PUBLIC INFORMATION & COMMUNICATION SERVICES (PICS)
NIH - TASK ORDER

RFTOP#277 TITLE: *Matching Search Technology to User Expectations: Identification and Evaluation of End-user Search Goals and Behavioral Patterns when Accessing and Retrieving Health Information via the Web.*

PART I – REQUEST FOR TASK ORDER (TO) PROPOSALS

A. Point of Contact Name: Wei Ma
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B. PROPOSED PERIOD OF PERFORMANCE: 21 days from date of award to 5 months from date of award.

C. PRICING METHOD: Firm Fixed Price - Firm should provide a single price not to exceed $40, 000. Please describe the methods to be employed and the estimated number of employee hours required. Firm rates for use of usability testing facilities and equipment. Describe the development of search models and task scenarios and other factors of the testing process.

This project's scope should encompass interviewing and testing of approximately four groups of 9 each participants including at least one vision disabled individual in each group. If, in the opinion of your firm, this is not a sufficient number to conduct a thorough evaluation, please specify how to best accomplish a thorough and complete evaluation for accessibility and usability.

D. PROPOSAL INSTRUCTIONS: Proposals should be submitted to me by e-mail at: maw@mail.nlm.nih.gov with a copy to luedtkt@mail.nlm.nih.gov. Please enter in the subject line the following text, "RFTOP# - Proposal." A signed task order form will later be requested from the successful bidder.

E. RESPONSE DUE DATE: Wednesday, August 31, 2005 at 4:00PM EDT.

F. TASK DESCRIPTION:

The Office of Computer and Communication Systems (OCCS) of the National Library of Medicine (NLM) desires to conduct a feasibility study to ascertain interface guidelines and user-centric requirements for search interfaces to web-based medical resources. For example, MedlinePlus, acclaimed as the "goldmine of good health information from the world's largest medical library", is updated daily and is intended to be used by health professionals and other public consumers. Users of this Web resource may include hospital staff, nurses, physicians, pharmacists, medication manufacturers and distributors, healthcare information suppliers, and anyone else interested in this information for care-giving or personal reasons. MedlinePlus

covers information on over 700 diseases and conditions and lists hospitals and physicians, contains a medical encyclopedia and a medical dictionary, health information in Spanish, health information from the media, and links to thousands of clinical trials. It is also an extensive but not exhaustive information resource on prescription and nonprescription drugs.

This study will model user search behavior with NLM's web based health information resources and explore and integrate existing user search goal classification schemes. For example, one recent study suggests that so-called navigational searches (specific pages a user might try to find on a site) are much less prevalent than previously thought, while an unexplored "resource seeking" user goal may account for a much larger fraction of total web searches. Such insights have clear relevance for the presentation and evaluation of results data. Elsewhere, user motivations for visiting medical sites have been described as falling into only three basic categories: (1) Advice Seeking (2) Term Look-up and (3) Should I see a Doctor? The adequacy of these initial classification schemes shall be addressed together with the value and user-perceived quality of displayed informational items. The actual information value and relevance of presented and accessed health topics as judged by the user shall also be explicitly addressed and evaluated in our study.

We seek to validate and usability test gained knowledge with prototyped designs of search interfaces employing any imminent NLM medical information application.

This study's focus on user retrieval behavior specific to health related information is expected to contribute to needed guidelines for Web site application design collectively referred to as 'search'. The specific OCCS programmatic driving forces that fuel this proposal are: (1) Increased consumer and patient use of on-line health care information. (2) Accelerated development and use of an electronic health information infrastructure.

Little is currently documented concerning user task goals and in-situ or contextual needs of consumers when accessing NLM's resources to obtain medical and health information. We know that meeting end-user requirements with strictly technology-centric solutions is not sufficient to provide a satisfying and informing user search experience. A target user experience that is useful, usable, and desirable comprises all of the following:

- ***Goal context, access heuristics, search strategy formation***
- ***Query terminology and formulation***
- ***Decision-making under uncertainty, cognitive bias and perceptual influencing factors that determine results link selection***
- ***Display bias when judging results presentations and the influence of various result organization schemes on item selection and/or item discarding***
- ***Tools and post-search functionality available for results filtering***
- ***Perceived value of the resulting information with respect to user's goals***

From this perspective we define Web site "search" as a combination of design characteristics and corresponding end-user behaviors. Successful search design is achieved when an appropriate balance of site display characteristics and search engine power exists, and when users are given interaction protocols and those query and results tools that best match their natural information seeking patterns and task contextual needs.

