

Collecting User Requirements in a Virtual Population: A Case Study

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The central concern in information systems is designing systems that can meet the needs of the users (Norman & Draper, 1986; Whitten & Bentley, 1997; Preece, Rogers, Sharp, Benyon, Holland, & Carey, 1994; Shneiderman, 1998). If an information system does not meet the needs of the users, the users may use the system either minimally or not at all. An extensive information gathering process takes place prior to the technical design of any system. This process has many different names. It has been called user requirements determination, information requirements determination, requirements definition, systems analysis, or requirements gathering (Preece et. al., 1994; Martin, DeHayes, Hoffer, & Perkins, 1994; Whitten & Bentley, 1997). This process determines who the users are as well as what the needs of the users are. An appropriate information system that meets the needs of the users can then be designed.

Traditionally, custom information systems have been designed for specific organizations. These organizations may have had one location or multiple locations. Alternatively, information systems may have been designed for a set of organizations with a well-defined user population. To determine a system's user requirements, the main data collection technique was a site visit. During site visits, systems analysts observe user behavior and interview managers and users (Whitten & Bentley, 1997). Sometimes, surveys are also distributed to the users (Martin et. al., 1994; Whitten & Bentley, 1997). Another technique for collecting user requirements is Joint Application Development (JAD). JAD is a technique by which all stakeholders in the system (users, managers, designers, etc.) meet in workshops to help determine the course of the system development, including defining the system requirements (Whitten & Bentley, 1997). All of these techniques rely on collecting data at physical locations. Even in organizations that are geographically distributed, there are a number of physical locations where people work that are available for information gathering to determine the system requirements.

DETERMINING USER REQUIREMENTS FOR WEB-BASED RESOURCES

In the current technological environment, many resources are designed specifically for the Web and the Internet. In creating web-based resources, the focus still needs to be on user-centered design (Lynch & Horton, 1999). The user population (or potential user population) of web resources can differ greatly (Lazar & Preece, 2000). For some web resources, including electronic commerce sites such as *Lands' End* or ama-

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zon.com, or news sites such as cnn.com, the resources are focused on the entire population of web users (Lazar & Preece, 2000). For other types of resources, such as an online community for anesthesiologists, there is a narrow focus. The resources are targeted to very specific populations (Lazar & Preece, 2000).

Many web-based resources are considered to be online communities (Lazar & Preece, 1998). Although definitions of an online community vary, a general definition of an online community is a group of people who share a similar interest, share networked resources, and communicate using a computer-mediated communication tool (Lazar & Preece, 1998). Some online communities are based on specific geographical communities, such as Cleveland, Seattle, and Blacksburg, VA (Lazar & Preece, 1998; Schuler, 1996; Cohill & Kavanaugh, 1997; Anderson & Gansneder, 1995). In these types of online communities, also called community networks, there is a well-defined physical population of users, who are available to help the system analysts determine user needs. In other online communities, the focus of the community is a special-interest topic such as religion, illnesses, academic interests, and sports (Lazar, Tsao, & Preece, 1999; Preece & Ghozati, 1998; Gaines, Chen & Shaw, 1997). This is an increasingly common situation, where web-based resources are being developed for a focused population, but there is no "physical component" to the population of users. Although there is a specific population of users, there is no city, organization, or company to which all of these people are affiliated. These users communicate continuously through computer-mediated communication tools, but may meet face-to-face infrequently or may never meet at all (Lazar, Tsao, & Preece, 1999; Lazar & Preece, 1998). Because there are no face-to-face meetings, many of the traditional techniques for gathering user requirements cannot be used.

If users or potential users are distributed around the country or even around the world, and there are no "physical" locations where these people gather, site visits are not possible. Without a site visit, techniques such as observation, interviews, and focus groups may not be possible. JAD, a structured workshop where all stakeholders meet, may also be impossible, since the users have never met face-to-face. It might be possible to use software such as *CU-SeeMe* or *NetMeeting* to communicate with the potential users, but this assumes that all stakeholders have access to these software packages, as well as adequate bandwidth to support these applications. Researchers have used the research paradigm of ethnography to learn more about user behavior in online com-

munities that are already in existence (Preece & Ghozati, 1998). However, it is hard to use ethnography to become a part of the online community and read what others post when the online community has not yet been developed.

