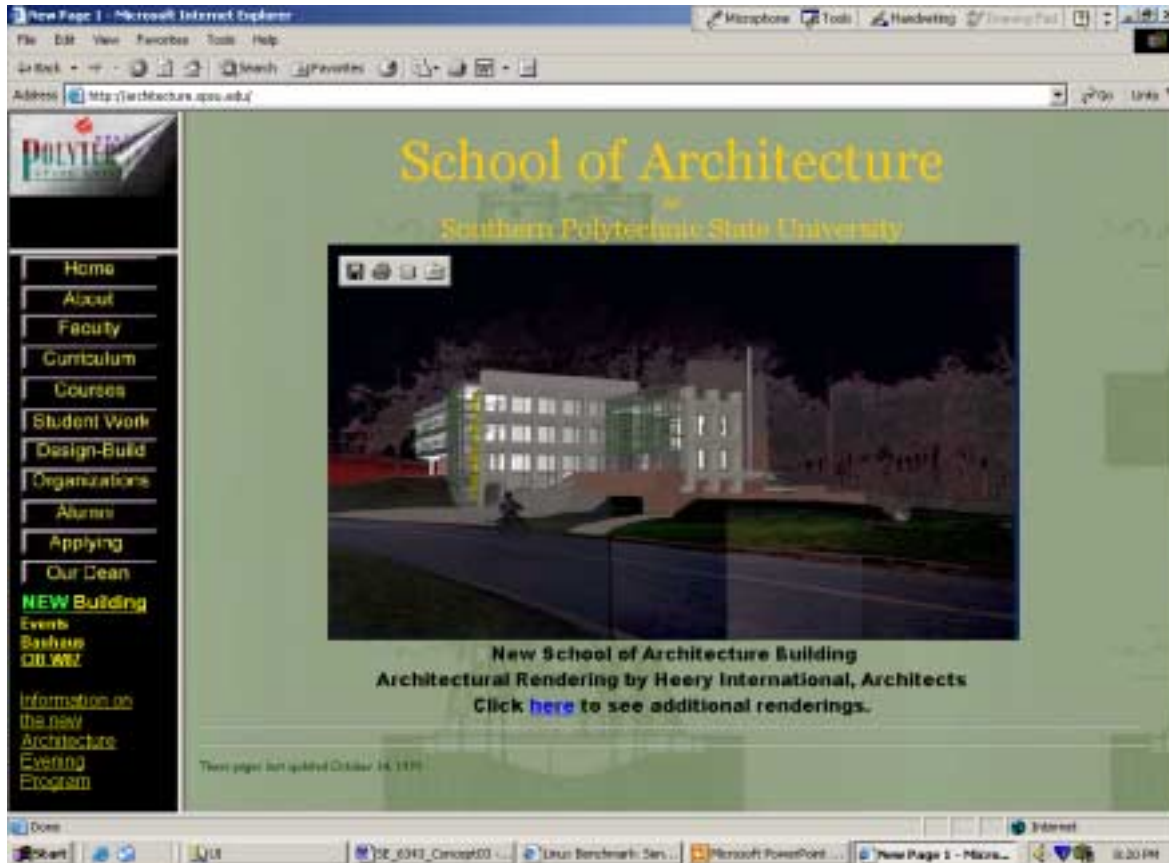
Precedent 2: <http://www.benchmark-estimating.com.au/feedback.html>



Precedent 3: <http://www.arch.uiuc.edu/elvin/index.html>



Precedent 4: <http://architecture.spsu.edu/>



Recommendation - Contacts

- The contact information--easy to find and up to date.
- Have at least two ways of contacting: a form and an email.
- Have a questionnaire as option.

Recommendation - Feedback

- The feedback page should be easy to find and easy to use.
- The required fields should be kept to a minimum, preferably four or five
- The response time --under three seconds
- User should get a feedback message
- Have data validation either on the client side or on the server side
- Availability should be 24/7

4.6.4 Update contents--Mohammed Anjorin, Roger Mir, Satish Gurrapi

Overview

- File size issues
- Photo size on the page should be 25 kb
- Web page should be 50 kb
- Compression factor for photo file should be between 1 & 5

Update contents

- Content Management System
- Third party control
- (http://www.editworkspro.com/online_html_editor_demo.php)
- Advantages of third party control

4.6.5 FAQ and reference links--Tony Mazza, Parimi Venkatasatya

An Overview

- FAQ
 - Categorized
 - Dedicated web service
- Reference links
 - Common links as content addresses
- Pre-formatted search
- FAQs Categorized by User Group

Frequently Asked Questions

- For Prospective Students
- For Architects
- For Parents
- For Builders

Questions Frequently Asked by Students

How is the course structured?

Are we REALLY going to build it?

What is Design Build?

How is the course structured?

The Design build course is a two semester program. The first semester is dedicated to the design of a structure, from the concept phase through the approval of the project for construction. During the second semester, the students work as a part of the construction team, actually building the structure that was designed.

[Return to Student FAQs](#)

[Return to FAQs main page](#)

FAQs “Top Ten” Presentation

- Top 10 Frequently asked Questions
- What is Design-Build?
- What Schools offer Design-Build Courses?
- Where can I learn more about Design-Build?
- ...

Other Frequently Asked Questions

- How hard will I have to work?
- How many other classes should I take at the same time?
- ...

FAQs Categorized by Topic Area

- Frequently Asked Questions
- About Design-Build
- About the Course at SPSU
- About this year’s project
- ...

Reference Links

- Common Links
- Common Links as Content Addresses
- Pre-formatted Search Link--Takes user directly to results that they would receive if they went to and entered the search string, e.g., “Schools of Architecture”

Frequently asked questions by user groups

- For prospective students
- For architects
- For parents
- For builders

Dedicated Web Service—Similar to Windows File Explorer

5 Conclusions

6 Recommendations

7 References

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Navigational Design Objectives for the SPSU Design – Build Website.

By: Lawrence Thomas
Kelvin Sigler
Robert Combs

Abstract

A key component of every website is the navigation mechanism. It provides the user with a quick outline of the website, much like the table of contents does for a book. It also provides a guideline for website developers concerning the layout and potential categorization of that content. It is therefore very important that a good set of usability goals and criteria be established.

In establishing these goals, the designer must keep the client's goals in mind. Many clients are uncertain of the available options. They are hence unable to make an informed decision. This paper outlines the process followed by the navigation design team in helping the client make an informed decision.

Introduction

A good software engineering project fulfills the client's with the functionality and usability requirements within a specified time and financial budget. It is utterly important that the developers and client have the same understanding of those requirements if the project is to be successful. Our team which consists of Robert, Kelvin and Larry, was assigned the task of designing a navigation framework for the new design-build website. To accomplish this task, we decided to first come to a common understanding of the definition and usefulness of website navigation mechanisms. We also investigated the various mechanisms available for website navigation. This paper presents the results of our investigation and our recommendations for the design-build website.

Methodology

To settle upon a site navigation mechanism for the Architectural Website we decide that we needed to find answers five basic questions. First we need to be sure that we understood **what is website navigation**. To answer that question we went to a number of website development tutorial websites and found their definitions of website navigation. We also found the help file of Microsoft FrontPage particularly helpful in answering that question.

Next we needed to know why such a mechanism was important or useful in a website. We all had general ideas; however we resorted to **Google** (<http://www.google.com>) searches to find more opinions about the importance of a good website navigation mechanism.

Once we were convinced of the **usefulness of a navigation** scheme, we researched the kinds of Website navigation **mechanisms available** to us and basically browsed over websites seeking sites that best exemplified the mechanisms we had found.

The next step was to present our findings to our clients and solicit some feedback so that we could decide on a style that was in keeping with our clients' tastes. Our findings were presented to the client along with some feedback forms. We were then able to tally the responses and get an idea about the **clients' preferences**.

Finally we needed to establish some **thresholds for testing** our mechanism. We resorted to Dr. Rich's website on usability to get some guidelines on usability metrics. We also searched the web by entering the phrase "good website navigation" into a Google search.

We were then able to establish some criteria for designing the navigation of our site.

1. What is website navigation
2. Why useful?

3. What types available?
4. What does the client prefer?
5. What characteristics identify a website with a good navigational mechanism

Findings

1. Navigation saves the user from some frustration
2. Navigation helps the user get an overview and understanding of the layout of the website.
3. Navigation should assist the user in finding things easily on the website.
4. Navigation mechanism should not overwhelm th site contents.
5. Our client generally preferred the technique employed by <http://www.delta.com>
- a hybrid of the **hierarchal** and **local**, employing breadcrumbs.
6. <http://www.k-state.edu/> was the second choice

What is website navigation?

The navigation scheme is the road map of any site. It is a way of letting users know exactly where they are in respect to the overall layout of the site, and how to get where they need to go from the current location. It is most commonly implemented as some sort of menu that allows users to jump from one page or topic to another within the website with minimal effort.

Why navigation is useful?

In the modern high-paced world, few people have the time to brows through a website trying to find a particular nugget of information. They need a way to quickly determine the scope of the website and its contents. A navigation mechanism on a website is like a table of contents or an index in a book. Each major category can be considered a chapter and each subcategory a topic in that chapter. No reader enjoys thumbing through an entire book to find a specific topic and analogously, no user wants to wade through all the pages of a website searching for her topic of interest. To further complicate matters a user may have arrived at your site through some external link and, instead of coming in through the front door, they may have ended up deep in the body of your site. The navigation mechanism gives the user a simple and effective way to gain his bearings quickly.

The navigation scheme, if effectively designed, also serves as a good guidance tool for the developers. This is a very important point. Many developers design the site first and then they implement a navigation mechanism. The navigation should be a very integral part of the website design it helps developers categorize and organize the website. If we go back to our book analogy we can regard the navigation in terms of a well laid-out book plan.

Most importantly, good navigation should contribute to the overall usability of a website; it should complement the search tool provided on the site. No matter how much intelligence we build into search tools they will never be able to replace certain aspects of human recognition. So that a user may search for a topic which he/she cannot precisely define to the search tool. However, a quick glance at the site navigation or site map could help him identify a most likely location for the topic; or, at the very least, a location to contact the site owners for more help.