Ultimately this feasibility study will help improve the way users can accomplish Web site searching for health information. Anticipated user query goal candidates to be included in a goal

taxonomy are: finding out 'What Is It?' (Informational Disease or Drug Lists), 'What Are the Symptoms?' (Directed or undirected Comparison Look-ups), 'What are the treatment options?' (Interactive Education), 'What are the available resources?'(Resource & Location Identification) and/or suggestions for 'What do I do next?' (Seeking Advice). The study will provide needed knowledge to formulate evidence-based user interface guidelines for user-centric designs of medical and health informative search interfaces.

Interviews, a focus group and usability testing evaluations concerning user requirements of search functionality (query and search result displays) are all methods suitable to this feasibility study.

NLM will select a human factors and/or Usability Testing contractor to support the following activities:

A) Data collection and field interviewing support (appointment setting, question preparation, findings summaries documentation)
B) Performing goal and task analyses and developing a conceptual human search model together with specifying a range of critical search scenarios based on field interview & focus group data
C) Preparation of design guidelines and scenario implementation of prototype mock-up designs
D) Recruitment and remuneration of public users for usability testing including preparation of test protocols, test screens and outcome log documentation. Video recording and issue segment creation and final report preparation of best practices search interface design guidelines.

In order to develop truly user-centric information services, designed search and information retrieval functions on health information Web sites need to match user information seeking goals. Establishing guidelines for search interface designs by addressing the 'why' of searching will be essential to building satisfactory and excellent search interfaces to NLM's quality medical resources.

The study will be designed to answer the key questions shown together with suggested study methods in Table 1 below:

Table1.: Key Questions Related to Potential Study Methods

Inquiry/Evaluation Focus	Key Study Questions	Primary Method	Supporting Methods
Understanding - User Search Goals and Contextual Factors	What are the main tasks, motivations and search goals of people accessing health information on a Web site?	FB[1]	LR[2] MA[3]
Modeling - General public user searching for health information	What are the nominal information retrieval scenarios for health information resources?	FB	LR MA
Analyzing - Tracked Usage Data user search query and	What are the effects of current design variables known to influence user query	MA	FB

[1]FB = Field-based Contextual Interviewing of Medical Professionals and Members of the Public
[2] LR = Literature Review – ACM Digital Library – peer reviewed papers on User-Centric Search and Trade Study – such as Forrester Research Reports on Search Engine Features and Search Market trends.
[3] MA = Manual Analysis involving exploratory categorization, classification, and modeling.

result item selection	formation and result selections?		UT[4]1
Preparation of user interface guidelines for query and results design (specific to health information applications)	Which interface attributes can be employed to match 'natural' user search strategies and optimize user goal satisfaction?	UT1	FB LR MA
Designing and Usability Testing of User interface prototypes for query and results functional displays (Prototype 1)	What display structures, widgets, and grouping principles for guiding search behavior should be employed in the query and results page design of a NLM medical information resource.	UT2	MA FB
Designing and Usability Testing of User interface prototypes of post-search results tools[5] (Prototype 2)	What do users want to do with multiple initial search results? When is a satisfactory search experience achieved?	UT2	MA FB
Documentation, Review & Validation of User Interface Design Guidelines	What are the recommended features and interface requirements for a Web-based medical search interface?	MA	UT1,2 FB
Design Requirements for Search Engine Selection and Web site Design	What are the user-centric criteria for selecting a search engine from among competing vendor claims?	MA	LR FB

Study Design – This 'feasibility" study we will focus on a subset of key questions related to acquiring a better understanding of user's goals for health information Web searching. We expect proposals to address the key questions with a converging empirical effort that integrates and summarizes findings from various complementary study techniques, including field interviewing and observation, focus group exploration, and iterative prototyping and usability testing of proposed functionality.

Envisioned methods range from mining existing data sources to actively collecting data via field interviews and usability testing of prototyped interface designs. We will encourage the use of so called "discount study" techniques during this first feasibility phase of the User-Centric Search research employing only small groups (n<10) of volunteer subjects. Proposed work can range from a small scale but comprehensive Literature Review (LR) of Professional Journals articles and/or Technology Trend Study Reports (Forrester analysis or Adaptive Path Research Reports) to performing Manual Analysis (MA) of already tracked usage data. This will provide a foundation for structuring field-based (FB) interviews with medical professionals and other potential or actual MedlinePlus users (general public, potential consumers, patients and