In a situation where the traditional forms of requirements determination cannot be used due to the lack of a physical presence, how does one go about collecting the user requirements? How does one attempt to determine who the potential users of the resources are, and then access those users so that appropriate resources can be developed? The goal of our study was to learn more about the process of gathering user requirements in a virtual population. The next sections will provide a case study of collecting user requirements when there is a well-defined target population of users, but there is no physical location where site visits could take place.

CASE STUDY - THE DOWN SYNDROME ONLINE ADVOCACY GROUP (DSOAG)

Background

The parent of a child with Down syndrome, biochemist Dr. Bob Siegel founded the Down Syndrome Online Advocacy Group (DSOAG) with the goal of "bridging the gap" between parents of children with Down syndrome and the Down syndrome research community. The DSOAG focuses primarily on scientific research by legitimate, non-commercially funded organizations. It is not intended to function as a support group, or to solicit monetary donations from the public.

The freedom from geographic and scheduling constraints offered by online resources appeals to many parents of children with Down syndrome. For parents who live in rural communities, cyberspace may be one of their few means of access to information pertaining to Down syndrome and other parents who can serve as resources.

At the time that the DSOAG was founded, a variety of online resources pertaining to Down syndrome were already in existence. Two moderated weekly chat rooms were available through America Online (AOL). Several Down syndrome web sites already existed, but they tended to function more as a marketing tool or a support group. Siegel envisioned the DSOAG as an online community that would accomplish the following:

- Provide parents of Down syndrome children with access to information provided by scientists involved in Down syndrome research.
- Provide information about the process by which funding for health-related research is allocated by U.S. lawmakers.
- Provide information about channels for donat-

ing money to legitimate Down syndrome-related organizations.

Although time constraints prevented Siegel from fully implementing the DSOAG, he had constructed a prototype. We agreed to assist Dr. Siegel with the implementation of the DSOAG, which would afford us the opportunity to learn new methods of requirements determination.

Challenges of Determining User Requirements

The first task in furthering DSOAG development was to learn more about the needs of the community's potential members. For the purpose of collecting user requirements, we decided to focus on the users that were known to have used the other existing online resources for two reasons. First, these users could be identified and contacted. Secondly, these users were known to have an interest in the resources provided by the DSOAG.

There were a number of challenges in gathering the requirements from this user base. Because the potential users were geographically distributed, face-to-face meetings were not feasible. Most users would not have access to video conferencing, conference calling, and other group communication mediums, so the synergy that can be attained through focus groups or JAD sessions would not be possible. Phone interviews were impractical because of cost, time constraints, and the unavailability of potential users' phone numbers. Paper surveys were impractical because we did not have the postal addresses of potential users. We decided to start by interviewing Siegel, who introduced us to Cindy Bohon-Casten, moderator of an AOL Down Syndrome chat room.

Face-to-face Interviews

To develop a high-level understanding of the envisioned online community, our interviews with Siegel and Bohon-Casten focused on the following questions:

- How would the existence of the community benefit its potential short-term members? What would be the community's long-term goals? What could the community offer to its members?
- What are related resources (e.g., chat rooms, list servers, web sites) currently available on the Internet?
- What are the populations of the currently existing parent and research communities? What are their demographic and geographic breakdowns?
- Would user involvement be feasible in the design and testing phases of development? Are there any local face-to-face groups that could be a resource for requirements gathering or testing?

- How could members of the currently existing parent and research communities become aware of the DSOAG's existence?
- What issues and situations do the community leaders want to avoid as the community evolves?
- What are the availabilities and sources of funding?
- Who are the subject matter experts who could provide information to the community?

Interviews with Siegel clarified his vision of the DSOAG's mission and the intended use of the web site. The following specific goals were identified:

- Provide current information regarding the research of Down syndrome being conducted by the medical community.
- Promote awareness of the U.S. government's funding process for biomedical research.
- Provide a conduit for funding to research institutions that are not affiliated with pharmaceutical corporations or other commercial entities.

Siegel and Bohon-Casten strongly emphasized that the DSOAG was to function as an online resource of information. They were aware of several relevant list servers, web sites, and print journals that would be of interest to community members.

