ABSTRACT

Users’ participation in the design process may change the overall goals of the design. Also, the context in which a prototype is tested might play a critical role in the design process. This paper presents how the contexts of use and a dialogue among users and designers shaped the DHS. The DHS is a Web-based system that allows users to attach a commentary to certain Web documents. This system was used in a pilot study and two longitudinal case studies, defining a discussion context and an annotation context. Through a text-based commenting dialogue, users contributed ideas for the design and helped repair errors. The dialogue space also supported designers’ own communication by making new ideas and prototypes explicit. The experiences from the development of DHS have given valuable insights on how to achieve lightweight participatory design of collaborative system.

Keywords

Design, participatory design, comments, threading, Web annotations, Web applications, on-line discussion

1. INTRODUCTION

The process of designing a new system, aiming to support a specific task, might be full of unexpected results. The original goals can easily swerve, and in this process the task is also redefined. Furthermore, the artifact (in this case the system) adapts itself to the requirements that the new task imposes and creates new possibilities that, in turn, may modify the task. Carroll [2] defined this process as the task-artifact cycle.

In this paper, we present our experiences from the design of a collaborative tool, the Domain Help System (DHS), which bears witness of the task-artifact cycle through iterations of user participation. We focus in particular on the evolution of the tool in relation to the contexts in which it was used, and on how the commenting feature of the system contributed to its design “from the inside”.

The study has given valuable experiences for the development of collaboration tools, integrating users into the design process in a straightforward way by supporting a dialogue between users and designers.

The approach is to create an easy to access, public, persist dialogue space embedded in the application to be developed. Users and designers share this dialogue space. The dialogue space is used to make comments on the system not only by the designers but also by the users. Furthermore, users can voluntarily and unobtrusively make comments on the system. It seems that an immediate acknowledgement that the comment will be read by the designers and that a response to those comments are given in the persistent dialogue space has stimulated users participation in the design of the system.

Also such dialogue space on the WWW is a suitable tool for supporting distributed teams of designers especially in the development of Web-based tools.

2. THE DHS PROJECT: IDEAS AND RATIONALE

The Domain Help System (DHS) project started in 1996, an originally aimed to put forward a new approach for the design of help systems. In contrast to traditional help systems that relate only to the tool in which they are embedded, this system should also support the collaborative development of the domain knowledge relevant for a task or a set of tasks.

The content of traditional help systems is static, in the sense that users cannot add to or modify their information. For example, after solving a problem, users cannot record how it was solved which might be useful as the user might later forget the steps he performed to reach the solution. Neither can the solution be shared with others, e.g. colleagues, who may need to solve the same or a similar problem in the future. One way not to forget solution is to make annotations about it, but traditional help systems typically lack this feature. To tackle these deficiencies of traditional help systems, we intended to design a help system open to users. Furthermore, the system would not only be problem-oriented, but also support the development of domain knowledge relevant for a task.

The original idea was to let users include and share new items of domain knowledge, and thus collaboratively “feed” the system.
to build up an “iceberg model of information” [8]. This meant that initially only a minimum of information would be presented, geared towards the information needs of an experienced user, and that gradually more information would be available upon request.

A requirement was also that the system should be Web-based in order to support a widespread network of users, ease of access and ease of updating.

After an initial discussion stage in the design group, the approach to the information structure was simplified. The basic units of domain knowledge were to be represented by Web documents or sections. Comments are a simple way to represent related items of information, so it was decided to use this representation in the system. If expressing an opinion, comments give users the chance to participate in a discussion, and this may be the basis for a dialogue within the system. These features were consequently chosen as basic elements of the DHS system.

The present design of the system has evolved through several studies of use in natural contexts, where users have participated in discussions about the design of the system as well as about the task at hand.

