Estudo e Proposta de Ferramentas para Comunicação e Expressão em Redes Sociais Inclusivas Online

Este exemplar corresponde à redação final da Dissertação devidamente corrigida e defendida por Elaine Cristina Saito Hayashi e aprovada pela Banca Examinadora.

Campinas, 12 de Março de 2010.

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Estudo e Proposta de Ferramentas para Comunicação e Expressão em Redes Sociais Inclusivas Online

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Resumo

Com o desafio de projetar interfaces de usuários que contribuam com a promoção de uma cultura digital entre os cidadãos brasileiros, uma Rede Social Inclusiva (RSI) está sendo desenvolvida no âmbito do Projeto *e-Cidadania*[2]. Seu intuito é o de viabilizar o acesso ao conhecimento para maior número de pessoas, independentemente da sua familiaridade com as Tecnologias de Informação e Comunicação (TIC) ou do seu grau de letramento - entre outras habilidades.

Os sistemas de apoio e as pesquisas conduzidas sobre os mesmos apresentam pouca preocupação com a questão da inclusão e acessibilidade, principalmente quando relacionados a redes sociais. Neste contexto, esta dissertação propõe um mecanismo de meta-comunicação cujo objetivo é apoiar os participantes de RSI na sua comunicação com o sistema no que diz respeito ao modelo conceitual das funcionalidades. A pesquisa foi realizada com base nos princípios do Design para Todos, utilizando-se dos artefatos da Semiótica Organizacional e de técnicas adaptadas do Design Participativo.

As contribuições do trabalho incluem: a identificação de requisitos para ferramentas de comunicação e expressão buscando atenderàs necessidades dos cidadãos brasileiros, na sua maior extensão possível; a proposta de um mecanismo de meta-comunicação para redes sociais inclusivas e uma avaliação preliminar de tal mecanismo.

[2] www.nied.unicamp.br/ecidadania

Abstract

In order to face the challenge of designing user interfaces that contribute to the promotion of a digital culture among Brazilian citizens, an Inclusive Social Network (ISN) is being conceived in the *e-Cidadania* Project[3]. It aims at making possible for people to access knowledge, regardless of their familiarity with Information and Communication Technologies (ICT) or their literacy skill – among other abilities.

The support systems and the research lead on such systems present few concerns with the question of the inclusion and accessibility, mainly when related the social nets. In this scenario, this work proposes a mechanism for meta-communication to support participants of this ISN in all communication that are related with the conceptual model of the system's functionalities. The investigation was carried out based on the principles of the Design for All, using artifacts from Organizational Semiotics and techniques that were adapted from the Participatory Design.

The work contributions include: the identification of requirements for communication and expression tools aiming at the fulfillment of Brazilian citizens' needs, in the vastest extension possible; the proposal of a meta-communication mechanism for inclusive social nets; and a preliminary evaluation of the considered mechanism.

[3] www.nied.unicamp.br/ecidadania/*e-Cidadania*-project/view?set_language=en

Tecendo a Manhã

Um galo sozinho não tece uma manhã.
ele precisará sempre de outros galos.
De um que apanhe esse grito que ele
e o lance a outro; de um outro galo
que apanhe o grito que um galo antes
e o lance a outro; e de outros galos
que com muitos outros galos se cruzem
os fios de sol de seus gritos de galo,
para que a manhã, desde uma teia tênue,
se vá tecendo, entre todos os galos.

E se encorpando em tela, entre todos,
se erguendo tenda, onde entrem todos,
se entretendo para todos, no toldo
(a manhã) que plana livre de armação.
A manhã, toldo de um tecido tão aéreo
que, tecido, se eleva por si: luz balão.

(João Cabral de Melo Neto)

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Capítulo 1

Introdução

Os processos de comunicação são inerentes às relações em comunidade e eles permitem que as atividades em grupo ocorram. De modo semelhante, as expressões afetivas fazem parte das interações humanas e estão diluídas nas conversas do dia-a-dia. Quando, porém, inseridas no mundo digital, as formas de comunicação podem não ser tão triviais, principalmente entre as pessoas que não estão familiarizadas com a tecnologia, que possuem baixo letramento, ou que possuem algum tipo de deficiência.

No cenário de ferramentas tecnológicas de comunicação e expressão, o presente trabalho tem foco nas interfaces de usuário para os mecanismos de comunicação em Redes Sociais Inclusivas (RSI). Mais especificamente, nossa atenção está na comunicação de mão dupla que ocorre a respeito das idéias subjacentes às funcionalidades do sistema de RSI. O objetivo da comunicação designer-usuário é clarificar as intenções do designer, permitindo assim uma melhor compreensão e melhor utilização, por parte dos usuários, dos recursos disponíveis no sistema. Sendo uma via de mão dupla, no outro sentido temos as comunicações que partem dos usuários, que têm suas impressões sobre o sistema para serem manifestadas e aproveitadas pelos designers para o constante aprimoramento de seus produtos. Assim, o mecanismo de meta-comunicação aqui proposto é resultado da articulação das partes interessadas no sistema, que leva em consideração um cenário metodológico em que ambos - designer e usuário – têm voz no processo de design.

Uma das motivações deste trabalho encontra-se no Desafio 4: "Acesso Participativo e Universal do Cidadão Brasileiro ao Conhecimento", proposto pela Sociedade Brasileira de Computação, como um dos Grandes Desafios de Pesquisa em Computação no Brasil para os anos de 2006 a 2016[4]. Este desafio está relacionado com maneiras de desenvolver interfaces de usuário que promovam o acesso universal, ou seja, propostas que não discriminem e que incluam o maior número possível de cidadãos.

[4] http://www.sbc.org.br/index.php?language=1&content=downloads&id=414 (último acesso em Fev. 2010)

Os sistemas de apoio e as pesquisas conduzidas sobre os mesmos apresentam pouca preocupação com a questão da inclusão e acessibilidade, principalmente quando voltados para as redes sociais. São poucos os materiais que podemos encontrar na literatura que direcionem os designers na criação de ferramentas de suporte pensadas para uma população em sua diversidade e riqueza cultural, como temos no Brasil. Da mesma forma, os recursos para capturar respostas hedônicas dos participantes são ainda modestos, a maioria focando na expressão afetiva do indivíduo em relação ao seu ambiente como um todo e não em relação às possibilidades de interação presentes nas funcionalidades propostas pelos designers da RSI.

Este trabalho esteve diretamente relacionado com o Projeto *e-Cidadania*, cujo principal resultado é o design e desenvolvimento da Rede Social Inclusiva *Vila na Rede*. As ferramentas propostas nesta pesquisa foram analisadas, desenvolvidas e avaliadas para as funcionalidades presentes no *Vila na Rede*.

O principal objetivo deste trabalho foi investigar a relação de comunicação e expressão dos elementos de interface de usuário e propor ferramentas que ofereçam suporte aos seus participantes, permitindo maior interação com o sistema e aprendizado constante de forma autônoma. Buscamos isto, levando sempre em consideração os diferentes graus de letramento (digital ou literal) e necessidades específicas destes participantes. Tais ferramentas devem ser integradas a um sistema web de rede social inclusiva, o *Vila na Rede*, desenvolvido no escopo do projeto *e-Cidadania*. Artefatos e técnicas da Semiótica Organizacional e do Design Participativo foram aplicados, em consonância ao desenvolvimento do *e-Cidadania*, mantendo em contato constante pesquisadores e usuários da comunidade alvo do Projeto.

1.1 Contribuição e organização

As principais contribuições deste trabalho são:

- Identificação dos requisitos para desenvolverem-se ferramentas de comunicação e expressão para o perfil de cidadãos brasileiros;
- Proposta de um mecanismo de meta-comunicação para redes sociais inclusivas;
- Validação do mecanismo proposto;

- Potencial serviço de extensão (oportunidade educacional para pessoas fora da academia - um dos propósitos da Universidade) promovido entre os usuários envolvidos.

Este trabalho está organizado da seguinte maneira: no Capítulo 2 são descritos os primeiros contatos com nossa comunidade alvo e suas habilidade e dificuldades com o uso de TIC são analisadas; no Capítulo 3 mostramos como a necessidade de um mecanismo de meta-comunicação foi detectada em atividades que envolveram diretamente os membros da comunidade alvo e são apresentados alguns requisitos iniciais que foram elicitados para tal mecanismo; uma vez confirmada a importância da presença de tal mecanismo, o Capítulo 4 revisa a literatura sobre meta-comunicação e outras ferramentas de suporte; em seguida, o Capítulo 5 descreve as especificações do mecanismo; e o Capítulo 6, a sua validação.

Estes capítulos incluem o texto original de artigos publicados e/ou submetidos, conforme descrito a seguir:

Capítulo 2: "Facing the digital divide in a participatory way - an exploratory study", Elaine C. S. Hayashi and M. Cecília C. Baranauskas. Proceedings of IFIP Human-Computer Interaction Symposium - HCIS 2008. Springer, Boston, pp. 143-154. DOI=http://dx.doi.org/*10.1007/978-0-387-09678-0_13.*

> Tendo em mente o desafio de desenvolver sistemas de interação voltados para a diversidade de usuários que temos no Brasil, este capítulo reporta nossa primeira aproximação com a comunidade alvo. Com o intuito de melhor compreender as habilidades dos cidadãos brasileiros e o contexto no qual estão imersos, uma prática participativa foi aplicada e analisada. Esta atividade nos mostrou como é o relacionamento que os usuários estabelecem com as TIC e como eles entendem os diferentes modelos de interação. Foi possível comparar o desempenho com o uso de diferentes formatos de mídias (apenas som, apenas texto, imagens e interação face-a-face). Dentre outras observações, pudemos constatar como a experiência anterior se reflete no comportamento destes usuários e os benefícios de se utilizar um avatar nos sistemas.

Capítulo 3: Communication and expression in social networks: Getting the “making common” from people, Elaine C. S. Hayashi and M. Cecília C. Baranauskas.

Proceedings of the 2009 Latin American Web Congress, Joint LA-WEB/CLIHC Conference, Mérida, Mexico. IEEE Computer Society 2009, pp. 131-137.

> Este capítulo descreve o processo que nos permitiu compreender a importância dos conceitos de meta-comunicação e comunicação transversal em Redes Sociais Inclusivas. Como parte deste processo, atividades que incluem usuários alvo e pesquisadores de diferentes áreas foram conduzidas. Estas atividades são descritas neste capítulo, os resultados são discutidos e deles, normas foram derivadas para comporem os primeiros requisitos de sistema.

Capítulo 4: Understanding Meta-communication in an Inclusive Scenario, Elaine C. S. Hayashi and M. Cecília C. Baranauskas. 25th ACM Symposium On Applied Computing - ACM SAC 2010. Proceedings of the 2010 ACM Symposium on Applied Computing. New York : ACM, 2010. v. 2. p. 1213 - 1218.

> Este capítulo examina a literatura sobre meta-comunicação e outros frameworks de suporte, e completa com a descrição de práticas Semio-participativas que foram realizadas dentro de um cenário inclusivo, com o objetivo final em mente de estender o conceito de sistemas de ajuda para propor um instrumento de suporte mais amplo, que permita que os seus usuários possam continuamente aprender durante o uso destes sistemas inclusivos. Os resultados desta investigação informam o design inicial de um sistema de suporte instanciado no contexto de redes sociais inclusivas online.

Capítulo 5: Specifying Meta-communication Mechanisms for *Vila na Rede* System. Elaine C. S. Hayashi and M. Cecília C. Baranauskas. University of Campinas, Institute of Computing: Technical Report IC-09-41.

> Este capítulo define as funcionalidades do mecanismo e detalha os seus principais elementos. Começando de uma descrição geral do mecanismo a ser implementado, apresenta o mecanismo de comunicação a ser desenvolvido no *Vila na Rede* - um sistema de rede social inclusiva desenvolvida no contexto do projeto *e-Cidadania*.

Capítulo 6: Meta-communication and Inclusive Scenarios: Issues and Alternatives. Elaine C. S. Hayashi and M. Cecília C. Baranauskas. To be submitted.

Uma vez definidos os elementos da interface do mecanismo de meta-comunicação, conduzimos a avaliação do protótipo de ferramenta que implementa tais mecanismos. Este capítulo apresenta a atividade participativa desenvolvida para avaliação preliminar do mecanismo e seus principais resultados, também indica o *Design Rationale* (DR), um registro das razões das decisões de design adotadas ao longo do design. O objetivo deste DR é informar designers sobre problemas que podem ser encontrados durante o design de sistemas inclusivos, e apontar algumas possíveis soluções, com seus respectivos argumentos.

Apêndice I: Ferramentas de Comunicação e Expressão em Redes Sociais Inclusivas: Design Rationale. Elaine C. S. Hayashi e M. Cecília C. Baranauskas. University of Campinas, Institute of Computing: Technical Report IC-010-06.

Este apêndice revisa as decisões de *design* que atualizaram o mecanismo de meta-comunicação, a partir da descrição apresentada no Capítulo 5.

Além das publicações mencionadas no corpo deste texto, esta pesquisa de mestrado, realizada durante o desenvolvimento do projeto *e-Cidadania*, também contribuiu no seguinte conjunto de publicações:

NERIS, V. P. A., MARTINS, M. C., PRADO, M. E. B. B., HAYASHI, E. C. S., BARANAUSKAS, M. C. C.: Design de Interfaces para Todos - Demandas da Diversidade Cultural e Social. In: SEMISH - Seminário Integrado do Software e Hardware, 2008, Belém do Pará. Anais do XXVIII Congresso da SBC, 2008. p. 76-90.

ALMEIDA, L. D. A., NERIS, V. P. A., MIRANDA, L. C., HAYASHI, E. C. S., BARANAUSKAS, M. C. C.: Designing Inclusive Social Networks: A Participatory Approach. In 13th International Conference on Human-Computer Interaction (HCII 2009), 2009, San Diego. In Proc. HCII 2009 - LNCS, 2009. v. 5621. p. 653-662 (Trabalho apresentado no HCII em San Diego).

NERIS, V. P. A., ALMEIDA, L. D. A., MIRANDA, L. C., HAYASHI, E. C. S., BARANAUSKAS, M. C. C.: Towards a Socially-constructed Meaning for Inclusive Social Network Systems. In: In: International Conference on Informatics and Semiotics in Organisations (ICISO 2009), 2009, Beijing. In Proc. ICISO 2009, 2009. p. 247-254.

HAYASHI, E. C. S. ; Neris, V. P. A. ; MARTINS, M. C. ; BARANAUSKAS, M. C. C. ; Lara S. Piccolo ; Roseli Costa . Avaliando a Qualidade Afetiva de Sistemas Computacionais Interativos no Cenário Brasileiro. In: X Simpósio Brasileiro de Fatores Humanos em Sistemas Computacionais, Porto Alegre. Usabilidade, Acessibilidade, Inteligibilidade - Workshop no IHC, 2008.

HORNUNG, H. H., HAYASHI, E. C. S., NERIS, V. P. A., ALMEIDA, L. D. A., MARTINS, M. C., BARANAUSKAS, M. C. C.: Bringing human-computer interaction to an agile process model. Technical Report IC-08-10, Institute of Computing, University of Campinas - UNICAMP, 2008.

ALMEIDA, L. D. A., NERIS, V. P. A., HAYASHI, E. C. S., HORNUNG, H. H., BARANAUSKAS, M. C. C.: An exploratory design for inclusive social networks. Technical Report IC-08-11, Institute of Computing, University of Campinas - UNICAMP, 2008.

HAYASHI, E. C. S., NERIS, V. P. A., ALMEIDA, L. D. A., MIRANDA, L. C., LOPES, C. L. R., MARTINS, M. C., BARANAUSKAS, M. C. C. Inclusive social networks: Clarifying concepts and prospecting solutions for *e-Cidadania*. Technical Report IC-08-29, Institute of Computing, University of Campinas - UNICAMP, 2008.

HAYASHI, E. C. S., NERIS, V. P. A., ALMEIDA, L. D. A., MIRANDA, L. C., MARTINS, M. C., BARANAUSKAS, M. C. C. Clarifying the dynamics of social networks: narratives from the social context of *e-Cidadania*. Technical Report IC-08-30, Institute of Computing, University of Campinas - UNICAMP, 2008.

HAYASHI, E. C. S., HORNUNG, H., BARANAUSKAS, M. C. C. Launching Vila na Rede: First results of *e-Cidadania* Project. Technical Report IC-09-14, Institute of Computing, University of Campinas - UNICAMP, 2009.

MIRANDA, L. C., ALMEIDA, L. D. A., HAYASHI, E. C. S., NERIS, V. P. A. , BARANAUSKAS, M. C. C. A participatory practice for designing inclusive social networks in the *e-Cidadania* Project. Technical Report IC-09-15, Institute of Computing, University of Campinas - UNICAMP, 2009.

HAYASHI, E. C. S., ALMEIDA, L. D. A., MELO-SOLARTE, D. S., LOPES, C. L. R., BARANAUSKAS, M. C. C, MARTINS, M. C. Prospecting requirements for online communication in social network systems. Technical Report IC-09-16, Institute of Computing, University of Campinas - UNICAMP, 2009.

HAYASHI, E. C. S., BARANAUSKAS, M. C. C. Ferramentas de Comunicação e Expressão em Redes Sociais Inclusivas Online. In: Dias, et al., *Anais do V Workshop de Teses, Dissertações e Trabalhos de Iniciação Científica em Andamento IC-UNICAMP*. Technical Report IC-09-36, Institute of Computing, University of Campinas - UNICAMP, 2009, p. 99 – 101 (Pôster apresentado durante as comemorações de 40 anos de computação na Unicamp).

Capítulo 2

Facing the digital divide in a participatory way – an exploratory study ©

2.1 Introduction

According to Drucker (1993), the main resource of our society in the future will be knowledge. Terabytes of information are digitally available and this amount grows everyday, but it is not everyone who is able to access it. The information is there and the means to spread it are also available through Information and Communication Technology (ICT). Some authors say the barriers to access knowledge do not have a technological nature, but rather social and economical ones (VARIAN, 2005), (Information, 2008); illiteracy for example is one of these barriers. In the reality of many developing countries, we have to consider both types of illiteracy, the literal and the digital illiteracy.

