User-Centered Evaluation of an On-Line Modern Greek Language Course

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Abstract: In this paper, a set of user-centered evaluation methods, used to construct a richer conception of the audience of an online Modern Greek online course, are presented. First an analysis of the design methodology employed in this specific case study is provided and then examples of how valuable usability information can be extracted from different user-center evaluation methods is presented. Conclusions, related to the analysis of the information obtained through the different evaluation methods and about the usability of the course, are also provided.

Introduction

Learn Greek online

Kypros-Net, Inc. is a not-for-profit organization that provides information on-line about the island of Cyprus, including news, history, culture, etc. Its web site (http://www.kypros.org) receives about 1 million hits per week (and around 40,000 unique visitors per day). One of its services is an online course for learning Greek. The course includes 105 audio lessons with corresponding notes, a Greek-English-Greek dictionary, and a spellchecker. In addition, a section of the site's discussion board is dedicated to student questions about the course.

The Greek on-line course content evolved gradually over three years. Based initially on 105 (around 20 minutes each) digitized lessons it gradually developed into a complete Greek Language course. The web site was developed by the Kypros-net team in 1998. The site was designed to encourage student participation in its subsequent development (Participatory Design).

Design Approach

Our focus has been to design an online learning community. We believed that this online interaction and community would increase our users' motivation, commitment and satisfaction with the online course. The Participatory Design (PD) methodology blends nicely with our goal. In particular, involving users during system development is thought to lead to greater user commitment, acceptance, usage, and satisfaction with the system (Baroudi et al., 1986).

In the design phase of the on-line Greek language course, we implemented PD as a four-step process (Blomberg & Henderson, 1990, Ellis et al., 1998, Zaphiris & Zacharia, 2001), each corresponding to one of the four levels of the classical spiral software engineering development (Boehm, 1987) model (Fig. 1)

a) Building bridges with the intended users. This step opened lines of communication between intended users and the development team. Specifically this step involved the initialization of a multidisciplinary development team, identifying key groups of end users, and creating new methods of communication with users. The development team came out of the Kypros-Net Inc. (http://www.kypros.org/) group. Through their

involvement in Cyprus and Greece related projects, they had longstanding relations with the intended user community.

The intended users have been especially people of the Greek Diaspora, travelers to Cyprus and Greece and other Greek speaking areas and people who are generally interested in the Greek culture and language or languages in general. In our case bridges with the intended users were build through our years of work at providing information about Cyprus through the web pages of Kypros-Net, Inc. who primarily attracts the same user population as our intended Greek language online course.
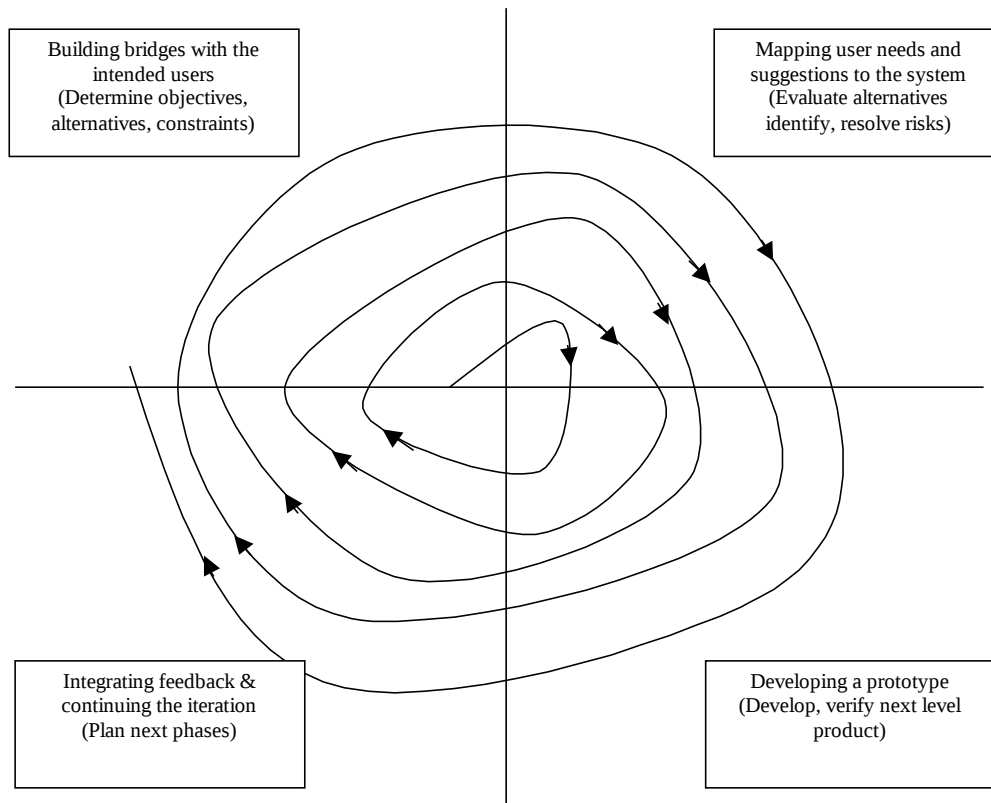
Figure 1: The participatory design methodology employed in this project. In parenthesis the corresponding levels of the classical spiral design methodology.