3. BASIC CHARACTERISTICS OF THE DHS SYSTEM

![Figure 1 Layout of the DHS in a Web browser](image)

A crucial concept in the DHS system is the domain, i.e., a shared information space defined by a specific context or application. Technically, a domain corresponds to a site on the WWW where a collection of Web documents is gathered and to which users can attach comments. The participants share the information contained in the documents, and jointly create an evolving set of comments on each document. In the evaluations of DHS made so far, each case study has corresponded to one domain, which has served as a common space for asynchronous collaboration within a certain user group and task.

To participate, users send their documents in electronic format to the so-called editor of the domain, who makes an HTML version of them, if needed, and includes them in the domain. Using the DHS, users can retrieve the Web documents and the comments, or add new comments, but they cannot delete or modify any of the original information stored in the domain. An instructional document (so far entitled “About this prototype”, ATP) is also included in the domain. This document describes how to use the DHS system, and gives some troubleshooting advice. In the case studies, users were told that they could make any kind of comments (error report, suggestion, complaint, etc.) on the system or their experiences of it in the commenting space of the ATP document, which would then be read by someone from the design group. In this way users were encouraged to participate in the design of the system notably while they were interacting with it.

A central concern in the design of the DHS has been how to use the screen space to allow for direct and visual access to both documents and comments. The present interface is based on the use of frames for the main components of the system: an index frame, a Web document frame, a comment frame and command frame (see figure 1). Priestley [9] has claimed that HTML frames provide an ideal way to preserve and present the relationships between modules, and communicate the hierarchy of the information domain.

When the user enters a domain in DHS, the Web browser window is divided into four scrollable frames as follows (see figure 1):

- The index frame (left frame) displays a table of contents of the domain. This list is generated automatically by the system, and includes links to all the Web documents in the domain. Also, each link is marked with how many comments the Web document has received so far. By selecting a link, the corresponding Web document and its comments are presented to the user. The DH reserves the first place in this list to the ATP document.
- The Web document frame (top-right frame) displays the currently selected document. The document in this frame is what we will call the active Web document. When the user enters the system, by default, the first active Web document is the ATP document.
- The command frame (bottom-right frame) displays buttons for making a comment, “Add Comment”. When selected, it pops up the Add comment window (ACW) (see figure 2) in which users can write their name (or nickname) and their comment. One submitted, the comment is appended to the list of previous comments on the active Web document and it is immediately visible in the command frame.
- The comment frame (middle-right frame) displays the set of comments made so far on the active Web document. If a Web document has no comments, a message saying so is presented to the user. The comments are chronologically ordered, so that the most recent comment is shown when a Web document is selected. Comments are marked with an id number (sequential) and the time of creation, and author. The command frame has simple navigation bar presented after each comment, with links to the “First-Previous-Next-Latest”, to enable easy navigation within the set of comments.

The command frame (bottom-right frame) displays a button for making a comment, “Add Comment”. When selected, it pops up the Add comment window (ACW) (see figure 2) in which users can write their name (or nickname) and their comment. One submitted, the comment is appended to the list of previous comments on the active Web document and it is immediately visible in the command frame (providing instar
acknowledgement that the feedback has been received and is now published). An email with the comment is automatically sent to the author of the active Web document (see further below), and the ACW is closed.

4. CONTEXTS IN WHICH THE DHS HAS BEEN USED: EFFECTS ON DESIGN

As part of the design process, the DHS prototype has been introduced to groups that were to solve a real collaborative task. The characteristics of the use of the tool in these contexts led to design changes that reflected the different purposes and circumstances of collaboration. In this evolution, users’ participation through the ATP dialogue was an essential element. Moreover, the features that the system acquired through its use in these different contexts were gradually changing the goals that we had at the very beginning of the project. Finally, we were not developing a help system but a more general, collaborative tool offering a variety of possibilities.