The Unesco's World Report (Unesco) states that ICT creates conditions for the emergence of knowledge societies and these societies are a source of development for all. But for this society to arise, it is necessary to bridge the gap and diminish digital divide. In order to achieve that we need to develop systems that can be accessed by everyone. As stated by Shneiderman (2000), universal access initiatives should address at least three main issues: user diversity (user with different skills, knowledge, age, gender, disabilities, literacy, etc), technology variety (support to a broad range of hardware, software and network access) and gaps in user knowledge (the difference between what users know and what they should know).

In a country that has continental dimension and 189 millions of inhabitants, the variety of its population could be huge. While 86% of Brazilian's adult population is considered

literate (World Bank) only 26% is actually capable of understanding a simple written text (RIBEIRO, 2003), 14% has some kind of physical disability and 79% (of the population with 10 years old or more) have never accessed the internet (IBGE).

In spite of the supremacy of some computer hardware and software, it is necessary to think of solutions that can be accessed through any platform, i.e., that can be reachable by anyone. But much more than that is the challenge of designing interface and interaction solutions to reach the diversity of the population.

The Brazilian Computer Society's (SBC) challenge #4 dares us to think of and research about "Participative and universal access to knowledge for the Brazilian citizen". This is one of the five Grand Challenges in Computer Science Research for the years 2006 - 2016 that resulted from an event in 2006 sponsored by SBC (SBC The Brazilian Computer Society).

Today there are public and private initiatives in the country to provide universal computer access, but most people do not make sense of possibilities brought by computers and internet. What kind of system could be developed that would work as a source of knowledge and would be appealing to the Brazilian's less favored population?

According to Melo and Baranauskas (2006), the accessibility recommendations are not enough to handle all the complexity that the *Design for all* demands in the scenario we have. To start facing the challenge, we decided to work directly with the user, who should have an active role in the design process. Participatory Design (PD) methods, tools and techniques have been successfully adopted (ROCHA e BARANAUSKAS, 2003), (KENSING e BLOMBERG, 2004), (MULLER, 2002) in this sense: a design with, for and by the user (LANZARA, 1983). Including the user in the design process is vital to make sure we are creating systems that make sense and that are part of the users' context of life.

At the same time, we have noticed in recent years the amazing success that sites like Orkut are having in Brazil especially with the young people. Ramachandran et al. (2007)states that it is clear that "social networks play a dominant role in influencing the adoption and the use of ICTs". That gives us a hint that online social networks may be the means we were looking for to promote the digital culture in this population.

Within this context of universal and participatory access to information, we have been conducting participatory practices with a selected group of people in Campinas – a city in São Paulo State – as part of a project of a broader scope in which the objective is to develop online social networks that are inclusive and meaningful for Brazilian citizens. In this paper, we describe preliminary findings regarding activities we started within this community to investigate possible design solutions. The goal in the activities we are going to report in this paper was to recognize and better understand the relation this group has with ICT, how they interact and make sense of it. We also investigated how they respond to the different forms of media: text, sound and images. As a result, we present here preliminary findings and first lessons learned from this work.

The paper is organized as follows: the next section gives details about the scenario and group of participants in the study, describing the practices carried out. Section 3 presents preliminary results of analysis. Section 4 discusses some lessons learned from this experience and Section 5 summarizes a conclusion.

2.2 The Participatory Study

2.2.1 Scenario and Subjects

The study we are conducting takes place at *Vila União*, a suburb area in Campinas considered class D and E in terms of socio-economical indicators. A kind of "TeleCenter" hosts the activities; it is a physical space where several community initiatives for digital inclusion associated to the federal and local governments take place; *Casa Brasil*, *Centro de Referência da Juventude (CRJ)* and *Jovem.com* are some of those programs. *Casa Brasil* is a national initiative to promote digital inclusion. It is a public space where people have free access to a TeleCenter, library and basic computer courses. The same building also houses the *Jovem.com* and *CRJ* (Youth Reference Center). Both are projects from the city of Campinas and they all have the same objective: bring digital inclusion to the community as a means of opening the doors for social inclusion (Casa Brasil).

Within that community, we formed a group of 10 to 15 people representing part of the diversity we have in our population in its cultural, social and economical aspects. We named this group *Cenário Estrela* (or *Cenário**). Inspired by the numbers from the IBGE

(Brazilian Institute of Geography and Statistic) we took percentages of the population in terms of gender, age range, literacy and income per family. We used these numbers to invite people from *Vila União* to take part of Cenário*. We counted on a partnership with the local Secretary for Citizenship from the City Hall to help us form this scenario. *Casa Brasil* is hosting the Cenário* and our team of researchers in regular practices twice a month. Figure 2.1 illustrates this place.

Fig. 2. 1 - A view of Casa Brasil

On the first day of activities, we had 10 participants from the Cenário*. This group had 3 men and 7 women. We have attempted to have a group composition reflecting the less favored in terms of access to technology. For example, for ages around 30's the percentage of participants do not reflect the proportion we have in the country, as they are the part of the population who are most likely to have access to computer and internet, either at work or at college. Because our focus is to study the ones whose relationship with technology is lower or none we have chosen to maintain less people from the 30 to 49 age range. Nonetheless the point of view of the digitally literate still exists in the group and it is important when we think of the *Design for All* (two participants are well familiar with technologies).

The population of this Cenario* is very talkative and sincere, which significantly contributes for the success of our activities. They are able to express their thoughts and desires and are always willing to contribute and participate. Just as the Brazilian reality itself, the group is very heterogeneous: some of them had never touched a computer before while others are attending college. Despite de diversity, all members get along very well in a healthy and democratic atmosphere. Also, their commitment to the activities has contributed to the quality of our achievements.

2.2.2 Method and Practices

Before meeting the people of Cenário*, the group of researchers met to discuss and design the activities. The preparation stage is an important part of the process as it makes clear what the objectives are and how they should be achieved. In this preliminary work, all artifacts that are needed are designed and constructed and tasks are reviewed and distributed among researchers. Rehearsals may also be necessary; when you put yourself in the place of the user in the activities you are able to anticipate problems and also you may realize what other props might be needed throughout the practice.

The next step after the preparation is the activity execution itself. The first time with the users required a quick individual presentation and elucidation about the project and its purposes and goals. During the activity, all interactions were video taped and all conversations were recorded using MP3 devices. This has been done in accordance with the Brazilian rules of ethics in research. All the recordings were properly edited and saved to be used in the analysis, and are now part of a rich material that is of great importance for the research.

The analysis phase consisted of examining all material in order to understand the findings and derive preliminary conclusions regarding the objectives of that stage. The activities described in this article are part of an initial stage of design when we want to get acquainted with users' relationship with ICT. This accounts for the "gaps in user knowledge", an issue mentioned before, that is one of the three challenges mentioned by Shneiderman (2000) in gaining universal usability for Web-based services. Being aware of what users know is essential for development as it allows us to understand the users' context, which is a basic requirement of user-centered design (MINOCHA, 1999).

For this initial stage of the study we considered starting with the Story Telling technique (MULLER, 2002)followed by a practice we designed to investigate the accomplishment of a common task (related to getting a second via of an id card) through different media. In the next sections we describe each activity and its preparation.

2.2.2.1 StoryTelling

The StoryTelling Workshop is a PD technique usually applied in the early stages of design in order to help the designers to identify and clarify the design problem (ROCHA e BARANAUSKAS, 2003). According to Muller (2002), stories and storytelling in participatory work can function in at least three ways: 1. understand the product or service (when told by the end-user); 2. present what a designed service will do (when told by the designers) or 3. used as triggers for conversation. In our context, this method worked not only as a conversation startup, breaking the ice on the first day with the users but also helped us understanding the users' context.

With all participants gathered in a circle, each one told the group one case of success and one case of failure in using any type of information or communication technology. Simple examples of misuse of daily appliances like cell phones and digital alarm clocks were enough to make the group recognize common difficulties with technology in general. This identification added for the cohesion of the entire group. Knowing that all have abilities and difficulties made the group fell comfortable in sharing and freely participating in the activities without fear or constrain.

Activity preparation. The StoryTelling does not require much preparatory work. No extra materials besides the chairs arranged in a circle in the room and badges for the participants are necessary. The only action proposed beforehand, was that the researchers would think of simple cases of success and failure of their own, so that they would be able to share their experiences too, especially if the users would not feel comfortable to start with their stories.

2.2.2.2 Simulating a Service in Different Media

This activity aimed to investigate how comfortable the members of Cenário* feel getting information from different types of communication channel. An imaginary situation was proposed to the group: "*Paula, a married woman, 25 years old had lost her identification*

card and she does not know what she needs to order a new one". One of the researchers played the role of Paula and she told the Cenário* about her problem. The group was supposed to help her and find out what were the necessary documents that she needed. For that, they were divided into four groups and each was taken into a different station: Station 1 (S1) an information booth simulation; Station 2 (S2) an Automated Response Unit simulation; Station 3 (S3) an iconic (graphical) computer screen simulation; and Station 4 (S4) a textual computer screen simulation. After talking to Paula at station S5 to present her with the answer, all groups got together again and shared their experiences. The stations are briefly described below.

Fig. 2. 2 - Interaction at S1 (left) and S2 (right).

S1 – Information booth simulation. Here the users interacted directly and personally with an attendant who followed a script to give the users all the information they would ask him for. This script was previously prepared and the desk had paper and pen in case they wanted to take notes.

S2 – Automated Response Unit (ARU) simulation. This station simulated an ARU: a call center service where the user interacts with a machine. ARU provides audible responses (pre-recorded sentences) to digital inquires from the user, usually by telephone.

The audible information on S2 came from a laptop computer that was kept hidden from the users behind a box. This box was built so that the audio source would be put in evidence, preventing the users from having any visual contact with the source of information.

S3 – Iconic computer screen simulation. Cardboard pieces were make believe computer screens. With these artifacts the users were able to obtain the information from images and concrete objects displayed under a structure similar to the ones found in most of the internet sites. The researcher would hand in a cardboard at a time, accordingly to the users' choice, as if they were screens that came after users' mouse click.

S4 – Textual computer screen simulation. The same cardboard pieces were prepared for S4 as for S3, only that here there were no images, but only text. All the information was written and glued into the cardboards.

Fig. 2. 3 - Images (S3) and Text (S4).

S5 – Paula´s place. This was the station where all groups went after they were done with their tasks. Paula waited here for them to return and tell her what documents she would need in order to apply for a new identification card. At the end of each report, Paula asked the users two new questions: whether the copies could be regular ones or the original documents were needed and if her husband, who had also lost his id card, would need the same documents.

*Activity Preparation***.** Before going to *Casa Brasil* for the activities, all material was thought and prepared. For S1 there was the script for the help attendant, the cardboards with information for S3 and S4, and the pre-recorded sentences for S2. The content for all stations were basically the same: the list of documents necessary for acquiring different

cards. This content is a simplification of what we found in our government Portal regarding this type of service.

Cardboards were chosen for this activity for the same reason most designers make use of paper prototyping: it is inexpensive and so familiar that users can feel more comfortable and not afraid of using (ROCHA e BARANAUSKAS, 2003), (CHAND e ANIND, 2006) them as they could be in front of a computer screen.

For S3, the cardboards were prepared as to offer as many images as possible and less written information. On the other hand, the screens simulations for S4 were text only. Both intended to deal with exactly the same information content.

Fig. 2. 4 - Results being delivered at S4

The sentences recorded for S2 were saved on a laptop computer, but they actually had a manual process of activation. One of the researchers had to control the reproduction of the audio files accordingly to the users' response. Both laptop and researcher were hidden from users' sight through a box installed between them.

2.3 Preliminary Results

2.3.1 Warming up with Story Telling

A rich material resulted from this practice. All users had something to tell us and it all helped us to understand and identify abilities and barriers that stand between users and technology.

Four out of our 10 participants had an experience to share about the use of cell phones. Even knowing that the device has more features than just making and receiving calls, most

people are limited to these functions. It is interesting to notice that cell phones are no longer restricted to the upper levels of the social-economic pyramid. According to IBGE (IBGE), 37% of our population (aged 10 years old or more) have a cell phone for personal use and most people have more than one unit, as per the National Telecommunications Agency (Anatel)`s data (ANATEL), which shows that there are more than 120 million units supplied with mobile communication services. Mobile phones are also one of the preferred means of communication for deaf people in Brazil.

Other four participants reported their story of familiarity/unfamiliarity with computers. They all seem to understand that computers and internet access are a powerful source of knowledge but it seems that the elder consider these technologies something for the younger generation. Most people of age 50 or more think they do not have the skills to perform simple tasks in DVDs, mobiles or computers.

From this activity we can say that the StoryTelling workshop was an efficient mechanism of bringing people closer in the sense of knowing they all have something in common to share. Besides being able to recognize users familiarity with ICT, we were also capable of identifying vocabulary and metaphors used by Cenário*`s population. Their culture was also put in evidence, showing us a reality that we were not aware of. For example, one of the users mentioned that her mother did not allow her picture to be displayed on a social network website because it would reveal to strangers her bank account password. The concern about money was also noticed when another participant told us of the day when she did something wrong while using her telephone and she believes that a touch of a wrong button on the telephone made her loose all her telephone credits at once.

2.3.2 A Simple Task in Different Interaction Media

In average it took the groups about ten minutes to finish their tasks. The fastest, and by the way also the most effective one, was the group who worked at S1 with the help attendant. They got all the information in 3’38’’. The group to spend the longest time interacting with his station was S2: they needed 21’06’’ to deal with the sound device. The users who went to S1 were the only ones to bring to Paula the correct list of documents, although no group was able to correctly answer Paula’s extra questions.

None of the groups took written notes of the information received; they all seemed very confident on the answer and had in memory the list of documents.

In S1, the group that interacted with a real person was able to maintain a regular conversation with the source of information. One of the members of this group mentioned to the attendant that Paula had her ID card stolen, which was immediately corrected by another participant. Paula's introductory talk was only oral.

Two of the three users on S2 left the station very confused and aware of the fact that they did not have the correct answer for Paula. The options from the audio simulation were too long for them to keep close attention. One of the participants from this group demonstrated very good memory and focusing capacities. She was able to specify details like how the picture for the new ID card should look like (front picture, recent and in plain background), and even named the documents that Paula should present in case she was single (married and single persons need different certificates)

It was interesting to note how a previous experience from a user that participated on S3 interfered in the task execution. She herself had had the same problem of losing her identification card. The difference was only that she is widow. By the time she experienced this situation though, she had trouble finding one of the necessary documents, which was her jobholder card[5]. One of the first screens presented to the users has a menu with three options. They are pictures of three different documents and the users were supposed to choose the one corresponding to the doc they had lost. She (with her group colleagues) promptly pointed to the jobholder card instead of the ID card and a sequence of different screens followed. They only noticed the misjudgment when the list of required documents appeared with the lost ID card on it. The result that the group presented to Paula was not correct, and they even mentioned a document that does not exist: a single's certificate (meaning the person never got married. Actually she meant birth certificate, which does exist).

The text-only material from S4 worked smoothly and they were able to easily identify the right path through the screens. One of the participants was very attentive and read

[5]In Brazil, most employees have a document that looks like a passport, where all previous employers register the information about the job held by that person during the period that he or she worked for them.

everything thoroughly. They did not take any notes though, and at the end they provided Paula with incomplete information.

2.3.3 Discussion and Lessons Learned

2.3.3.1 Users and their previous experiences

In different moments we could observe how users' prior experience can inadequately influence tasks performance.

Each life experience is unique and when we talk about a country with continental proportions like Brazil, we can count a variety of about 189 million different backgrounds. We can not prevent users from bringing their previous knowledge to the task, quite the contrary, but we must think of ways to make it in their benefit. Making the system simple in structure (NORMAN, 1990), minimizing distraction and interruptions is not enough.

2.3.3.2 Real life metaphor

The team to present the best result participated on a station where a real person informed the procedures to request a new ID card. In that situation, users' memory and attention were stimulated by visual aids (the attendant's complexion), audio (attendant's voice) and synesthetic (attendant's body expression and movement). That suggests us that redundant or complementary information are of great value when aiming for an interaction that resembles more like a human-human communication instead of a human-computer one (REEVES, LAI, *et al.*, 2004). As designers we must be careful though, not to overlap too much multimedia information as it could lead to a contrary effect (REEVES, LAI, *et al.*, 2004), (LEAHY, CHANDLER e SWELLER, 2003); it could even cause problems in memorization or learning (JAMET e LE BOHEC, 2007).

One metaphorical embodiment of all this multimodal complexity could be that of an avatar. This idea came up from a conversation with a user who stated that the system should be like a "Geraldo online" (in reference to the name of the person who played the role of the attendant on S1). Indeed, this metaphor was taken in a prototype for a subsequent activity. The avatar would represent an attendant that gives all necessary information. According to Marcus (MARCUS, 1998), the use of metaphors in interfaces can offer numerous advantages: the familiarity will require less training from users; it can add appeal; it may

increase ease of learning; it can assist to a more direct communication; and cultural associations of user communities could be made. Still needs further investigation the implications of the anthropomorphic nature of the avatar for this population.

2.3.3.3 Multimodal interaction

The ARU simulation did not have a good acceptance in our experiment, but the use of auditory menus could help not only the visual impaired users but also the illiterate. Experiments on cell phones showed that such a menu is feasible (EIRIKSDOTTIR, NEES, et al., 2006) and another study performed with blind children evidenced that sound at the interface can enhance memory and learning (SÁNCHEZ e FLORES, 2004).

Graphic representations help users with subnormal vision, the illiterates, or even the hearing-impaired users. But alone, the images may not make sense or could be misleading, as we saw on S3, when sometimes more text was needed in order to complete the information that the picture provided.