Survey of Community Members

After collecting high-level user requirements, we concluded that it was necessary to attain more specific knowledge of the needs of potential users. During the interviews, it was learned that another AOL chat room moderator was maintaining a list of chat room participants' e-mail addresses. A link on the DSOAG's prototype web site allowed users to add their names to a mailing list. From these sources, a list of approximately 180 e-mail addresses of interested parties was compiled. Due to the previously mentioned impediments to phone and mail surveys and focus groups, we decided to conduct a survey via e-mail to collect specific user requirements.

Based on our interviews with Siegel and Bohon-Casten, a survey (Appendix A) was crafted to gather the following detailed information from the 180 households represented by the e-mail list. The survey addressed the following issues, which are relevant to the design of this online community:

1. Technical considerations
 - a. Hardware (PC, Mac)
 - b. Browser (AOL, Netscape, Internet Explorer)
2. Experience with online facilities (e-mail, chat room, bulletin board):
 - a. Frequency of use.

- b. Percentage of online time spent on Down syndrome-related issues.
 - c. Advantages and disadvantages.
 - d. Online resources and features desired (check-list and open question).
3. Experience with face-to-face groups:
 - a. Names of specific groups.
 - b. Advantages and disadvantages.
 4. Community demographics:
 - a. Geographic location (city, state).
 - b. Description of geographic community (urban, rural).
 5. Open feedback of information community members wanted to share.

An e-mail message from Bohon-Casten, already familiar to many of the parties on the e-mail list, explained our purpose for creating the survey, our affiliation with the DSOAG, and the source by which we received the survey recipients' e-mail addresses. We attribute the survey's extremely high 43 percent response rate to the support of a strong community leader.

The survey, itself, was prefaced with a message that emphasizes the survey's voluntary nature, the participants' entitlement to skip questions, and the expected completion time of approximately five minutes. Most importantly, privacy concerns were addressed by assuring the recipients that we had access only to their first names and e-mail addresses, which would be kept confidential. We also stated that the individual survey responses would be kept confidential and would be used only in conjunction with our project.

USER REQUIREMENTS GATHERED

The type of hardware and the browsers by which the users viewed a web site had a significant impact on the site's design. The two most commonly used browsers, Netscape and Internet Explorer, respond to HTML tags differently. The size and resolution of the monitors being used can have a drastic impact on the site's appearance.

The following data, about the DSOAG community is illustrated in Figure 1 and was collected through the surveys. It illustrates that the DSOAG web site needed to be designed in accordance with the limitations inherent in a number of different web browsers. It would be a mistake to design a site that is maximized for use with only one browser, because that would not accurately represent the user population. It is interesting to note that 90 percent of the respondents use PCs. Although most of the respondents belonged to face-to-face support groups, they were relatively experienced with online facilities. Sixty-eight percent of the respondents had been using online facilities for one to three years.

Survey respondents reported visiting chat rooms between one and twenty times per month. The opportunity to visit with other parents of children with Down syndrome, the availability of information, and the convenience of accessibility to resources from home were commonly cited advantages of online facilities.

Privacy issues and the reliability of information greatly concerned survey respondents. When using chat rooms, respondents were displeased with the prevalence of off-topic or irrelevant conversations, the difficulty of entering conversations, the limitations of nonverbal communication, and the inability of users to search for information within the chat room.

Respondents indicated that the following web site features would be useful:

- Links to relevant web sites, libraries, and knowledge bases.
- Listservs and advice columns with questions answered by qualified experts.
- Moderated question-and-answer sessions with medical doctors and researchers.
- Summaries of current research related to Down syndrome.
- Current news items related to Down syndrome.
- Information about the funding of Down syndrome research.
- Online letters to "sign" and send to legislators.
- Information about adult clinics, residential facilities, and teen and adult vocational programs.
- Links to educational information.
- Links to relevant periodicals.
- Links to related sites, such as augmentative communication, sex education, and sensory therapies.
- Information regarding funded legal support.

Finally, respondents requested that the DSOAG web site contain information about Down syndrome relative to various ages, that the site be easy to use, and that the site include minimal graphics for quicker downloading.

