Redefining the Web: Creating a Computer Network Community

Rosemary Andrada

Collaborative Software Development Laboratory
Department of Information and Computer Sciences
University of Hawaii
Honolulu, HI 96822
(808) 956-3496
rosea@uhics.ics.hawaii.edu

CSDL-TR-94-09

Last Revised: December 23, 1994

Abstract

Organizations are formed to accomplish a goal or mission, where individual members do their part and make a combined effort leading toward this goal. As the organization grows in size, the level of community inevitably deteriorates.

This research will investigate the strengths and weaknesses of a computer-based approach to improving the sense of community within one organization, the Department of Computer Science at the University of Hawaii. We will assess the current level of community by administering a questionnaire to members of the department. Next, we will introduce a World Wide Web information system for and about the department in an effort to impact the level of community that exists. We will then administer another questionnaire to assess the level of community within the department after a period of use with the information system. We will analyze the results of both questionnaires and usage statistics logged by the system.

Contents

1 Introduction **3**

2 The World Wide Web **4**
2.1 Background 4
2.2 Design of Database 4

3 The Experiment **7**
3.1 Duration 7
3.2 Method 7

4 Results **8**
4.1 Analysis of Questionnaire Responses 8
4.2 Statistics of Server Accesses 10

5 Conclusion **10**

A Pre-Test questionnaire to [faculty/students] **12**

B Post-Test questionnaire to [faculty/students] **14**

1 Introduction

This research proposal is concerned with computer-based mechanisms for improving the "sense of community" within an organization. A broad definition of the word community would be a 'unified body of individuals'. However, we view a "sense of community" more narrowly, in terms of the "collective self-awareness" of the organization. From this definition, it is possible to characterize the level of community by evaluating the following measures:

1. Can each person associate names with the faces of others in the organization?
2. Does everyone know each other personally?
3. Can people correctly identify a 'resident expert' on some subject?
4. Is everyone aware of the different projects in the organization and which persons are involved in them?

Positive answers to these questions would indicate some level of community within an organization. However, I can find at least one instance of a negative response to each question when posed to our department.

1. A fellow Master's student who had been in the program for almost two years recently told me that he still had never seen a particular faculty member.
2. I have been with the department for almost two years and I feel that I know the staff and many students personally. However, I am personally familiar with only a handful of the twenty faculty members. This is mainly due to the fact that I've worked with them closely either as their teaching assistant or on a research project.
3. Another fellow graduate student told to me that when he was asked which faculty member to see regarding a particular field of computer science, he could not give the new student an answer.
4. Upon introducing ourselves on the first day of a graduate seminar class, a student mentioned he worked in one of the department's research labs. My professor responded by suggesting that the student inform us of what goes on in that lab since nobody else knows. One would at least expect faculty members to be aware of each other's projects.

Through this research, we expect to learn the strengths and weaknesses of a computer-based approach to improving the sense of community within one organization, the Department of Computer Science at the University of Hawaii. First, we will assess the current level of community by administering a questionnaire to members of the department. Second, we will introduce an information system for and about the department

in an effort to impact the level of community that exists. Third, we will administer another questionnaire to assess the level of community within the department after three months of use with the information system. We will analyze the results of both questionnaires and usage statistics logged by the system.

2 The World Wide Web

2.1 Background

The World Wide Web (WWW or Web, for short) is a network of inter-linked information which started at CERN, a particle physics laboratory in Geneva, Switzerland. The WWW defines the components of a global information system and how they work together. These components consist of clients which are used to access information servers on the network. Clients and servers talk to each other in a WWW protocol specification called HTTP (HyperText Transfer Protocol). Organizations all over the world have set up their own information systems which they make available on this network.

A Web Server acts as the interface between a database and a client program using the WWW protocol specification. It is possible for a Web Server to interface with WAIS, GOPHER and ftp servers. However, Web Servers primarily serve information from a local database, which is structured as a directed graph of linked files. There is one main file, or Home Page, which is the entry point to information in a particular database. Since the Web uses HTTP, files generally need to be written in HyperText Markup Language (HTML) format. An HTML file consists of text, which is displayed to the reader of an HTML document, and tags, which tell the client programs, or browsers how to format that text. Documents written in HTML have the ability to link regions of text to another document. Browsers highlight these regions to indicate that they are hypertext links. Documents may contain links to other files in the database as well as other files residing on other Web sites.

