IDEA GROUP PUBLISHING

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ITP4715

Gathering User Needs: A Case Study on the Process Used to Gather User Needs for for the Adaptive Management Area's Forestry Portal

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ABSTRACT

This paper will introduce the reader to the processes a cross-functional team of individuals from management, forestry, and computer science backgrounds employed to gather User Needs for a forestry Portal. Gathering User Needs prior to development is critical for the practical success of a technology project. However, more often than not, User Need surveys are forgotten and overlooked in the fast paced world of technology development. This paper will introduce the reader to some general research that has been done on the value of User Needs studies, provide some background on the Adaptive Management Area's Portal Project and then discuss in-depth the methodology and the results of the User Needs study conducted for the AMA Portal project. We will conclude the paper by presenting our findings, discussing the lessons learned and future steps in the project.

INTRODUCTION

User Needs Research:

If you build it and they will come," said Shoeless Joe Jackson's ghost in the movie, "*Field of Dreams*." Without asking for anyone's advice or opinion, Ray Kinsella built his baseball diamond and prayed that people would use it. Ray hoped for the best, but without knowing who the users were, what their needs were, and how they would use the (field of his dreams) baseball diamond., Ray was setting himself up for potential disaster.

Ray is not alone in his strategy of overlooking user needs and requirements. Although *usability* has become a buzzword for websites in the last few years, many projects still dismiss the need to conduct usability studies. Project directors assume usability studies are simply too time consuming, futile and take up too many resources. Project directors are not interested in slowing things down in the fast paced, need it yesterday world of Internet development.

Research has shown however, that spending a little more time upfront on conducting usability studies can prove to be good business. Studies show that if fixing a usability problem is $1 in the discovery phase of the project, the cost of fixing the same problem post-implementation will be between $100-$160 (McLaughlin, Intranet Journal 06/2001)

Barry W Boehm, in his book entitled *Software Engineering Economics* (Boehm 1981) analyzed sixty-three software development projects in Fortune 500 companies such as IBM, GTE and TRW. Boehm determined the ranges in cost for errors created by false assumptions in the requirements phase but not detected until later phases. The table below describes Boehm's finding that cost goes up based on the phase of the project. In his example, Boehm illustrates the cost benefit of including users in the initial requirements phase of the project as opposed to the operations phase, which can be very costly if changes have to be made based on user's input.

Relative Cost to Fix an Error

Phase in Which Found	Cost Ratio
Requirements	1
Design	3-6
Coding	10
Development testing	14-40
Acceptance testing	30-70
Operation	40-1000

Unclear user requirements continue to be the leading cause for software project failures. The Standish Group Report published in 1995 surveyed 365 IT executive managers representing over 8000 applications. One of the objectives of the study was to find out which factors cause projects to fail and be challenged. Lack of user input was the number one cause for project challenges followed by incomplete requirements and specifications and changing requirements and specifications. (The Standish Report, 1995)

Projects that fail to collect user needs may make incorrect assumptions as to what users are looking for. Catastrophic results can occur based on design decisions based on false assumptions. For example, the Johns-Manville Corporation decided to develop, manufacture and market asbestos building products. The company made the assumption that asbestos was safe to the human population. Their momentous, erroneous assumption cost the company $2 billion dollars and 52,000 law suits as residents in the area started encountering severe health problems as a result of asbestos in the air. The company eventually went bankrupt and reorganized as the Manville Company. (Gause and Weinberg, 1989)

The examples above have shown the importance and benefits that can be realized by including users in the initial design of projects. Users are central to the success or failure of a web-based project, for what use is there in *building something if they will not come*.

Background

Supported by a National Science Foundation grant, personnel from the Forest Service, Bureau of Land Management and Fish and Wildlife Service of the Pacific Northwest have joined forces with faculty and graduate students from the Oregon Health and Science University to develop a web-based portal for Pacific Northwest forestry information. The content of this portal will focus on forest ecosystem research and management. The agencies are faced with information management challenges similar to other organizations. Namely,

- increasingly diverse user base in interests, disciplines, and points of view,
- growing numbers of data and information users,
- very large amounts of information being generated and archived at multiple locations, and
- complexity in content and structure of information.

Initial activities of this three-year project focused on determining the needs and desires of the Portal's future users. For the Portal, probable users include researchers, educators, resource managers, policymakers, non-governmental organizations and the public.