b) Mapping user needs and suggestions to the system. Our conceptual design model has been "to design an online effective Greek language course that can build and sustain an online learning community of students". Based on the questions and inquiries we received from our users we tried to match their needs (they wanted an easy to follow, both elementary and advanced course that they could attend at their own paste) with our conceptual design model.

c) Developing a prototype. The project consists of 105 audio files, which were originally recorded as Radio lessons in Modern Greek for English speakers back in 1960's. The lessons were retrieved from the archives of the Cyprus Broadcasting Corporation, digitized in Real Audio 5.0 format and published on-line. Although, an optional textbook accompanied the original Radio lessons, the lessons were designed as a complete standalone course. We used several tools to assist the students of the lessons, including an online English-Greek-English dictionary, a Greek spell checker and a web-based discussion board for the students of the lessons.

d) Integrating feedback and continuing the iteration. Feedback from our users and suggestions are continuously incorporated into our design through a series of additions and corrections. At some point, the users started exchanging through email written notes taken by the advanced users. This phenomenon suggested that we should provide the users with the capability to post their notes on the project's site. Users have also compiled lists of verbs and vocabulary words used in the Audio Lessons, and other grammatical notes.

Recently users have been involved in groups that design and post quizzes for their classmates. Furthermore, a user has developed (and made it available online for free) a palm-pilot version of the dictionary.

User-Centered Evaluation Methodology

Many aspects of usability can best be studied by simply asking the users. This is especially true for issues related to the users' subjective satisfaction and possible anxieties (Nielsen, 1993).

Since the course is highly dependent on user participation, the design team from the beginning has taken steps in collecting and analyzing user feedback. Evaluation of the course has been from the beginning an integral part of our Participatory Design implementation. First, a questionnaire was provided for collecting feedback about the general usability of the course. Secondly a discussion board was created where users could post their questions and comments and finally an email address was provided through which users could contact the design team.

Questionnaire and Discussion Board postings Evaluation

One hundred and eighty one students, taking the online 'Learn Greek Online' course responded to an online questionnaire assessing the overall usability of the course. The questionnaire was based on the Computer System Usability Questionnaire (CSUQ) (Lewis, 1995) and was administered through the web-based user interface evaluation with questionnaires system provided online by Gary Perlman (http://www.acm.org/~perlman/question.html). CSUQ consists of nineteen usability questions to which the respondent was to agree or disagree on a five point scale, ranging from 2 (Agree) to –2 (Disagree).

Table 1 shows the overall ratings for the online course for the individual questionnaire questions. A graphical representation of the results is provided in Figure 2. Next the responses to all questions were combined together and the average overall ratings was plotted in Figure 3.