Traditionally, these systems are used to provide multi-media information, such as text, graphics, video and sound. Viewing information in these different ways can do more than just inform; it can entertain, enlighten, spark interest and perhaps on a small scale, bond those that put out the information with their intended audience.

To the best of our knowledge no one has set up a Web server specifically for the purpose of improving a sense of community among its intended audience. Typically, a Web Server is set up to provide information and no effort is made to assess the impact this information has on the community of users.

2.2 Design of Database

Web sites typically 'serve up' information to anyone requesting it. Sometimes the motive is to teach its users about something. In this research, there is a specific

audience and specific information we wish to relay to them. Special care is needed when thinking of how to structure the database in order to satisfy its primary requirement: improving the sense of community in an organization.

First, the database should contain information about each person's personal interests. In an academic organization, research interests should be included while commercial organizations might want to include current projects of individuals and/or subgroups. There should also be a section detailing programs or services offered by the organization. Just as families maintain photo albums of themselves, so should an organization maintain a photoboard of all of its members. Information systems can offer useful information when compiled and organized properly by a willing maintainer. However, allowing all members involved in an organization to make their own contribution will add a unique flavor to the information presented. By increasing the visibility between the members of an organization, we also increase the sense of community within it.

It is important to include information about people's personal interests. Most organizations are not founded upon personal interests, but rather on a common goal or mission, usually professional. Making others in the same group aware of one's hobbies is an attempt at encouraging further bonding within a community. This may not increase the sense of community overall since it is unlikely that a group formed professionally will have the same hobbies. However, it is likely to form clusters of subgroups. Using a Web server, this could be implemented by having a document, linked by the main home page, dedicated to the purpose of displaying everyone's personal interests. It would list many different hobbies and those people who enjoy participating in that activity. The list of hobbies and people would start out small. At first, we expect user's interests to vary greatly such that we may get a listing of many different interests associated with only one or two people. As more people in the organization use the system, they will view others' interests, realize they share it too and will go ahead and add their names. Some level of community would be developing as people become more aware of other's interests and offer to share a bit of themselves by adding their own interests to the list.

We also want to include a page detailing projects and research interests of different individuals or groups in the organization. In larger organizations, people's attention tend to remain narrowly focussed on their own projects. We want to make people aware of other projects being conducted to shed light on how the different parts of an organization combine their efforts to attain their high-level goals. Having information about each others projects also informs us who is the resident expert on a subject area. Accessing this page demonstrates that the viewer has more than a passing interest in what goes on in the organization. People showing interest in areas of their organization outside their own work contributes to the sense of community.

Having a photoboard of all the members in an organization is comparable to having a photo album of members of an extended family. We want to create this sense of family in the organization. Members in an extended family do not generally know every other member. But keeping a record of all the names and faces helps to maintain the family bond. People in an organization don't have to know every other person, but it is helpful

to have a photoboard as a reference. It can facilitate introductions of new members and help to avoid embarrassing moments of forgetting names. While it is not necessary to go out and memorize all the names and faces or to meet each person, it is a comforting feeling to have one's picture displayed showing that this is a place where you belong. This is your family at work.

So far, much of the information suggested for inclusion could be compiled by a third party. This is generally the person that maintains the Web server. Having information provided by one source is good in that everything can be presented uniformly and tailored around a common theme, making the overall view of the system more coherent. It is limited in that it presents only one perspective of the organization. We want to further increase the sense of family by fostering an environment where its members can make their own contributions to their organization's information system. This can be easily implemented because Web Servers allow users to create their own Home Page. These documents are typically maintained by the user.

The database may be accessed anytime at a user's leisure. They are free to choose what information to access. As new items are added to the database, users need some mechanism for knowing what information has been seen before and what is new. New information differs between users. We attempt to keep the users abreast of changes in the database by having a "what's new" page. This document lists items changed in the last few days, week and month. Unfortunately, Web servers do not automatically detect changes in the structure of the database. That is, it is unable to detect changes in the way documents are linked. Aside from parsing all HTML documents in the database, the only way to discover changes in content is to check the date a document was last modified. However, this has the disadvantage that changes made to a file due to a typographical error are indistinguishable from significant changes of content. In any case, until a better mechanism for detecting modifications is developed, listing recently modified documents that may include those with insignificant changes is better than not listing them at all.