The first context of use was a pilot study made in our research department. Sixteen participants produced 77 comments that contained almost 4,000 words and a 20-minute interview was held with 13 of the participants. The study lasted for three months. The study used an early prototype of the DHS, and explored the potential of the system for the purpose of revising the department’s Web presentations. This context shaped the course of the project in the direction of a general development of a Web-based tool for sharing knowledge, and opened the way for two subsequent case studies. In these studies, data were collected both through interviews and Web-based surveys, and by storing the comments users submitted using the system.

The design group members, consisting of three people, were distributed in different locations. They met occasionally face-to-face during this process, and otherwise communicated via email. One of the designers also participated as editor in the domains.

The case studies were made in an educational setting, where students submitted one document each to the domain, and were instructed to comment on each other’s documents. Both studies were longitudinal (1997-2001), as data were collected through repeated instances of the courses, and made partly in parallel with each other. In the first study, made within a Computer Supported Collaborative Work course, students (68) had been instructed to write about an experience of collaboration with technology and discuss each other’s texts using the DHS. Comments therefore referred to information in previous comments as well as in the surrounding document. The student produced 327 comments containing almost 31,000 words. The other study was performed in the context of an academic writing course for graduate students (48). Here, comments were typically made to help participants improve the grammar and style of the document section, and thus the individual comment were seldom linked into a dialogue. The students produced 69 comments containing almost 81,000 words. This distinction between a “discussion context” and an “annotation context” for the use of the system also had effects on the subsequent design. We will call these studies the D-study and the A-study respectively.5

4.1 Permanent View of the Document to be Commented on

In the pilot study we were using the Add comment window shown in figure 2. A significant change to it was to make the window bigger and divided into two frames, where the left frame contains the active Web document (see figure 3).

Users from the case studies pointed out in the interviews that the Add comment window was intrusive when it popped up. It usually appeared on top of the main browser window and could partially cover the Web document frame. If the comment the user intended to make was related to the content of the active Web document, then the user might need to refer to it while making the comment. In fact, the teacher of the writing course in the A-study expressed how important it was to have a permanent view of the text to be commented on. Changing focus from the Add comment window to the Web document frame was found by users to be both distracting and confusing, as the Add comment window might be completely hidden by another browser window. Figure 3 shows the modified Add comment window that offers a permanent view of the document to be commented on while a comment is written.
4.2 Need to Quote from the Original Text

In many of the comments, the users made direct reference to the text of the Web document. Very often, this reference was achieved by cut-and-paste from the Web document frame\textsuperscript{6}.

It emerged that cut-and-paste of the content of the original Web document was done more frequently when the DHS was used in the annotation context. The students regularly used quotes to refer to the parts of the document that they wanted to comment on, as the comments usually concerned the style and grammar of the text. To support this action we included a button that, when activated, automatically pastes the text of the active Web document into the text area where the comment is about to be written. In this way those users who want to quote the original text are supported by the system. In example\textsuperscript{7} (taken from the A-study), Karla has copied part of the text that she is revising into her comment.

1. Comment \#1 99/10/06 16:32:18
Karla:
[\ldots] Later, you write: “The use of refineries for manufacturing mechanical pulps demand a high energy input.” Why not make this more clearly a disadvantage? [\ldots]

5. THE USE OF THE COMMENTING DIALOGUE IN THE DESIGN OF THE DHS

Experiences from the case studies show a variable use of the commenting space, as we have seen above, where the interactive aspect of the dialogue of comments is more or less pronounced. Generally, a new comment in DHS may refer either to the corresponding document or to a previous comment, or both. In addition, certain comments were made on a meta-level, so that their content would refer to the ongoing discussion itself, or to features and experiences of the DHS system. The last-mentioned comments were primarily made in the ATP section of the domains.

These dialogues evolving around the ATP document had a crucial role in the development of the DHS. This space for comments was used in very different ways, reflecting the users’ varying background and interest in system design. The following comment made by a user in the pilot study illustrates how a comment contributed to the change of the tool.