In addition to the questionnaire, we analyzed a total of 371 postings (posted online from December 1998 to March 2000). After a first careful reading of the 371 postings five main categories were identified: (1) Technical related questions and instructions related to technical questions, (2) Content related issues, like spelling, grammar and syntax, (3) Resources and Notes related postings, (4) Miscellaneous.

Then we conducted a more elaborate study and categorization was performed looking into nine subcategories of the four main categories based on the technical actions necessary to improve on each one of the categories. Table 2 shows the frequency of postings for each subcategory.

|	Question	Rating
Q1	Overall, I am satisfied with how easy it is to use this online course.	1.40 (1.14)
Q2	It was simple to use this online course.	1.40 (1.13)
Q3	I can effectively complete my work using this online course.	1.20 (1.22)
Q4	I am able to complete my work quickly using this online course.	1.05 (1.27)
Q5	I am able to efficiently complete my work using this online course.	1.10 (1.24)
Q6	I feel comfortable using this online course.	1.49 (1.07)
Q7	It was easy to learn to use this online course.	1.37 (1.15)
Q8	I believe I became productive quickly using this online course.	1.19 (1.17)
Q9	The online course gives error messages that clearly tell me how to fix problems.	0.13 (1.60)
Q10	Whenever I make a mistake using the online course, I recover easily and quickly.	0.81 (1.29)
Q11	The information (such as help, on screen messages and other documentation) provided with this online course is clear.	0.89 (1.34)
Q12	It is easy to find the information I needed.	0.83 (1.37)
Q13	The information provided for the online course is easy to understand.	1.24 (1.07)
Q14	The information is effective in helping me complete the tasks and scenarios.	1.19 (1.06)
Q15	The organization of information on the online course screens is clear.	1.20 (1.23)
Q16	The interface of this online course is pleasant.	1.30 (1.12)
Q1	I like using the interface of this online course.	1.23 (1.17)

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Q18	This online course has all the functions and capabilities I expect it to have.	0.99 (1.30)
Q19	Overall, I am satisfied with this online course.	1.40 (1.06)

Table 1: Mean user ratings with standard deviation in parenthesis

In addition to the nineteen questions, users were also encouraged to provide feedback by listing up to three of the most positive and up to three of the most negative aspects of the online course.
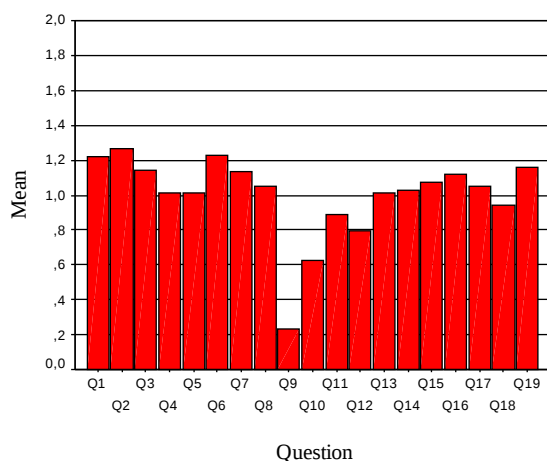
Figure 2: Plot of mean user ratings for the 19 questions
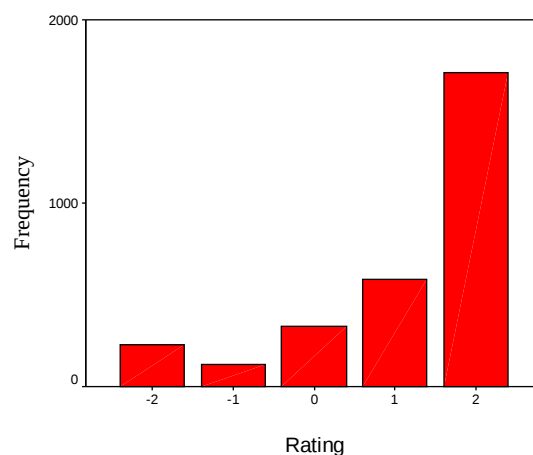
Figure 3: Overall Usability Ratings for the course

