




Matching Search Technology to User Expectations: Opportunities to improve medical search interfaces

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The Task

Title: *"Matching Search Technology to User Expectations: Identification and Evaluation of End-user Behavioral Patterns when Accessing and Retrieving Health Information via the Web"*

Purpose: *"To document persona profiles of various health professionals, define basic search scenarios, derive user sense-making and heuristic decision models and describe how some current and potential NLM Web site users obtain, review, and employ on-line medical information. Translate findings into interface design and recommendations."*

2

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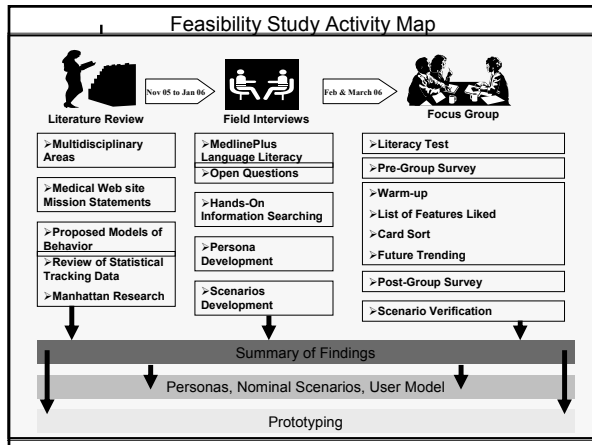
Outline

- o Why is Search an Issue?
- o Activities Map
- o Literature Review: Assessing what we Know and Don't Know
- o Medical Literacy and Cognitive Obscuration
- o Interview Participants: Persona's and Scenarios
- o Filters and Organizing Schemes
- o Sense making (Search over time)
- o Search Definitions and Types of Search
- o Models of Searching as sources of design requirements
- o Focus Group Findings
- o Some Conclusions

3

The Problem Statement

- What are the usability criteria for search engine selection?
- Ever increasing amounts of information compete for user attention
- Rapidly changing and evolving content for Medical and Health Information proliferates on Web sites
- Highly technical language is used
- Scientifically proven knowledge is complex and people avoid complexity
- The information is there but people don't access it or can't find it
- Do users know what they are looking for?
- How do users know when they are "done"?



Medical Literacy

- What We Know:
 - Many people are unable to find and understand information that is intended for them and could benefit their health
 - The primary sources for Medical Knowledge are Television, Magazines, Relatives and Friends
 - When people seek a Medical Website they use WebMD or Association Sites
 - People misspell and misread medical and drug terms
 - Women more than men communicate medical information
 - Older people demographically have more need for medical information look-up but younger populations are more practiced in the use of Web based technologies
- What We Don't Know:
 - How medically literate are NLM's prototypical Web site users?
 - How people acquire what knowledge from Web sites
 - What types of information people are looking for
 - Why people don't get to the information intended for them

From Medical Literacy to NLM Website: Medline Plus Literacy

Medical Literacy Test (Pilot and Health Care Interviewees):

METHOD: Two HF specialists randomly collected "medical terms" from NLM's MedlinePlus Web site (Up to 3 levels deep.)
THEIR TASK: Each selected 5 words of similar judged difficulty and belonging to different "aspects" of the medical domain. Terms found were rank-ordered with respect to perceived complexity with an inter-rater agreement coefficient near 1.
TERMS: 30 terms were presented in rank-ordered form from easiest to most difficult.

INSTRUCTIONS: Participants in interviews were asked to indicate (checkmark) all those terms on the list that they were familiar with to the extent that they could explain the terms' meaning to someone else. (!)They did not actually have to define the meaning)

Results:
 All Participants had some level of medical knowledge.
 They marked **only about half of the items on the list as words or terminology that they could explain to someone else.**

Terms Used In Our NLM Web-Sourced Literacy Test: Easy - Low Level Literacy Terms

Instructions: Please place a check mark against all of the following lists of words from top to bottom that you believe you know the meaning of and could explain to a third party:

Level	Term	College 2 nd Year	BS NW	BS	MS ESL	MS NW
Easy	Exercise	X	X	X	X	X
	Bone	X	X	X	X	X
	Eyes and Vision	X	X	X	X	X
	Stomach	X	X	X	X	X
	Heart	X	X	X	X	X
	Heartburn		X	X	X	X
	Depression	X	X		X	X
	Birth Defect	X	X	X	X	X
	Antacid	X	X		X	X
	Gene	X	X	X	X	X