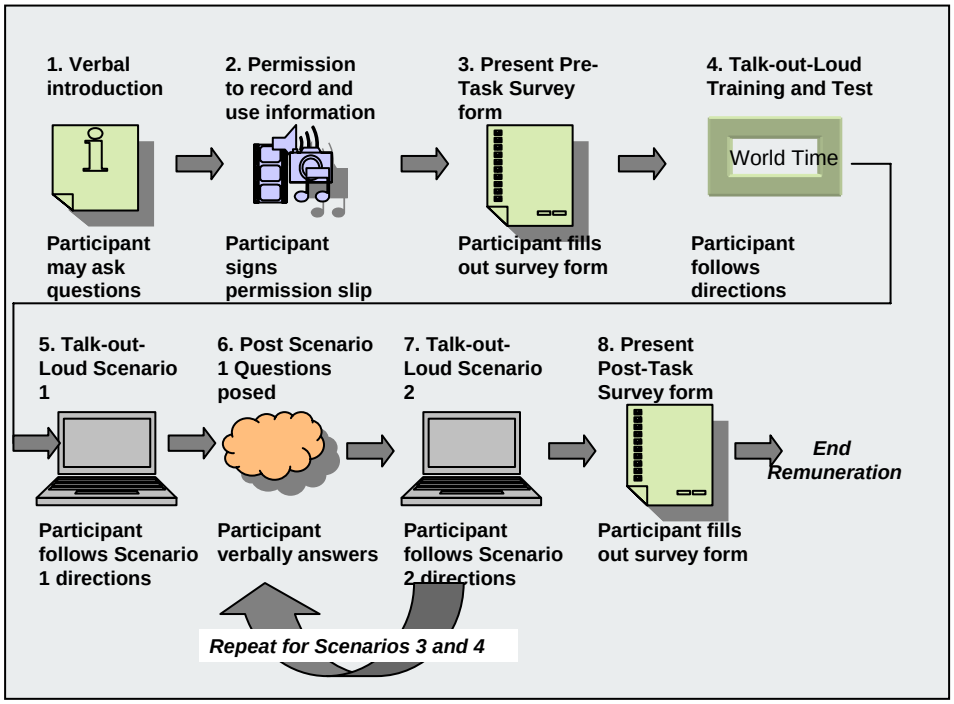
[4] UT = Usability Testing – application of structured and exploratory usability testing protocols in a one-on-one lab setting with prototype designs and selected Web –based search interfaces.

[5] Tools such as Vivissimo's CLUSTY, MindMap, and other graphical relationship presentation or filtering tools.

caregivers) who may or may not have particular disease concerns (specific conditions diagnosed or 100% healthy).

These exploratory modeling and data collection efforts will then be translated into interface design guidelines which will in turn guide our building of iterative testing prototypes (IP) for both query and search result designs and functionality. Two mini-rounds of laboratory–based usability testing (UT) (with small groups of <10 people) will provide evaluative insights into new user-centric and user-goal sensitive structural and functional design features.

Several Search Interface Prototypes (SIPs) will be tested through designed scenarios in a usability lab testing environment. The following depicted general testing protocol should be employed for a range of 4-5 typical search scenarios with two groups of 9 each user representatives:



Prototypes will be tested in two iterations, once with an initial prototype design (compared with current design), and then with a modified final prototype design.

The results of this study will consist of a final report including a user-centric search model and a complete statement set of desired, good or best practice user interface characteristics (recommendations) for application to NLM medical Web resources interface design.

Estimated Timeline – The expected start date is as soon as possible (3 weeks after award or sooner). Field study phases and focus group activities are planned to run from about project week 3 to week 9 depending on logistics and availability of interviewees. Prototyping activities and associated usability testing mini-studies, are expected to be completed by week 20 (5 months) after project initiation.

The features to be tested include:

User Search, Goal Indexing and Terminology. The effectiveness of user's interaction with proposed search utilities and needed functionality will be explored. Cognitive judgments will be collected from users relating their understanding of labels, category headers, and action buttons. Exploring how user-centered interface display features (results presentation to a search query) increases a user's likelihood of finding the desired medical information and how search success should be measured will be primary topics to be explored. Best of breed medical information sites will be identified and catalogued and their "search" or other useful interface features analyzed.

The contractor is expected to use a combination of some or all of the following methods: (1) Semi-structured stakeholder field interviewing; (2) heuristic inspection of search interface features; (3) focus group exploration of medical information needs (4) Structured scenario walkthroughs with query and result design prototypes; (5) Pre- and post-usability testing surveys; (6) Analysis of any existing statistical usage/tracking data for NLM medical resource sites; (7) At least one each testing session with an assistive technology (AT) device user.