Types of Website Navigation

There are three basic types of navigation as defined by Rosenfeld and Morville¹. Namely:

- Global

- Local
- Hierarchical

Other types exist but they are some variation or combination of the types mentioned above. **Global** navigation is a navigation mechanism that exists on every page in the website. It provides links to the entire website. It should be consistent so that users quickly become familiar with its layout. The common practice is to place a navigation bar at the top of each page. Some sites also place a copy or a limited copy at the bottom of the page. This works best “if you are presenting information in fewer, broader categories.” Figure 1 below shows how this kind of navigation would work

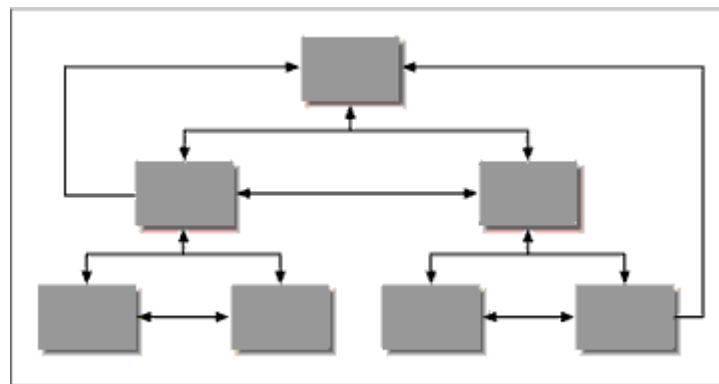


Fig. 1 A Global menu example³

Local navigation provides navigation within a top-level category. For example, supposing the site had top level items such as <design techniques>, <buildings> et cetera. A user navigating within the buildings category would only have first-level subcategories of the buildings visible to her. Hyperlinks that jump within this document would be considered local navigation.

The **Hierarchical** approach is ideal for sites with a large amount of information to present in many sub-categories. The tree metaphor best exemplifies the layout of this mechanism. Imagine the homepage as the root with main categories represented by the main branches which also have branches – the subcategories. This is very similar to the directory structure on your hard drive. Figure 2 shows how this would work. Notice the top-down only navigability.

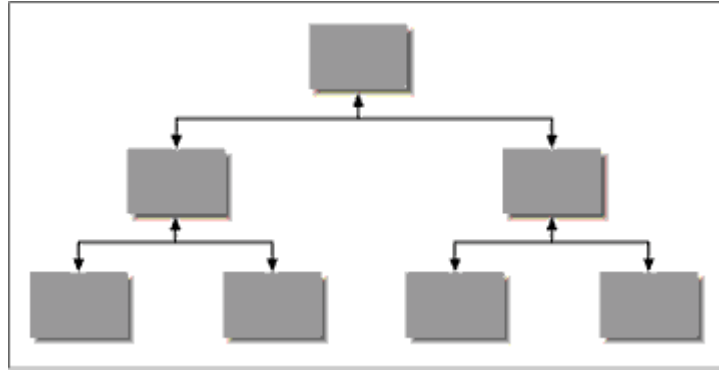


Fig. 2 A Hierarchical menu example³

The table below summarizes the advantages and disadvantages of the different techniques.

Technique	When to use	Advantages	Disadvantages
Local	<ul style="list-style-type: none"> • Lots of info • Not many subcategories 	<ul style="list-style-type: none"> • Mechanisms used generally supported by all browsers. • Simple • effective 	<ul style="list-style-type: none"> • More clicks required for navigation from point A to point B. • Not always obvious how to get back
Hierarchical	<ul style="list-style-type: none"> • Lots of info • Many categories and subcategories (consider re-organization) 	<ul style="list-style-type: none"> • A very effective way of getting the user from any point to any other point. 	<ul style="list-style-type: none"> • Normally requires non-standard mechanism to implement • May not be supported by all browsers • Irritating delay traversing tree
Global	<ul style="list-style-type: none"> • Seeking maximum navigation ability 	<ul style="list-style-type: none"> • Many options available to user 	<ul style="list-style-type: none"> • Many options may become too many options

Styles of Navigation

Web designers have applied the techniques described above in several different ways. They have been bundled into five main categories which are generally referred to as navigation styles. The styles of navigation are²:

- Embedded links
- Bread-crum trail – helps keep the user aware of his/her current location as it relates to the rest of the site.
- Left/top/pop-up nav bar
- Tab navigation
- Site map
- Mix and match navigation schemes for optimal usability.

An **embedded link** is a simple hyperlink from one word or group of words to another location. For example, if you were referring to the [SPSU](http://www.spsu.edu) website, you could make the letters “SPSU” a hyperlink to the site.

The **pop-up nav bar** is the most widely used form of navigation in use today. It is very flexible and it can be used for both **Global** and **Hierarchical** techniques. The navigation bar on the top of Microsoft’s site (<http://www.microsoft.com>) is an example of a **nav bar** on the top of the page, while SPSU’s homepage (<http://www.spsu.edu>) displays one on the left hand side. In addition, some designers place the bars in frames. There are many usability problems presented by frames as noted by Jakob Nielsen⁴. Particularly, he states that they are bad because “they break most of the navigation features in a web browser (bookmarks, backtrack, and going to a URL all stop working).”

Location	Pros	Cons
Top	<ul style="list-style-type: none"> • Out of the way until needed - then user scrolls up 	<ul style="list-style-type: none"> • May be very large and significantly reduce visible part of page – especially at lower resolutions
Left (side)	<ul style="list-style-type: none"> • Screens more width than length (more available space) • Allows for shorter 	<ul style="list-style-type: none"> • Disappears when user scrolls • Portions or all of bar could disappear due to scrolling

<p>Frame</p>	<p>lines of text – more legible</p> <ul style="list-style-type: none"> • .Does not scroll • No need to reload that part of page with every new page • Changes can occur in frame only 	<ul style="list-style-type: none"> • Can be confusing (only main page URL is displayed in menu bar) • Difficult to book-mark pages
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The **Tab** metaphor works just like the nav bar but it is more suitable when there are only a small number of categories to display. Perhaps the best approach is to use a combination of these approaches as needed, keeping usability goals in mind.

Usability Goals

- Usability objectives:

We established the following two objectives as our primary usability objectives:

- 1) User should know where they are.
- 2) User should know how to get to where they would like to go.

- The measures and metrics:

- 1) Click counts from a mouse
- 2) Performance as in load time
- 3) Navigation to content ratio
- 4) Depth of pages per subject
- 5) Time it takes user to find what they are looking for.
- 6) Dead Links

- Usability Criteria:

- 1) There should be 0 dead links.
- 2) Web Pages should not take more than 5 seconds to load (Especially on a LAN).
- 3) Obvious navigation. On the average, it should not take the user more than a minute to what they are looking for.
- 4) Hierarchy should not be too deep. No more than 5 levels.
- 5) Ratio of navigation size to content size should be minimal. This ratio should be no more than 66%.

2-3 clicks to get from page to page

Item	Criteria
Navigation mechanism size	Should not exceed one third of screen size

Responsiveness	If sub-menus are used – no more than a half second to display
Mouse Clicks	The user should be able to get to any page within 3 mouse clicks
Links	0 dead links
Look and Feel	Navigation mechanism should be consistent on all pages.
Hierarchical Depth	No more than 5 levels

From what we were able to show the students were more impressed with the Delta site, because it was easier to read. They did like the KU site because of the thumbnails. They felt they were too small and were useless since you could not click them to go to a particular part of the web site. They also stated they did not like the small thumbnail. But they would like to see larger thumbnails that you could actually click on to go to a particular Web link. The students also expressed that they did like the menu bars to be at the top of the web page vs. the bottom.

During the presentation we pointed out the different types of navigation techniques. We noted in the Delta side that it was difficult using a frying technique. We pointed out was that the primary content categories were on. When you selected a link on the left side the content appeared in middle of the page. Differing concepts was not what was important but to show how the main categories are on the left side of the page. This is what we referred to and it's a side bar link or vertical bar link. A picture of the page is noted as figure 1 in the appendix. The Delta site also uses a navigation feature that we called breadcrumbs. This is where a path of each category link you chose is listed after you select a new category reference link. An example is: Home ▶Travel ▶Reservations

This feature let's the users know where they are in the web site and how to get back to a previous category.

The KU site used the Pull Down approach to navigate the user to each link. This feature 1 gives the users another list of links based on the primary category. The benefit of this feature is its familiarity to standard windows navigation. You give the user a primary list of topics and then give them several small subcategories.

Another approach to navigation is to place the categories at the top of the page and keep them there. We called this the top menu design. A list of categories is placed at the top of the page and reappears on each page. This approach gives the user an option to easily view the list of available options.

The Kansas state site uses the tool tip technique to display the different subcategories, under the main category. This concept is very similar to the pull down menu technique. It can present a problem by having the topics overlay the main topics. You would have to move the mouse in order for you to see the main categories again.

Recommendations and Rationale

1. Adopt the style used by <http://www.delta.com>
2. Do not frustrate the user with “dead” links.
3. Try to provide shortest possible path to all topics on website.
4. Categorize topics so that navigation is well organized and gives a good picture of the layout of the site.

The metrics we propose for measuring which website is the easiest to navigate are:

Consistent Navigational Structure – this section represents the consistency of the navigation layout throughout the website. If the navigation structure were to deviate for one page, the website would not have a consistent navigational structure.

Easy to Navigate – This section represents the level of difficulty it is to find information or to find what you are looking for.

Lets you know where you are – This section represents

Allows you to get to where you want to go – From any page, you should be able to go directly to the location you would like to go, which means that there should be no dead links.

	Consistent Navigational Structure	Easy to Navigate	Lets you know where you are	Allows you to get to where you want to go
www.delta.com	Yes	Yes	Yes	Yes
www.buffalo.edu	No	No	Somewhat	No

Delta

Delta was consistent in all aspects and very easy to navigate.

<http://www.delta.com/home/index.jsp>

Buffalo

The navigational structure for this site was not consistent because it used frames for some pages and a scattered lists of links for other webpages. It was not easy to navigate because of the inconsistent navigational structure. On some pages, it let the user know where they were and it did not allow the user to go to another location. Some links were dead ends.

<http://www.buffalo.edu/>

Vertex

Overall, we found that Delta's site was the easiest to navigate because the it's navigational structure was consistent, easy to follow, always let you know where you where with breadcrumbs, and always allowed you to get to where you want to go from any page.

Value

Giving the presentation to the class, gave us the feedback we needed to figure out what the users preferred. It keeps us from making an invalid assumption as to what they might like. It gives us a chance to show design concepts, from previous work without having to design each scenario. Now we can incorporate their suggestions into our prototype.