Our Process

The following is a list of the tasks performed as part of our User Needs study:

- Identify the Target Audience
- Conduct Usability Interviews with Representatives of Target Audience
- Compile User Needs Statements

- Conduct User Needs Requirements Review with Interdisciplinary Team
- Write User Needs Statements Document highlighting which needs were accepted and rejected
- Conduct Retrospectives Study

Identify Target Audience

The usability team began the study by identifying the Portal's target audience. Prior to starting any user oriented study, it is critical to know exactly who the target user will be and what problem the user is trying to solve by using the product. A user is an individual who is affected by or affects the product that is being designed and, in some cases, will make or break the success of the product. For example, a study of software tools conducted at a major corporation indicated that seventy percent of tools purchased were never used. Of those tools that were used, just one person or a small group used ninety percent, even when the goal was to purchase the software for a large organization. (Gause and Weinberg, 1989)

In order to narrow down and define the target audience, representatives of the forest project interviewed people interested in agency work, natural resource scientists and agency people themselves. Through interviews and analysis, it was determined that the target audience was defined as:

Local forest communities of the Pacific Northwest, specifically those individuals on the management and research side of the public and private sectors.

With our target audience clearly defined, we could then focus on a distinct segment of the population for conducting our user interviews.

Conduct Usability Interviews with Representatives of the Target Audience

Beginning in the Spring of 2000, interviews were conducted with representatives of the targeted user population. Our goal was to gather requirements for the Adaptive Management Portal's system design. The majority of these interviews were conducted with potential information providers of the AM Portal. Many of these interviewees can be considered both providers and users of forest information and were interviewed in this light, e.g. queried from both aspects. Notes from these interviews can be reviewed at http://www.cse.ogi.edu/forest/team/phase1.html.

Interviews were conducted with PNW Research Station personnel (as information providers) to help determine what the station can do to make their information most useful and accessible to their customers. These interviews focused on information content, format, delivery, and customer profiles.

The interviewer was given a guiding questionnaire to work with so we could ensure that certain aspects of the information acquisition process were not overlooked. The following questions were available to the interviewer as a guide, but were not available to the interviewee. Certainly, not all the questions were addressed in every interview and scenario, but it was intended that the compilation of scenarios would enable the formulation of responses to all the questions with a significant degree of confidence. Below is a list of the questions that were available to the interviewers:

1. Briefly describe your current position/responsibilities.
2. What was your initial question?
3. What information, specifically, were you looking for? Did you know that it existed?
4. What information source (broker) did you use to search for the needed information? (library, WWW, backroom, personal contact, etc.) What did you like/dislike about the source you used?
5. Was there a particular information source(s) that you initially contacted? If so, why that source?
6. What tools did you use to assist with your information search? For instance, telephone, computer (if computer, pc? modem rate? OS? on a LAN?, etc.). Is this process pretty much standard for all your information searches?
7. What fields did you use to search for your information (e.g. title, creator, location, forest type, keywords, timeframe, etc.)? Do you generally use the same fields for information searching, e.g. location or author?
8. What terms did you use within these fields? Did the terms come from a standard vocabulary e.g. ITIS, HUC?
9. What formats and related software tools did you use to access, view, manipulate and use the information you located (e.g. excel, PDF, arc info, Word)? Why these formats?
10. How much time do you estimate was spent on this information inquiry? What percent of time was spent searching for it, retrieving it, reviewing it, evaluating its quality, or reformatting it for your own use?
11. Did you save the retrieved information to be used later if needed? If so, how did you organize this retrieved information (file folder, bookmark, manila folder, etc.)?
12. Was there information that you could not locate even though you were certain it existed?
13. Within your organization, did anyone besides you participate in the information acquisition process?
14. Outside of your organization, did anyone else participate in the acquisition process?
15. What was the intended purpose of the information you were seeking? Did it fulfill its purpose? If not, why?
16. Were you locating it for yourself or someone else?
17. What level of detail did you need the information to be (raw data, analysis, peer reviewed publication, newsletter, abstract, scribbled notes)?
18. How did you determine the level of quality of the information you accessed?
19. Next time you require information what will you do differently?
20. How do you feel your information searching and acquisition process could be made more efficient? (what features are missing or would be helpful (technical, organizational, etc.

Interviewees were asked to provide either responses to general inquiry regarding their information seeking and gathering behavior, or were asked to articulate an actual case of a recent information inquiry they conducted (scenario).

In all, approximately 45 interviews were conducted in person and by phone. All members of the Portal development team participated in the process, e.g., by attending interviews, reviewing the results from the interviews and suggesting follow-up questions. This full-team involvement is particularly important to assist with interdisciplinary (computer science, business management and biological science) collaboration and communication.