Category	Subject	N	%
Tech/Instructions	Problems with needing/installing Greek drivers and fonts	56	15.1
	Problem with/wanting to download lessons	49	13.2
	Problems with installing/using RealPlayer	40	10.8
Content	Questions about vocabulary	28	7.5
	Questions about grammar/spelling	17	4.6
	Questions about dialect	2	0.5
Resources	Questions about availability of text, CDs or including links to web sites.	37	10.0
Notes related questions	On-line notes	73	19.7
Miscellaneous	Miscellaneous	69	18.6

Table 2: Frequency of postings per subcategory of usability issues.

Analysis of Server Logs

The data described below are taken from the cumulative log file record, a 590-megabyte corpus, for a 30-month period from July 19, 1998, when the learn Greek online project was officially "launched," through December 31, 2000. The project is a unique complete online course of the modern Greek language and has been extensively promoted on the internet and by the Cyprus Broadcasting Corporation on local Cyprus radio and television.

Total number of successful hits	3,704,104
Total number of user sessions (visits)	1,256,770
Distinct Users	900,481
Average hits per day	4061

Average user sessions per day	1378
Average user session length	0.47 minutes
Average number of documents examined per user	2.55

Table 3. Access statistics for the course: July 19, 1988 to December 31, 2000.

These logs, in the extended log file format, keep track of who was visiting the site (unique internet addresses), when they came, what they requested, how long they looked at each page, where they were before they came to the site, what browser they were using, what country they were from, and more. Log files were analyzed using wusage (http://www.wusage.com). Table 3 represents the overall access statistics for the 30-month period.

Site Traffic. Traffic to the site peaked following the addition of each new item and any publicity campaign, then tapered off considerably during the late spring and early summer, probably in correspondence with the academic calendar, and then picked up and resumed a state of about 1378 user sessions per day. (User sessions are defined as a sequence of HTTP requests from a unique user, as determined by internet protocol address. Sessions are considered to have terminated if there are no requests for a 30-minute period.) During the 30-month period, there were an estimated 1,256,770 user sessions, lasting an average of 0.47 minutes with the longest lasting 174 minutes. Sessions were split roughly equally between daytime (8:00 a.m. – 6:00 p.m., user's local time) and evenings (6:00p.m. –8:00a.m., user's local time). There were 46.7% of sessions in the daytime and 53.3% in the evenings.

Requests for Site Features. With respect to features of the site that were accessed, 25.61% of the hits were caused from accesses to the Greek-English-Greek dictionary associated with the course indicating a substantial usage of this tool by the students of this course or even by visitors that are not regular users of the rest of the items of the online course, this is further supported by the fact that over 40% of users enter the site through the dictionary section. The main course page attracted 13.71% of the accesses. From the individual audio lessons, it can be observed that lesson one runs high (6.43%) whereas the rest of the lessons received accesses below 1% of the total, this shows to us that a lot of visitors to the kypros-net website show interest in investigating the course (by listening for a few minutes the first audio file) although they might not be interested in taking the course (for example they might already know enough Greek, they might be interested to know that such a course exists but they don't have time to learn Greek right now etc.)

Users' Software Profile. The server log analysis enables us to detect the software (browser and operating system) that our user population uses when accessing our site. The majority of our users uses Microsoft Internet Explorer as their browser (41.5% MSIE 5, 20.8% MSIE 4) with Netscape coming second (10% Netscape 4). In terms of operating system Windows 98 comes first with 30% of visits and Windows 95 second with 20% of visits.

Referrer Log Entries. Analysis of the referrer log data suggests that most of the traffic that did not come as a direct result of one of the links on the Kypros-Net other pages arrived at the course website from a net guide or search engine. For instance, more than 130,000 accesses came from yahoo, 13,962 from msn, 13,346 from altavista and 8,551 from google. The keywords that most frequently brought visitors to the site were "greek dictionary", "greek language" and "greek translation" again showing a high popularity for the dictionary of the course.