2. Comment \#6 97/04/03 15:16
Peter:
Wouldn’t “next” be more suitable than “more”? Nice tool!

After this comment, the design group had an asynchronous discussion (using the commenting feature of the DHS) about a possible change of the word “More” to “Next” in the navigation bar of the commenting space. The word “More” had been used until then, because we were still thinking in terms of the concept of an “iceberg model of information”. It was assumed that the navigation hyperlink would take the user to the next level, that is, to more general information, but in this application, it was rather taking us to the next comment on the same level. We might have arrived at this decision in one of our face-to-face meetings, but the important point is that it was a user who made us aware of the situation.

In the following sections, we describe how the presence of the commenting dialogue helped induce changes in the design of DHS. We first describe cases that actually led to the introduction of new features as suggested by users. Then, we describe a case of user input that did not lead to any change in the system, decision motivated by the overall purpose of the DHS as document-centred collaboration tool.

5.1 New Comment Awareness

One of the main problems of the first version of DHS was the lack of awareness about new comments. The only way for users to know if a comment had been added to the system was by visiting the domain. In fact, they might have to browse the entire domain to find a new comment. In many cases this search might be fruitless, if the user was expecting to find a new comment and none was found. Even worse, users could accidentally skip Web document to which indeed a new comment had been added. As a result, users might decrease the frequency of visiting the domain and perhaps forget about it. It was quite possible, therefore, that a response to a comment might take a long time, and might, hence, be less relevant when it arrived.

Example 3 (not taken from the ATP) shows such a situation in which the response to a comment was made almost 27 days later.

3. Comment \#1 97/03/18 22:18
Diana:
I think it is best to remove all the “forthcoming” references. It is much nicer to include them when they get published!

Comment \#2 97/04/14 09:46
Oliver: [author of the document]
I agree with Diana. It seems to me as if the text is an old version. Where should I put the corrected version?

To alleviate this problem, an awareness function was introduced so that an email message is sent automatically to the author(s) of the Web document when a comment is made on it. The text of the comment is attached to the email and its subject is labelled in such a way that the receiver would recognize that the message is sent by the DHS system and also to which document it belongs.

This makes the author aware of what a particular member has been doing, and especially aware of the feedback on their documents. This approach of awareness is known as share feedback [3], i.e. presenting feedback on individual user activities within the shared space (p. 112). However, in this case receiving a lot of email could be overwhelming. It has been discussed to implement the concept of coupled/uncouple awareness [5] in a future version of DHS to mitigate this problem. Generally speaking, this means to give users the possibility to decide how often they want to get an email, and select the Web-documents that they might be interested in from a perspective of awareness about new comments.

5.2 To Locate Comments in the Domain

Sending the comments via email solves only part of the awareness problem. Although the email message indicates to which document the comment has been attached in its subject field, users might prefer to read a comment in its proper context.
that is in the DHS domain itself as all the comments are presented together in one scrollable frame. For this purpose, they would often move from their email program to DHS, where there was accordingly also a need to find new comments quickly. To facilitate for users to locate new comments, it was decided to attach a comment counter tag beside the links in the index-frame to indicate how many comments had been made on the document when the current session started, for example: 

Example 3 illustrates this situation. Mark not seen by the designer might be found and communicated by the Clear & Send buttons show up slightly masked by the slightly too small, as the vertical scroll bar is beyond reach and can, however, be maximised...) It also, unfortunately, appears the ment window has resize handles, but still cannot be resized. (It

Comment # 37 97/05/05 23:41
Sussy:
I would also like to be able to resize the comment window, but maybe there is a reason for it to be fixed that I have forgotten. (Hopefully this, rather than the window itself, can be fixed?)

Comment #8 97/04/03 16:47
Charles:
Mark, your Ref #7 was a mistake of mine in the HTML tag. Now it works. Thanks.
About resize the comment window there is no way as this is an HTML parameter and is FIXED. I can modify it but not dynamically.