Compile User Needs Statements:

As a result of conducting user interviews, a list of desires and needs were identified (listed in the summary table section of this paper). Team members took the statements and used them to identify activities and attributes that were required to develop and operate the Portal. These activities and attributes were prioritized based on their importance to the overall success of the project, the level of effort and associated costs required, their feasibility and the risk involved in implementing them. Any attributes and activities not addressed were documented for later consideration.

The user community expressed a great amount of interest and excitement for the Portal. Most users rely on the Web to some degree for their information requests although the majority of the interviewees still rely on their personal contacts as their first step for information retrieval. Users generally employ various quality measurements to judge the credibility of a site principally, author's background, citations used, institution of origin.

Generally speaking, users were looking for an easy-to-use Portal which would provide them with verifiable, credible information for their research and management needs. The Pacific Northwest region is quite large and extensive, therefore the Portal development managers will have to employ great care in making the content applicable to a wide variety of subjects and information should always remain current and thorough . Users were looking for both raw data and analytical results and wanted to search for information using a variety of keyword options. Most users were Internet-savvy but still wanted some form of human interaction when it comes to assisting them if any questions arise. Users would like the Portal to be available and accessible "24x7."

A Portal that would gather and collaborate disparate islands of information into one site is highly desirable and required. For example, a forest entomologist for the Division of Forestry said that very little information on the

Web pertains to the maritime forests of Southeast Alaska. From the perspective of this user, there is a great void in information pertaining to the Alaska region.

We learned that often no records for the specific place of interest exist, so people would like to be able to search for documents about conditions that are similar to the ones of direct interest. The definition of similar may vary depending upon the question. For example, one may want to know similar with regard to climate and terrain or similar with regard to size of community. Most frequently, field biologists, foresters and other subject matter experts prepare reports, often synthesizing literature with spot observations or inventories and model results. Usually, these are for specific projects or watersheds, but always about a specific place. Their work then is usually to find out what is already known about a specific place, either in general or about a specific topic, such as the fish or the vegetation or the recreation setting. We identified 28 topics or domains that are frequently the source of information searches.

We learned that most of the agency personnel use a variety of location identifiers, some of which are used in common and some of which vary by agency, or even within an agency. On the other hand, four land classification systems are used, with as many as three different kinds used within one agency. Each federal agency seems to have its own road and trail classification and naming conventions.

Summary Table:

User comments and needs were summarized, divided into high-level categories and listed below. It is interesting to note that quite a few of these user needs are general enough to potentially be applicable to the development of Portals from other disciplines.

As we progressed along in the interview process, we noticed many of the user needs were repeated amongst several interviewees. This repetition is good news for Portal developers as it displays that users are generally interested in similar features.

Conduct User Needs Review with Interdisciplinary Team

From the list of user needs statements, team members identified activities that were required to build or develop the features. These activities were then prioritized based on their importance to the overall success of the project, the level of effort and associated costs required and the risk involved. All team members were invited to be involved in the analysis process, as together they have knowledge regarding the level of effort and time required.

The user needs review was conducted on August 28, 2002 with the technical team. Each user need was discussed and categorized:

- Category A: Need is taken care of
- Category B: More information about the need is required
- Category C1: Provide description of how or by whom it will be taken care of
- Category C2: Out of scope of the project

The meeting lasted approximately 2 hours and the end results were very positive. It was discovered that many of the user needs statements were being fulfilled in the design of the portal and those that were not were going to be discussed in the deployment plan. A good number of user needs were in fact policy related statements which the technical team could not answer. The next step in this process will be for the Forestry Department representative to discuss the policy related needs with his team.

Retrospectives Study

Reaction to the user needs study was generally positive. In the retrospectives study, (also commonly known as a post mortem review) we set out to find what worked, what didn't work, what we would do differently and any next steps that need to be taken. Some general observations are listed below:

What worked: Participants found the user needs study to be helpful as it was successful in obtaining direct feedback from end users. Technical members of the team particularly found the scenario type of user needs statements to be useful as they were able to picture how the users would utilize the system. The user needs study was also an important way of maintaining communications with the team as a whole as each member of the interdisciplinary team was involved at some level of the analysis.

What didn't work: The user needs study was spread over a one year time span. Participants felt this duration of time was too long as user's attention to the study would be unfocussed after a long duration of time. Participants also felt it would have been more beneficial to meet on a regular basis to uncover project progress and to keep team members fully engaged in the process.