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4. <http://www.useit.com/alertbox/9612.html>
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Title: Design-Build Portal:
Search Functionality Exploration

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Course Title: SE 6343

Abstract

This paper discusses some key points to keep in mind when designing search functionality for a website. Our findings show that frustration, as a user of searches, can be avoided if certain key things are considered by developers before and during implementation. Search content and search scope need to be defined. It is important to make use of indexing by having key words in as many places and in frequently searched locations of a website, like nested in HTML tags, titles, text body, and metalinks. The scope is important because it defines where and to what extent we will search. We also discuss the power and advances of Google search engine and how it can help manage and perform our searches for the proposed Design-Build portal. As a part of our recommendations, we also present some usability measures.

Introduction

Search engines and its capabilities have had direct impact on the popularity of the Internet. Search engines enable users to search through vast contents of different web sites in seconds. The Internet is like a library, in that, it is a data repository where users can find data and information they need. Search engines, like card catalogs (used before personal computers became popular), aid users in locating data. Imagine entering into a library that has no card catalog of some sort (electronic or in wooden file drawers) to help visitors locate data. Visitors would have to physically go to each shelf and flip through each book to find whether that book contains the data they need. This time-consuming process is eliminated with the invention of the card catalog. Searching on the Internet works similar ways. Without search engines, Internet users would be lost in a sea of knowledge.

When we visit a web site and cannot find information by following the links, we always turn to look into the site's search mechanism. That is why the search mechanism is one of the most important user interface elements in web site design. Most of the web sites have built-in search engines to help users find information within the web site, such as www.walmart.com and www.codelabtech.com. But not all search engines perform well. There are two types of problems with on-site search:

- Unclear search scope.
- Irrelevant search result.

www.webtop.com recently did a survey about quality of search on the Web and found that 71% of people who use the Internet said they were frustrated by web searches.

Our goal is to design a search system for Design-Build web portal. In this paper, we will discuss how to design an effective search system to avoid these problem. Our method of approach is primarily searching the library and the Internet. By analyzing findings, we will make recommendations for our group project design later in the paper.

The other topic we are going to discuss in this paper is the Google search engine.

Google is arguably the best engine out there for speed and accuracy. Google ranks every website's importance based on which other sites link to it. Let's look at Google more closely and find out the secret behind Google's popularity and success. From there, let's look at the knowledge we can gather from Google and apply to our design plan for a web portal for design build.

This paper will discuss the importance of web page content and key locations where it is crucial to place important key words. Search functionality designed for a specific web site is part of that site's navigation. Some people like direct navigation (searching) of content while others like indirect navigation (browsing) of content [1]. Searching for information on a site allows users to go directly to what they are looking for. Browsing a site allows users to indirectly find what they are looking for. Thus, it is important that search engines designed for specific sites return accurate results from that site's content, and be-

yond if necessary. Content available for searching should include databases as well as repositories of internal and web-based documents [2].

Method of Approach

The first method of approach was searching the school library for books and articles on the topic. We found several books that were very enlightening. Jared Spool in her book “Web Site Usability” lists the search system problems [Spool 1999]. Gray Daniel suggests how to avoid poor showing in search engines [Gray 1999]. Vanessa Donnelly from an information architect view discusses keyword search [Donnelly 2001]. Aixiang Yao and Marc Abrams give the details on how to implement search system for the Web [Abrams 1998]. These books added value to our research, but we need updated information. So, we turned to the Internet.

The second method of approach was searching the Internet. The articles we found on the Web were newer than books with more current discussion on the topic.

The method of approach for learning more about Google was a combination of looking at various internet websites to see how they have their search function put up, talking to various users about how they want to perform search on the net, benchmarking and also looking at various web articles to gain more knowledge about Google features and why they are so popular. The method of approach used in this research involves going over notes collected from requirement meetings with the users, reading books, and searching the Internet. The first step in researching for this topic was to go over any requirements given by the user, in addition to any suggestions and ideas they had. We began by reading the Precedent Jury notes and Task Questionnaire from our meeting with the architecture students on November 4, 2002. This gave us an idea of what our clients wanted for the search functionality. In the Precedent Jury notes, we looked at each student’s comments about the search functionality. In the Task Questionnaire, we focused on the search-related questions. From the comments and answers of these two documents, we discovered that most architect students were concerned with the search content within the website but did not specify any further. There were only a couple who wanted to search content outside the website. And of those, it seemed that they were more interested in searching other design-build project databases, not the World Wide Web as a whole. Most stated that search content is important to them and that they wanted the ability to search on design/build projects, project members, reference links, and FAQ key words. With this in mind, we went to the bookstore and looked at a few web site design books like *Designing Web Usability: The Practice of Simplicity*, *Building a Web Site For Dummies*, and *Don’t Make Me Think*. Each book was a good reference for general search and detailed explanation of search importance and design. We then searched on the Internet and came across several

useful websites, like www.ahref.com and www.intelligententerprise.com that contained more information on how to design and maximize the search functionality for a web site.

Findings

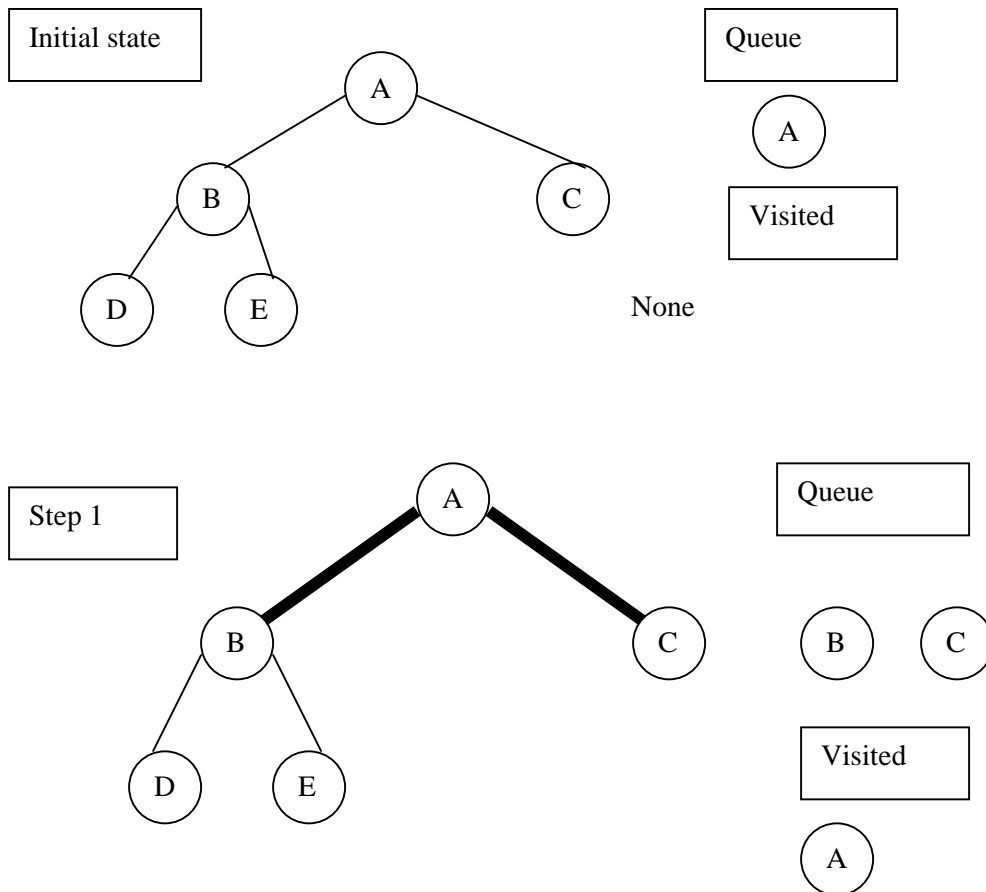
Abrams and Yao view the search system for the Web as consisting of four functional modules: gatherer, indexer, search, and retrieval [Abrams 1998].

Gatherer

Gatherer collects information about document in order to index them. It usually starts from the home directory of the web server. Then follow the hyper link index the next document. There are two common search algorithms: Breath-first search and Depth first search.

Breath-first search is to start with a queue containing a list of nodes to visit. It will first traverse the entire hyperlink in current document. Then it will visit next level of hyperlink.

Figure 1 illustrates this algorithm.