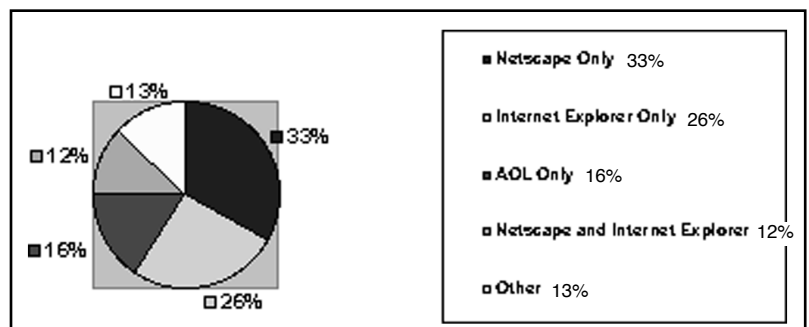


Figure 1. Browser usage

IMPLEMENTATION

Content

Based on the results of the survey, several links to research institutions, medical journals, listservs, and lawmakers were included on the DSOAG web site. The site also contains a medical explanation of Down syndrome and an overview of the process by which the U.S. government allocates research funding. The DSOAG site was designed to include access to a chat room and bulletin board. Dr. Siegel had originally implemented the site on a server hosted by TopChoice (www.topchoice.com), which offers chat room and bulletin board features.

To provide community members with current information, the site includes a link to Dogpile.com (www.dogpile.com), a web site that routinely searches the news wires for information on selected topics. The search terms "Down syndrome" and "research" are currently programmed. The link to Dogpile.com is accompanied by a message to visitors, indicating that they can return to the DSOAG site by clicking the "Back" button of their browser.

A form letter advocating the allocation of funds to Down syndrome research is currently being developed for inclusion on the DSOAG web site. Community members will have the option of e-mailing the letter directly to lawmakers or printing and mailing a hardcopy of the letter.

Researchers and clinicians are also invited to submit descriptions of their research findings and information about alternative medicines or treatments of Down syndrome. Submissions can be made via e-mail links available throughout the web site. The DSOAG web site is located at <http://www.dsoag.com>

Usability Concerns

The DSOAG web site was designed with a white background, and a turquoise blue navigational bar was added to the left side of each page. The navigational bar included the names of each page (e.g., "Research News," "Lawmakers") that could be accessed from the current page. To improve downloading times, only minimal graphics were placed on the web site.

Due to inconsistencies among browsers, the same web page may appear differently depending on the browser through which it is viewed. Code that functions well in one browser may produce unusable results in another browser. The DSOAG web site was developed to promote a consistent appearance and behavior when viewed with both Internet Explorer and Netscape Navigator, which the survey indicated were the most commonly used browsers. Introducing plug-in applications,

such as the TopChoice chat room and bulletin board, can decrease the site's consistency (Preece, 2000). However, these applications can also increase the functionality of the site, providing more resources for community members (Preece, 2000). In some cases, plug-in applications may necessitate the use of a particular browser (Benyon, Stone, & Woodroffe, 1997). Therefore, to minimize the negative effects associated with browser compatibility, the TopChoice facilities were chosen for the online community over alternatives such as CommunityWare, whose facilities were challenging to AOL members and Mac users.

User Testing

User testing was conducted to confirm that the site's features were functioning as designed, and to evaluate whether or not the web site's design presented any problems with usability. Of particular concern was the ability for users to navigate among the chat room, news groups, and existing site. Navigation within the DSOAG web site also received considerable focus.

Usability testing of the DSOAG web site was performed by a total of 12 users. The web designers observed while three of the users navigated through the web site. The other nine users performed remote usability testing on the DSOAG web site, through the web. Users were asked to work through a checklist of features. Based on feedback from the usability testing, font sizes and font styles were changed to be consistent across the entire web site. Definitions of terms and clarifications of resources were added.

Current Status

The Down Syndrome Online Advocacy Group online community was implemented in December 1998. It was advertised to potential users through the AOL chat rooms. The home page of the online community is displayed in Figure 2. A link to the DSOAG was provided on a number of Down Syndrome-related web sites. To help people find the DSOAG, information about the DSOAG was submitted to a number of search engines. Dr. Siegel is now managing and advertising the community. A number of added features, including the form letters for increased funding, are currently under development.