Medium Difficulty – Moderate Level Literacy Terms

Level	Term	College 2 nd Year	BS NW	BS	MS ESL	MS NW
Medium	Reflux	X	X		X	X
	Valve	X	X		X	X
	Ulcer	X	X		X	X
	Phobia	X	X	X	X	X
	Metabolism	X	X	X	X	X
	Osteoporosis	X	X	X	X	X
	Mutation	X	X	X	X	X
	Myopia	X	X	X	X	X
	Colitis					
	Hemophilia			X	X	

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Difficult - High Level Literacy Terms

Level	Term	College 2 nd Year	BS NW	BS	MS ESL	MS NW
Hard	Sphincter			X	X	X
	Gastroesophageal		X		X	
	Autosomal Dominant					
	Leukodystrophy					
	Keratotomy					
	Squamous					
	NSAID					
	Sucralfate					
	Ibandronate					
	Hemochromatosis					

10

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Implication: Roughly half of the medical terminology that is shown on the MedlinePlus Web site is **NOT** familiar to people with a college degree.

United States National Library of Medicine
 Search NLM Web Site

Search Term(s): CCL Search Help

Search results for "CCL"

From National Library of Medicine

- 21_21 http://www.nlm.nih.gov/mesh/indexingmanual/21_21.htm
- TECHNICAL MEMORANDUM 419: Mantle cell lymphoma http://www.nlm.nih.gov/mesh/indexingmanual/TM_419.htm
- 28_14 http://www.nlm.nih.gov/mesh/indexingmanual/28_14.htm
- 25_10 http://www.nlm.nih.gov/mesh/indexingmanual/25_10.htm
- HTA 101-II: FUNDAMENTAL CONCEPTS 69 <http://www.nlm.nih.gov/nichr/hta101/ta10104.html>
- Toxicology Tutor III <http://sis.nlm.nih.gov/enviro/toxtutor/Tox3/gloss.htm>
- Unified Medical Language System® (UMLS®) - Basics

11

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Literacy is a HUGE issue:

Typically only half of this NLM Website can be "understood" by average educated users.

United States National Library of Medicine
 Search NLM Web Site

Search Term(s): CCL Search Help

Search results for "CCL"

From National Library of Medicine

- 21_21 http://www.nlm.nih.gov/mesh/indexingmanual/21_21.htm
- TECHNICAL MEMORANDUM 419: Mantle cell lymphoma http://www.nlm.nih.gov/mesh/indexingmanual/TM_419.htm
- 28_14 http://www.nlm.nih.gov/mesh/indexingmanual/28_14.htm
- 25_10 http://www.nlm.nih.gov/mesh/indexingmanual/25_10.htm
- HTA 101-II: FUNDAMENTAL CONCEPTS 69 <http://www.nlm.nih.gov/nichr/hta101/ta10104.html>
- Toxicology Tutor III <http://sis.nlm.nih.gov/enviro/toxtutor/Tox3/gloss.htm>
- Unified Medical Language System® (UMLS®) - Basics

12

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Filters and Organizing Schemes

Some Findings from Interview Participants:

- o Any user search typically starts with Google!
- o The Benchmark: the entire search experience needs to be shorter in duration than the time it would take to look up info in a reference book. (Medline plus should be available as a toolbar search)
- o Content Access could be organized by role of the user (separate area for physicians, nurses, researchers versus lay people; general educational materials versus case study professional articles and content)
- o Always provide a topic preview summary describing what the content entails
- o Mark applicable content "Easy Read" or "Professional" to guide people
- o Mark content with original language (if the article is in Chinese) indicate this in the English language abstract reference
- o On Medline Plus, participants avoided going to areas that have large numbers (of hits) associated with them – they will go to the smaller sets first.
- o Show all video and alternate media materials together in a "multi-media" room for broadband access.
- o Provide FAQ –like (what to ask) topics about diseases, drugs, treatments
- o Provide "blog"- like content by medical experts discussing major current topics
- o Provide links to on-line educational multi-week "courses" and give CEU credits.