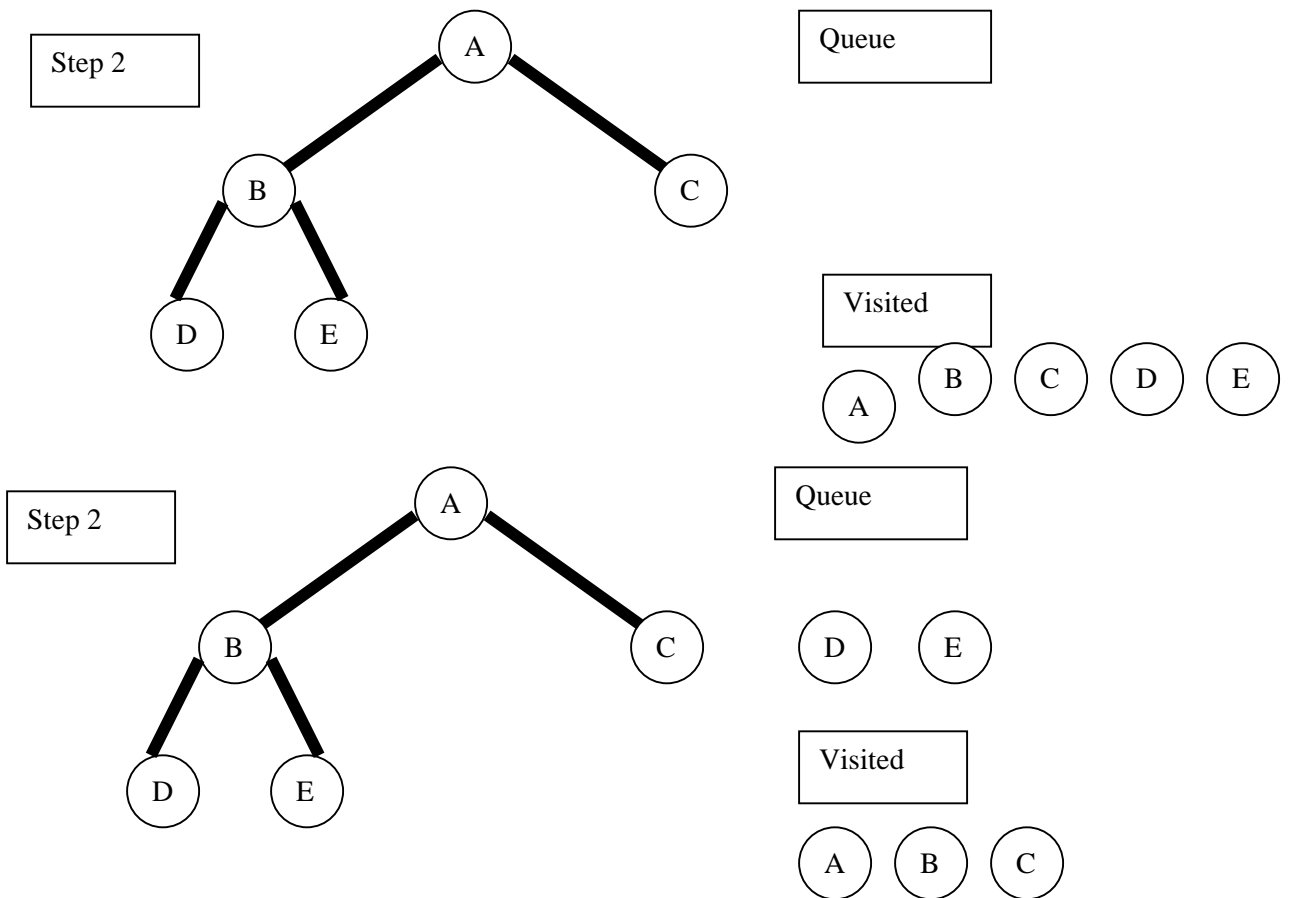


Figure 1

Breadth-first can be visualized as a spider traversing all the paths starting from the most inner circle to the most outer circle.

The depth-first search algorithm is to start from a document and visit the first hyperlink to this document. Then it visits the first hyperlink to the next level of document. It keeps visiting until a document without any link is reached.

These two algorithms have different usage. Breadth-first gather variety topics on a web server. Because it well matched to hierarchical page structures, it is preferred by several search systems. The disadvantage of this search algorithm is overloading the server because of the rapid requests. On the contrary, depth-

first algorithm can fast locate a variety of web server. It also can spread successive page requests by a gatherer over multiple servers.

Indexer

An indexer creates index for the information collected by the gatherer. Indexing is the key component of the search system. It affects the quality of records, which is the accuracy of the identification and correct retrieval of documents.

There are three indices, which can be used to identify information. They are primary index, inverted index, and full-text index. Primary index can be used as unique identification for each record. For instance, URL can be used as primary index in a database of web documents. When searched only on primary key, the database's capability can be limited. Thus, we need alternative keys to expand the search power. The index using an alternative key to search database is called inverted index. For example, document title can be used as an inverted index. When all the terms in the document are indexed, is called full-text index. It is fast and effective, especially when the user wants to search using only one piece of information.

Search

The search module contains two parts: a search language and search engine. The search language transfers the users search query into a formal representation in a database query language. The search engine then finds all records that meet the criteria specified by the query. The capabilities of the search language depend on the database. The more sophisticated the database is, the more power the search language is. Keyword matching is one of the search languages. It can directly combine terms input by the user into a search query. It is the most common search capability and is used by almost all the search systems for the web. Boolean search can narrow and refine keyword search. It allows user using Boolean operators such as AND, OR, and NOT, to combine keywords.

“Wide Area Information Server (WAIS) is one of the popular indexing and searching methods currently used on the Web” [Abrams 1998] WAIS is a client-server Internet service and offers a sophisticated search language and search engine.

Retrieval

The retrieval module let the users access to original documents located by searching. There are two models for retrieval: direct retrieval and client-server retrieval. Direct retrieval can be used when the original document is stored in the database. When it is retrieved from database, it can be directly returns to the user over Internet. In some cases, users have to retrieve the original documents named in the URL re-

turned by searching by contacting the web servers named in the URL. This is called client-server retrieval model.

Now let us look at the findings section for Google.

Google ignores common words and characters such as "where" and "how", as well as certain single digits and single letters, because they tend to slow down the search operation without improving the results.

Google will indicate if a common word has been excluded by displaying details on the results page below the search box.

(Source: <http://mairead.freeservers.com/nielsen.html>) According to author Nielsen's view, surveys and analysis software are no substitute for testing with actual human users performing clearly defined tasks in a one-on-one situation. After a series of such tests, the Nielsen Norman Group developed 222 general principles of design for e-commerce sites, ranging from keeping logos to a minimum to always putting a search box on the home page. Testing out these principles on web sites, the group did not find any web-site that conformed to these principles exactly, but identified Amazon.com, the online retailer, and Google.com, the search engine, as two of the best-designed sites on the web.

(Source: <http://www.usatoday.com/usatoday/20020109/3757266s.htm>) According to this web article, Google processes 150 million searches a day. In the past year or so, it has become the search engine behind websites such as Yahoo and Netscape. It's been profitable for the past four quarters, making half its money with ads and half by doing searches for other sites. Tech leaders such as Gene Kan of InfraSearch and New Internet Computer CEO Gina Smith are dedicated fans of Google. Google's secret is a patented technology called PageRank, developed by the founders, Larry Page and Sergey Brin . PageRank not only matches words, but it analyzes the links that point from one Web site to another. The idea is that if other sites point to your site, other Web site operators think your site is pretty good.

(Source:

http://www.infinityinformations.com/search_engine_optimization/search_engine_optimization_popularity.html) Google has agreements with both Yahoo and Netscape to provide back-end search capability for visitors conducting searches on their sites. Only visitors that search directly from Google's site are included in Google's usage share. Google's site (<http://www.google.com>) ranked as the sixth most popular destination on the Web in March 2002, attracting 33 million unique visitors, according to Jupiter Media Metrix. According to the latest press release on May 1, 2002, Google has been selected by AOL to provide editorial search results and paid listings to AOL's various search properties in the United States, including AOL Search, Netscape Search and CompuServe Search. America Online Inc.'s decision to hire search engine leader 'Google' to help its 34 million members find their way around the Web provided another reminder of Google's rising popularity.

(Source: <http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/Google.html>) Google is distinguished

by its **ranking algorithm** based on how many other pages link to each page, along with other factors like the proximity of the search keywords or phrases in the documents. It uses not only the number of other pages that link to a page, but also the importance of the other links (measured by the links to each of them).

Searching on the Internet is an art. Each person has his/her own way of searching. One person may search broadly by topic and someone else may search directly by typing in a proper noun. So keeping this in mind, it is important in a web site's content to use major key words frequently and in locations that search engines normally scan.

The main focus web sites are either to inform and/or promote. Content within a website will aid directly in doing this. A website set up to sell a product will not sell well if the product is not promoted well and accurately [3]. In order for the product to sell well, visitors would have to see the value in purchasing this product through reading information on the web site. If the information they are looking for is not found, either by browsing or searching, then they may not see value in the product. Thus, it is crucial to provide the content needed for visitors to search on. Let us assume a web site that sells watches is having a sale. The watch web site has hundreds of watches, dozens of which are water-resistant, but nowhere in the content of that site does the key word "water-resistant" appear. If a visitor comes to the website looking specifically for a water-resistant watch and decides to do a search for "water-resistant watches" or some form thereof, he/she will probably not find any results for that search. In seeing this, the visitor will have to assume that there are no water-resistant watches sold at this site. This could have been avoided if the content of the web site included the key word "water-resistant" to describe particular watch selections. This points out the importance of having key words located in multiple locations within the content of a web site.

Another method to use in returning positive results during a search is to make use of the location and frequency of key words [4]. Title tags, meta tags, metalinks, page titles and first paragraphs are most frequently scanned locations for search engine key words [5]. Not only are key words important, as mentioned in the paragraph above, the location and frequency of these key words in a web site's content is equally as important. Search engines normally scan a web page's title tags, meta tags, metalinks, page titles and the first one or two paragraphs of a web page content for relevant results for a search.

Recommendations

Search scope

"Users were often confused about what parts of a site the search engine would examine." [Spool 1999]
The first thing to design search system for a web site is to clearly define the search scope. Based on the 11/07/02 questionnaire result, we have 7 people who want search within the web and 2 people don't want.

For beyond the site search, there are 4 people want and 2 people don't want. In this case, we decide our search scope is beyond the web site. That doesn't mean that users can search within the Design-Build web portal site. Instead, the search results are not limited within this web site.

Indexing

How we index information will directly affect the effectiveness of the search system. In order to make sure the search result can be shown, we have to pay close attention to the following area: [Gray 1999]

- Page titles
Page titles should be well-written, and have meaningful name.
- META tags
The keywords and description should precisely describe the content of the site.
- Descriptive text
The first text content on the page should be summarized what the page contains.

Our guild line for design a search system for Design-Build web portal are:

- Since search is so frequently used by the users, the search box should appear on every page of the web sites.
- The search box should be large enough to allow a minimum of 20 characters to be entered.
- The font for the search box is Arial.
- The font size in the box should be 10 points and no smaller than 8 points.
- To the right of the search box should be a button labeled "search".
- The search should begin with either the touch of the return key or the click of the "search" button.

The benchmarks we are going to use are:

- www.codelabtech.com
- www.asce.org
- www.dbia.org

The usability objectives are:

- Easy to locate on each web page.
- Effective search.
- Quick search.

The measures and metrics are:

- Response time (in second)
- No. of clicks

- Availability (in day and week)
- How many match found
- Success rate (percentage)

The criteria are:

- Search response time in 15 second.
- Max 3 clicks
- Availability 24X7
- Target information found on the first page should be 50%

The evaluation methods we are going to use are:

- Benchmarking
- Heuristic review
- Usability evaluation with users

The search engine users like Google because it is simple, easy to use and effective. These are the features, which every almost every user seek in a search engine.

Advantages of using Google:

- Google is the BIGGEST search engine database in the world
- The user can do simple or advanced searches.
- The search topic or words are highlighted in search results. Often the user can find what he or she is looking for by simply scanning Google's results.
- Google allows searching by full text of most PDF files on the web (no other search engine does this yet) as well as MS Word, PowerPoint, Excel and Corel WordPerfect and other file formats.
- Google offers Advanced Search forms if the user prefers forms searches, and allows the user to do almost everything in simple search that the advanced search offers. The user can choose what works for the specific search without losing much functionality.
- Offers limited searching limiting to fields, a vast foreign language selection (in Advanced Search only), a rich and easy to use image collection (also in Advanced Search).
- Google can be customized upto a certain extent according to user search requirement. The user can choose the languages he or she wants in the "Google" part (has the most complete international set of choices). The user can also specify how many results to display, which can save

loading time for the results. Then the user can click SAVE PREFERENCES and a cookie will be set identifying what the user requested.