Lessons Learned

The following are the lessons that we learned, based on our experience in designing a web site in this unique environment. We believe that these lessons are applicable to other development projects in similar situations:

1. Introduction by a community leader (Bohon-Casten) was key to high response rate of survey.

We were able to collect full user requirements only because of the overwhelming response to our survey. A total of 78 people responded to our e-mailed survey. We believe that the high response rate was due to the support of Bohon-Casten. She was already familiar to many of the parties on the e-mail list and explained our purpose for creating the survey, our affiliation with the DSOAG, and the source by which we received the survey recipients' e-mail addresses. Because of her actions, we were not seen as "outsiders," but as people who could be trusted. Instead of being seen as "junk mail," our messages were seen as important to read. When sending out any type of survey, it is helpful to have someone who is a "trusted source" introduce the survey to the population of interest and stress the importance of the survey (Lazar, Tsao, & Preece, 1999; Bertot, McClure, & Fletcher, 1997; Fowler, 1993).

2. Project leaders are important.

Without the support and advice of Siegel and Bohon-Casten, it is questionable whether the online community could be developed. These "project leaders" or "community leaders" were able to give us a high-level understanding of the requirements for the online community. The project leaders were able to give us access to the user population and encouraged people to respond to the survey. The project leaders were the liaison between the potential users and the technical developers. The project leaders are similar to project managers or user coordinators in traditional system development (Martin, DeHayes, Hoffer, & Perkins, 1994). Furthermore, once the technical infrastructure for the online community is developed, these project leaders are going to be the ones who stay on to manage the community and encourage people to join the community (Lazar & Preece, 1999). Without these project leaders, it is possible that interest in the community will wane and the community will die (Lazar & Preece, 1999).

3. Face-to-face meetings aren't crucial.

Although face-to-face meetings with potential users would be nice, this case study showed that face-to-face meetings with the population of users are not necessary. We were able to determine the user requirements without meeting face-to-face with the users. With our 78 survey responses, we were able to incorporate the input of 78 potential users. It is doubtful that we would have been able to talk to 78 users on the phone, and due to the distributed nature of the popula-

tion of potential users, it would have been impossible to meet with 78 users face-to-face. In a situation where there are no face-to-face meetings, input from a large number of people is required. If we had received only 10 responses from our survey, we would have not been able to develop a set of good user requirements.

4. Some contact with the virtual community is necessary for user-centered design.

The survey respondents were more than happy to share their visions for the online community. With their feedback, not only were we able to develop a better set of requirements, but the respondents developed a sense of ownership of the community. In designing an online community, user input is a necessity (Preece, 2000). If a community is developed without input and feedback from users, more than likely, people will not populate the online community. When designing an online community, users must be involved in the design process. This concept has recently been named community-centered design (Preece, 2000).

SUMMARY

When building a web site or an online community, it is important to determine what the user requirements so that they will utilize the resources that are developed. Techniques for gathering user requirements exist for traditional information systems, but are only starting to appear for developing online communities. Techniques for gathering user requirements for an online community that represents a physical town, such as Blacksburg or Seattle, cannot be applied to developing online communities for geographically distributed populations. In developing a geographically distributed population, it may not be possible to have face-to-

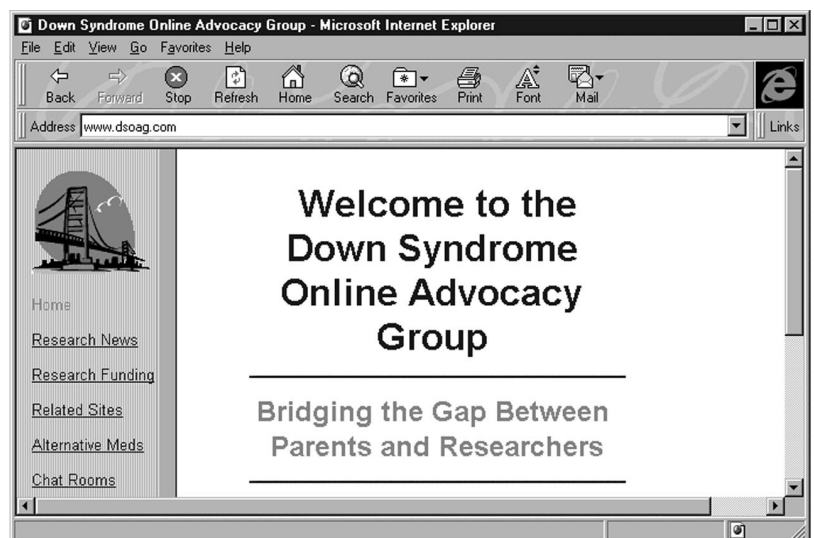


Figure 2. The Down Syndrome Online Advocacy Group (DSOAG)