The fact that the users could read comments reporting an error or suggestion inside the system, and that these comments were public, seems to have encouraged them to make comments on the system. Additionally, they could see the response that designers provided to other comments. This presumably assure them that they were heard by somebody, that behind the system there was a person who took responsibility for the system and tried to remedy their problems or fulfill their requirements. A this appears to have increased the users' trust in the system, at the same time their participation in the design. This i consistent with earlier work involving the successful deployment of an integrated email function ("Email Help") into a software tool and the use of an internet discussion group that facilitate user feedback [6,7]. It was found in that study that feedback was important aspects for successful elicitation of user feedback:

• The user must know how to provide feedback
• The user must feel that the feedback has an impact (at the very least is acknowledged)
• The user must feel that providing feedback does not distract from the work at hand

In the case of the DHS the first and second of these aspects mentioned were facilitated by the fact that ordinary system functions were used for giving feedback on the design. All the users in the interviews and in the surveys reported that making a comment (from the interface point of view) was very easy. Indeed the Add Comment window of the system has a simple design and the input fields and buttons are clearly labelled. By from a practical point of view as all the comments in the system are shown to all the participants, they can see how others have made their comments. In the surveys made in the A-study participants indicated that one of the reasons why they visit others' homework was to learn how a comment was made. A one participant stated "Interesting to see what others have written and how they make comments." The DHS provides uses with the sense that their comments are received as they can see them in the system once submitted. The responses that are given to the participants also show others that the feedback has been received. Note that in example 8 the participant wrote "fixed behind this" in her comment that means that she expect someone to reply to her request.
5.4 A Case of Unchanged Design: The Problem of Threading

Threading refers to arranging the sequence of contributions to a computer-mediated discussion according to their subject, by using the "reply-to" relationship as ordering principle. In newsgroup readers, for example, users can select to read a particular thread; and the threading of discussions is emphasized by graphical means such as indentation.

In the commenting dialogue of DHS, comments are chronologically ordered, and no subject line is used when creating a new comment. In fact, a threading functionality was requested several times by users of the pilot study, as illustrated in example 9.

9. Comment #23 98/02/20 14:21
Jimmy: I think threading of comments will be important as their number grows.

Although this suggestion recurred several times, we decided that threading was not suitable for our goal. Threading requires an initiating post with a subject or topic that users consider a representative one. In our case, the subject of the discussion was given by the Web-document of the particular domain. By creating another subject, the discussion deviates from the original purpose. Another reason was that we were not expecting a large number of comments for each Web-document. Indeed, the average of the number of comments (for all the Web documents that got commented in the domain but the ATP document) were: for the pilot study 2.6, for the D-study 4.3, and for the A-study 2.6. On the other hand, the average number of comments for the ATP document, that was present in all the domains, was 16.2. Here the discussion was not centred on the document, but on various properties of the DHS system itself.

Whitaker, Terveen, Hill & Cherry [13] in a quantitative study on Usenet newsgroups discussions, found that messages on average referred to previous messages, which indicates a lower amount of interactivity than might be expected (p. 262). This could mean that for a commenting space with a moderate number of comments, say ten, threading would not be necessary. In the DHS case studies, users were using the id number to make reference to a previous comment (see above comment #8 in example 7). We also observed that if a response to a comment was adjacent to it, the author usually did not bother to make an explicit reference to it, which increased the sense of a written dialogue.

An important factor was that during a discussion, participants most of the time made an explicit and direct reference to the content of the document in question. For example, "what you wrote", "the situation you describe", "the people in the examples", "I found your text to be interesting". That means that the conversation was indeed about the active Web document, i.e., the document was the centre of the ongoing discussion. In other Web-based forum tools, such as newsgroups, the original text that started the discussion is not easily reached by users, and the discussion often gets far away from the original topic suggested in the first text (so-called topic decay in computer-mediated communication has been discussed by Herring, 1999). The tendency to lose the initial focus gets more pronounced as time passes. In the DHS, we found that the central topic of the discussion, in this case, the content of that document, was always recalled in the comments. Even if the new comment was made a long time after the very first comment was made; the new comment would, somehow, touch on the document that originated the discussion. This is presumably related to the fact that users can always view an original document while using DHS, and the discussions are not threaded. Generally, the document has a more important role in our system than the starting message of a newsgroup discussion.