Discussion - Conclusions

The results of the questionnaire provide valuable suggestions to the design team of the online Modern Greek course.

The course ranks high in terms usability (Fig. 3) with the majority of the respondents rating all nineteen questions high. When combining all responses to all questions together we get an average overall rating for usability of the course of 1.53 (S.D.= 1.23) with the majority of responses (57.6% of 2974 valid data points) being the highest score of two. Only 11.9% (7.7% gave scores of –2 and 4.2% gave scores of –1) of responses were below zero.

Although the course ranks high in terms of usability the analysis does signal a need for improvement of the course. When looking at the individual questions rankings one can see that question 9 (The online course gives error messages that clearly tell me how to fix problems),question 10 (Whenever I make a mistake using the online.course, I recover easily and quickly), question 11 (The information (such as help, on screen messages and other documentation) provided with this online course is clear) are all related to help and error messages and are all ranked low (below 1.0) when compared to the other ranking questions.

This suggests that users need better feedback from the interface and there has to be better source of suggestions for solutions to errors they encountered. Relating this further to the content of the course, it can be concluded that when users for example get error messages from the real audio player (such as network congestion) they are left wondering what this implies and how and if they could correct it.

Another interesting result is the comparatively low ratings for question 12 (It is easy to find the information I needed). This might suggest a more careful re-design of the information architecture of the course with clearer indications where users can find the different material.

On the other hand users give the highest rankings to question 1 (Overall, I am satisfied with how easy it is to use this online course), question 2 (It was simple to use this online course) and question 19 (Overall, I am satisfied with this online course) showing a high overall satisfaction of users with the online course and its ease of use.

Feedback was also solicited in the form of asking the users to list the most positive and most negative aspects of the course. Looking at those results, it can be seen that students consider the course easy to learn and fun. On the other hand they point out technical problems (especially with the audio streaming) and pedagogical issues (no instructor, no tests) as the most negative aspects of the online course. The design team of the online course can use this as a valuable source of suggestions for future re-designs. For example, better ways of streaming the audio should be investigated; possibilities of including academics involved in teaching Modern Greek in the online community should be explored

Besides the insights derived from the user questionnaire, we were able to identify additional usability issues from the postings of the users on the discussion board of the course. As we can see from Table 3, the users had additional usability problems, like the lack of technical related instructions. The design team responded by adding links to external resources or actual instructions in the appropriate sections of the course.

Furthermore valuable usability conclusions (what sections are most popular, what software our users are using) can be drawn through the analysis of the server log.

Our evaluation methodology has been from the beginning designed to be in two parts. The results presented in this paper, are the results of the first stage of our user-centered evaluation. Our first stage (as can be seen on this paper) was focused primarily on content related evaluation. We focused on receiving feedback that will give us enough information to know whether our content is sufficient and of high quality. In our second user-centered evaluation stage (currently in progress) we are primarily focusing, apart from further usability evaluation, on the pedagogical strength of our course. More specifically, users have volunteered and are currently involved in groups that develop quizzes for each lesson of the course. We strongly believe that the results of those quizzes will give us enough information to judge whether our course is pedagogically successful. Furthermore we are currently administrating a new online questionnaire (consisting of 3 individual stages) to quantitatively evaluate user satisfaction and course usability. We have already collected more than 5000 completed questionnaires and we will be presenting the results in a follow up publication. Furthermore our team is currently involved in qualitatively analyzing further the interaction among students of this course, this will be done by using Social Network Analysis to further analyze the online community of our discussion board.

Future research on this specific case study can include heuristic evaluation of the course, survey and interviews with representative users, and finally a formal usability test on specific tasks with real users.

Those who wish to study traditional courses have accurate information about their audience from class listings, interviews and surveys. Creators of on-line courses have digital counterparts to these measures. In this paper, we attempted to outline some methods we used to construct a richer conception of the audience of the "Learn Greek Online" course.

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