- A built-in subject directory can be helpful sometimes.

Some Google shortcomings:

- Lots of "stop words" which the users have to precede with a '+' to search or search in quotes.
- Google cannot do complex Boolean searches that would require () –(Solution: Use Alta Vista Adv. Search.)

Value

By writing this concept paper, I create a clear picture of search system design. I learn the four modules to implement a search system for the web. My recommendations are based on my findings. I believe my suggestion will benefit our project.

Finding the Web documents on the World Wide Web (www) can be easy or can be very complex task. This is in part due to the sheer size of the WWW, currently estimated to contain 3 billion documents. It is also because the WWW is not indexed in any standard vocabulary. Unlike the other major search services, Google is a "pure" search engine. It does not flash any news, email, chat, stock quotes but provides a simple but effective way of conducting web search. The good thing about google is that Google Site Search with optional Google Web Search is free for universities and educational institutions. The website is well maintained and frequently updated to keep up with the user needs. So, we see a clear guideline by using Google as our primary example and benchmark for the search functionality of the web portal. This paper explains the importance of searching and how content, location and frequency of certain key words are important in getting correct, relevant results when performing searches.

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Email, Contact and Feedback Form
SE6343 Concept Paper Three

Publication Date: Nov 22, 2002

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Introductory

Problem Statement/Information Goal

The task of our group is to investigate the design of email, contact information and feedback form. We want to find some precedents and do a usability evaluation in those areas. Based on our finding, a concept design proposal will be presented to our client. The proposal will be focused on this special topic.

Definition of Terms and Abbreviations

User Interface

The user interface (UI) of a computer program is the part that handles the output to the display and the input from the person using the program. The rest of the program is called the application or the application semantics. [CLAY94]

Usability Testing

The goal of usability testing is to find out how people use a specific Web site or application. Tests can be conducted one-on-one or in small groups. The tests may take place in a formal lab or in a more typical environment like home or work.

State assumptions that apply to the final project or this area of study.

Methods, Assumptions, and Procedures

General Description

Over the course of one semester, the authors have tried to find out what a usability testing means and how we could do test on the precedents of the future 'Design Build' [CARP02] portal at the School of Architecture at Southern Polytechnic State University. We performed a user requirement analysis session by interviewing the students from architecture. Then we decided the major five task/function sections of the website. We made a usability test on several precedents found on the web. We analyzed the advantages and disadvantages of each precedent. Then we made a jury with our architecture students to collect their preference. Analysis of the questionnaire is given below which leads to our recommendations to the concept design of the email, contact and feedback section of our group project.

Selection Criteria

1. Books, articles are at most five years old in technical field. This time limit is extended for the class textbook for it's published in 1994.
2. Web searching on www.google.com using "contact", "feedback form", "feedback form design", "usability test" ... etc.
3. Follow the link or reference in the findings to know more.

Specification for the Data/Findings to be taken over

The articles/papers are chosen based on the reading questionnaires attached in the appendix.

Assumption

Once we learned that the user wants to have email and contact information listed on the future website. The rest is rather simple and obvious --- collect them from students of architecture who take the design build class offered by Professor William Carpenter. So our main efforts are put on the concept design of the feedback form.

The authors have to do some information gathering and analysis in a field the authors have little experience. So the information presented is just for personal and group reference only.

Findings and Discussions

Some precedents

Precedent 1: <http://cs.nmu.edu/~benchmark/>

Comments:

The home page is **very simple and concise**. There are **two links** to the feedback page in the home page:

[feedback](#).

Questions, comments? [Mail us](#).

I checked the source code of the feedback page, I found

```
<form method="post" action="index.php">
```

So the index.php on the server will handle the feedback.

Precedent 2: <http://www.benchmark-estimating.com.au/feedback.html>

Comments:

This is a commercial site of a software company. There is no direct link from home page to feedback page. The way to access it is a little bit *tedious*: Click "Contact Us", then read through their **mail address and telephone numbers**, you can find a small inline link as: "Or you can use the feedback page - [click here](#)."

It has *more fields* to be filled. Since its customers are all over the world, so it lists the "country" field as **mandatory**. **Different colors** are used for you distinguish the fields.

The source code shows it *doesn't have a data validation* and it's using Perl on the server to do the form processing. It also let you **send email** to them.

Precedent 3: <http://www.arch.uiuc.edu/elvin/index.html>

Comments:

This site doesn't have a method to contact the author.

Precedent 4: <http://architecture.spsu.edu/>

Comments:

Doesn't have a Contact Section. Contact information *hides* under "Applying" button. It's very hard to find.

Questionnaire analysis:

After the precedent jury with the students from architecture, we collected 10 questionnaires.

	Precedents we should use	Precedents we should not use
Precedent 1	8	0
Precedent 2	3	3
Precedent 3	1	4
Precedent 4	1	9

Obviously Precedent 1: <http://cs.nmu.edu/~benchmark/> wins. Since Precedent 4 "hide" the contact information, it's the least preferred one --- even worse than Site 3 that doesn't has the contact information at all.

Also one user recommends another site www.match.com. After checking with that site, we agree that www.match.com is a good reference.

According to answers to question 13, 10 votes for providing email on the website for contact methods. However, we believe the final decision is in the hand of Mr. Carpenter.

What kind of contact methods to use?

Email	10
Mail Address	3
Phone No.	3

According to the answers to question 14, our architecture students want to know following aspects of the website visitor:

Why they are interested in design build?

Area & Association (schools, organizations, potential sponsor)

Personal information (Email, name, phone No.)

So we will include these into our design of feedback form or in the questionnaire if there is one.

Recommendations

Based on the above precedents and questionnaire analysis, we made the following recommendations:

- The contact information should be easy to find and be up to date.
- The feedback page should be easy to find and easy to use.
- Have at least two ways of feedback: a form and an email. Have a questionnaire as option.
- The required fields should be kept to a minimum (at least less than precedent 2), otherwise the user will be reluctant to fill it.
- The response time after the user submit form should be less than three seconds and a message will tell the user if it succeed or not
- Availability 24/7
- Have data validation either on the client side or on the server side.

We also want to use the above recommendation as the usability criteria and metrics when evaluating our design in next semester.

Value

A well designed website will make the contact information easy to find. Also a feedback form functions for the purpose of collecting user information, getting user's opinion on the content as well as the layout of the website. And the website owner/designer can improve the quality and usefulness of the website. When you have a form on your site, you'll improve the chances of a future visit, a continuing relationship, or even a potential contract.

To write this concept paper, we need to do a lot of research on user interface design and usability issues. This knowledge and research experience will be helpful to our future investigation in those fields.

By working as a group, we also learned to coordinate with other researcher/students. It's good to practice team work at school.

Reference

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Appendix A. Proposed Reading Questionnaire

1. Is this an article related to our design section?
2. What are the techniques described in this article?
3. Is the information out-dated or up to date?
4. What are the main conclusions and recommendations of this article?
5. What is the overall relevance and value of this article to my information goal?

Proposal for
Implementation and Testing of
Frequently Asked Questions
And Reference Links
In a Design Build
Web Portal Application

Abstract:

Frequently Asked Questions (FAQs) and reference links are common to most web sites today and the task of discovering the most appropriate implementations of these features is left to the developer. Through the use of a complementary combination of benchmarking, analysis of competing web sites and user feedback sessions, an appropriate and nearly complete design concept may be developed. This paper discusses the process used to discover an appropriate implementation of these features, and recommends guidelines for testing of the features to ensure that the product delivered meets the expectations of future users of a Design-Build web portal under development. The successful implementation of these features provides a vehicle for the growth of web sites (particularly those intended to be utilized as portals) rather than being a factor involved with the site's eventual demise.

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Introduction:

Frequently Asked Questions (FAQs) and Reference links are two frequently occurring features encountered in internet applications. The diversity and range of implementation styles and functionalities has grown in both of these areas, from simple uncategorized lists to dedicated applications in FAQs and simple URLs (Universal Reference Locators) to “Intelligent Agents” that anticipate where the user is trying to navigate in reference links. Although almost any implementation would provide a minimum level of functionality, the developer is tasked with discovering the most appropriate implementation of these features. These areas provide numerous options for implementation, necessitating user/customer involvement in the decision making process to ensure that appropriate options are selected for implementation. In this area of the paper, we are focusing our efforts on the discovery of the most appropriate implementations of FAQs and reference links on a web site to be utilized as a web portal in the area of Design Build education for the Southern Polytechnic State University School of Architecture’s Design Build program.

Methodology:

The approach and methodology used in discovering available and appropriate options in these areas is substantially the same as that utilized in other design areas of the Design Build web portal project.

Students in the Software Engineering program (the developers) worked in groups to identify those user groups that might visit the portal to look for information as well as those tasks that the users would be expected to attempt through the portal. Those users and tasks were presented to representatives of the Design Build program for approval and modification. Those tasks for which the representatives identified support as required or highly desirable were identified for future investigation.

Once the user and task lists were established, the developers reviewed other web sites providing features that allowed users to accomplish those tasks that the portal site was anticipated to support. Those sites that seemed to provide the best implementations of features were selected for discussion by the class for possible use as benchmarks in the development of the portal for functionality and usability. These candidate benchmark sites were discussed by the Software Engineering class to identify the best representative sites in terms of presentation, functionality and usability for discussion with the Design Build class. The class also developed a feedback form to collect the Design Build class’s preferences for the presented sites and a questionnaire to gather information regarding questions that the developers had regarding a number of aspects of the site to assist in the refinement of the feedback received from the Design Build class through the presentation.

The developers met with the Design Build class to present and discuss available features and their desirability in the portal project. Through the use of the sites selected as benchmarks, the Design Build class was presented with visual examples of the proposed features, allowing the class to provide responses that refined or modified the look and feel of the presented sites, improving the amount and quality of information available to the developers after the session. Those feedback and questionnaires that were returned were consolidated and provided to the Software Engineering class for

use in the development of proposals for implementation of features based on the preferences of the Design Build class.