Images and sounds are very helpful to add meaning to the context. They provide users with more resources for them to build they own reading strategies. This greatly facilitates understanding, but alone (i.e. only images or only sound) they are very less powerful.

2.3.3.4 The common ground

As heterogeneous as they can be, a group of users will always have something they share. It may be a point where they all agree or basic needs they all want to be fulfilled. There can be many different backgrounds that lead to different ways of thinking, but even so we can find more invariants than we could imagine. By focusing in these invariables we can move towards the Design for All. In the experiments we have conducted so far we saw that this recognition of the common ground is more easily noticed when we work directly with the user, in a participatory way.

2.3.3.5 Digital divides

From the StoryTelling activity we learned that even though they may not use ICT in its full capacity, the Cenário* is aware of the ICT' existence and its utility. Their concern relies mostly on the fear of loss, especially that of money. We perceived that during the StoryTelling activity, when they reported cases of losing credits due to misuse of the device

or even a mystical relationship between having a picture shown on a web page and the bank account password being broadcasted. So, besides all initiatives for making technology available to the whole population, it is necessary to think of systems that would be so relevant that the contribution brought by its use would be greater than their fears or beliefs. Participatory practices contribute, may be in a small proportion, to the process of eliminating some of the myths by having the user actually use and see how the technology works and how they can benefit from it.

2.5 Conclusion

At the same time that ICT creates conditions for the emergence of knowledge societies, it can be a source of digital divide. In a developing country that has continental dimension and millions of inhabitants, the variety of its population is huge. The emergence of a knowledge society as suggested by UNESCO demands development for all. In this paper we address some issues regarding the challenges of making systems that can be accessed by everyone in these societies.

We presented how we are facing the challenge by describing the participatory approach we are using, illustrating it with the first practices in the Cenário*, with a group of users formed as to represent part of the diversity we have in the Brazilian's population, with its vast social, cultural and economical differences.

These activities were part of a project that aims at the development of inclusive social networks that make sense for people as a way of promoting their own life conditions by interacting in the digital world. The paper discusses the preliminary results and lessons learned from the activities designed for this study. The next steps include a more in deep study of the vocabulary mostly used by our target public and a test on the acceptance of some ideas taken from this present study, like the use of real life metaphors (avatars and voices) in informational web sites.

Capítulo 3

Communication and Expression in Social Networks: getting the "making common" from people ©

3.1 Introduction

e-Cidadania is a research project that connects researchers from different fields of knowledge (computer science, anthropology, arts, education, medialogy) working towards one common objective: making a socially aware design (BARANAUSKAS, 2009). It is rooted in Brazil, a country of continental dimensions, characterized by its vast cultural diversity and where social and economic inequalities exclude part of the population from the benefits and opportunities brought by Information and Communication Technologies (ICT), making the disparities among levels of society even bigger. In this scenario, *e-Cidadania*'s goal is to foster a digital culture by developing solutions of Societal Interfaces (BARANAUSKAS, HORNUNG e MARTINS, 2008), that is, interaction design solutions that are socially responsible and engaged with the purpose of building a fairer place for its citizens to live.

One of the main resulting contributions of the *e-Cidadania* project is *Vila na Rede*, an Inclusive Social Network (HAYASHI, NERIS, *et al.*, 2008), (NERIS, ALMEIDA, *et al.*, 2009) that is being developed with and by the users of a Brazilian community that is rich for its many interconnections and social and environmental engagements. *Vila na Rede* is intended to be a social network system that provides users with a welcoming environment

in which they feel comfortable and can identify themselves with; a system that makes sense to the users. Being part of the users' world, the system is expected to be frequently used and thus contribute to the creation of digital habits.

Profiting from this rich research context, this work investigates communication and expression in social networks, focusing on technological tools that users can make use of in order to "make common" their thoughts, feelings, worries, etc during the use of the system.

The concept of community, as pointed out in Tardini and Cantoni (TARDINI e CANTONI, 2005), is intrinsically related to the concept of communication, which can be seen already in the words, as they have the same root: *common* (community: from *communis*, "common, public, general, shared by all or many"; and communication: from *communicare*, "to impart, share", "to make common"[6]).

Communication can be understood as the factor that integrates human societies (MATTELART e MATTELART, 1999) and is defined by Rogers (ROGERS, 1976) as "a process in which the participants create and share information to reach a common comprehension". As it would be expected, the definitions for Inclusive Social Networks (ISN), reported in (HAYASHI, NERIS, *et al.*, 2008), (NERIS, ALMEIDA, *et al.*, 2009), intersect the concepts of communication and of community. ISN, as understood by its users, are what connects the interests that people/communities have in common, offering no barrier to their participation and keeping in mind that there are rules for participating/acting. It is also seen as the place where communities and systems integrate, forming a single mass of communication.

In order to understand how words (and other signs used to code and convey meaning) are manifested and articulated in groups, activities involving representatives of a community in Brazil was planned. From these experiments, we have been able to collect data needed to identify patterns (to extract the norms that are active in the community) and other system requirements for the development of communication mechanisms that make sense to its users. This paper describes this process and it is organized as follows: section 2 presents the theoretical and methodological references; section 3 describes the application of the

[6] From the Online Etymoly Dictionary http://www.etymonline.com

techniques and their dynamics; section 4 presents the results of the activities; section 5 discusses the results and lessons learned; and section 6 concludes.

3.2 Background: a semio-participatory approach to design

Starting from the definitions of Participatory Design (PD) and Organizational Semiotics (OS), in this section we describe how both were combined in Semio-Participatory Workshops to conjoin knowledge and efforts in the investigations conducted by *e-Cidadania*'s researchers.

In PD, end users are actively involved in the process of design since the earlier stages of the system lifecycle. They participate in decision-making, construction and evaluation processes. This approach started in the early 70's and its techniques include role playing, games, storytelling, and a variety of other activities that bring users and developers together. They are supposed to promote a more democratic result and improve efficiency, expertise and quality of the software designed (MULLER, 1997), respecting the users and considering their previous knowledge and specificities.

Looking at the history of PD (BøDKER, GRøNBÆK e KYNG, 1995) we can observe that the techniques were meant to be applied in work environments, where users usually have similar goals and abilities. For this project, we are considering the entire Brazilian population as audience, a scope that carries with it a wide variety of backgrounds and consequently many challenges. For this reason, adjustments are needed in revisiting the PD

Fig. 3. 1 - Moments of two workshops: (a) the application of the PACFILMO and (b) the simulation of Online Conversations

Tab 3. 1 - Card categories and related questions and ideas.

Question	Category	Related concepts and ideas
Who	Person	Subjects of the action and their roles
Shares	Action	Exchange, access, offer, advertise, buy
What	Things	Idea, information, knowledge, culture; products, services, benefits
With whom	Person	Subjects of the action and their roles
Where	Location	Places
How	Interaction	Interacting, cooperating, collaborating, learning, participating
When	Frequency	How often
Using what	Means	Tools
Why	Objective	Reason, motive, objective

techniques for this scenario.

Inspired by previous results of activities that combine PD and OS artifacts (BONACIN, 2004), (BONACIN e BARANAUSKAS, 2003), researchers from *e-Cidadania* are working with representatives of the population in Semio-Participatory Workshops.

Usually, informational system analysis focuses on data flows and data manipulation, disregarding the social qualities of information, which are the basis of organized activities (STAMPER, 2003). For the design to meet the true organizational needs, it is necessary to understand the system of social norms that determines these information needs. In this sense, artifacts from OS help us to explore the many different factors related to this issue, providing a better understanding of meanings and intentions underlying the activities.

Stamper's social norms (GAZENDAM e LIU, 2004) differ from the more general notion of norms, in which norms are universally valid and accepted in different societies, meaning standard values to be followed. Here, norms refer to the socially constructed and rather informal rules about the behavior of a certain community, valid for a finite period of time. Once these social norms are understood, it is possible to predict behavior and represent them.

To accomplish that, Stamper proposed the Norm Analysis Methods – NAM (SALTER e LIU, 2002), (STAMPER, ALTHAUS e BACKHOUSE, 1988), as part of the MEASUR (Methods for Eliciting Analyzing and Specifying User's Requirements). NAM allows social norms to be described in a format that can be used in the development of information systems (LIU, 2000), as each norm is associated with a pattern of actions (tasks) to be performed in the system. This format, proposed by Liu, consists of:

<Norm>::= whenever <condition> if <state> then <agent> is <D> to do <Action>.

Where <D> is a deontic operator that specifies, for example, if the action is mandatory, permitted or prohibited. NAM usually follows SAM (Semantic Analysis Method) (GAZENDAM e LIU, 2004), as the later originates a semantic model that maps the relationship of possible actions – or patterns of behavior – with its agents, generating affordances (GIBSON, 1986) to which norms can relate.

The OS methods combined to PD practices composes the Semio-Participatory Workshops adopted by *e-Cidadania* to construct its systems and methods to promote a culture mediated by computational technology. From the results of these workshops, a rich set of data was collected that supported the study of communication and expression in online social networks, as discussed in the next sections.

3.3 PACFILMO and simulation of online conversations

Since the beginning of project *e-Cidadania*, Semio-Participatory Workshops were conducted within the target community with the objective of understanding and eliciting requirements for system design and development. For the first encounter, activities were planned in order to clarify the issue to all involved participants, and also to make it evident who the involved parties were. This was achieved following PAM's artifacts (PAM: Problem Articulation Method, also part of the MEASUR Methods). The results from that first workshop - described in detail in (HAYASHI, NERIS, *et al.*, 2008) - served as a basis

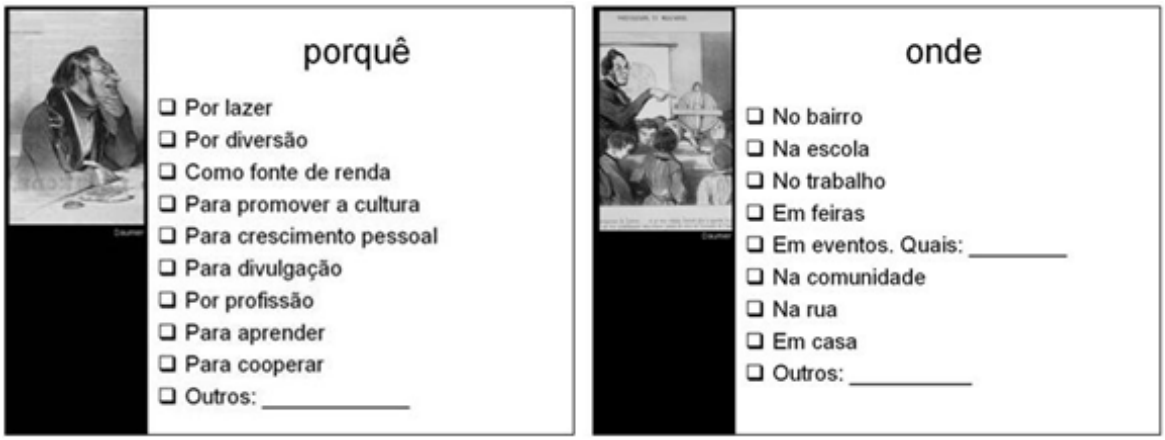

Fig. 3. 2 - The "Why" and "where" cards from PACFILMO. Translation: "Why: for leisure, for fun, as a source of income, to promote culture, for personal growth, to advertise, by profession, to learn, to cooperate, else:…" and "Where: in the neighbourhood, at schoo l, at work, in fairs, in events (which:…), in the community, in the streets, at home, else:…"

for the activities that followed.

In this section we describe two activities that took place in those workshops: the PACFILMO – derived from PASTEL technique (MULLER, 2002), a card like game from Participatory Design (MULLER, 2002); and the dynamics of "Online Conversations", an activity proposed to simulate online dialogs. All activities involved end users with different abilities and backgrounds (ranging from computer experienced to first timers) and researchers from diverse fields. In average, 30 people participated in each workshop and their ages varied from 20 to 60 years old. More information on the profile of users can be found in (HAYASHI, HORNUNG e BARANAUSKAS, 2009).

3.3.1 PACFILMO

For this PD activity, we adapted the PictureCARD technique from Muller (MULLER, 2002), in which cards representing objects and events from the users' world are used. Just like in the original technique, participants receive a set of colored cards. They are asked to arrange these cards in a sequence to help them organize their ideas to tell stories that explain the dynamics of their daily activities and their habits. In the PictureCARD, the cards are grouped into six major categories: Person, Action, Season, Tool, Event and Location (PASTEL). In order to broaden the scope of information to be presented in the narratives, we added new categories, transforming PASTEL into PACFILMO: People, Actions, Things ("Coisas" in Brazilian Portuguese), Frequency, Interaction, Location, Means and Objective. These categories were inspired in some of the concepts resulted from the Semantic Analysis that took place during and after the first workshop (HAYASHI, NERIS, *et al.*, 2008). The objective of these different categories of cards is to direct the narratives to answer the question: "Who shares what with whom, when, how, where, using what and why?". Table 3.1 relates each part of this question to the cards of PACFILMO and the concept or idea intended to be elicited.

In PASTEL, each category is divided in subclasses, while PACFILMO has no subdivisions. This is because we believe that the main information needed to compose the narratives is already represented in the existing categories. These narratives consist in sources from which it is possible to identify norms that rule social interactions and communications that take place in a community.

Each card has a picture representing its category and a list of options from which the user can select those that apply, or get inspiration to write their own words or sentences. Examples of two cards are shown in Figure 3.2 and Figure 3.1(a) illustrates participants using the cards during a workshop.

As a result of this practice, 21 narratives were produced, which are further discussed, together with other results, in section 4.

3.3.2 Simulating Online Conversations

During another Semio-Participatory workshop, an activity was conducted in order to elicit how communication processes take place in the community. With the objective of simulating real time dialogs in a low-cost recordable format, post-its were used to convey the messages that were placed on a poster that represented windows of the online system being developed.

Each participant received a different color of post-it that was used - in the researchers' point of view – in a similar way as a window from Instant Messaging software, where users write their messages. The only rule in the activity was that no oral conversation should take place, but nothing was mentioned about gesture, drawing or using other different signs in the post-its.

To start, the whole group – composed of end users, community leaders and researchers from different fields – were guided in a discussion focusing on real world communication.

Fig. 3. 3 - Poster after the completion of the simulation activity.

The questions that composed the script of the discussion were previously prepared and they were based on design decisions that should be taken for the creation of the communication tool to be used in the *Vila na Rede* Inclusive Social Network. To start the discussion, a pertinent role play theme and scenario was proposed: the interactions during a handcrafts fair. The questions that guided this discussion covered different aspects of these real life conversations and the responses were later compared with their actual behavior during the activity of simulation.

For the simulation of the online conversations, the group was divided into three smaller groups to facilitate the arrangement of people in front of the poster. At the end, the entire group got back together and in this opportunity they were requested to express their opinions on the activity. Figure 3.1(b) illustrates the activity's dynamics and Figure 3.3, the resulting poster.

3.4 Results

From the two practices described in section 3, a rich research material was collected and served different focus of interest of the researchers. In this section, we present an analysis of the results that were found to be pertinent to the study regarding communication and expression tools for social networks.

3.4.1 PACFILMO

The PACFILMO technique resulted in almost 95 filled cards that were summarized in 21 stories that represent the communities' actions in specific situations of their daily activities.

After the workshop, researchers met to discuss the cards and stories, which resulted in some tables that, to organize the analysis, mapped the information obtained from the activity.

Norms were extracted from the stories and a few examples of these norms, represented in the general format (as in Salter and Liu, 2002), are shown on Table 3.2.

Tab 3. 2 - A few examples of norms in the general form.

If	then
the person wants to announce a party	this person may use the computer.
someone wants to use another person's idea (i.e. a recipe)	he/she must ask for permission before using it.
the client needs a beauty product	the client may buy it from the hairdresser
a person works as a teacher at the preparatory course	this teacher must not daunt critical thinking

Following the method of Norm Analysis (LIU, 2000), more details can be added to the norms in order to obtain the format that was shown in section 2 (whenever condition, if statement then agent is deontic operator to do action).

Tab 3. 3 - Table adapted from Salter and Liu (2002).

norm:	**announce a party**	
responsibilities:	member of *Vila na Rede*	
information identification:	user id; date, time and address of the party	
triggers:	there is a party	
	pre-conditions	the member is logged in the system
	post-conditions	the party is announced
communication mechanism:	**written text; pictures; video; sound and/or LIBRAS**	
detailed norm:	whenever there is a party	
	if the person is a member of *Vila na Rede*	
	then the person	
	can announce the party at *Vila na Rede* using text, images, sound, video or LIBRAS	

A table was proposed in (SALTER e LIU, 2002) to organize the information acquired during the stages of Norm Analysis. These stages involve analyzing the responsible for the norm (who can perform the norm or who is involved with it); identifying the related information and what event triggers the action described in the norm. To this process, we have added a new stage: identifying communication mechanism. Table 3.3 shows one

example of the table in the format proposed by Salter and Liu (2002) with the new field. The data of this field inform by which means the message involved in the norm/action can be conveyed in the system. This information was considered to be pertinent especially when studying communication tools. As all stories were intentionally related to communication, it was possible to add the field for our analysis.

Each norm can originate (and/or be triggered by) other norms and they indicate the actions that the system should be able to support. In this way, the norms derived from the PACFILMO's activity can be used to inspire features needed in the information system *Vila na Rede*, as Table 3.4 (requirements 1 to 6) shows

3.4.2 Simulated Online Conversations

Some of the norms resulting from the analysis of PACFILMO's data could be confirmed observing the natural social network's conversations simulated in the participatory practice.

A total of 95 messages was posted by 12 participants during the approximate period of 15 minutes of activity. Participant's actions in the course of the activity were observed and interesting aspects were noticed. They were caught "talking" using gestures and annotations about the fact that they were not supposed to make use of oral communication. One participant demonstrated to have difficulties to express herself in the written format and an oral conversation to solve that situation was started for a short moment.