The information content must be as self-maintaining as possible. We want to create a collaborative system whose contents are generated and maintained both explicitly and implicitly through the activities of the people in an organization. Self maintenance means both that information should be added as a side-effect of people's normal work processes, and should be deleted as an outcome of garbage-collection activities. The maintainer of the Web server, or webmaster, would explicitly keep the system up to date by adding new information or modifying documents to reflect changes. The database is also implicitly maintained by users who create their own home pages. These documents are the sole responsibility of the users that create them. They can change the contents of the documents and they also decide whether or not to keep them at all. As an added measure of self-maintenance, it is easy to write a program to search the file system for user-created home pages and maintain this list on a daily basis. As more people create home pages, their document will be automatically added to the list. The expiration of these files is not a problem since a member's account and files are purged once they leave the organization. The photoboard can be maintained in the same way as the list

of home pages. Users may keep a file of their digitized picture in their directory. The program would search the file system for such files and maintain that list on a daily basis. Users can change their picture or refrain from displaying their picture without having to consult the webmaster. The elimination of the "middle-man" also expedites matters concerning how immediately the changes will take effect.

3 The Experiment

We will perform the following experiment to evaluate the impact of our system on improving the sense of community in the Department of Information and Computer Sciences at the University of Hawaii.

3.1 Duration

This study will last from January 11, 1994 to April 1, 1995. The system currently under development will be publicly released in January, 1994. This experiment will continue for a period of about three months, at which time we will evaluate the level of community within our department.

3.2 Method

We must first determine the level of community in the department prior to releasing the information system. Pre-Test questionnaires investigating the current level of community will be sent out separately to faculty/staff and students. Appendix A contains the Pre-Test questionnaire. The questionnaire will be e-mailed to all undergraduate and graduate students in ICS. However, the ICS faculty will receive it both through e-mail as well as a hardcopy in their mailbox. Anonymity is important. So all data will be kept strictly confidential. The responses may be printed out and turned in at a mailbox in the ICS lounge. However, for those that do not care to turn in a hardcopy, an e-mail reply will also be accepted. Many people do not wish to be bothered with surveys, so we will offer an incentive for completing the questionnaire. People who respond by email are automatically entered in the drawing. Those who submit their surveys by hardcopy may detach an entry form from the bottom and turn it in at the same time. The prize will be a $30 gift certificate to a local restaurant of the winner's choosing. The questionnaire will be sent out a few days before the Web server is released.

Once the server is released for public view, changes to the database will evolve in the manner dictated by its users. Users may find some information included to be ineffectual and request that it be removed. They may also find that some useful information was omitted and request that it be added to the database. An area where users have more control over the evolution of the database is in their home pages. They may include any information about themselves they wish to publicize to the

world. People generally give some personal information and include links to their favorite places to visit on the Web.

An important factor in this research is encouraging as many people as possible to use the system as well as getting them properly trained to use it effectively. Some of our target audience may not be interested in participating in this research. Nevertheless, they will be made aware of what information exists. The information will always be available should they reconsider and wish to participate. On the other hand, people may be very interested in using our system, yet do not know how to get started. Once they do get started, they may wish to do more with the system, but find they don't have enough information to continue. Members of the department will be encouraged to regularly access the database as well as make contributions to it. Sessions will be provided on a regular basis on how to use the Web client, Mosaic, for accessing database information. Additionally, we will demonstrate the different features of the server that facilitate contribution to the database.

After the experiment is over, we will send out post-test questionnaires to determine the level of community at this time. They will be conducted in the same manner as the pre-test questionnaire. Appendix B contains the post-test questionnaire.

4 Results

The objective of this study is to determine through experiments, if an appropriately designed WWW server can increase the level of community in our target organization, the Department of Information and Computer Sciences. Data will be collected in two ways. The first is through the responses we receive from the pre- and post-test questionnaires. We will also collect data directly from the Web server since it keeps a log of all requests made.