Findings:

Generally accepted conventions for reference links found on most web sites today include:

- Colors
 - Blue for unvisited links
 - Purple for visited links
- Underline links (except in navigation bars)

Style recommendations for web development made by Jakob Nielsen and Marie Tahir [NIEL98] in the area of reference links improve upon those conventions, by adding the following:

- Differentiating links from regular text and making them scannable
 - Begin with an information carrying word
 - Keep them as brief and specific as possible
 - Users often scan through links when deciding which one to select
- Don't use generic instructions or terms as link names
 - Use meaningful text that indicates where the link will take the user
 - Instead of having a link labeled "More..." use labels that indicate what the user will find more of (e.g., "More New Fiction").
- If links load anything other than another web site, make sure that the link explicitly tells the user what will happen
 - Some users with slow connections may not want to access audio or video players
 - Users may not have the appropriate plug-in application to use the files (e.g., PDF files)
 - By indicating what will happen, the user can choose the links that they have the appropriate plug-ins for, avoiding those their browser may not support.

The sites presented to the Design Build class as benchmarks for the Frequently Asked Questions and Reference Links features, as well as the preferences indicated by the Design Build class are summarized in the following table.

Frequently Asked Questions (FAQs)			
Implementation Style	Site or Model Presented	Selected for Use	Not Selected
Uncategorized	http://www.ucc.ie/xml/faq.xml	2	4
	http://www.dbia.org/fr_sitemap.html	4	5
Categorized	http://www.enrollment.gatech.edu/help/	4	2

Dedicated Interface	Microsoft™ Help application	6	1
Reference Links			
Implementation Style	Site or Model Presented	Selected for Use	Not Selected
URL link	http://www.spsu.edu	2	4
Preformatted Search	Search Google for “Design Build”	4	1
Intelligent Agent	Microsoft Office™ “Paperclip”	0	6

Preferences of respondents for implementation styles to utilize in development of Design Build web portal project. (Total responses = 10)

Two preferred implementation styles were identified through the meeting with the design build class – categorized FAQs and a dedicated interface. These implementation styles have different strengths, primarily based upon the amount of information to be presented. When the volume and diversity of the information to be presented is small or narrowly focused, categorizing the information is relatively easy to accomplish. As the volume and diversity of topics increase (beyond 8-10 categories or a total of 60-75 items), an interface that allows the user to enter a subject or keyword to locate answers becomes more valuable.

The Design-Build students indicated a strong preference for the preformatted link style resulting in a search being completed on a search engine (e.g., [Search Google for “Design Build”](#)). The class also indicated a general dislike for the “common” style of reference link (e.g., <http://www.spsu.edu>) and an overall disapproval of the intelligent agent (e.g., Microsoft Office™ “Paperclip”).

The questions posed in the questionnaire regarding FAQs and reference links (as well as a summary of the responses) follow:

Question 1: What are the most important questions that you or your parents or colleagues had about Design-Build before coming to Southern Polytechnic?

Responses:

- Will it work to teach me design?
- What type of publicity is the architecture program at SPSU getting?
- What scale project are we working with?
- Where is the project located?
- Process of project?
- What is it? (2 responses)

- Did not know about the program.
- Parents have no real question (personal choice).
- What does it mean?
- How does it work?
- So are you actually going to build this building?
- What is required for the program?
- What is the program like?

Question 2: If you wanted to learn more about Design-Build, what would you search for on google.com?

Responses:

- Education / design build
- Design / build (5 responses)
- SPSU design / build
- Architecture schools
- Urban re-development
- Social projects
- Design-Build Architecture

Question 3: What web sites have you found most useful in gaining information on Design-Build?

Responses:

- DBIA (Design Build Institute of America, <http://www.dbia.org>)
- Auburn University Rural Studio Project (<http://www.arch.auburn.edu/ruralstudio/>)
- Yahoo search engine (<http://www.yahoo.com>)
- Google search engine (<http://www.google.com>)
- College/University web sites on this topic (specific URLs not provided)
- Wore apparent
- Design-build.com (<http://www.design-build.com>)

Recommendations:

Recommendations in these areas are grouped by subject area.

Frequently Asked Questions (FAQs):

It is expected that the initial list of Frequently asked questions would be short and well focused, possibly growing to a substantial size over time. Based upon this expectation, the following recommendations are made:

- Frequently Asked Questions (FAQs) should be initially implemented as a categorized list (similar to <http://www.enrollment.gatech.edu/help/>)
- Categories to be implemented are still to be determined, possibilities include
 - By user group
 - Parents
 - Prospective Students
 - Architecture Students
 - Architects and Design professionals
 - Builders and Construction professionals
 - By viewpoint or topic area
 - About Design-Build
 - About the SPSU Design-Build program
 - Architecture Schools
 - Top Ten listing
 - Top 10 questions in one category (in frequency order)
 - Other questions in 2nd category but no specific order
- Each question should link to, or be directly associated with the answer to that question.
- Each answer should be short (1-2 paragraphs) clear and concise, but may link to other questions for further clarification or information.
- A link back to the top of the page will be provided at the end of each answer to allow the user to continue reading the FAQs or return to the question list, without requiring extensive scrolling to get there.

A dedicated interface (a web interface similar in style to Microsoft's Help application) is recommended for a future design implementation, if the number of questions becomes unmanageable using categorized presentation.

Reference Links:

The preformatted search and "common" (URL) styles of reference links are recommended for the site, following the style guidelines as indicated in the above findings, particularly the improvements made by Jakob Nielsen and Marie Tahir [NIEL98]. In order to improve the usability of the "common" links, they will be labeled with a short description on the target location rather than presenting the target URL (for example, [Southern Polytechnic State University](http://www.spsu.edu) instead of <http://www.spsu.edu>).

Those sites provided by the Design-Build students as useful resources will be included as links, as well as any additional links discovered during the life cycle of the web portal. The current list of sites is:

- DBIA (Design Build Institute of America, <http://www.dbia.org>)

- Auburn University Rural Studio Project (<http://www.arch.auburn.edu/ruralstudio/>)
- Yahoo search engine (<http://www.yahoo.com>)
- Google search engine (<http://www.google.com>)
- Design-build.com (<http://www.design-build.com>)

Preformatted search links resulting in searches being executed on www.google.com will also be provided. Based upon the information provided through feedback by the Design-Build students, the following link labels and the associated search criteria are suggested:

- [Search Google for "Design Build"](#) (Design + Build)
- [Search Google for "Design Build Education"](#) (Design + Build + Education)
- [Search Google for "Architecture schools"](#) (Architecture + School)
- [Search Google for "Urban Redevelopment"](#) (Urban + Redevelopment)

These lists are subject to expansion and refinement throughout the life cycle of the web portal as more sites are identified and as target URLs are changed or removed from service.

Usability Testing Recommendations:

To ensure that the features discussed here provide the user with the desired information and meet their expectations, heuristic review and usability testing of these features with small groups of users is recommended.

Frequently Asked Questions (FAQs):

The navigation path to the FAQs should be evaluated by asking the user to locate the FAQs from the homepage and major sub-pages of the portal site. The user should be able to reach the FAQs with no more than one navigational error in every case. If users are having more than one error locating the FAQs, the navigation path should be changed to improve clarity.

A cognitive walkthrough to evaluate the organization of FAQs is recommended. When a user is asked where they would expect to find the answer to a question provided to them, the appropriate answer should be found in the category expected by the user at least 90% of the time. If multiple users expect to find an answer in a category other than the one it is listed in, the question may either be duplicated in that category or moved to the category expected by the users.

When presented with a list of questions whose answers are located in the FAQs, the user should be able to successfully answer each of the questions within 15 seconds when starting at the home page.

An appropriate expert should review each question and its answer to determine their accuracy and completeness. Users should then review each question and answer to

determine if they are satisfied with the clarity and content provided. If users have unanswered questions after reviewing each pairing, their question(s) should be evaluated to determine if the current question and answer should be modified or a new question and answer pairing should be developed.

Reference Links:

The navigation path to the reference links should be evaluated by asking the user to locate the reference links from the homepage and major sub-pages of the portal site. The user should be able to reach the reference links with no more than one navigational error in every case. If users are having more than one error locating the reference links, the navigation path should be changed to improve clarity.

Each reference link should be evaluated to ensure that its label is clear and the destination matches the user's expectations. For each link, the user should be asked the following questions:

- What response do you expect to receive if you select this link?
- (After selecting the link) Did the link work?
- Was the response that you received the one that you expected?
- If not, why not?
- Did the label clearly describe the link's results?
- If not, how can we describe it more clearly?

If a link fails to meet the expectations of more than one user, its label and/or target location should be evaluated based on user feedback for modification.

Each preformatted search link should be further evaluated to ensure that the search results returned from the search engine (www.google.com) are accurate. This may be simply done by selecting the link, and ensuring that the "You searched for" value in the results set matched that in the URL string sent to the search engine. Any discrepancy in this area should result in a modification of the URL sent to the search engine until complete agreement is reached.

Value

In a web portal application, the quality, accuracy and completeness of the Frequently Asked Questions (FAQs) and reference links are of critical importance. Deficiencies in either area will quickly result in decreased user satisfaction with the site, as well as a decline in the number of return visits made by users. By tailoring these areas of the site to meet the expectations of the diverse user population expected to use the site, traffic will be increased in two ways – repeated use by the same users and referral by those users to the site of new users. Both of these results are very desirable in any web site, especially a web portal application.

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**TOPIC : DESIGN CONCEPT PROPOSAL FOR
UPDATING CONTENT ON THE DESIGN BUILD
WEBSITE**

CLASS:USER INTERFACE DESIGN AND IMPLEMENTATION(SWE 6343)

GROUP MEMBERS: ROGER MIR, SATISH KUMAR, AND MOHAMMED
ANJORIN

PRESENTED TO DR.RICHARD HALSTED-NUSSLOCH

DATE: NOVEMBER,21ST 2002

INTRODUCTION

This paper was sub- divided into two main categories based on the feedback that was provided to us from the clients. The two categories are:

- File sizing recommendations for Updating content on the design build website
- Utilizing a content management system for the design build website.

This overall paper is thus considered in these two categories.

FILE SIZING RECOMMENDATIONS FOR UPDATING CONTENT ON THE DESIGN BUILD WEBSITE.

Presented By Mohammed Anjorin and Satish Kumar.