From the 95 messages posted, we could observe that 21 were related to the process of communication itself. There were attempts to clarify the communication, to confirm the reception of the message, requests for communication or clarification, and conversation about problems with the communication process.

3.5 Discussion

The results presented in section 4 are discussed here with the intention of composing the first macro-level requirements for the communication and expression tools of *Vila na Rede*, involving the concepts of meta-communication and transversal communication. With PACFILMO, norms were derived from stories of daily activities, indicating what are the

social protocols followed by the community. During the activities for the Simulation of Online Conversations, participants' accounts on their behavior were contrasted with their actual behavior. While most of the norms were confirmed, other new situations revealed that the virtual world's protocols are not always like the real life's. For example, while in real life interactions people usually engage in conversation with strangers, in online settings people would rather request strangers to identify themselves first. Also, in online dialogs each person can be paired with multiple interlocutors simultaneously - with different topics being discussed in each section, but in face to face conversation it is not common to see people managing to keep parallel conversations with more than one person. As an inclusive system, one important requirement of *Vila na Rede* is that it should support users that are not familiar with technology to make the transitions between these two worlds, as natural as possible. Other system requirements were derived from the activities and they are listed on tables 3.4 and 3.5. While some results were already expected and already in use in some social network systems, other requirements or concepts might not had been noticed when using different approaches. Requirements 13, 14, 15, and 16, for example, are relevant for the users of a social network that intends to be inclusive and were observed during one of the activities.

Tab 3. 4 - Requirements derived from the results of the PACFILMO activity.

Evidence	**Requirements**
Norm: Youth can communicate by their drawings.	1. The system should support the exchanging of images, allowing users to upload/send/share images, or take pictures of the drawings.
Norm: Professionals may provide extra information related to their products or services	2. Users should be able to start conversations with the authors of an announcement in the context of the product/service announced (but not restricted to this context).
Norm: Teachers and students can learn from videos	3. The system should provide multimedia support.
Norm: Teachers must share information and knowledge with students.	4. Since relevant information will be shared during conversations, users must be able to retrieve the content of past conversations (multimedia chat history).
Norm: Employers must recommend good employees.	5. Comments can be posted on advertisements.
Norm: Meetings among students can happen even from distance	6. System should allow multiple users to communicate together

3.5.1 Transversal Communication

Intrinsic to any social interaction, communication is present in any community daily actions. As mentioned before, the sharing nature of social networks are strictly related to the act of communicating, as can be seen since the words etymological roots.

All the PACFILMO's stories explicitly referred to some action of communication (e.g. "The handcrafts woman may advertise her embroidery work in face to face conversations"; "Students of the preparatory course may discuss the subjects in online groups"). That puts in evidence that communication is not restricted to certain areas of a social group or specific moments, but permeates across it, intersecting every dimension of its interactions.

Usually, web sites reserve a specific place for conversations, i.e. chat rooms or instant messaging software outside the page. But for a communication tool to make sense to the users of the Inclusive Social Network we are building, who might not be familiar with the online world, the starting point for conversations should not be restricted to a certain page of the site nor be apart of it (requirement 14 and 2 on Tables 3.4 and 3.5). The concept of communication should transverse the entire system, and maybe even beyond, mixing with the natural face-to-face conversations or other physical means of communication. Applying it to the ISN, this could be translated into a synchronous communication tool that allows voice, text, video and SMS conversations, which can be started from any point of the system where the name of the user is shown.

3.5.2 Meta-communication

Throughout both activities, the discussion about how, why and when to communicate was evident. The nature of the PACFILMO activity itself already demanded for the debate on discourse characteristics. The participants seemed to be perfectly comfortable with this kind of conversation, as this subject is very common in our daily interactions. Making the purpose clear and specifying the dynamics of actions are very important for the establishment of a common understanding and effective communication.

Thus, another norm could be added to better model the interactions in social settings:

Whenever <communication takes place>, if <in need of making communication clear>, then <interlocutors> are <supposed to>, to <interact about their communication subject>

Tab 3. 5 - Requirements derived from the results of the Online Conversation activity.

Evidence	Requirements
Participants communicate by facial expressions	7. Use of smiles (emoticons)
Sometimes participants were not aware of the arrival of a new message directed to them. The writer of the message had to point that out.	8. There must be a mechanism to alert users about new incoming messages, intent of sending files, and about the interlocutors actions (e.g. informing that the other users is typing).
Participants posted messages to individuals (keeping more than one conversation at a time) and to the group.	9. Multiple sections of conversations should be allowed
	10. Users may choose to start a new conversation or add the person to an existing conversation.
Unsigned posts were asked to be identified	11. Anonymity should not be motivated (e.g. users should be signed in to talk to others)
Gestures and mimics were used	12. System should support other media (e.g. video) so that users may be able to see each other while communicating
One participant posted two messages revealing her sentiment about the activity to the entire group.	13. Support of affective expression about the system
Conversations were not restricted to the activity, some topics continued being discussed by participants during the break.	14. There should not be a specific page as starting point for conversations.
A low literate participant had difficulties in writing her messages.	15. System should provide support for other media (e.g. videos, sounds) so that users may be able to communicate in many formats, not excluding the written one.
A low literate participant asked for help in order to write a message.	16. Users should be able to find support in the system to overcome their difficulties, clarify their doubts, get assistance to use the features.
Participants who were not sure about their roles in the activities, asked researchers for clarification.	

The results from the activity of simulation show that some of participants' written messages were related, in different levels, to the action of communicating itself (e.g. "Aren't you going to answer my question?", "I didn't understand", "she had already answered (…)" – which are examples of the ex post (YETIM, 2001) type of meta-communication). This was also observed in their behavior during the activity. They made use of signs (e.g. to ask for silence, because to rule was not to talk) and gestures (e.g. pointing to the poster as if saying: "you should talk to me only by that means" or "look, a message for you, answer it!") in order to communicate about their communication task.

When one participant needed to be helped to accomplish the task (the participant that demonstrated trouble to express herself in the written format), she obtained support from

outside the activity – one of the researchers provided her with the necessary help. These are indications that provide substantiation to the concept of having a meta-communication support in the system. In this sense, a context aware online help tool could literally talk to them (i.e. in the format of an avatar), to explain about the system's features and to provide for the less experienced computer users the necessary resources to have a smoother process of familiarization with most common internet/technological metaphors, jargons and interface elements. Such a tool is expected to provide users with a more pleasant online experience, addressing users in a rather informal way.

One possible way to evaluate the user's sentiment - and to cope with requirement 13 (Table 3.5) - is to furnish the system with a hedonic poll tool. Such feature would not only let users talk to the system, but also it would help developers to monitor the ISN, identifying the acceptance of new releases, allowing them to recognize necessary adjustments to maintain users engagement.

3.6 Conclusion

In the context of the research project of *e-Cidadania* and the Inclusive Social Network *Vila na Rede*, this paper investigated the demands from the target communities (digitally illiterate but socially active) regarding communication tools to be used in online environments. To this end, we have extracted data from two activities conducted by *e-Cidadania*'s researchers within the community in Semio-Participatory Workshops: the PACFILMO technique and the Online Conversations Simulation. From them, some norms and system requirements were derived. As a result of this analysis, we were able to conclude that the concept of communication should permeate the entire system - as it permeates our entire social lives – and thus should be transversely present in the system, that is, it should intersect all pages in crosswise dimension, allowing users to share their feelings and thoughts with other members of the network. Furthermore, users should be given the ability to express their affective response towards the system. Finally, a meta-communication – communication concerning communication – proposal is needed in order to assist users in their experience within the system, i.e. learning while they use the system.

Since we have always kept in mind the issues of universal access, even though we had considered the digitally excluded as the target audience for these activities, the concepts of

meta-communication and transversal communication could also be explored regarding CMC systems in general. Both aspects of meta-communication and communication are present in everyday situations and are experienced by all, and thus it is expected that its use in CMC could benefit all users – from the novice to experts -, provided that the meta-communication feature would be able to furnish the users with the information in the appropriate level for them.

The next steps of this research include the formulation and instantiation of the communication and meta-communication concepts at *Vila na Rede*, which must address two aspects: its format (how the information can be presented to the users so that it is natural for them to interact with) and its contents (what information will be presented to the users).

Capítulo 4

Understanding Meta-communication in an Inclusive Scenario

4.1 Introduction

In the context of huge cultural and socio-economical diversity faced by population in developing countries – which results in differences in the access to technology and knowledge – a social network is being conceived to reach the many levels of the Brazilian society, involving low literates and the digitally excluded. In the development process of this Inclusive Social Network (ISN), representatives of the target audience are involved since the initial phases, contributing to the design of communication and expression tools to be used in the system. From previous activities, conducted in order to clarify and better understand how communication take place in communities' natural contexts, we were able to generate a set of requirements that supports, among other things, the need of a meta-communication mechanism (HAYASHI e BARANAUSKAS, 2009). This mechanism would provide users with the necessary assistance, to make their online experience possible, pleasant and gratifying.

This paper describes the meta-communication features designed to assist users in performing tasks in the system and to prepare the less experienced ones with some basic Internet and computer related concepts. The literature review presented in the paper guides the definition of this meta-communication tool, identifying characteristics of current works and indicating what would have to be adapted in order to address our target population's

needs. Such tool would provide novice users with procedures to use the system and with tips and clues for quicker accesses for advanced users. As the ISN allows users to post their own multimedia files, this help content could be enriched with the collaboration of the users themselves. A Participatory Practice and other activities carried out within the community already anticipated the kind of contribution that can be expected from the users. In these activities, participants acted as the online help, providing the steps to successfully use the system, and as "helpees", following the steps proposed by other participants, indicating communication problems and suggesting improvements in the text.

The main contribution of this work is the comprehension that it brings to the challenge of designing online support systems intended to promote universal access to the knowledge that is shared in social networks, contributing to the establishment of a digital culture among the less favored ones and thus, fighting the digital divides and promoting social inclusion.

This paper is organized as follows: first, we introduce the context of researchand previous works in the project. Section 3 summarizes and discusses some relevant related work.; Section 4 briefly describes a participatory activity, focusing on its contribution to the system. As a result from the literature review and the activity performed, Section 5 presents the proposal of a task driven multimedia meta-communication system; and Section 6 concludes.

4.2 Background

In *e-Cidadania project*, researchers from different fields and with different focuses are working together in order to achieve the same common goal: contribute to the creation of a digital culture among Brazilian citizens. As part of the project results, the online social network *Vila na Rede* is being developed for, by and with a community in São Paulo State, through activities that involve concepts, artifacts and practices from Participatory Design (PD) (MULLER, 2002) and Organizational Semiotics (OS) (LIU, 2000; STAMPER, ALTHAUS e BACKHOUSE, 1988). From these activities, a rich material is produced, from which the many researchers are able to examine the data needed for each focus of interest. This work, in specific, profited from those sources in the process of building the first structures of the concepts of communication and meta-communication in inclusive

social networks. In this section, we briefly describe past activities regarding communication mechanisms, which led us to the present work reported in this paper.

Artifacts from OS are being used combined with adapted PD techniques (BONACIN e BARANAUSKAS, 2003) throughout the various Semio-Participatory Workshops conducted within *e-Cidadania* project. A series of workshops started with the clarification of the problem, using the Stakeholder Analysis Chart and Evaluation Framework, as proposed by Baranauskas, Bonacin and Liu (BARANAUSKAS, BONACIN e LIU, 2002). These artifacts made it possible for the group to organize ideas and understand the context (environment) of use of Inclusive Social Network Systems. They resulted in an ontology chart of the domain, which mapped the concepts and relationships as reported by the users (NERIS, ALMEIDA, *et al.*, 2009).

During other activities, participatory practices were designed to better understand face-to-face communication within the culture of Brazilian communities. These works (HAYASHI e BARANAUSKAS, 2009) resulted, among other findings, in the understanding that, for the target audience, a communication mechanism should not only provide means for synchronous and/or asynchronous conversations among participants, but also it should provide them with a channel of communication about the system. This two-way road would be composed of: 1) a means that would allow users to express their feelings towards the use of the system and 2) a means that would allow designers to support users with the use of the system. These results were derived from Workshops intended to investigate how the members of the communities interact in their daily activities. This knowledge was necessary in order to understand what are the metaphors, communication elements and other props that they make use of. When transiting from the real life to the computer mediated set, it is important to facilitate *meaning make* regarding elements on the digital reality, especially for those not used with technological artifacts.

4.3 Literature review

Meta-communication can be defined as an abstraction used to complete or add to the concept of communication; in the context of this paper, it is used to mean “communication about the underlying system communication” (HOPPENBROUWERS e WEIGAND, 2000; YETIM, 2001). It is present in any daily conversation as an attempt to resolve intricacies

that might occur during the process of communication. For example, when you ask someone to repeat something that you were not able to hear, it is a request for clarification, that is, it is an effort to recover from a failure during the course of conversation. In this case, it is a reaction from a disturbance that happened in the communication, but there might also be more proactive responses. For example, you put a note on your office door advising that you are on a meeting, so that your colleagues will not interrupt your conversation. In this case you are preventing a breakdown to take place in your ongoing communication processes.

In this sense, Hoppenbrouwers and Weigand (2000) mention two types of meta-communication: *ex post meta-communication*, as the communication about communication that takes place after the breakdown; and the *ex ante meta-communication* being the proactive discourse. Yetin (2001) goes further, adding another type of communication in between these two: he calls *meta-communication in action* the communication that takes place during a disruption in the conversation.

Ex post meta-communication is composed of discussions that have intentions such as clarifying, explaining, correcting or solving the problem that had caused the breakdown (HOPPENBROUWERS e WEIGAND, 2000; YETIM, 2001). It is usually based on more specific contexts, involving the particularities of the subject (or task, system, program, etc.) being considered at the moment of the disruption of the communication process. In this case, it is difficult to anticipate and provide solutions beforehand, as is the case of *ex ante meta-communication*.

In *ex ante meta-communication*, issues are usually treated in a more abstract perspective, involving base topics that usually are recurring. The informational discourses of *ex ante meta-communication* often relate to general rules and norms (HOPPENBROUWERS e WEIGAND, 2000). Yetim (2001) also sees the discourses on norms and rules as subject of *ex ante meta-communication*, but the author understands that they should be considered with high importance also in *ex post meta-communication*. The reason, he points out, lies on the fact that it might be difficult to anticipate all aspects and situations to be considered beforehand when taking into account a very diverse virtual community.

When going from the general definition of meta-communication to the context of computer-mediated human interaction, de Souza defines meta-communication as, "technically communication *about* (aspects of) communication itself" being "the most popular aspect explored in metacommunication (…) how it gives users a key for interpreting communication itself." (DE SOUZA, 2005) This communication concerns both the one that is held between humans and is mediated by the computer and the communication that happens between users and computers. Earlier, in 1988, still in the context of human-computer interaction, Sanford and Roach (SANFORD e ROACH, 1988) included in the definition of meta-communication the interactions that occur to express the relationship between users and the information – that is, the subject of the communication. The authors recall that, basically, problems during the use of technology occur because people are used to communicate with people and, as so, they tend to use the patterns and protocols of human communication that make sense to them. They go on and argue that, in order to build interfaces to be used by the widest variety of users, it is important that the interface adapt to the human communication protocols mostly used by the users.

In this direction, Willis (2006) observed that the majority of help systems do not adapt their interactions to the user. He compared the help system implementations with the natural help seeking of people. In his experiments, he confirmed the hypothesis that usually the implementations do not support the human communication patterns. From his results, only four in eight applications provided what he called "help-on-help", that is, a feature that provided users with a way to learn about the use of the system before they could use it effectively. Such feature is very important, given that the cultural and cognitive diversity among individuals make it difficult to match designers and users mental models, so that, as explained in (CAPOBIANCO e CARBONELL, 2002) even expert users need support. Willis (WILLIS, 2006) referred to learning theories to understand more about help seeking behavior. He learned from Nelson-Le Gall (apud WILLIS, 2006) that the human help searching mechanism is usually a step-by-step process.

Help systems are supposed to provide users with access to meta-information about the tasks that they need to perform during the use of application software. That means - as Capobianco and Carbonel argue (CAPOBIANCO e CARBONELL, 2002), that all software should include such meta-communication facility. The authors specify this concept of meta-

Tab. 4. 1 - Characteristics and objectives of support mechanisms, according to different authors.

Reference	Support mechanisms should…
Andrade and Novick (2008)	Cope with different levels of expertise (suit users with different skill levels)
Capobianco and Carbonel (2002)	Introduce the system; Handle failures; Provide support on systems functions and commands; Inform the current and past contexts (user's previous actions and current state); Enable the users to change their current state; Provide "learn by doing" approach (support users in performing their tasks); Furnish users with the knowledge/skills needed to use the system; Adapt to the progress of the user (as he/she learns with the support mechanism); Identify users' intentions and anticipate their next action Provide similar help strategies as the ones adopted by human tutors.
Kashihara, Nakaya and Ota (2006)	Provide guided navigation planning
Kehoe and Pitt (2006)	Give users control (to stop, advance, etc.); Keep topics short and relevant in order to minimize cognitive load; "Chunk" the information in appropriate manner so as to make most efficient use of short-term memory capacities; Use elements of conversational language (e.g. simpler words);
Sanford and Roach (1988)	Use communication protocols that the users are familiar with; Model different levels of communication (same content can be expressed with different words)
de Souza (2005)	Allow the designers of the system to communicate with the users; Provide minimalist insights about the application; Be diffused in all interactions; Use typical sentences that express the need for help;
Willis (2006)	Adapt their interactions with the users'; Provide a two-way communication (system-users and users-system); Present the instructions in step-by-step format; Simulate the treats of humans (e.g. robot or avatar)
Yip (2004)	Make the site structure explicit, as accessible site maps can improve users' performance (though the use of hyperlinks may affect success rates).

communication as being the communication concerning all exchanges of information that are related to the conceptual model of the systems' functionalities. The authors list some objectives that support system should have. These objectives and other characteristics reported by other authors are listed on Table 4.1. This table gathers some characteristics/requirements of support systems in general, complementing the list of principles and features presented by Purchase and Worril in (2002) specifically for online help systems. The characteristics presented by Kehoe and Pitt (2006), also shown in this table, were actually thought for a help system based on speech technology, but when

considering the universal access of systems, we may generalize these aspects to be taken by every system. The meta-communication tool to be described later in this paper expands the concept of help systems, as it groups support mechanisms in general (e.g. text-to-speech tools, guides, site maps, navigation plan, etc.), constituting a broader scaffolding instrument to let users climb up in the process of learning with the use of inclusive systems.