face meetings with users. New techniques for gathering user requirements in these virtual populations need to be developed. This article presented a case study of using electronic mail surveys to collect user requirements. A number of techniques, such as "project leaders," were presented that can be applied to other development projects. ☺

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APPENDIX A.

Survey Sent to Gather Requirements

Dear Parent,

We are in the process of creating a web site to serve as a bridge between parents of children with Down Syndrome and the research community. We have become involved with this project through a graduate seminar class we are attending at the University of Maryland Baltimore County.

We received your e-mail address from Cindy Casten and Mary Greene, moderators of the Monday and Tuesday night AOL chat rooms concerning Down Syndrome. In order to create an effective web site that will meet your needs and attract additional participants, we have compiled the following survey. This is a completely voluntary survey, and you may stop at any time or skip any question. It would be of great help to us if you would take approximately five minutes within the next day or two to answer the following questions and return this e-mail to its sender.

A NOTE ABOUT PRIVACY:

We have received no information about you other than your e-mail addresses and your first names, and these will be kept confidential. All responses to your survey will be kept confidential. If you have any concerns about privacy, please feel free to e-mail either or both of us at the addresses listed below. The results of this survey will only be used for this project.

THANK YOU for your assistance with this project. We look forward to working with you to create a useful information source and online community.

Sincerely,

Elizabeth Hanst

Judah Buchwalter

DOWN SYNDROME WEB SITE SURVEY

1. Place an "x" next to the hardware you primarily use for Internet access:

1. PC (IBM clone)
2. Mac
3. both

2. How many years have you been using online facilities (e.g., e-mail, chat rooms, bulletin boards).

3. What city and state do you live in?

City: _____

State: _____

4. Place an "x" next to the phrase that best describes your community.

- 1. City ___
- 2. Suburbs ___
- 3. Country ___

5. On average, how many visits per month do you make to Down Syndrome-related chat rooms?

6. What are the benefits you derive from visiting the chat rooms?

7. What do you consider to be the limitations or drawbacks of the chat rooms?

8. What percentage of your time in the chat room is spent on Down Syndrome-specific issues?

9. Do you use a browser other than AOL to surf the WEB?

9a. If yes, then which browser (e.g., Internet Explorer, Netscape)?

10. Place an "x" next to the features in the following list that you would find useful on a web site: (Place 2 "xx"s if you would find them very useful).

- 1. Links to web sites concerning research of Down Syndrome ___
- 2. Summaries of current research related to Down Syndrome ___
- 3. Information about funding of Down Syndrome research ___
- 4. Links to legislators ___
- 5. Online letters that you can "sign" and send to lawmakers ___
- 6. Chat room ___

7. Instant messaging within a chat room ___

8. Bulletin board ___

9. Moderated question and answer sessions with researchers ___

10. Moderated question and answer sessions with medical doctors ___

11. ListServ with questions answered by qualified experts ___

12. Advice column with questions answered by qualified experts ___

13. A recommended list of research organizations for donations ___

14. A secure mechanism for doing online donations ___

15. News items about Down Syndrome ___

16. Links to libraries/bases of knowledge about Down Syndrome ___

17. Organized archives of previous discussions ___

11. What information or tools, other than those listed above, would you like to be able to access from a web site?

12. In what face-to-face groups related to Down Syndrome are you involved, if any?

13. What are the benefits you derive from your involvement with face-to-face groups?

14. What do you consider to be the limitations or drawbacks of face-to-face groups?

15. Is there anything else you would like us to know that will help us to design a useful web site for your usage?

Feel free to forward this survey on to anyone else that may be interested.

THANKS FOR YOUR HELP!
Judah Buchwalter and Elizabeth Hanst