INTRODUCTION

This section of the paper deals with file sizing as it relates to updating content on a web page. To update content on a web page which will have a high number of photo images, the maximum file size of a photo to be updated on the site as well as the maximum file size for a page within a site (combined text + photo), play a critical role on the machines ability to download the material in reasonable time. Download time could be the difference between increased site use or decreased site usage. Hence download time

must be kept at the barest possible minimum without compromising the quality of the content delivered and without having any negative effects on our machine.

We analyze how we can effectively consider these issues in the context of our specific project and we produce a set of recommendations which optimizes the output and performance of the web page and the users machine each time content is updated on the web site.

METHODOLOGY

The research for this section focused on developing a relevant set of recommendations for file sizing issues for our project. The research was conducted using search engines on the internet to conduct keyword searches related to our subject matter.

In particular, the search engine Google was used to search for pertinent material by typing in such search key words as “File Sizes for Web Pages”, ”Download Time for Web pages” ,”Web page file size Recommendation” .

We perused the material and selected those with an emphasis on making recommendation for file sizing on web pages, download times for pages and combinations of both. The referenced documents are documented in the Reference section.

FINDINGS

Based on the questionnaire we provided to the clients we received the following responses for the following questions:

How frequently will content be updated on the website

Option: Will it be in terms of a)Days b)Weeks c)Months d)Years.

Write down a choice as follows from the example below .

(Example: 5b means every 5 weeks) :

Majority Response Choice: A Month.

Would you like a Content Management System (CMS) to be used to update the site.

Options: Yes No

Majority Response Choice: Yes

What period of time in hours is acceptable for updating Content on the web(i.e what is the maximum amount of time you would find acceptable between when the update starts and when the update ends and the site is re-released to the public)

Option: Please write your choice here:

Majority Response Choice: 3 hrs.

What is the maximum photo KB file size you would like for a page on this site

Options: 18KB 25KB 51KB 75KB

Majority Response Choice: 75KB.

What is the maximum total KB file size you would like for a page on this site(text + photo)

Options: 0-30KB 30-60KB 60-90KB

Majority Response Choice: 60 – 90KB.

What is the maximum picture pop up screen size for a photo in relation to the entire screen size.

Options: 25% 50 % 75 % 100%

Majority Response Choice: 50%.

DESIGN CRITERIA OPTIONS

Based on the responses shown above from the questionnaire we provided to the clients, we divided our assigned task into various sub- tasks for research, benchmarking and recommendations activities. This section deals with all the issues related to the sub-task of FILE SIZING for our web page.

Each time content is updated on a Web page, the resultant changes usually add more material, thereby increasing the memory file size requirements which ultimately affects the download time for the web page. To make a site more popular to users, the time it takes to completely access that site, the download time, must be reasonably low. Therefore, the download time for a web site, as well as the factors affecting it, are critical factors to be considered when updating content on a site.

In order to download a web page, the file size of the web page as well as the modem speed of the machine downloading it affect the download time for the given web page and its contents.

Options for the DOWNLOAD TIME and the MODEM SPEED are considered below.

DOWNLOAD TIME

From our research, we obtained some of the following specifications for download times.

- According to [2], the time it takes to keep the user attention focused while waiting for a web download is 10 seconds.
- [5] states that a good benchmark for downloading a page on the Internet is 15 seconds.

MODEM SPEED

From our research, we obtained some of the following specifications for modem speeds.

- Some users still use a 14.4 Kbps modem [5].
- 28.8 Kbps modems are used extensively [8].
- 56.6Kbps modems are cited in [3].

FILE SIZING

The file sizing is considered in terms of photo file size that will be loaded up on the website as well as the total web page (text + photo) file size.

Photo File Size

From our research, we obtained the following specifications for photo file sizes and/or download times from various sources. Some of the specifications we collated are as follows:

- Loaded photo images should be between 10 to 20 KB [7].

- A sharp, quality photo image has a 20 KB size [6].
- Running on a 28.8Kbps modem, a 25 KB photo will download in 9seconds .Using a 56.6Kbps modem the same photo will download in 5 seconds.
- Running on a 28.8Kbps modem, a 50 KB photo will download in 18seconds .Using a 56.6Kbps modem the same photo will download in 10 seconds.
- Running on a 28.8Kbps modem, a 100 KB photo will download in 36 seconds .Using a 56.6Kbps modem the same photo will download in 19 seconds [3].
- With a 28.8Kbps modem, a 25 Kb photo with 15Kb of text (for a total web page of 40Kb) will give a download time of 15 seconds [1].

Maximum file size for a page within a site (combined text + photo)

From our research, we obtained the following specifications for the maximum file size for a page within a site (combined text + photo). Some of the specifications we collated are as follows:

- Using a 28.8 Kbps modem, the total web page with a file size of 34Kb will download in 10 seconds [2].
- According to [6], the average web page size in 1999 was 60Kb.
- According to [1], the maximum file size for a page within a site should be between 30 - 60 Kb.

Considering all the possible alternatives in each design criteria option set, we will now make specific recommendations which we feel will best implement the preferences of the clients whilst simultaneously providing optimal machine and relevant application performance.

EVALUATION OF DESIGN CRITERIA OPTIONS AND FINAL RECOMMENDATIONS

Download Time

Since according to [2], the time it takes to keep the user attention focused while waiting for a web download is 10 seconds and [5] states that a good benchmark for downloading a page on the Internet is 15 seconds. However, in practice a download time of 10 seconds is attained by very few graphic intensive web pages [2]. We will try to aim for a download time that is close to 10 seconds but below 15 seconds. According to [], a 40kb text (photo + text) will give a download time of 12 seconds.

We will advise that our designated download time for a page on our site is 12 seconds but that it does not exceed 15 seconds at the most. This is a relatively fine range that will guarantee that the users attention is not diverted while downloading the page or a photo on the page.

Final Recommendation

Download Time will be 12 seconds. However, download times of up to 15 seconds will be permitted.

Modem Speed

Modem speeds of the majority of systems used in most household or business environments are 14.4Kbps [5], 28.8Kbps [8] and 56.6Kbps [3]. In [5], it states that a modem speed of 14.4 is used on very few systems these days. The more popular modem speeds on most machines these days are 28.8Kbps and 56.6Kbps [8]. However, since we are designing for the wide majority of users out there we will select the lower option choice of 28.8Kbps.

Final Recommendation

We are selecting a modem speed of 28.8Kbps as our modem speed design criteria.

Photo File Size

The maximum photo file size selected by the client was 75 KB .This choice seems to indicate that the client wants the photo to be able to accommodate the largest photo KB size that may be required for the website no matter the file size. However, implicit in this desire is that the pictures have a fast download time from the page and also maintain a sharp photo quality resolution.

This means we must optimize a combination of the following criteria when loading and updating photos on a page:

- Quick download times for photos.
- Sharp picture quality resolution.
- Adequate photo KB size for the given image.

According to [2], the time it takes to keep the user attention focused while waiting for a web download is 10 seconds. However, [3] states that for a 25KB photo file size at the same modem speed, it will download in 9 seconds.

Therefore, our recommendation is that a photo size has a memory size of 25KB.However, the photo size can be extended up to a size that does not exceed 30KB.This ensures that we maintain a photo download time that averages about 10 seconds with a range between 9 and 12 seconds which is acceptable. This ensures we will attain our quick download time, it will be enough memory size to capture the fine details of the photo ensuring the sharp photo quality we desire.

Final Recommendation

We advise a photo size on the page to be 25KB.Permitting additional memory size not exceeding 30KB.

Maximum file size for a page within our site (combined text + photo)

The maximum file size for a page within the site selected by the client was the 60 - 90KB, the largest option provided amongst the answers.

In a study on the average web page size conducted in [6], the paper cited that in 1999, the average page on the web was 60 KB while in 1997 it was 44 KB. This means we should strive to keep our total web page file size between 44 - 60 KB. However, according to the file size - download time table in [3], if we prorate the download time for a 60 KB page it would yield 18.2 seconds. In addition, the incidence of

linkrot, the tendency of a hypertext link from one web site to another to become useless, increased tremendously for pages with about 60KB[6] over those web pages had a 44KB size .This means we want to avoid web pages as large as 60KB.However, a total web page file size of 44KB seems to small for our web page which will have photo images. Therefore, we will recommend a total web page size of 50KB.

According to [6], if we prorate the download time for a 50KB web page, we get a download time of 15.2 seconds. This is very close to our outer download limit of 15 seconds and we will deem it as being acceptable. This total web page file size will also reduce the possible likelihood of linkrot, since the file size is below 60KB.

Though it may seem a 50Kb web page file size may not contain all that is required ,it is indeed possible to achieve maximum file size for a page within the site to be 50KB by ensuring that unnecessary adornments which will increase the memory requirements are avoided for our web page.

Final Recommendation

The total web page file size (text + photo) should be 50KB.

Photo Placement On the Web Page

According to [7], placing a thumbnail image that links to the larger image is a very useful tool for downloading images. This is because the user will voluntarily accept downloading the larger image and it does not delay the download time of the entire page. The user implicitly accepts the download will take a while by using the thumbnail image. This means the thumbnail is a very useful tool since it can reduce the download time.

Final Recommendation

Thumbnails should be used when uploading the photo images.

Photo Quality and Resolution

Compressing the photo files can be done using photo image editing tools such as Microsoft's PictureIt, Adobe's PhotoDeluxe, or any program of choice from [3].Editing must be done to ensure the compression of the photo does not take up too much memory space. According to [4], it is advisable to compress a JPG file somewhere between 1- 5. Compressing too much will negatively affect the quality of the picture (ie beyond a compression factor of 10) and blurring the image though it reduces file size.

Final Recommendation

The Compression Factor for a Photo File should be between 1 and 5.

RECOMMENDATION SUMMARY

- **Download Time will be 12 seconds. However, download times of up to 15 seconds will be permitted.**
- **We are selecting a modem speed of 28.8Kbps as our modem speed design criteria.**
- **We advise a photo size on the page to be 25KB.Permitting additional memory size not exceeding 30KB.**

- **The total web page file size (text + photo) should be 50KB.**
- **Thumbnails should be used when uploading the photo images.**
- **The Compression Factor for a Photo File should be between 1 and 5.**

VALUE

This activity helped us to develop a set of recommendations which we believe will help greatly in implementing the actual construction of the website and its successful maintenance once the site becomes operational. This activity gave us an opportunity to actually go through some of the thought processes actual web designers would have to consider when designing professional web pages.

The research was particularly revealing to me and Satish because we discovered some of the in depth issues that needed to be addressed when updating content on a web page .For instance, discovering the range for a recommended file size for a web page was useful and it would aid us in the future if we ever decided to build web pages.