4.1 Analysis of Questionnaire Responses

We first need to know the original state of community. We would like to know what specific elements of community currently exist or are missing from the department. There are different types of questions posed. The first three questions deal with raw numbers and try to establish how many members of the department one knows. Answers to these questions will tell us how many other members of the department people are familiar with. Questions 4 through 6 are fact-finding questions. They have right and wrong answers. These answers will tell us how well people actually know each other. Question 7 informs us on how different people like to communicate with each other. Since we will be using the Web client, Mosaic, we asked question 8 to see how many people will need to be introduced to this software. The last open-ended question will give us feedback on what people think about the level of community within the department.

We are looking at two main variables here. The first is how many members of the

department are aware of the Web and actually use Web browsers to access information across the Web. We will only consider two categories which is that only a few people may be using it or many people are using it. The other variable is the level of community. It may be either low or high. Given that the Web is rather new and only gained in popularity in September 1993, a little over a year ago, we might assume that the initial number of Web users in the department to be only a few. The transitory nature of any student body in a university department allows us to assume that the level of community would initially be low. The students far outnumber the possibly more cohesive subgroup of faculty and staff. So we begin with the assumption that few people in the department are actively using the Web and the level of community is low. Since there are two variables with two possibilities each, there are four possible outcomes.

The first possibility is that the computer-based approach made no appreciable difference to the level of community. That is, there still remains only a few people using the Web and the level of community is low. It might be that not enough advertising was done to promote the use of the Web. So not too many more people even know about its existence. It may also be that people were made aware of the system but were not properly trained to use it. The desire to use it could be there but was not supplemented by the ability to employ it in a useful manner. This could be countered by providing better or more frequent training sessions. Lastly, it may be that users were aware of the system and were fully knowledgeable about how to use the system but simply did not find any utility in it. If this were the case, then one could argue that the database was not appropriately designed to promote community within the department. In any case, infrequent use of the system will not contribute to raising the level of community in the department.

The second possibility is that there is still only a few number of active users of the system, but coupled with a higher level of community. Again, the reasons behind having only a few users of the system can be attributed to those as in the first case. However, we need to discover how the level of community increased. One answer is that there was an outside factor and the computer-based approach made no impact on the department's sense of community. A very likely answer is that only a few people submitted the pre-test questionnaire and the same few turned in the post-test questionnaire. If these were the only people participating in the research, then it would make sense that the level of community in that smaller group had increased. From this result, we can say that the information system did have a direct impact on raising the sense of community in a small group. This is interesting, but we also know that this can be done even without a computer mediary.

The third possibility is that more people are using the system but the level of community is still low. This is an interesting case in that the fact the many people are using the system means they have a more unified view of the department, yet do not feel that the department has unified sufficiently. Since more people are utilizing the system, we know that advertising was not a problem. If most users were only passively using the system, i.e. did not make home pages, add their pictures or list their personal

interests, then we could say the level of community remained low due to a lack of active participation. Unfortunately, this still does not reveal to us whether the problem of raising the level of community lends itself to a computer-based solution.

The last possibility is that we find more people using the system and an increased sense of community among members of the department. This is our desired outcome. It means we have succeeded in designing an appropriate database for the purpose of increasing the level of community in a specific organization. We would have advertised well enough and trained users to effectively use our information system. The content of the database represents a minimum of what is necessary to increase visibility between department members.

Since the experiment lasts three months, we are unable to monitor the possibility that a decline in interest in the system may directly affect the sense of community.

4.2 Statistics of Server Accesses

The Web server we are using keeps a log of all incoming requests. Information about which documents are being requested, when, how often, etc. is all noted in a logfile. We use the program getstats.c written by Kevin Hughes of Enterprise Integration Technologies (EIT) to compile these statistics. Unfortunately, it does not collect data on which specific user requested what document. However, it is able to tell us what machines and from which domains these requests came from. It also logs the number of requests made by a particular machine. This is important because it tells us how much traffic is attributable to users outside the organization and to users from within the organization. The server also logs which documents were being requested, how many times it was requested and the last date it was requested. Documents garnering a low number of accesses could indicate that it is not easily found during navigation. It may also mean that the information is boring or not very useful. Documents which have not been accessed in a long while may prove to be outdated. We hope that documents accumulating the most number of accesses are those which are dynamic and created by users in the department.