As for the position of the support tool, or the starting point for its interaction with the users, in (SILVEIRA, DE SOUZA e BARBOSA, 2001), the authors suggest interrogation marks as the link for additional information on the subjects found inside the content. These marks would be placed next to topics to be described in the system's help tool. Although this solution is very appropriate in the context of fully literate users, as its basis contains mostly textual information, it may not make sense for those who are not familiar both with information technology and with reading rather long pieces of text.

Most of the findings on the literature about meta-communication and about help systems are not concerned with its access by the low literate. The scenario of having users not familiar with technology and, at the same time, with low literate levels is a challenge for IT research that has not yet been investigated in depth.

In the next section we describe and discuss results of activities conducted with our target users with the objective of better understanding how they communicate when providing support (in the use of a system) to others.

4.4 How users help their peers – a semio-participatory workshop

The activity described here took place during one of the Semio-Participatory Workshops conducted by the researchers from *e-Cidadania* project. In these workshops, end users and researchers interact together in activities that combine artifacts from Organizational Semiotics with techniques from Participatory Design. As a result, we have the materialization of the concept of Socially Aware Computing (BARANAUSKAS, 2009), where theory, methods and artifacts are combined into a use towards the construction of socially responsible design, which is participatory and universal in nature.

These Workshops provide researchers from various fields with real contexts rich data. All activities are recorded in video and audio formats for posterior analysis and some researchers take notes in previously formatted forms in order to keep track of minor details that the global view captured by the camera might miss.

4.4.1 Scenario and participants

The place for the sessions is a TeleCenter at Vila União, a low-income neighborhood in Campinas (a city in São Paulo, Brazil). This TeleCenter held – as of the date of this experiment – several community initiatives for digital inclusion and environmental maintenance, most of them associated with federal and local governmental projects/funding. A group of approximately 30 people joined our Workshop, encompassing from people in the community to researchers. Among the invited participants, there were community leaders from different initiatives; end users with different computer interaction abilities, with low literacy skills; and fellow researchers. The intention was not only to try to represent the diversity found within the Brazilian population, but also to gather the people who would be able to help us answer our questions. For example, some focal people - like the instructor from an elementary computing course, the volunteer from a community school, and the employee from a local non-governmental organization - were invited for the Workshop, as they were expected to be familiar with problems that are commonly faced by novice users of technology. Moreover, we believed that we would be able to elicit relevant information directly from end users with little or no access to technology, as we would be able to understand, from their interactions, how they communicated in order to explain their peers how to perform specific tasks through the system. More information about the local members of this group can be found in (HAYASHI, HORNUNG e BARANAUSKAS, 2009).

4.4.2 Activity

In order to design systems that make sense to their users, it is important to understand the users' context and abilities. This can be very complex when dealing with users like the Brazilian population: who not only has many different backgrounds and experiences but is also mainly composed by functionally illiterate citizens (UNESCO defines functional literacy as the literacy which allows the person to effectively perform his/her functions in

the group or community[7]. However, this person would not be capable of understanding longer extracts of written text).

In this sense, the objective of the activity described here was to observe these users' natural behavior when supporting someone else in the use of a technological artifact. In this practice we seek to answer the following questions: 1) What kind of reference do people use in order to explain the use (performing a task) of something relatively new? 2) Do they articulate having anticipations of problems (*ex ante* and ex *post meta-communication*) in mind? and 3) How detailed or general are their instructions? A form was prepared as a guide for the researchers when observing the users. This way the observers would be able to direct their focus on the concerns reflected by the above mentioned questions.

Participants were divided into smaller groups and each received a different task. They all had to prepare a material with the instructions to perform the task at *the ISN system*. Some tasks involved not only a certain understanding about *Vila na Rede* possibilities but also some notion in the use of computer systems in general. The activity had four main phases, which we describe next.

1. Browsing the system (Fig. 4.1). As soon as each group received the task that they were supposed to explain, they were led to computers with Internet access so that they would be able to browse the system and check how to perform that task. Each group was supported by two researchers who worked as facilitators and observers. The facilitator's role was to help participants in their interaction with computer and with system *Vila na Rede* in order to complete the activity. Meanwhile, the observers took notes about users' behaviors and speech, completing the forms that had been previously prepared for this purpose.

2. Writing the help content. After browsing the system to perform the task, each group wrote their indications about how to complete that task. They received a piece of paper and a pencil. Some groups had to refer back to the system in order to provide more detailed information. The reason why this was written on a piece of paper and not in digital format is exactly because most participants were not familiar with word processors.

[7] http://www.uis.unesco.org/ev.php?ID=5014_201&ID2=DO_TOPIC, accessed on October, 2009

3. Checking the procedures. When all groups had finished writing their support on their papers, the groups exchanged their works. Now, the groups would try out the other groups' work, following the instructions that had been written. In case they found some inconsistency or something that were not clear, they were invited to improve that material, writing their contribution using a different color in the previous text.

4. Group discussion. At the end of the day, all participants were gathered in one single group and, leaded by one of the researchers, they commented on the activities and on the procedures that were now the result of two groups' work.

4.4.3 Results

It was interesting to note that the novice users had almost the same concerns as the more experienced users when trying to convey the information. Although the participant who worked as an instructor at a computer course for beginners were aware of the most common problems faced by the novice users of computers, also the participants who were not familiar with the system had a clear understanding of what the instructions should contain, as they also had experienced their own difficulties.

During the final discussion it was possible to notice that some less experienced users felt more confident after performing their roles as "instructors", writing directions for others to follow. In one specific group, the more novice users performed even better than the more

Fig. 4. 1 - A moment at the workshop.

experienced ones after browsing the system and checking that they knew how to do the task and how to teach others how to do it too.

After the workshop, the task analysis performed by the researchers using GOMS (HAYASHI, NERIS, *et al.*, 2009) was then compared with the directions created by the participants. The first difference that we notice is that the participants were always more specific than the researchers, instantiating each task as much as possible. Although abstraction helps when building the support system as more pieces of instructions can be reused, e.g. in (LEE e LEE, 2007), instantiation provides a better support for the novice users who might not be able to recognize the more impersonal directions.

Another aspect to comment is that participants did not consider conditions where more than one flow was possible. Some tasks were possible to perform following different directions, depending on the starting point or simply depending on preferences. For the activities, users wrote only one way of performing the task, even when they knew different ways of doing the same thing – in one group it was clear that the only way they knew was the one they were working with, but in others they mentioned other possibilities while working, but never cogitated writing them down. This position is consistent with daily face-to-face conversations. For example, when explaining to a tourist about the way to get to some point in the city, we usually tell them only the one considered the easiest way (to the teller or to the fellow). When replicating this to an inclusive system's support tool, deciding what the "easiest way" is might not be as simple.

All groups described the instructions in a step-by-step format, resembling the GOMS format, and no complete paragraphs were used. This can be understandable for the participants who had low literacy levels, but even literate participants chose the step-by-step with fewer words format. This answers our first question on what kind of reference people use in order to explain about the use of a system (how to perform a certain task): in a step-by-step format, which is consistent with the results from (WILLIS, 2006), which comes from a different context of use. In regard to the other two questions, we saw that the users did not try to anticipate problems and that, as already mentioned, they tend to be as specific as possible; i.e. concreteness is preferred to abstractness in the instructions. In the next section we discuss some of the characteristics that this support tool should bear.

4.5 The mechanism

The activity described in the previous section, together with the results from the literature review and other previous work, helped us to have a better understanding of the meta-communication tool to be developed in the context of inclusive social networks. The mechanism to support users of inclusive systems need to go beyond help systems or users' manuals that simply display information upon search. In our context, we understand that this mechanism should work in a more proactive way, offering support in a rather transversal manner. The resources found in help systems would be combined with the kind of information found in other features such as maps, introductory videos and the "about" screen; but all presented in a way that should be as natural as if listening to an acquaintance.

Multimedia formats that could be adapted to each user would guarantee its access by as many people as possible. Those with low literacy skills could profit from it as well as those with some kind of visual impairment, for example. As multimedia artifacts we could suggest video, 2D or 3D avatars, and even sign languages. This mechanism would welcome the users since their first entrance in the system, supporting them throughout their experience, suggesting uses, informing possibilities and showing how to perform tasks in a step-by-step and concrete way.

Those first-timers in the online world would find the motivation and support that would guide them, teaching from some basic computer notions to more advanced uses of the system. For those already familiar with online systems like social networks, this tool would function as the interaction point from where they could profit more from the systems features, learning what it has to offer and allowing them to "communicate" with the designers of the system.

Having in mind the different interaction abilities of our users, this support should be presented in an adjustable way, allowing users to choose from a variety of formats as text-only, sound-only, video, or some combination of them. In addition, as seen in the recommendations from the literature review, the adjustment should also consider the growth of users' knowledge, being more present in some moments, and less in others, as represented in Fig. 4.2.

Since the information on instructions should be, as seen in the activities, more concretely detailed, and, as seen in the results of the experiment, users feel more confident and motivated when they are able to help other users; the system should then allow users to create their own support material to be shared among them. Specifically at *Vila na Rede*, researchers from the *e-Cidadania* Project incorporated the role of "sponsors" in the system. That is, a user can invite another user to join the system and he/she will support them, by introducing them to the system, showing how to access, what to do, etc.

The content of this support tool would include information on the tasks that can be performed in the system, tips on the use of technology and maybe even informal comments, all related to the context of the page visited at that moment – depending on the technology available, even related to the focus of the attention of the user.

Being that context usually in the middle of the screen, one possible location for the support tool to be is the area below the upper right corner of the screen, which is both near the context and in a rather peripheral (not the main focus) area. Other characteristics that the meta-communication should bear are summarized from Table 4.1.

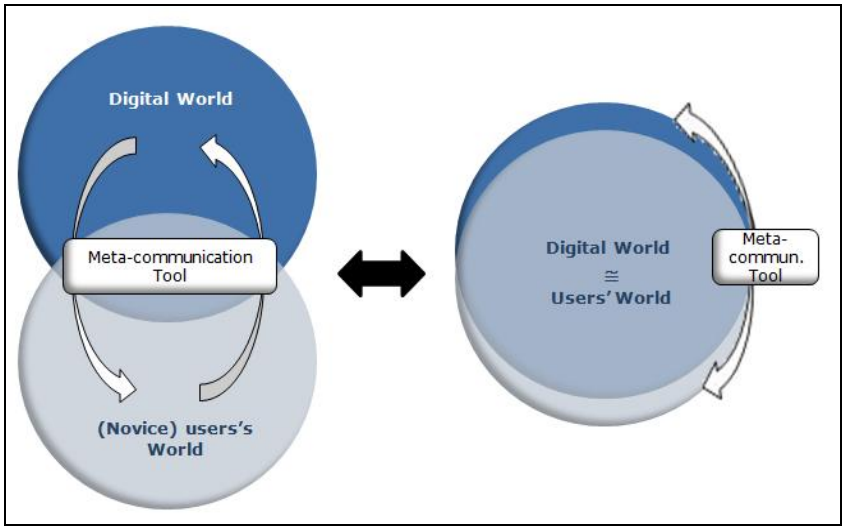

Fig. 4. 2 - Flexibility of the meta-communication tool.

4.6 Conclusion

In this technology-driven globalized world, functional illiteracy and lack of ICT knowledge (characteristics of the majority of the population in developing countries) can jeopardize the economic growth of the country and promote social divides. *e-Cidadania* Project aims at proposing and developing systems that are usable and that make sense to this people. In the context of this Project, Semio-participatory Workshops are methodological instruments of e-Citizenship, allowing a co-design of these systems. Regarding communication and expression in inclusive social networks, former results indicated the need for meta-communication mechanisms to facilitate the access and operability of inclusive systems.

This paper reviewed the literature findings on meta-communication and other supporting tools focusing in their adequacy to the context of Inclusive Social Network Systems. Moreover, it investigated the meta-communication issues in one of *e-Cidadania*'s Workshops that aimed at exploring user's understandings on supporting/explaining to others the use of a system. Drawing on the investigation results, we presented some directions that inform the design of a meta-communication tool in the context of inclusive systems in general. These directions are now being implemented and evaluated in the social network system in the context of the *e-Cidadania* Project. Further work involves extending the concept of meta-communication to allow users to express themselves regarding their feelings towards the system.

Capítulo 5

Specifying Meta-communication Mechanisms for Vila Na Rede system

5.1 Introduction

Earlier investigations (HAYASHI e BARANAUSKAS, 2009) have led us to conclude that Inclusive Social Network systems such as *Vila na Rede* (the deliverable resultant of the *e-Cidadania* project) asks for a meta-communication mechanism to support not only the novice users, but everyone interested in reaching the digital world of information by learning more about the systems' features and possibilities.

A generic and simple definition for meta-communication is "communication about the communication". More specifically for the context of this research, we can adopt the definition provided by Capobianco and Carbonel (CAPOBIANCO e CARBONELL, 2002), in which meta-communication refers to all exchanges of information that are related to the conceptual model of the system, i.e., the communication that takes place in order to clarify or overcome problems during the communication processes and the communication surrounding the system's concepts. That includes the communication between designers and end users, allowing designers to explain to the users what their intentions were when building the system and helping users to make sense of the system and its features.

The issue of designing a support tool that helps users to better understand the system -and thus to better use it - becomes a challenge in our context, as we can have users that not only have low levels of literacy but also low familiarity with technology. Another aspect of this communication between designers and users lies on the fact that it should not be a one-way road. Users should be provided with means to express their feelings towards the system.

Previous activities had given us basis to support the concepts involved in this meta-communication mechanism, which would be composed of 1) communication tools; 2) a scaffolding system and 3) an affective response system.

The communication tool that will integrate *Vila na Rede* is to be described at a report to appear. This technical report presents the characteristics of the scaffolding and affective response systems and it is organized as follows: Section 2 presents the scaffolding system with its format (2.1) and content (2.2); Section 3 instantiates the affective response system and Section 4 concludes.

5.2 A Scaffolding System

In this section we present the scaffolding system and its surrounding issues. While the majority of the characteristics came from activities that actively involve the end users expected for this system, other decisions were based on results found in the literature - which should be evaluated within our context in future investigations.

As this system is to be used in the *Vila na Rede* inclusive social network by Brazilian citizens, it is necessary to consider the characteristics of this population, which has a vast diversity of backgrounds (socio-cultural, economical, etc) and abilities. This diversity demands extra efforts from the designers when thinking in interaction elements for the development of universal solutions, that is, design results that could be used by all.

The issues concerning usability and accessibility guided the definition of this system's format, content and elements, which are described in the following subsections.

5.2.1 Format

Help systems are found in many different applications and web sites and they are most often presented in written formats. For example, the web page of the Ministry of Work and Employment in Brazil (Fig. 5.1) has its help mechanism – a FAQ list – available only in textual format. This could be a huge obstacle to be overcome by an illiterate user, for example, who is expecting to find support in this page.

At the online social network *Orkut* – vastly used by Brazilian citizens –, we can already find some tips in the format of a video. Sometimes only showing a sequence of steps with a musical background (no speech) and sometimes showing a real person talking and explaining something. This is already a good initiative to include the most number of people. Nonetheless, the videos are available for very few topics, leaving almost 90% of the information still in the written format. Another characteristic of the online help feature of

Orkut is that its access point is almost “hidden”: it is found as a small–font sized written link at the bottom of the internal pages (Fig. 5.2); and there is no access point for the help pages in the entrance page of *Orkut*.

Fig. 5. 1 - Help page of the Ministry of Work and Employment in Brazil.

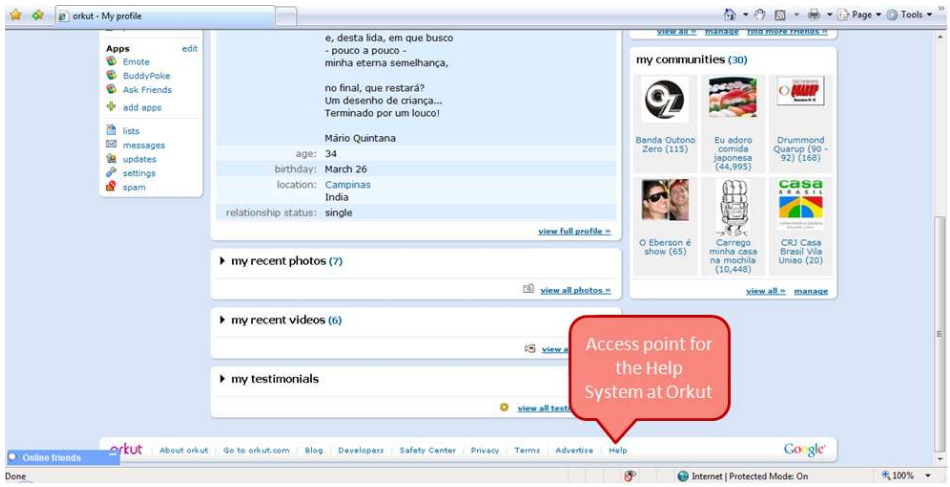

Fig. 5. 2 - An inside page of Orkut.

The scaffolding system that we are designing for inclusive social network systems has the following characteristics:

- *Multimedia*. It could be a video with subtitles, a sequence of cartoons, or a speaking head (or avatar), also with subtitles, present in all pages of the system. The video format solves the problem of users that are both illiterate and digitally illiterate. Furthermore, it is also a good option for those that are deaf (they would not be able to hear the avatar or person speaking, but would be able to read the lips or read the subtitles) or have limited hearing.