Also, discovering acceptable download times provided useful information which could be used in an individual capacity in future.

CONCLUSION

The recommendations provided have been investigated and offered based on the research performed and the feedback provided from the clients.

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Internet URL:www.swin.edu.au/corporate/webmanager/help/sr/dh_file_size.htm

File Size:Requirements/Advice

[2] Jakob Nielsens's Alertbox

Internet [URL:www.useit.com/alertbox/9703a.html](http://www.useit.com/alertbox/9703a.html)

Size Limit for Web Pages

[3]Genealogy.com

Internet URL:www.genealogy.com/php_photoexpl.html

Photos On the Web

[4]Web-Pub Project

Internet :www.kented.org.uk/ngfl/webpub/graphics.html

Graphics For Web Pages

[5]Pixel Politics

Internet [URL:http://216.71.73.234/pixelpolitics/file_size.html](http://216.71.73.234/pixelpolitics/file_size.html)

Speed:The Holy Grail

[6]All Things Web

Internet [URL:www.pantos.org/atw/35654.html](http://www.pantos.org/atw/35654.html)

How Much Is Too Much

[7]Learning Technology Service

Internet URL:www2.ncsu.edu/guides/using_graphics/sizing.html

Using Graphics in Your Web Pages : Sizing And Optimizing Graphics

[8]

Internet URL:www.useit.com/alertbox/9703a.html

The Need for Speed

PAPER CONNECTIVITY

All the concepts of File sizing considered above are to be implemented for the website within the context of using a Content Management System for Updating the Content for the Design Build website. The Content Management System analysis and recommendation is what is provided in the next section below.

Content Management Systems in Software Design

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ABSTRACT

To build a successful product involves brainstorming users and task analysis which includes users input, and their intellectual and learning activities. A

product could be successful if it's well received by the intended audience. I have found valuable information regarding CMS in the www.editworkspro.com, www.monde.com and www.autotrader.com web sites. Reading CMS books, Visual Studio.net magazine, and related articles in web will guide you to build a successful web site using appropriate CMS in the design-build web project.

INTRODUCTION

What is the Content Management System (CMS)? Why do we need CMS? Web sites are continually updating their contents. They provide a medium, tools, which organizations can provide up-to-date information to their customers and interested parties. The emphasis on providing relevant information makes it vital. So that when an organization implements a Web site they implement a systems that allow the effective maintenance of the site content. A CMS can be a commercial control that allows a low level technical skills can maintain a Web site. A CMS allows you to replace typical HTML textbox in your web pages. It lets your clients to create content with rich text, lists, tables and images instead of plain text. After carefully resource several CMS (<http://ez.no>, www.monde.com.au/monde/admin/intro.html, www.midgard-project.org and www.postnuke.org), we have selected EditWorksPro. Because it's using 100% DHTML, JavaScript and ASP/PHP code, and there are no slow Java or ActiveX component worry about, and everything is handled in the browse.

METHODS

- Used Google web site, www.Google.com, to search for Content Management Systems.
- Selected few CMS and presented to the class
- Gathered information from class presentation, input from students and teacher.
- Group discussion and input from IT specialists and Web master in work.
- Presented to the intended audience, Architect students, teacher etc., and got input from them.
- Drew valuation tables to evaluate the best CMS which will meet our needs. As an example: price, feature, file size, technical support, reliability and scalability etc.

FINDING

After extensive investigation in the web site we have found several CMS. Below are the lists of some of them.

- The Monde Online Agency (www.monde.com.au/monde/admin/intro.html) makes use of highly intuitive controls in their customized content management systems to increase the ease with which users with low level technical skills can maintain a Web site.
- The Auto Trader company (www.autotrader.com) is using a CMS to allow its customers to put an ad in their Web site. Customers can list their details auto information including add or upgrade multiple photos, customizable font type and colors, etc.
- The Edit Works Pro (www.editworkspro.com) is a browser-based WYSIWYG editor that you can use to edit complete HTML files **OR** snippets. It's 100% DHTML, JavaScript and ASP/PHP code, and there are no slow Java or ActiveX Components worry about and everything is handled in the browser! Best on all its features, flexibility, reliability and usability we have chosen this product.

What are the main tasks (task goals) for our area?

Our main tasks are as follows:

- Feedback form
- Get user input
- Update contents
- Help content manager to select a best method to update contents.

There are several companies in the market who provides CMS services. Some of them offer CMS services through their own Web site. Such as: www.monde.com. This Web site provides CMS services to increase the user friendliness for which users with low level technical skills can maintain a Web site. But this Web site does not provide standalone control(s), which could be directly implement to our Web site. That was one of our main issues. What we were after is this. A control that we like to own and make a rapper around it to implement to our Web site. After several hours of surfing in the Web, we have found that what we were looking for. A software tool, CMS, call EditWorks, www.editworkspro.com. It allows us to implement its controls directly to our Website and it's inexpensive. It's easy, actually. Control comes with a step-by-step setup guide, which takes developer to setup only two minutes. You need to include the control in your webpage to use its feature. Once you include the control in your page, you are ready to use its properties and methods. ASP Example:

```
<!-- #INCLUDE file="class.editworks.asp" -> 'Including EditWorks controle to the website
<%
set myEW = new EW 'create an instances of Edit Works
'Set the initial value
myEW.SetValue("<b>Welcome to Southern Poly Technical University</b>")
'Show the control
myEW.ShowControl 500, 300, "myimages"
%>
...to retrieve the HTML ...
<% Response.Write myEW.GetValue(false) %>
```

Edit Works Pro Feature list

- The perfect addition to any content management system! With just a couple of line of code you can let your clients edit their web pages or only specific areas of their web site, such as news items from a database.
- Edit, source and preview tabs. Preview your HTML content in real-time before saving it to the file or to a MySQL, Access or SQL Server database!
- Easy to use API to hide buttons and tabs, set the image directory, set the controls width, disable image uploading and deleting, restrict access to the source or preview tabs, etc
- Create and modify tables and table cells. Set their border color, alignment, cell spacing and more! Once you've created a table, simply right click inside of it and use the handy popup menu to change its attributes!

- Create and modify forms, text boxes, radio buttons, check boxes and buttons. Design your next contact or purchase form directly from your web browser!
- Complete support for style sheets -- If your HTML code contains a <style> tag or links to a style sheet, then those styles will automatically be available in the style sheet drop down list on the toolbar!
- Right click popup menus inside the Edit Works Professional control make it look and feel like a Windows-based HTML editor! You can right click to cut, copy or paste, modify table, link or image properties and more!
- Upload images directly into your content using the powerful Edit Works Professional image manager. You can also disable image uploading and image deleting by calling the DisableImageUploading and DisableImageDeleting functions!
- Web developers: Setup a site for your clients, feed back form, get user input, update contents, and then let them edit their HTML content using Edit Works Professional. Make your money back 10 times over!

What are the benchmark or precedent UI designs in our area?

- Create and modify forms, text boxes, radio buttons, check boxes and buttons.
- Edit, source and preview tabs
- Standalone Control

What are the appropriate usability objectives (e.g., easy to use, simple to learn, recognizable, etc.)?

- Text editor
- Buttons for upload, delete, cancel, edit, etc.
- Popup color picker for easy text color
- Popup table generator
- Insert button for upload images in the text editor

As you see, EditWorksPro control provide all and many more features which you can take advantage of it to easily upload and insert images, delete, cancel, edit, pick color from pup up menu, create a table from table generator, etc.

What are the appropriate usability measures and metrics (e.g., time-on-task, errors, percent completion, navigation path take, satisfaction, etc.)?

- A friendly or meaningful error messages should be displayed to the user.
- Time of task should be less than 20 sec.
- Percent completion should be displayed on the status bar.
- Navigation path must have return path that allow user to use forward or backward navigation tab.
- Overall satisfaction must be acceptable by the most of the audience.

RECOMMENDATIONS

- I strongly recommended to the following:
 - Identifying problems, opportunities, and objectives
In this first phase of the systems development life cycle, the Software Engineer is concerned with identifying problems, opportunities, and objectives. This stage is critical to the success of the rest of Design-Build system, since no one wants to waste subsequent time addressing the wrong problem.
 - Determining information requirements

The next phase is to determining information requirement for the particular users involved. The techniques you can use to the prospective audience (Architech, Teacher, Students, Community workers, etc.) to do that are: interviewing, questionnaires, observing, etc.

- Analyzing system needs

In this phase you can use of data flow diagrams to chart the input, processes, and output of the system's functions in a structured graphical form.

- Design the prototype recommended system and present to the audience

In this phase you can use the information collected earlier to accomplish the logical design and prototyping of the information system.

- Developing and documenting system

In this phase you can develop a Design-Build system that is need.

- Testing and maintaining the system

Before the information system can be used, it must be tested. It is much less costly to catch problems before the system is signed over to users.

- Implementing and evaluating the system

In the last phase of system development, the Software Engineer implements the information system. This involves training users to handle the system.

Since, our goal is to develop a web site using Design-Build technique. We have done extensive investigation in the web site using www.google.com to determine the best CMS uses. We have found several of them, www.monde.com, www.autotrader.com and www.editworkspro.com in the web, and presented them to the prospective audience. They decided one of them, www.editworkspro.com, because of its user-friendly functionality. Knowing your audience and frequently communicating with them will help you to build a success systems which will be accepted by the most of the user.

VALUE

There are several techniques involved in the Design-Build system. In this class I have learned lot about Design-Build system, and it's advantages and disadvantages. Below are some of them, which I have learned in this class:

- How to gather information—surfing web, brainstorming in class, etc.
- How to investigate (www.google.com)
- What technique should we use to get user input (invite architect students, professor, etc.)?
- What is benchmark or precedent UI designs technique?
- What are the usability measures and metrics?

Class is very helpful to me, and confident that I will be able to carryout these experience to my professional career. In addition, it's value added information for me, and it will help me to build my career.

CONCLUSION

In this paper, we have discussed several CMS, www.monde.com.au/monde/admin/intro.html, www.autotrader.com and www.editworkspro.com, and their advantages and disadvantages. Since, we have decided to use a CMS tool, EditWorksPro, that we can exclusively implement to our web site and take full control and advantages of it. As we have described in this paper, editworkspro control will full fill our needs, and give us full control over their tools. It's inexpensive, easy to implement and fun to work on—drug and drop.

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