5 Conclusion

Our goal was to investigate how a computer-based information system impacts the level of community in an organization. We chose to use the WWW to employ this technique. Much thought was put into the design and content of the database so as to increase a sense of community among a body of people. We decided that personal interests, current work projects and a photoboard were essential to this purpose. Having a what's new page is necessary to facilitate navigation through and inspection of newly added information. A pre-test questionnaire is to be administered to assess the original level of community. The information system is then released for public use. After the three-month experiment, a post-test questionnaire is to be given to assess the level

of community after some months of using the system. We assumed there to be an initial state of few people being aware of the Web and a low level of community. A resultant state of few users and low level of community indicates problems with getting the system started or poor design of the system. It does not however, discount that an appropriately designed system could increase the level of community. A resultant state of few users and a high level of community might indicate that computer-based systems can increase the level of community in a small body of individuals. The third possibility that there are more users but the level of community remains low could mean the database was not appropriately designed or that users are only passively utilizing the system, thereby not making a significant contribution to the level of community. The last possibility that more users are working on the system an the level of community has increased indicates that an appropriately designed database can contribute to the sense of community in an organization.

A Pre-Test questionnaire to [faculty/students]

1. Which group do you work with most?
   - Faculty
   - Staff
   - Grad student
   - Undergrad student
2. How many [ICS students/faculty members] do you feel you know personally?
   - 0-10
   - 10-20
   - 20-30
   - over 30
3. How many [ICS students/faculty members] do you think you could name, given their face?
   - 0-10
   - 10-20
   - 20-30
   - over 30
4. How many faculty, graduate students, undergraduates do you think are in the department? Please provide three numeric estimates
   - Faculty
   - Grad students
   - Undergraduates
5. What ICS research projects are you aware of? Please briefly list the projects you can think of immediately and any faculty, staff, or students you know who are involved in them. (If you know many people involved in a particular project, then simply estimate the number of involved people and provide that number.)
6. Assume you had a question about one of the following topics. For each of the topics, name one or two people in the department who you would want to "just stop by" to talk with about it, or leave it blank if you can't think of anybody.
   - Departmental rules
   - Artificial intelligence

- Software Engineering
- Computer networks
- Hypertext and multimedia
- Cognitive Science
- Computer Programming
- Human Computer Interaction
- Computer games
- Employment opportunities

7. For each of the following types of communication, indicate whether you use it Daily, Weekly, Monthly, or Never, to communicate with other people in the department.

   - Email
   - Telephone
   - Fax
   - Informal meetings (lunch, etc.)
   - Formal meetings
   - Other (please specify)

8. Do you use Mosaic, or any other Web client to access the World Wide Web?

9. (Optional) Please write any other comments you have about the sense of community in the department below.

B Post-Test questionnaire to [faculty/students]

1. Which group do you work with most?
   - Faculty
   - Staff
   - Grad student
   - Undergrad student
2. How many [ICS students/faculty members] do you feel you know personally?
   - 0-10
   - 10-20
   - 20-30
   - over 30
3. How many [ICS students/faculty members] do you think you could name, given their face?
   - 0-10
   - 10-20
   - 20-30
   - over 30
4. How many faculty, graduate students, undergraduates do you think are in the department? Please provide three numeric estimates
   - Faculty
   - Grad students
   - Undergraduates
5. What ICS research projects are you aware of? Please briefly list the projects you can think of immediately and any faculty, staff, or students you know who are involved in them. (If you know many people involved in a particular project, then simply estimate the number of involved people and provide that number.)
6. Assume you had a question about one of the following topics. For each of the topics, name one or two people in the department who you would want to "just stop by" to talk with about it, or leave it blank if you can't think of anybody.
   - Departmental rules
   - Artificial intelligence

- Software Engineering
- Computer networks
- Hypertext and multimedia
- Cognitive Science
- Computer Programming
- Human Computer Interaction
- Computer games
- Employment opportunities

7. For each of the following types of communication, indicate whether you use it Daily, Weekly, Monthly, or Never, to communicate with other people in the department.

   - Email
   - Telephone
   - Fax
   - Informal meetings (lunch, etc.)
   - Formal meetings
   - Other (please specify)

8. Do you use Mosaic or any other Web client to access the World Wide Web?

9. How often have you been accessing information from the ICS Department's Web site?

   - Rarely or never
   - A few times a month
   - A few times a week
   - Amost everyday

10. Did you create your own Home Page?

11. Did you find the information presented about the department useful? If so, in what ways? If not, why not and how would you improve it?

12. (Optional) Please write any other comments you have about the sense of community in the department below.