Finally, in DHS users may in the same comment refer both to a previously made comment and to the Web-document itself which means that there is a dual context for the comment in dialogue. The reference to previous comment was usually made by its identification number. Example 10 shows such a situation. Paola makes reference to comment #1 and gives her opinion immediately after this, she mentions "the first example" but the time she refers to the Web-document around which the discussion is held. This would not be so easy to understand in a threading environment, which rather emphasizes the internal coherence relationships of the dialogue of messages.

10. Comment #3 98/02/19 12:42
Paola: Louis, [who wrote a previous comment] comment #1
You wrote about what you can "gain" from collaborating. You didn't mention how much does it "cost" to you! In the first example, what kind of big effort could it be to say to the one who sits next to you "feet up, the cleaner is coming"?

6. THE ATP DISCUSSION SPACE AS A TOOL FOR SYSTEM DESIGN

6.1 A virtual jotter for designers

The need to make an annotation (of an idea, for example) can occur at any moment in a design process. Members of the DH design group used the discussion space as a repository of ideas facilitated by the ubiquitous nature of the Web. The simplicity of DHS for annotations can be contrasted with dedicated notebook systems, e.g. the Virtual Notebook System (VNS) [1: 4], a hypermedia system supporting the collaborative work of scientific group. The VNS is a repository of data, hypotheses and notes, and scientific information while the DHS can be seen as a simple notebook for Web documents. In spite of its simplicity, the Web-based commenting space of DHS allows for annotations in different forms (e.g., text, pictures, sound clips) when users or designers needed to illustrate their ideas.

We observed that when an individual idea was reported in a system by one of the designers, it was, generally, communicated in a clear and explicit manner. It seems that this was done because the designer wanted the rest of the group (not only the designers but also the users) to understand the idea. If not, other would ask questions until the issue was clarified.

We believe that this space was used as a "virtual jotter" for designers because it allowed information sharing in an accessible form, and that it helped designers avoid forgetting their ideas. Most importantly, all the information gathered was in one place for the future design process. In Example 11 Joh...
jots down the idea and does not address another person in his comment.

Comment #11 98/07/14 11:53
John:
One click to resize the frames: The idea is to get a better overview of the section or of the comments, depends on the users what s/he wants

Observe that he bothers to elaborate his idea in a way different from a personal note, where a few words would have been enough as a reminder. The reason given (in personal communication with John) was because the comment was going to be read by other designers as well as the users. The public aspect of the written comments might increase understanding among designers and users. We have not yet investigated the reaction of the users to this kind of annotations, and therefore this problem merits further investigation.

6.2 A Medium for Participatory Design

Table 1: Project member versus users’ participation

<table>
<thead>
<tr>
<th></th>
<th>Design group (3 people)</th>
<th>User group (13 people)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nº  %</td>
<td>Nº  %</td>
<td>Nº %</td>
</tr>
<tr>
<td>Comments</td>
<td>33  69</td>
<td>15  31</td>
<td>48</td>
</tr>
<tr>
<td>Words produced</td>
<td>1923 63</td>
<td>1106 37</td>
<td>3029 14</td>
</tr>
<tr>
<td>Error report</td>
<td>6  43</td>
<td>8  57</td>
<td>14</td>
</tr>
<tr>
<td>Suggestion for the design</td>
<td>8  44</td>
<td>10  56</td>
<td>18</td>
</tr>
<tr>
<td>Statement/opinion</td>
<td>9  64</td>
<td>5  36</td>
<td>14</td>
</tr>
<tr>
<td>Encourage the work</td>
<td>4  67</td>
<td>2  33</td>
<td>6</td>
</tr>
<tr>
<td>Question design related</td>
<td>4  80</td>
<td>1  20</td>
<td>5</td>
</tr>
<tr>
<td>Solution/answer</td>
<td>10  83</td>
<td>2  17</td>
<td>12</td>
</tr>
</tbody>
</table>