What we will do differently: Although there were clear deliverables with the user needs project, it would have worked better in terms of timeline if a schedule and key milestone dates were maintained. The task list for the team was quite fluid as a result of a lack of schedule for the project. In the future, the user needs team feels there needs to be a master schedule that would maintain milestones, key deliverables, work breakdown structure and communications plan for the project.

CONCLUSIONS

The interviews that have been conducted thus far are one step in a longer user needs process. Work that preceded this interview process was centered on:

- identifying the primary activities to be supported by the portal, namely providing and seeking forest information in the form of documents and reports; and
- beginning the process of identifying the domains of interest for keywords that will be used to describe and to search for documents.

Ongoing work includes trial use of the prototype technology by field personnel and continued selection and evaluation of controlled vocabularies for the domains of interest.

The intent of the user interview method was to further incorporate user needs directly into the system design so that main decisions concerning architectural and functional requirements could be made based on user input.

Interviews of individuals and small groups of individuals continue as we move the Portal from being a "good idea" to demonstrations to prototypes, and finally to implementation. The target for full implementation on several of the sites is June, 2003.

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USER NEED	DESCRIPTION
Ease of Use	
➢	Users are looking for a well organized, fast, efficient, intuitive, free and easy to access Portal.
➢	Users are looking for a web-based filing system that permits reuse of retrieved documents.
➢	Novice portal users would like to be able to use the Portal with relative ease and minimal training. Users would like 'how to' documentation to be provided.
➢	Users look at document references to broaden their search and determine content and quality.
➢	Users would like to be able to browse for documents about related topics but do not want their mailboxes to be automatically flooded with those documents; instead they would like to be prompted about their further interest.
Credible	
➢	Proven credibility is important to users.
➢	At the present time, many users rely on personal contacts for information.
➢	Users determine quality by researcher and institution. A few determine quality by looking at the science behind the document through research protocols and peer reviews.
➢	Bibliographies/ references within archived documents are important for helping users to determine quality.
➢	Users suggest a short background of the author and his or her affiliated organization be made available to assist in determining quality.
➢	Users do not want to have discussion rooms associated with the Portal, they want it to provide an easy way to store and access reliable "gray literature."
Applicable	
➢	Users want to search for documents about a place.
➢	Often no records exist for the place of interest so users would like to ask about similar conditions.
➢	Users would like to be able to access incomplete, ongoing research activities.
➢	Researchers seek raw data.
➢	Decision makers seek assessment.
➢	The users of the AMA portal come from a wide variety of backgrounds and regions. Accordingly, a wide range of subjects should be covered in depth and effectively.
Personal Contact	
➢	Site needs to employ multifaceted communication strategy (i.e. addresses, contact names, phone numbers and titles should be made available).
➢	Users would like a list of discipline experts to be provided.
➢	Users would like to be able to search by people. Questions they would like to be able to answer include: "who is working on this and how do I contact him?" "What is Lynn working on? What hypotheses is she studying?"
Searches	
➢	Using place name as a keyword is important and using spatial location information is generally not used.
➢	Most contributors and users (and providers) don't use controlled vocabularies to search or archive. Some stated that they would like to use cv's if it was an accepted standard and readily available. Most users employ their personal knowledge to develop keywords for cataloguing and searching.
➢	Users would like to be able to search in a variety of ways, including: keywords, creator, location, timeframes, author and forest type, by bibliographies, institution specialists etc. Large categories should be broken down into smaller subtitles and more defined searches.
➢	Users commonly search by activity. Examples here include tree planting, thinning, burning invasive species, stream restoration, research and campground maintenance.
➢	Users search for documents by specific people.
➢	Users look for information in many formats including: reports, maps, decision records, photographs and data summaries.
➢	Users would like the ability to choose between the browse and search functions.
Available	
➢	Users would like good customer service. If the information is not available on the Portal and a user calls an Information Agent, a deadline needs to be set as to when the user can expect a reply.
➢	Users would like the Portal to be available 24x7.
Format	
➢	Users need to print, view and copy detailed maps, documents, PDF files, presentations, photographs and analytical results.
➢	Users would like to access full text documents.
➢	Users would like the ability to re-archive documents locally and some use bibliographic cataloguing systems.
➢	Users prefer the level of detail to be a white paper.
➢	Users would like a bulleted summary of page content to be provided
.➢	Users would like to be able to choose whether they want to view large graphic files.
Current Information	
➢	Users would like information to be date stamped and email updates of new or altered content should be sent if user requests it.
Thorough	
➢	Users would like hypertext links to be made available if the user requires more in-depth information on a topic.