Performance Measures to be used: User objective performance data including task goal specification, task completion (search goal destination), page click events, page dwell times and others shall be recorded and analyzed together with observational data and more subjective user judgments collected via surveys and standardized questions.

Dissemination/Use of Results – Clear and concise reports and recommendations from the user data, including prepared video highlight segments of illustrative testing situations shall be made available to application development team members and interested NLM stakeholders.

The contractor will work closely with NLM/OCCS to determine testing strategies appropriate to each area of study, and will provide NLM/OCCS staff and designated stakeholders with opportunities to observe the field interviews and usability testing sessions.

Clearances

These studies will not require OMB clearance since no more than 9 users in each user group category will be tested.

G. EVALUATION FACTORS

1. Corporate Experience:

The contractor shall have experience in the following:

- Recruiting and remunerating subjects from target populations
- Conducting structured field-based interviews with a wide range of people.
- Capturing knowledge gained from various field study methods and integrating this into a concise summary report.
- Demonstrated skill in Human Performance Modeling and Human Cognitive Processing.
- Preparation of user profiles (personas) and usage scenarios;

- Conducting field- or lab-based usability studies employing performance metrics tracking, annotation, and/or automated data collection and digital video systems (using MORAE or similar software).
- Preparing highlight video-clip summary presentations from recorded testing data.
- Preparing and following established and agreed upon usability testing protocols.
- Preparing User Interface Requirements and Functionality Specification statements.
- Preparing and conducting paper (or other mockup) prototype tests, if needed.
- Preparing screening instruments to identify suitable testing participants.
- Recording and analyzing response data
- Conducting a structured focus group to explore domain trends, best practices and end-user requirements.
- Evaluating information-intensive and/or medical information sites
- Preparing clear and concise Quick Reports, final reports and presentations from the response data and delivering results in English.
- Making recommendations for modifications to web page layouts and navigation schemes and site language employing quick-turn-around methods.
- Accommodating local area (Bethesda, MD) observational access for NLM staff to observe some or all of the testing.

The contractor shall utilize their own resource lists of potential study subjects for the purposes of recruitment, and be able to recruit subjects screened for provided demographic criteria and representing a mixture of geographical, urban/rural locations, institutional and non-institutional settings.

The contractor shall be able to perform usability testing at their site which should be in reasonable proximity to Bethesda, MD, equipped with computers and usability lab equipment and related software and video capture. The contractor shall accommodate persons with disabilities either at their site, at the person's home or office, or a disability equipment vendor demonstration site. The contractor shall be familiar with hardware and software used by persons with disabilities. The contractor shall be familiar with evaluations of Section 508 compliance criteria of the Rehabilitation Act and its application to electronic media and web sites.

2. Evaluation Process: Any proposed evaluation procedures will be assessed by NLM/OCCS to determine the extent to which these procedures are likely to produce innovative and meaningful results, the ability to provide quick turnaround support, provide local access to usability testing sessions and perform subtasks to match the OCCS teams' schedule.

3. Price: While price will not be the most important evaluation factor, proposed pricing structures will be considered in determining the firm that represents the best value to the government.

RFTOP# 277 TITLE:

PART II - CONTRACTOR'S REPLY: CONTRACT #263-01-D-0_____ TO # NICS-_____

Contractor:
Points of Contact:
Phone- Fax-
Address:

TOTAL ESTIMATED COST: Pricing Method
TOTAL ESTIMATED NUMBER OF HOURS:
PROPOSED COMPLETION DATE:

FOR THE CONTRACTOR:_____
Signature Date

SOURCE SELECTION:

WE HAVE REVIEWED ALL SUBMITTED PROPOSALS HAVE DETERMINED THIS FIRM SUBMITTED THE BEST OVERALL PROPOSAL AND THE PRICE/COST IS REASONABLE.

Billing Reference # _____
Appropriations Data: _____
(ATTACH OBLIGATING DOCUMENT IF AN ROC WILL NOT BE USED.)

RECOMMENDED:

_____
FAX # Signature - Project Officer Date

APPROVED:_____ _____
FAX # Signature - Contracting Officer Date

NIH APPROVAL -

CONTRACTOR SHALL NOT EXCEED THE ESTIMATED LABOR HOURS OR ESTIMATED TASK ORDER AMOUNT WITHOUT THE WRITTEN APPROVAL OF THE CONTRACTING OFFICER & PICS COORDINATOR

APPROVED:_____
Signature –Anthony M. Revenis, J.D., NIH-PICS Coordinator Date