16

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From Organizing Schemes to User Sense making

Some Findings from Interview Participants:

- o User Search is contextual
- o Users either have fairly specific goals – they want to go to something again
- o Or, they are engaged in some larger educational purpose – want to learn about
- o Web sites need to address user goals on the entry page (I see next) and every other page
- o Users are willing to explore and are "waiting for suggestions" from an expert or a "certified" organization
- o Google and WebMD are successful because they tell people where they might want to go, what to do next
- o Never have zero results on any search query without directing the user to a different area
- o In general, enable people to go from general to more specific knowledge without backtracking or re-directing them
- o Users look for "real" news (anything new that requires updating of existing knowledge is of interest to professional health care providers)
- o Both medical search novices (general population) and research experts repeat their searches over time.
- o Allow people to "manipulate" knowledge elements (shopping basket – book case metaphors)

17

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Are User Goals Addressed? Yes but....

The screenshot shows the NLM website with several callouts:

- Control and Prevention**: Points to the "Control and Prevention" link in the top navigation bar.
- Science-based Content on a Special Condition**: Points to the "List of NLM Databases and Resources" link.
- Insider Information (Medicine by Role)**: Points to the "MedlinePlus" link.
- Information useful for Parents**: Points to the "NewseerHealth" link.

18

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Three "Nominal" Search Scenarios found in Study

Search Domain Levels

- The Look-Up
- The Find-Out More
- The What's New

22

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Search Scenario (1): The Look-up

The Look-up Scenario:
Find out what a particular disease name or abbreviation means.

23

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Search Scenario (2) : Find out More

The Find-out-More Scenario:
Find out information about a newly diagnosed condition for a friend.

24

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Search Scenario (3): The What's-New Scenario - Repeated Searching/Learning

Find out information over time, follow authors, stay "plugged-in".

1 Expert Knowledge - want detailed articles with all the specifics to judge
Type a Term in Google Search Box

2 Compare Items
Read Results List

3 Apply Selection Heuristics: Affiliation of Authors, Implied specificity
Select and click an Item

4 Quick Read Abstract for desired "Specifics"

5 Decision Heuristic: Take time to read?
Click Item

6 Select Information for Highlight/Storage
Print, E-mail, Copy Reference, Subscribe for Updates, Store

Surface Heuristics: Date, Author, Title, Abstract, Is full text available?

Decision: Paid versus free resources

Iterate

25

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Characteristics of Search Scenarios

Search Scenario	Characteristics	Search Term Support
Look-up	One-Time Throw-away	Exact Match or Thesaurus of Terms Needed
Find-Out-More (Sense-making)	Elaborated Search for Resource Materials	Spiraled Knowledge (marking, transferring)
What's New (Longitudinal Searching)	Repeated Searching for Added Info	Integrating Knowledge (using)

Reach-Out Searching = Discovery Searching – some experts & other explorers use Google for this 4th search type - "Boldly go where I would otherwise not go".

26

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User Search Modeled

Activity Time

Level of Content Detail

Group of Matches

Individual Match

Data Cluster

Data Item

Individual Criterion

Group of Criteria

Find-Out-More Search (Scenario 2)

Simple Look-Up Search (Scenario 1)

What's New Search (Scenario 3)

browse search select filter evaluate backtrack match update

Cognitive Activity

27 Adapted from: Anonymous Proposal Review – "Tracking Cognitive Strategies" - to be published in 2006 HFES Proceedings

General Conclusions About Study Methods

- o Individual Interviews worked very well
 - Types of Searching (Personas, Scenarios, Models)
 - Catalogue of Competing Sites Visited
 - Actually Observing On-line Search Behavior
 - Pinpointing search difficulties
- o Focus Group worked well for
 - Generating specific need examples
 - Survey Questions detail (pre- and post)

28

Some General Search Study Conclusions

- o Medical Sites are not necessarily the favorite first choice when searching
- o A key issue is validity of information
- o The most up-to-date information is generally preferred
- o International links (and particularly foreign language documents) were generally dismissed
- o Distrust of both commercial and government sites was pretty equal
- o Search features/ utilities were criticized for many reasons
- o Seen as unnecessary and superfluous additions to sites
- o Lack of help in searching
- o Users did very little to preserve search results
- o There was a general lack of knowledge on some of the many NIH -related sites

29

The End

Thank You -
QUESTIONS?



30