- *Provide text to speech*. Although most of the blind users are very familiar and already have installed a Screen Reader application in their machines, some users may find it very useful to have a text to speech facility in the site - for example, those with temporary sight restrictions (e.g. in a dark environment) or the digitally illiterate blind person.

- *Step by step video lessons*. As seen in previous activities (HAYASHI e BARANAUSKAS, 2010), we noticed that users are very likely to inform and to follow step-by-step instructions. The content of these procedures would come from GOMS task analysis, as described in section 2.2.

- *Available in all pages, close to the main content of the page*. The user should be able to easily locate this material and it should be placed so that one could follow the instructions without scrolling or changing windows. The top right corner of the screen was chosen because it is near the main content, is visible although not the place most in evidence (as the top left corner is) of the page.

The combination of these elements should cover most of the deficits that could be found among users, with the exception of the case of a person who is both blind and deaf. Other combinations are shown on Table 5.1.

Tab. 5. 1 - Coverage of impairments.

Constrain	illiterate	digitally illiterate	deaf	blind
illiterate	- Text to speech - Avatar/talking head - Videos with instructions	- Text to speech - Avatar/talking head - Videos with instructions	- Talking head (lip reading)	- Avatar/talking head - Text to speech
digitally illiterate		- Avatar/talking head - Videos with instructions	- Talking head (lip reading) - Videos with instructions and subtitles	- Avatar/Talking head
deaf			- Talking head (lip reading) - Videos with instructions and subtitles	n/a
blind				- Screen Reader - Avatar/talking head

In order to let deaf users to read what is being said by the avatar, besides the subtitles, also a virtual presenter developed by Costa and De Martino (COSTA e DE MARTINO, 2008) will be used. This talking head (the face of a real person) moves her lips according to the text and it is specific for the context of the Brazilian Portuguese speakers, where each facial movement is described by an algorithm based model.

While the image of a real person partially copes with the problem of lack of personality or excess of "coldness" in computer systems, the virtual faces might be less invasive for some users. Other investigations from the same research group of Costa and De Martino have similar presenters that are 2D or 3D representations of a person. The 3D is an animation based upon a tri-dimensional geometric model; while the 2D is an animation based on photographic images of key-postures that are overlapped to produce an animation (DE MARTINO e VIOLARO, 2007; HIPPLER e DE MARTINO, 2008; SUGIMOTO, 2008). Figure 5.3 shows some examples of work on speech synchronized facial animation.

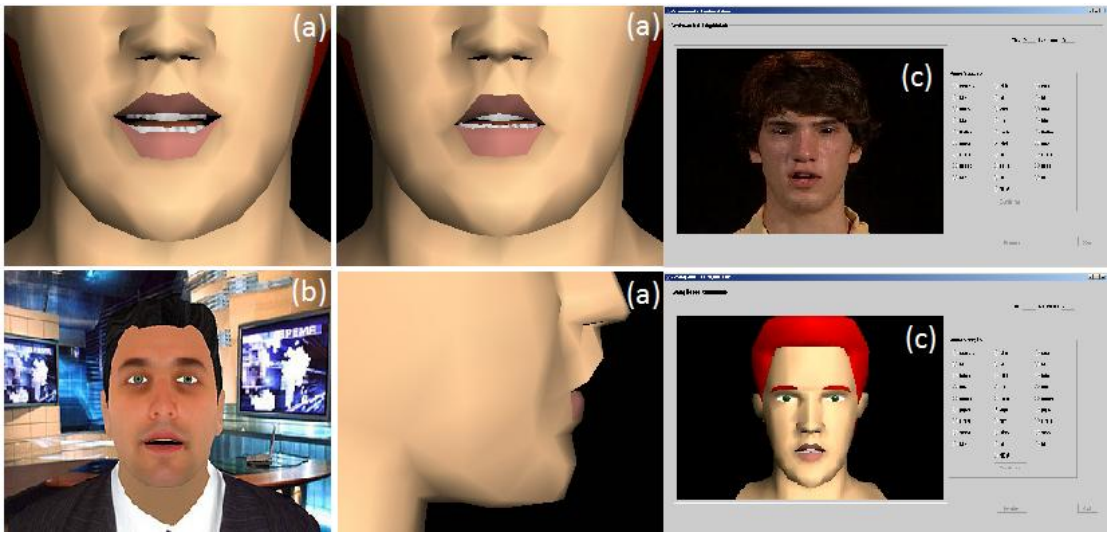

Fig. 5. 3 - (a) The posture of the synthetic face during the production of /a/ and /u/ [3]; (b) One of the faces of a Virtual Presenter [9]; (c) Screenshots of the frames of a real speaker video and of a facial animation [3].

This virtual presenter from Costa and De Martino (COSTA e DE MARTINO, 2008) articulates her mouth according to the text, which is read by a Text-to-Speech conversion software. This software generates a list of phonemes and times that are used by the program from the virtual presenter to generate a sequence of images that will form a video. An extensive work to adjust the voice output of the intended software to the input image of the presenter was performed by fellow researchers from project *e-Cidadania*.

This talking head would transmit information to the users upon request (the user has to click the "play" button). The multimedia would include not only the talking head, but also screen sequences showing steps, interviews with real users, and even videos recorded by the users themselves explaining about the system. Figure 5.4 illustrates this multimedia interaction point at *Vila na Rede*.

The player is the same one that is used inside the announcements to reproduce the video for products/events/ideas. Just as any player, it allows us to play, forward or rewind, control the volume, stop and also allows full screen view. Most of the content will be pre-recorded, except those produced online by the feature that converts text to voice.

Fig. 5. 4 - Vila na Rede and the meta-communication area.

Next to the text-to-speech tool, a button will allow users to have that same text read by the virtual presenter. By default, the text to voice instrument would only read the text (present the audio file) selected by the user; but upon request, the user will be able to hear it from the virtual presenter, with all the benefits that it brings (e.g. lip-reading and human presence).

For the instantiation of the meta-communication mechanism at *Vila na Rede*, we are using the virtual presenter from Costa and De Martino (COSTA e DE MARTINO, 2008) combined with the Festival Text to Speech tool[8].

For the designers of inclusive social networks - or other systems - who are willing to provide similar meta-communication facilities in their systems, there are some other software options that we shortly present on Table 5.2 - noting that some of the solutions are commercial or proprietary. For the solutions that present voices that might be considered

[8] Festival (http://www.cstr.ed.ac.uk/projects/festival/)

much artificial for their target public, there are commercial products available for purchase, for instance, the Natural Voices from AT&T[9] More on the content of the meta-communication mechanism will be explained in the next subsection.

Tab. 5. 2 - Software options for a meta-communication mechanism

Feature	**Solution**
Avatars/Talking Heads	SynFace (http://www.synface.com)
	SitePal (http://www.sitepal.com/)
	Johnnie Talker (http://digitus.itk.ppke.hu/~flugi/johnnie/)
	iFace (http://img.csit.carleton.ca/iface/)
	Xface (http://xface.itc.it/)
Text to Speech	Festival (http://www.cstr.ed.ac.uk/projects/festival/)
	eSpeak (http://espeak.sourceforge.net)
	odiogo (http://www.odiogo.com)
	(http://free-translator.imtranslator.net/speech.asp)
	NaturalReader (http://naturalreaders.com/)
	Text2Speech (http://sourceforge.net/projects/text2speech/)
	Festvox (http://www.festvox.org/index.html)
	PortaVoz (http://www.portalvoz.es/)
	FreeTTS (http://freetts.sourceforge.net/docs/index.php)
	MOBROLA (http://tcts.fpms.ac.be/synthesis/mbrola.html)
	Cyber Buddy (http://thecyberbuddy.com/)

5.2.2 Content

The information provided in this support mechanism will be related to:

- Description and explanation of the tasks that can be performed in the system (e.g. how to create a new account or how to help someone to create an account);

- The functionalities as they were meant to be used when thought by the designer (e.g. what are the arrows for) and overview of the system's possibilities;

- Tips, shortcuts and other advices for the novice user of internet (e.g. one may click on underlined words as they are links for other pages);

[9] at http://www.nextup.com/attnv.html (last accessed in Oct. 2009).

This content should include material produced by the final users, who could contribute by creating videos showing what they had learned to do in the system.

Every page will have the multimedia (video or virtual presenter) located in the same area reserved for the meta-communication mechanism. The primary video would be associated with the main content of the page but it could also show other material that is related to the task the user is performing. For example, when clicking on any of the options of the "Enquete" (poll system), the video would be ready to display, upon user request, information on the purpose of the "Enquete", as well as the sequence of steps to be performed in order to successfully complete the task of voting.

The GOMS model (Goals, Operators, Methods, and Selection rules) will be used to guide the creation of the material related to the tasks that can be performed in the system. The result of the GOMS analysis performed in (HAYASHI, NERIS, *et al.*, 2009) provided a list of the steps that should be taken in order to accomplish a given task at *Vila na Rede*. As seen in the activities performed within the target community of users and reported in (HAYASHI e BARANAUSKAS, 2010), people are more familiar with the step-by-step way of conveying instructions.

Next we present the content that the meta-communication mechanism will treat for each area of *Vila na Rede*:

5.2.2.1. Every page of the system will have the meta-communication area, which will provide the video (virtual presenter, film or sequence of screens) to support users' interaction with the system. Besides that, the virtual presenter will be able to read the text that the user will select to be converted into speech at the Text to Speech tool. At all instances it will be possible to add materials that are produced by the participants – registered users – of *Vila na Rede*.

5.2.2.2. Other elements that are present in all pages, and that can trigger the meta-communication from the same page are: (the other elements will only trigger the meta-communication area once taken to the destination page – for example: when one clicks at the "Entrar" button, the content on this feature will be available in the next page: the page that shows the first step to "Entrar")

-Search engine. When the cursor is placed in the field of the search engine, the video will be changed to display the one about this feature.

-Accessibility controls. When the user clicks at one of the accessibility controls (e.g. font size control), the video will be ready to display information on this feature, explaining how it works and how to undo the action.

-Poll. Once an option of the poll question is checked, the video will inform about the poll, how to vote, how to contribute with a question, and how to see the results.

-Online user - *ConversasOnline*. When the icon next to an online user is clicked, the window for the *ConversasOnline* will be opened. With that, the meta-communication area will present information about what can be done and details of that screen. Due to the complexity of this feature, the videos will be divided and each will present further details: the first one should give an overview; the second more details on how that tool works; and the third, the differentials of this tool. Figure 5.5 shows how this sequence of videos could be presented. The user will be able to choose if he wants to proceed in viewing the videos. All videos can be stopped at users will, but if he chooses to watch it until the end, the options will be shown and he will click to see the further information. Other pages that demand for more than one video will work in a similar way, as shown in Fig. 5.5. The support itself should inform the users about all these possibilities of controlling the exhibition of the videos.

-Going back. For those tasks composed of more than one step, the system will present the "back" ("voltar") button. The videos about the tasks should include the information that the user can go back.

Fig. 5. 5 - Accessing a sequency of videos.

-Scrolling arrows. Whenever a user click one of the scrolling arrows, the support area will be ready to inform about this feature (how to use it) and how it had been conceived (users' suggestion).

Home page – not logged in. The multimedia support area will display in the home page a sequence of videos consisting of: 1) an overview of what *Vila na Rede* is and what can be done and 2) an institutional video to announce *Vila na Rede*.

5.2.2.3 Terms of use. The support area will present a brief summary of what this document is about and its importance. It should be presented, as always, in a familiar way of speaking and in general terms.

5.2.2.4 Enter. There are basically two steps to be completed in order to enter the system with a valid user id and password. In the case of pictorial password, the two steps are composed of four screen sequences. Each screen will present a different support, showing what the user can do there and how to proceed in case of difficulty (e.g. forgot password).

5.2.2.5 Forgot password. In order to reset the password, the user has to go through three steps. Each screen will present the support according to where in the process he/she is.

5.2.2.6 Create new account. This process has three steps:

- User identification. There are six fields that can be filled in this step, being three of them mandatory. When the user clicks each field to enter the information, the support area will be ready to present a short information about that field. Before that, the support area will give a general idea about this page.

- Password. The video to be presented here is about the password in general: why it is needed, why it is necessary to confirm it; tips about saving it, and information about the possibility of resetting it; and about the possibility of going back to the previous step. In case of the pictorial password, this step will be composed of three screens. The video should inform that the correct sequence should be remembered.

- Secret questions. It is important that the support area makes it clear to the user that the images chosen here are not the password, but the questions that will be asked in case they forget their password. There will be two screens (one for each secret question). The first video will end by asking the user to choose the option that best answers the First question. The video for the second question would then inform that, in order to reset the password, it will be necessary to remember the answer for both questions.

- Confirm. The support area for this screen might suggest the user that he/she can take note of this information for future reference.

5.2.2.7 Contact us (Fale conosco). The video will inform about this feature, making it clear to the user that this is a channel of communication between him/her and the development team. It should be clear that if he/she expects to receive an answer, he/she should provide an e-mail. Each field of this form will trigger a short video informing about that specific field. The use of the media will trigger the videos as detailed in 2.2.13.

5.2.2.8 Products and services/ideas/events announcements main page. The support area in these pages will inform the user about the ads, how to navigate throughout the pages, how to order the ads (by most viewed, most commented or by date), how to see detail of one ad.

5.2.2.9 Page of an announcement. Once in the page of an advertisement, the video will inform about the information that is seen there (e.g. how to know who had posted it), and about the actions that can be taken from there: Collaborate, Comment, and - if the user is the owner of that ad - Edit.

5.2.2.10 Create a new announcement.

- Home (list of categories): The video will inform the three possible categories and the differences between them, giving simple examples for each: products and services, events and ideas.

- Create an announcement for products and services/events/ideas. The first video will inform about the category (products and services, events or ideas) and what can be done in that page. Then, for each field, an extract of video will inform about that field, and, as always, the user will be able to navigate through the videos, as shown in Fig. 5.5. Whenever the user clicks on any of the icons for the media, the video will be shown as detailed in 5.2.2.12.

- Confirmation message. In this page, the support area will inform the user that the ad has been created and that he/she can now see how it looks. It will also advise the user to review the announcement and inform how to proceed in case he/she wants to edit it.

5.2.2.11 Hedonic poll. When the user clicks the "sair" button (as detailed in section 3), the video in the next page will explain about the pictures and the purpose of that poll. There will be three screens for this voting, and each will present a video related to the step in place at that moment. The final video will thank the user for his participation and welcome him to come back and to spread the news to his/her acquaintances.

5.2.2.12 Media. Every page that allows the insertion of media (e.g. create new announcement, contact us, comment, contribute, etc) will display this video once the user has made a click in one of the icons representing the media. Accordingly to the icon he/she has clicked on, the video will give a brief overview about the insertion of that specific media and the two possibilities: upload an existing file or produce one at that moment. The next videos will be available for each field that the user clicks on, or according to the navigation buttons as shown in Fig. 5.5.

5.2.2.13 Text to Speech. Whenever the mouse is placed in this field, the video in the support area will contain explanation about this feature. Also it will indicate how the same talking head that is speaking at the moment can read that text for them (as seen in section 2.1).

5.3 Affective feedback

In order to allow users to express their affective state towards the system, a hedonic poll tool will be used. This tool differs from the opinion tool that is found in every page of *Vila na Rede*: the opinion poll is about questions that inspire conversation about curiosities of daily life and let users know each other, or questions that help researchers to know more about the system's participants. The questions of this opinion poll change frequently. The hedonic poll will be permanent and accessible every time the user clicks on the "sair" button (leave the system). Users leaving the system will be invited to rank their feelings, by choosing from one of the pictures representing their emotional states. There will be two sets of pictures to be chosen from. The result will be presented, showing the users how the community of users is feeling in general. Figures 5.6 through 5.9 illustrate this tool, which uses the SAM (Self-Assessment Manikin), as proposed in (LANG, BRADLEY e CUTHBERT, 2005), and which has been successfully employed previously in the Brazilian context (HAYASHI, NERIS, *et al.*, 2008). This pictorial format of poll was chosen, having in mind the accessibility issues as presented before (e.g. illiterate users). The blind users or users with vision impairment of some degree will not be excluded from this format, since they are equally accessible by using either screen reader software or the meta-communication resources described in Section 2. SAM was chosen from other tools developed to measure affective response from users (to appear).

Fig. 5. 6 - Step 1 of 4 of the hedonic poll: "how did you enjoy Vila na Rede today?"

Fig. 5. 7 - Step 2 of 4 of the hedonic poll: “how excited were you about Vila na Rede?”

Fig. 5. 8 - Step 3 of 4 of the hedonic poll: “how did you feel: small and helpless or big and powerful?”

Fig. 5. 9 - Step 4 of 3 of the hedonic poll: result displaying the average of the votes for that week.

5.4 Conclusion

This technical report presented some detailed description of the meta-communication mechanisms to be used at an inclusive social network system. This tool is part of the ongoing research on Communication and Expression Tools in Inclusive Social Network Systems and it was instantiated at *Vila na Rede*, from the *e-Cidadania* Project. This work intends to collaborate in the creation of web systems that work towards the creation of digital cultures among Brazilian citizens.

Capítulo 6

Meta-communication and Inclusive Scenarios: Issues and Alternatives

6.1 Introduction

Designing user interfaces that include among the users both the illiterate and the digitally excluded is a challenge that is being faced by Brazilian researchers. The popularity of online social networks and instant messaging systems are attracting to the digital world young people who had not had much access to Information and Communication Technologies before. Nevertheless, in Brazil, the population of users-to-be is composed by a vast diversity of profiles. Many of them have limited literacy skills - only 25% of the population was considered fully literate, according to the INAF (Brazilian indicator of functional illiteracy) as of 2009[10]; and others present some kind of disability - about 24.5 millions of people, according to research from 2000[11]. Moreover, we cannot forget that 22% of this population live below the poverty line[12]. In this way, the digital inclusion consists of an important means of augmenting opportunities and promoting better life conditions for all. . This fact makes the research challenge of designing inclusive interfaces even more impacting.