We have collected and categorized the comments made on the ATP document in the pilot study. In addition we have counted the number of words in the comments as a measure of the intensity of communication. The results were distributed in two groups according to who made the comment: a user or someone from the design group. In this way, we attempt to assess the participation of the users in the design process of the DHS.

In total, the ATP document in our pilot study received 48 comments, containing 3029 words. One comment could be classified in several categories. The design group made 33 comments (69%) that amounted to 1923 words. In other words, 31% of the comments and 37% of the words in the comments were produced by users who were not formally involved with the development of the project.

The comments made by the users contained error reports, requirements, or reported their impression of the system (see table 1). Note that in the categories “Error reports” and “Suggestion for the design” the users’ contributions exceed the one made by the design group members. To some extent, this may be related to the face-to-face meetings that the design group had. However, we may note that users suggested 10 differer ideas for the design of the DHS and reported 8 different errors.

6.3 Supporting Communication Among Designers

In example 7 above, a request to modify the interface is part of the comment #7. The response about the possibility to perform this request is also given in comment #8 of the same example. It is important to notice that the discussion among designers in the example was carried out in a distributed-asynchronous mode. Face-to-face meetings in a working environment might often be difficult to set up. The comment presented in example 2 (about the word “More” or “Next”) was a trigger for a discussion within the design group. Each of the designers sent their opinion with regard to that comment and a decision was taken, again without a face-to-face meeting.

The commenting interface supported the use of HTML tags. By using this option in their comments, designers could present high-resolution and high-fidelity prototypes in the communication about new system functionality. In Figure 4 on such example is shown. The comment has been signed by two participants (Susanna and Mark) before that comment a discussion about the topic to which it refers was held in the commenting space. This implies that these participants had been working on it together, and that the design idea is a result of their collaboration. The most important here is that they can ask others in the team to comment on their work or draft. But being aware that others peer-work and getting feedback may improve team work productivity. Observe (in figure 4) that Susanna gave her opinion on the design alternatives presented by Susana and Mark a few hours later. This was done without face-to-face meeting.

Figure 4 A fragment of the comments that shows a prototype signed by two designers.
7. CONCLUSIONS

In this paper, we have shown how the DHS system evolved through the influence of the expanding contexts of use. The original system idea was gradually modified both by its use in new areas of collaboration, and by the ongoing dialogue in which both users and designers participated. These experiences show that the quality of user-designer communication is a crucial aspect of successful design. However, it has also emerged that there are areas where some goals for the system must be given priority in relation to apparently well-founded demands in a particular context. Users might demand features that they are familiar with and be reluctant to try a new solution. Designers should keep in mind that users might capriciously define requirements that can dwindle down the novelty of the system. As a result, the new system would be just “one more” system illustrating well-known principles. In the case of DHS, our goals gradually focused on a general and simple design, supporting communication around Web documents as a part of small or medium group collaboration. Threading would, we argue, have concentrated the discussion just on the ongoing dialogue, neglecting the original document as a natural focus.

Users' participation in the design process of the DHS was in fact very active. This might be because they sensed that their comments in the shared space were being read, and responded to. The public response from the designer might also have contributed to increasing the users' trust in the design group. Including a common dialogue space within a system that is being developed is a simple way to increase users' participation in the design process. In fact, collecting other data from users during the use of a system may be too demanding or difficult for reasons of integrity. Giving the possibility to users to report about their impression of the system in an easy, unobtrusive, voluntary way, and ensuring that what is said will be taken into account, will increase users' participation in the design process as well as promote the development of common ground among designers.

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