Although Online Social Networks, Instant Messaging and other popular Internet resources may instigate the initial use of computers, it might not be enough for some users, as their interfaces are meant for the literate and are not concerned with inclusive aspects of interaction. It is important that the novice users feel comfortable with the use, so that they find the motivation needed to continue using even with the initial difficulties. For that, not only the application should make sense for them, but also it should be accessible and usable. The demanding question to be investigated then is: how to provide the appropriate

[10] IBOPE, 2010. Available at: www.ibope.com.br/ipm/relatorios/relatorio_inaf_2009.pdf (last accessed: Jan, 2010).
[11] IBGE, 2000. Available at: http://www.ibge.gov.br (last accessed: Jan, 2010).
[12] World Bank, 2008. Available at: http://devdata.worldbank.org/AAG/bra_aag.pdf

support for the citizens who are not familiar with computers and who have low literacy skills, so that they can make use of online applications? Or in other words, what are some of the characteristics that an online system meant to be inclusive should bear in order to be effective in a social context of diverse skills and competencies?

Being part of the *e-Cidadania* Project, this research profits from the project's context, which studies methods and systems to promote the digital culture among the Brazilian citizens. One of the *e-Cidadania*'s contributions is *Vila na Rede*, an inclusive social network system that is being developed as a conjoint effort of researchers from different fields and a community of users, composed by people with diverse profiles and backgrounds.

In this scenario of Inclusive Social Network for the Brazilian citizen, we then started our investigation by getting to know our end users better. As reported in Hayashi and Baranauskas (HAYASHI e BARANAUSKAS, 2008) an activity involving users that were chosen so as to represent the Brazilian communities' diversity was conducted in a Telecenter located in Campinas, São Paulo. The activity was conceived with the objective of understanding how these users relate to ICTs and to different kinds of media (e.g. sound, image, text). Among other findings, we were able to notice how their previous experience in daily activities reflects on their behavior online, and the importance of using real life metaphors.

Following that first contact with the target users, in two different workshops, again with the participation of end users, we studied the communities' natural social behaviors in face-to-face interactions in order to understand how technological tools for communication and expression could make sense to the less experienced users. In those processes, we confirmed the need of meta-communication mechanisms as support tools, not only for novice users but for all. These activities and the system requirements that were derived from them are reported in Hayashi and Baranauskas (2009).

Once the importance of a meta-communication mechanism was confirmed, we then searched the literature for the solutions proposed and/or already in use. Many interesting and important work was found on this subject (HAYASHI e BARANAUSKAS, 2010). Even though the works found are specific for different contexts (where either the final user

is literate or he/she already has some computer knowledge), we were able to delineate the initial characteristics of a meta-communication tool to be implemented in the context of the *Vila na Rede* Inclusive Social Network system, based on lessons learned on previous encounters with our target audience. The details of that mechanism are found in Hayashi and Baranauskas (2009b)From that specification, a prototype was built with the objective of evaluating the proposed mechanism.

In this paper we describe the process of elaboration and application of the participatory activity where the prototype of the meta-communication tool was evaluated. Preliminary results from this investigation are presented here together with an overview of the Design Rationale, with the issues and decisions that could be useful for other researchers interested in providing this kind of mechanism in their application contexts. The complete Design Rationale from which the one presented here was narrowed down can be found in (HAYASHI e BARANAUSKAS, 2010).

This paper is organized as follows: Section 2 presents the methodology that we have been using and briefly describes the meta-communication mechanism; Section 3 reports the workshop where the mechanism was evaluated, and discusses its results; Section 4 presents the design rationale and Section 5 concludes.

6.2Background

In order to design application systems that make sense to the users and that are accessible to all, we must have a socio-technical view of the problem. For that, the *e-Cidadania* project is following the principles of the Semio-Participatory Framework as proposed by Baranauskas (2009). In this Socially Aware Computing both the process of design and the resulting application are concerned with acting beneficially to the society at large, that is, they are both socially responsible and universal. In order to achieve that, it is important to take into account not only people's capacities about computer use, but all their experiences in life as well (BøDKER, 2006; NORMAN, 2004). In this direction, we have been conducting Semio-participatory workshops (BARANAUSKAS, 2009) in *e-Cidadania* Project. In these activities, the referential from the Organizational Semiotics (OS) is articulated together with the principles of the Design for all and with practices from the Participatory Design (PD) - adapted to our context. In this section we summarize the

theoretical referential that composes the methodology adopted by *e-Cidadania* project and that we have been following throughout this research project on communication and expression tools for inclusive social networks.

OS methods (STAMPER, ALTHAUS e BACKHOUSE, 1988; LIU, 2000) provide ways to model information systems from the signs that are used and that are meaningful for the involved people. OS is a branch from the Semiotics rooted in Charles Pierce, which studies signs and their roles as basis from which more complex concepts, like information and communication, can develop. In the OS from Stamper (1988), Informational Systems are seen as socially constructed – that is, resulted from human interactions – systems. They start at an informal layer, where the values, beliefs and habits of each member of the community (or organization) are relevant. In the next layer – the formal layer – the patterns of behavior found in the informal layer are now modeled into norms and rules and guidelines that will establish the requirements of the more internal layer of this onion structure: the technical. It is through these embedded layers that the Semio-participatory workshops are conducted and integrated into socially aware design cycles (BARANAUSKAS, 2009).

The activities that compose the workshops are inspired in techniques from PD (e.g. MULLER, 1997). Although PD had been originally meant for more homogeneous groups in work environments, this adaptation has been successfully applied in our scenario of different backgrounds. The techniques from PD allows a more democratic result in the design of applications, as final users and developers are both involved in all the phases of the process. This relationship foments other benefits, such as mutual learning between designers and users (as seen in Bonacin and Baranauskas, 2003) and the leverage of the comprehension of users' needs and abilities.

6.2.1 A meta-communication prototyped tool

In general terms, meta-communication can be understood as the communication about the underlying system of communication (HOPPENBROUWERS e WEIGAND, 2000; YETIM, 2001). As so, meta-communication concerns all information which is exchanged regarding the system of communication itself. More specifically and adopting the definition provided by Capobianco and Carbonel (2002), meta-communication can be seen as all

Fig. 6. 1 - A screenshot from the prototype of the proposed meta-communication mechanism

exchanges of information that are related to the conceptual model of the system, i.e., the communication that takes place in order to clarify or overcome problems during the communication processes and the communication surrounding the system's concepts. It includes the communication between designers and end users, which is the communication that allows designers to explain to the users what their intentions were when building the system and that helps users to make sense of the system and its features. The meta-communication mechanism proposed to be used in the inclusive social network of *Vila na Rede* is a system that will support users in their experience with the system. It is meant to go beyond traditional help systems or user's manuals, providing users with a scaffolding instrument that would not only provide them information on the system and its features, but also let them learn during its use, already preparing the novice users to use other systems.

From previous encounters with our target users (HAYASHI e BARANAUSKAS, 2009b e 2010), we have learned that the information presented to them should be as specific as possible, and tasks should be explained in a step-by-step basis. Moreover, multimedia resources like videos should add to the comprehension and accessibility of the information should be present in all pages. With that in mind, and also thinking about the different profiles and abilities that our target communities of users have, we proposed a mechanism to be presented to the users in all pages of the system in different media formats (e.g. images with text, audio only, video and video with LIBRAS - the Brazilian sign language). Figure 6.1 shows the image of the proposed mechanism for meta-communication. The information that composes the mechanism would be activated upon user request, from the

"i" (the international representation for "information") icons placed all over *Vila na Rede*'s pages. A more detailed description of this mechanism can be found in (HAYASHI e BARANAUSKAS, 2009b).

6.3 A participatory evaluation for the prototype

In order to evaluate the idea for a meta-communication tool, once again we gathered together with users from a community in Vila União, Campinas. In this opportunity, ten participants were given a task to be performed at *Vila na Rede* and a prototype of the meta-communication tool was prepared to support them in this task. In this section, first we provide an account on how the activity was designed and we briefly describe the participants involved; then the activity itself is described as well as its results.

6.3.1 Scenario and dynamics

A total of 20 users participated in this activity. The majority of them was also involved in the previous encounters. About 20 people took part in this Semio-Participatory workshop, from which 10 belonged to the community of target users - the others were researchers from the e-Cidadania project. From these ten users – whose ages ranged from 22 to 61 years old - four said that they had never or rarely had accessed the Internet. Two have elementary literacy skills. One participant was seen as the representative for many novice users, as he is the instructor of a community computer course. Other community leaders were present, like the representative of an environmental NGO and the coordinator of a community course that has the objective of preparing the youth to enter public universities.

Fig. 6. 2 - From left to right: (a) Station 1 at the workshop; (b) print screen of part of Vila na Rede's page; (c) user interacting with the prototype.

On a different day, a 18 years old, deaf high school student went through the same activity as well (Fig. 6.2c).

This workshop was composed of four independent activities, each at a different "station". Participants were supposed to individually visit each station, being the one described here the first one of the sequence as the task performed would be needed for the other stations. The activities from the other stations were related to other research interests and will be reported elsewhere.

Although each station was independent and had different purposes, the activities for all stations were prepared during meetings involving all the research group. Each researcher contributed with ideas and evaluated the other researcher's activity proposal. All researchers that took part in this workshop are involved in the same project *e-Cidadania* since its beginning, knowing well *Vila na Rede*'s main objectives and principles.

In order to be evaluated, the concept of the meta-communication tool was implemented in a prototype that simulated the tool that will be implemented at *Vila na Rede*. For this simulation, two monitors were set one beside the other (Fig. 6.2a). The monitor on the left was connected to a computer showing *Vila na Rede*'s home page and the one on the right, displayed the meta-communication prototype. Both allowed full navigation. The reason why the prototype was on the right side is because its place was thought to be on the right column of *Vila na Rede*'s pages.

The icon for "information" - internationally represented by the letter "i" in a blue circle - was placed beside each relevant information on *Vila na Rede*'s pages, as shown in Fig. 6.2b. They were the access point to activate the meta-communication tool and, only for this activity, these icons would sound upon click. This sound helped the researcher so that he would be sure that the participant actually clicked on the icon during the interaction with the mechanism.

Upon users click, the researcher then presented the prototype for the meta-communication tool. It provided the information related to the item where the icon was placed. The same information was presented in four formats: images with text, sound only, video and LIBRAS. These media were all prepared in AVI formats and were uploaded to Youtube.

Simple HTML pages, with the videos and buttons for changing between media (Fig. 6.1) composed the prototype prepared for this activity.

The entire activity was recorded both on a MP3 device and in video. Two researchers took part in it, one conducting the activity and the other one taking notes. After completing the task – to which each participant was given 10 minutes, they presented their opinions about the tool. Inspired by one of the stages of the Priority Workshops (Muller, apud Braa), we asked participants to write some positive, negative and desirable qualities of the prototype. For that, they received printed sheets with the images of the prototype and colored post-its (green for positive, red for negative and yellow for new ideas). Due to the short period of time that each participant had to stay in Station 1, these post-evaluation sheets with the colored post-its were given to the participants to be written later on that same day. Because of the pictures on the sheets, it was easy for the users to remember their experience with the mechanism.

Participants were given the task of filling out their profile on *Vila na Rede*, including the "further information" tab, which is related to information that the system will use to provide a tailored user experience (other ongoing). The researcher gave the user the task and waited to see whether they would find out how to perform it by themselves or not. Upon difficulty, she suggested the user to search for assistance and checked if the access point for the mechanism made sense for them and observed how effective the mechanism was.

6.3.2 Preliminary results

Although most of the participants needed to be hinted into the access point for the meta-communication feature, its acceptance after experiencing the mechanism was that of 100%. More important, the effectiveness of the tool was also 100% (all users who were not able to guess how to perform the task, knew how to do it after accessing the meta-communication mechanism). In this section we present a summary of participants' response considering three aspects, based on Norman's three levels of design (2004): visceral, behavioral and reflective.

6.3.2.1 Visceral Level

The visceral level is related to the initial impact or initial response from the user, which is usually determined by the relationship between the appearance of the product and the preference of the consumer or user. For this level, we considered the accounts from participants during their first contact with the evaluated mechanism.

All participants approved the idea of the mechanism in general. Two of them were really excited about the functionality (these two users had had little or no access to the Internet before, taking part of the workshops). One said that it was exactly what she needed. The other said that the mechanism would perfectly work as a substitute for her daughter, to whom the user refers to when in need of assistance to use the computer and who is not always available for - or willing to do - that job. Even those already skilled in computer and Internet liked it. One was surprised to see the information would also be available in LIBRAS and found it to be very useful, even though he himself would not need/understand it.

6.3.2.2 Behavioral level

For the behavioral level we characterize users' interaction with the mechanism. This level is related to the use of the system. Like the visceral level, the behavioral is rather a subconscious process, as we are unaware of our true reactions while experiencing a product or application.

During the interactions, only one participant experienced all available media. He clicked the buttons for the information in the formats of sound, images and LIBRAS - besides the video. Nonetheless, 90% of the others who did not interact with the different media seemed to understand what the different buttons were for. All of them used, to different levels, the instructions to complete the task.

The usability of the mechanism was in great part hindered by the use of two different computers. It might be that more participants would have interacted with the other media if everything were in the same computer. Only the two participants who were digitally literate felt comfortable to use the two mouses (there was one for each computer). In despite of the

problems of interacting with the prototype in the way it was settled, we believe that once the mechanism is implemented in its place at *Vila na Rede*, there should be no barriers.

6.3.2.3 Reflective level

This level of processing arrives after the experience is put into a conscious reflection. Users comments made on the pieces of paper after the interaction with the mechanism were taken as their reflective response, as they had to think in order to articulate their opinions on a written format.

No one used the red paper to write a complaint, but one left a suggestion to "enhance the audio", referring to the sound of the video, which was too low. A different participant commented that the presence of subtitles and pause buttons facilitates the access and comprehension.

One participant suggested that, instead of the "i" icon, there should be the word "information". The participant who interacted with all media formats reported that "all four options are extremely necessary to cover all profiles of users".

All other comments were positive, either stating that they liked, really liked, thought it to be important, or that it made the system easier to use. From previous experience with this kind of activity we know that the participants are sincere and would not omit a complaint if they had one.

The deaf participant contributed with suggestions about the LIBRAS video for the meta-communication mechanism. As a result of our interaction, we found out that it should contain not only a person signaling LIBRAS, but it should also show images (e.g. screen shots of the system), as images are important for them to contextualize the information. Now, in opposition to what some might believe, it seems that most deaf people would not make much use of subtitles.

6.4The Design Rationale

The participation of the target users since the beginning of the project was of vital importance for the construction of an interface that reflects their needs and abilities. In each encounter we learned more about our users' reality and about their experience within *Vila na Rede*. The collected material from these experiences (videos, reports, notes, MP3

records) was very rich in meaning and content. The analysis from these resulting material directed researchers' discussions towards the design of the meta-communication mechanism to be implemented at *Vila na Rede*. More specifically, the activity reported in the last section let us confirm our hypothesis and the decisions that needed to be made for the conception of the mechanism. A complete account on the issues and decisions made throughout the design process of this mechanism is reported in (HAYASHI e BARANAUSKAS, 2010). In this section, we briefly inform this rationale, focusing on the invariants from which the designers of inclusive systems might find support for their work.

As Hornung and Baranauskas (submitted) argues, because of the fact that design decisions are directly influenced by the context of the application, it might be more profitable to present a design rationale instead of a set of fixed design guidelines. According to Lee and Lai (1991), in a more general sense, the design rationale is an account on why an artifact was designed the way it is. It usually represents the historical record of the discussions or analysis that led to the choices of a particular artifact of the feature in question. That is, it registers the logical structure behind the design process.

Similar to the design rationale presented by Hornung and Baranauskas (submitted), the one presented here provides the Claims that supports (+) or refutes (-) the Alternatives that were found to answer the Design Problem, in order to better fulfill the initial Goal. Also because of the lack of space, we present the rationale on tables (Tables 6.1, 6.2 and 6.3) instead of the usual graphical representation.

Tab. 6. 1 - Design Rationale: Content

Decision Problem:	**What kind of content will be presented**	
Goal	**Alternatives**	**Claims**
Provide useful support	Detailed written descriptions of steps and reasons	- The reading culture among our target users is not strong; so long written instructions would not be appealing to them. - Support content is not the main focus of the system and therefore it should not be long.
	Video of actual users "teaching" other users	+ Language used is closer to them. + Most common difficulties and abilities are already known. + Users feel part of the system and proud to be able to contribute. + Motivation for the users to participate and to learn more.
	Information as specific as possible	+ Easier to understand - More work for designers to produce the material

Tab. 6. 2 - Design Rationale: Form of presentation.

Decision Problem:	**How to present the content**	
Goal	**Alternatives**	**Claims**
Present the content in a way that makes sense to all target users and is accessible to them	Use of an avatar	+ Resembles the face-to-face communication (e.g. as when asking someone for information). - If the images are too realistic, users might believe that an actual face-to-face interaction is possible.
	Multimedia: possibility of viewing the same content in different media formats (e.g. tutorial video, sound, text with images)	+ Attends the widest range of profiles of users. - Depending on the user's system configuration and Internet access, it might take more time to load.
	Presented in the same window as the user is working (in opposition to opening a new window)	+ Novice users will not feel lost with many different windows or having to navigate back. + The instructions can be followed at the same time that the information is being displayed.

Tab. 6. 3 - Design Rationale: Access Point.

Decision Problem:	**How to access (launch) the mechanism**	
Goal	**Alternatives**	**Claims**
Make the information fror the meta-communication easy to access	Traditional "help" link written somewhere in the page that takes to the content	- The reading culture among our target users is not strong, and even single words tend to be missed by them. - Far from the source of interest (it is not directly related to the content and it is not specific).
	Mouse over: the information displayed on the meta-communication mechanism changes accordingly to where the mouse is at that moment.	+ It is a more proactive response from the system. - Cost to load the media for each mouseover event - User lost on different media being exhibited (difficulty in associating the change of the information based on the mouse movement).
	The information is displayed whenever the user clicks upon an "?" icon placed beside each topic on the page	+ Easy to access + Gives more user control than the mouseover alternative. - The sign of a question mark might carry the negative connotation of doubt or ignorance
	The information is displayed whenever the user clicks upon the word "information" placed besides each topic on the page	+ Easy to access + Gives more user control than the mouseover alternative. - Too long - May interfere in the text of the related topic
	The information is displayed whenever the user clicks upon the "i" sign placed besides each topic on the page	+ Easy to access + Gives more user control than the mouseover alternative. + It is an international sign used in different scenarios - Some users may not understand it at first + The user will eventually learn what the "i" stands for: it is part of the learning process and digital/social inclusion proposed
	Sequence of videos that is automatically played whenever a user enters the page.	+ Easy to access, specially for the low literate or novice users of technology - Lack of user control - Some experienced users may find it invasive. - The sequence might be long when there are many information on a page. - Difficult to find quick and specific information.

Although decisions were taken based on the specific context of Brazilian use, there are some invariants that might be appropriate for designers of inclusive systems in other settings. Furthermore, even the design problems that would be handled differently

according to their particular context could also benefit others with the insight that the alternatives and claims presented here might raise.

The alternative of presenting the content in multimedia (Table 6.2) seems to fit the widest variety of audience possible. Having the same information shown in different media formats aids users in different conditions and could be useful even for users from places where literacy skills are not an issue; for example, an audio content would allow a user to follow the instructions without having to take his eyes away from the focus of attention. It is important that the videos are provided with subtitles in order to attend users unable to hear the sound - be it for a hearing impairment of lack of appropriate computer device. The LIBRAS content could be replaced by any other sign language.

The alternative of presenting the content in the same window as the user is working (Table 6.2) was considered based on the difficulty that novice users have with dealing with more than one window. Nonetheless, this choice might be useful also for advanced users who will not have to accommodate different windows in order to follow the help while using the system at the same time.

Considering the principles of the Design for All, the issues that present varied alternatives direct the developers to the challenge of designing Tailorable solutions in an inclusive way (NERIS e BARANAUSKAS, 2009).

6.5 Conclusion

Whereas support facilities are part of every computer system so as to facilitate its use, a few is concerned with access for all. The same happens with social network sites: they are eager to gather the most number of users by its innumerous features but they do not consider the low literate, digitally excluded users, nor users with some kind of disability. Considering the popularity of social networks and instant messaging software, and mainly the access to government services and information through the Internet, it is important that the systems are made accessible and inclusive, in order to reach the majority of citizens.

This paper presented a preliminary evaluation of a meta-communication mechanism for an inclusive social network system conducted within a Brazilian community. Moreover, it

discussed some design decisions taken throughout the process, in an attempt to inform designers of inclusive systems about the issues and the suitable alternatives that can rise during the development of the application.

The mechanism presented is being implemented at *Vila na Rede*, an inclusive social network developed within the context of the *e-Cidadania* project. Although this investigation takes place in the unique scenario of Brazilian users, it might inspire other countries that face similar problems of digital divide and low literacy to consider the implementation of scaffolding systems to help users learn while enjoy the system.

Capítulo 7
Conclusão

O contexto único de multiplicidade de riquezas culturais que temos hoje no Brasil exige que a criação de aplicações inclusivas seja abordada de maneira diferente das tradicionais. A pesquisa conduzida neste trabalho buscou conhecer melhor os usuários e seus contextos sociais para então propor uma ferramenta que fizesse sentido para os participantes de redes sociais inclusivas. A metodologia adotada viabilizou a construção do mecanismo proposto com a participação direta dos usuários alvo. Em um processo de aprendizado mútuo, pudemos ao mesmo tempo conhecer diversos contextos sócio-culturais e também foi possível contribuir, ainda que em pequenas proporções, no processo de inclusão digital de alguns dos envolvidos.

Durante os primeiros encontros na comunidade alvo buscamos responder a perguntas essenciais: Como este público se relaciona com as TICs? Que sentido fazem delas? No capítulo 2 mostramos alguns exemplos de uso de tecnologia e vimos como a experiência e o contexto de vida influem diretamente no entendimento e no uso desses artefatos tecnológicos. Tal resultado corrobora a importância de se adotar uma visão sócio-técnica para a construção das interfaces de usuário - uma maneira que possibilita que o sistema reflita os níveis informal, formal e técnico na relação dessas pessoas com sistemas de informação.

Com este primeiro resultado, a atividade seguinte teve o objetivo de investigar as normas sociais que regem a comunicação entre as pessoas no dia-a-dia. No capítulo 3, descrevemos as atividades em que foi possível observar e registrar o processo de comunicação entre os membros de uma rede. Como resultado, apresentamos alguns requisitos para ferramentas de comunicação e apontamos a necessidade de um mecanismo de meta-comunicação que fale diretamente com os participantes da rede, dando suporte e auxiliando-os em suas experiências com o sistema.

Uma vez diagnosticada a importância de mecanismos de comunicação e meta-comunicação em sistemas inclusivos de redes sociais, a pergunta investigada foi: o que já existe em

pesquisa em sistemas de apoio? Buscamos então na literatura uma base e este levantamento, junto com o resultado de mais uma atividade com o grupo da comunidade alvo, compuseram o capítulo 4, que traça as primeiras definições do mecanismo de comunicação (cujas especificações mais detalhadas foram descritas no capítulo 5).

No capítulo 6, pudemos observar através de práticas com os usuários, quão eficaz a proposta da meta-comunicação como sistema de apoio inclusivo pode ser. Neste capítulo, mostramos também o *design rationale* apresentado de forma a auxiliar designers de aplicações inclusivas interessados em replicar tal recurso em seus sistemas de redes sociais.

Ao longo do desenvolvimento desta pesquisa a nossa compreensão sobre diversos aspectos da população foi evoluindo, fazendo com que especificações propostas inicialmente sofressem modificações. Alguns destes pontos estão detalhados na subseção 7.1, enquanto que a visão geral deste processo de amadurecimento está descrito no *design rationale* que apresentamos no Apêndice I. As principais contribuições desta pesquisa foram resumidas na subseção 7.2 e os trabalhos futuros, em 7.3.

7.1 Lições aprendidas

Cada capítulo desta dissertação retrata uma etapa diferente que foi vivenciada durante esta pesquisa de mestrado. Em alguns casos, etapas posteriores nos permitiram clarificar entendimentos de etapas anteriores. Por exemplo, no Capítulo 5, ao descrevermos as especificações do mecanismo de meta-comunicação, afirmamos que o uso de avatares seria uma solução também para os surdos, que poderiam ler os lábios do avatar ou ler a legenda. Durante a fase de avaliação (Capítulo 6), o conhecimento adquirido com o contato constante com a comunidade surda nos fez perceber que nem as legendas nem a leitura labial resolvem o problema de acessibilidade dos surdos. Os vídeos LIBRAS, por sua vez, permitem que estes usuários possam acessar o conteúdo apresentado.

Conforme ilustrado pela Figura A.2, as LIBRAS foram introduzidas ao mecanismo de meta-comunicação posteriormente. Além das LIBRAS, foram adicionados à interface inicial do mecanismo também o acesso à informação via áudio e via imagens com texto, além do vídeo. A disponibilização do conteúdo por áudio seria útil não apenas para pessoas

com diversos graus de deficiência visual como também para os usuários com baixo letramento ou simplesmente para que usuários possam realizar as tarefas sem mudar o foco de atenção para a tela da meta-comunicação. Imagens com texto seriam o equivalente ao conteúdo tradicional que encontramos nas ajudas de sistemas online.

No Capítulo 3 descrevemos duas atividades (PACFILMO e Simulação de Conversas Online) que nos permitiram estudar os comportamentos sociais em cenários naturais para compreendermos como as ferramentas tecnológicas para comunicação e expressão poderiam fazer sentido para os usuários com pouca experiência com as TICs. Estas atividades não contaram com participação de deficientes auditivos. Porém, o mecanismo resultante do levantamento de requisitos feito no Capítulo 3 foi avaliado em atividades com um aluno surdo, conforme descrito no Capítulo 6. Desta maneira, foi possível verificar que os resultados apresentados (e.g. Tabelas 3.4 e 3.5) não discriminam ou atrapalham a realização das tarefas pela comunidade de usuários surda. Mesmo as conversas com mais de uma pessoa (Tabela 3.5), ocorrendo intercaladamente, são possíveis entre estes usuários.

7.2 Principais contribuições

Em suma, este trabalho investigou o design de interfaces de usuário para suporte à utilização de redes sociais de maneira a incluir o maior número possível de pessoas, sem evitando diferenciar ou categorizar usuários. Foram levantados requisitos para o desenvolvimento destas ferramentas para o cenário brasileiro e, com base nestes requisitos, foi feita a proposta de um mecanismo de meta-comunicação para apoiar os usuários, não de uma maneira assistencialista, mas procurando promover seu processo de aprendizagem, permitindo que estes usuários possam se familiarizar com a linguagem web e com o uso de tecnologia.

Neste processo, os participantes que colaboraram diretamente com o design do mecanismo tiveram a oportunidade de estar em contato com a tecnologia e com as atividades inerentes ao processo de pesquisa. Ao estabelecer este contato entre a comunidade externa e a pesquisa, este trabalho também contribuiu, ainda que em proporções muito modestas, para a expansão do conhecimento produzido pela Universidade, trabalhando no conceito de

Extensão, um dos pilares do ensino superior. Foi gratificante poder fazer parte deste grupo de pesquisa que nos permitiu, por exemplo, compartilhar da euforia de senhoras da terceira idade que aprenderam a usar o mouse ou que descobriram a Internet como fonte de informações. Esta pesquisa também envolveu um aluno surdo do ensino médio de uma escola pública de Campinas, que contribuiu no processo de avaliação da ferramenta (descrito no capítulo 6) e na criação do seu conteúdo LIBRAS. Esta vivência nos mostrou como se dá a relação dos deficientes auditivos com mídias e a dificuldade que existe para compreenderem textos em português. De outro lado, permitiu a este aluno uma imersão no ambiente de pesquisa e contexto da universidade.

Fazendo uma análise crítica do trabalho, levantamos algumas questões que discutimos a seguir:

•Em relação aos usuários participantes: as características destes grupos de pessoas foram suficientes para realmente refletir a diversidade da população brasileira?

Compuseram os grupos participantes das atividades relatadas neste trabalho pessoas de diferentes classes sociais, escolaridade e conhecimento de computadores.

A atividade descrita no capítulo 2 contou com a participação de um público que foi constituído com o intuito de se reproduzir proporções semelhantes às que encontramos na população brasileira. A escolha destes participantes foi feita com o objetivo de disponibilizar uma amostra do que seriam as habilidades e dificuldades dos usuários do sistema, de modo a refletir a diversidade da população, sem a pretensão de descreve-la na sua totalidade. Também não foi a nossa intenção prover uma "média" do perfil dos usuários, mas sim conhecer de perto as necessidades destas pessoas, com o intuito de investigar e prover soluções mais adequadas e que pudessem atender ao maior número possível de usuários, sem excluir ou diferenciar.

Para as atividades seguintes, o grupo de participantes incluiu líderes da comunidade – pessoas que, pelo seu contato direto com os habitantes dos bairros e estudantes dos cursos de inclusão, estavam aptos a responder pelos interesses destas pessoas; além de usuários finais com perfis variados.

Consideramos que o tamanho dos grupos foi adequado para os nossos propósitos. Participaram das atividades cerca de 10 a 15 pessoas da comunidade. Este tamanho está em conformidade com a proposta do Design Participativo, tal como apresentada por Muller (1997) e Baranauskas, Hornung e Martins (2008).

•Como destacar as contribuições desta pesquisa dentre os resultados do Projeto *e-Cidadania*?

O *e-Cidadania* teve importância vital para a realização deste trabalho. Além do apoio financeiro, pudemos contar com a contribuição científica do grupo de pesquisadores, cujos temas de pesquisas se inter-relacionaram com o nosso. Também baseamos toda metodologia nos mesmos princípios adotados pelo Projeto. Foi a partir das atividades realizadas em conjunto com outros participantes do projeto que pudemos coletar os dados necessários para a realização desta pesquisa em específico. Desta forma, o *e-Cidadania* constituiu uma rica fonte de onde o material foi coletado, analisado e transformado em resultados individuais, reunidos neste trabalho, e que estão delimitados pelo tema da meta-comunicação.

O mecanismo meta-comunicação está presente em todas as páginas do *Vila na Rede*, uma Rede Social Inclusiva que é fruto de um esforço conjunto de vários pesquisadores participantes do projeto *e-Cidadania*. O *Vila na Rede* está em produção e é utilizado por comunidades de usuários reais espalhadas pelo Brasil. Não apenas a comunidade do bairro onde as oficinas Semio-Participativas foram realizadas (Vila União, Campinas - SP) utilizam o sistema. Podemos ver também anúncios de pessoas de outos municípios (e.g. Pedreira, São Paulo) e estados (e.g. Minas Gerais). Segundo dados obtidos por sistemas de análise de tráfego, o Vila na Rede é acessado até em outros países (Portugal, Estados Unidos, Suíça, entre outros).

•O que trouxe de benefício para o resultado desta pesquisa a adoção de uma abordagem que leva em consideração a resposta afetiva dos participantes?

Esta pesquisa buscou pensar uma ferramenta que fizesse sentido para os usuários, possibilitando uma interação mais natural. Verificamos no capítulo 2 como os participantes atuaram melhor diante de um atendente real, que expressa e reconhece as qualidades

hedônicas das interações. Durante atividade descrita no capítulo 3, uma participante utilizou-se espontaneamente do recurso de comunicação para expressar seus sentimentos em relação ao grupo e à atividade. Não apenas nos encontros com os usuários que constatamos como a questão afetiva é importante para eles, como também estudos corroboram nesta direção, indicando a influência que as emoções exercem sobre percepção, aprendizado e outros processos cognitivos (PICARD, 2000); e como o lado emocional do design pode ser essencial para o sucesso de um produto, uma vez que sistemas que nos fazem sentir bem parecem mais fáceis de usar (NORMAN, 2004). Assim, a avaliação apresentada no capítulo 6 também levou em consideração estas respostas afetivas, proporcionando uma análise mais ampla em relação a aspectos de afetividade do mecanismo proposto.

7.2 Trabalhos futuros

Este trabalho investigou processos de comunicação e meta-comunicação envolvidos no design de sistemas que favoreçam o acesso a sistemas de informação para a diversidade de usuários em sua maior extensão possível e apresentou uma proposta de apoio a esses processos. O mecanismo de meta-comunicação proposto refere-se às trocas de informação referentes ao modelo conceitual do sistema, incluindo a comunicação que ocorre para clarificar ou transpor barreiras durante a interação com o sistema. Apresentamos os passos percorridos para a construção do mecanismo, identificando requisitos básicos e apontando as decisões tomadas para auxiliar os designers interessados em criar aplicações inclusivas em suas redes sociais. Não fez parte, porém, do escopo deste projeto fornecer um arcabouço que pudesse servir de instrumento para que os desenvolvedores pudessem criar seus mecanismos de meta-comunicação. Seria necessário definir os módulos e componentes, mas sem o enrijecimento de um sistema fechado; incluindo sempre as práticas com usuários e mantendo o instrumento de desenvolvimento aberto para a incorporação das especificidades de cada contexto. Conforme apresentado no capítulo 4, o conteúdo do sistema de apoio foi modelado com base no resultado da aplicação do método GOMS. O arcabouço que poderia ser construído para auxiliar desenvolvedores em seus projetos poderia contar com a proposta de novos métodos, específicos para este fim.

O mecanismo foi avaliado aqui enquanto em seu protótipo. Novas avaliações devem ser planejadas utilizando-se versões online do sistema. Um estudo comparativo poderá ser conduzido, avaliando a resposta (afetiva ou não) dos usuários diante de sistemas de ajuda convencionais das redes sociais e do mecanismo de meta-comunicação do *Vila na Rede*.

Outros recursos poderão ser adicionados à ferramenta, como por exemplo, um módulo de busca que permitisse que uma determinada informação pudesse ser recuperada a partir de um texto digitado no campo de busca. O uso de avatares ou sistemas de síntese de voz também poderá ser incorporado ao sistema, conforme resultado da pesquisa apresentado no capítulo 1 e definição mostrada no capítulo 5. Outro recurso possível seria um módulo de *ranking* que agrupe as consultas mais vistas, compondo uma espécie de FAQ (*Frequently Asked Questions*). A contribuição dos participantes da *Vila na Rede* com o mecanismo de apoio poderia ser implementada de uma maneira mais direta, onde fosse possível adicionar conteúdos de vídeo, áudio, LIBRAS ou imagens tal como é feito em outras áreas do *Vila na Rede*.

Para todos estes módulos, seria importante conduzir pesquisas para definir a melhor forma de interação do usuário, de acordo com suas habilidades e seu contexto, mantendo em mente as questões de usabilidade e acessibilidade. Além disso, seria preciso verificar se tais módulos realmente fariam sentido para a população alvo e em que medida não acrescentariam mais complexidade ao processo.

Finalmente, apesar da motivação e cenário deste trabalho terem sido redes sociais inclusivas, o mecanismo de meta-comunicação poderia ser implementado em outros sistemas inclusivos. Seria interessante investigar, testar e avaliar os resultados desta proposta também em outros domínios.

Bibliografia

Anatel. http://www.anatel.gov.br (2006). Accessed 12 Feb 2008.

ANDRADE, O. D.; NOVICK, D. G. Expressing Help at Appropriate Levels. **Proceedings of the 26th annual ACM international conference on Design of communication**, Lisboa, 2008, p. 125-130.

BARANAUSKAS, M. C. C. Socially Aware Computing. In: **Proceedings of the VI International Conference on Engineering and Computer Education**, **ICECE 2009,** Buenos Aires, 2009, p. 1-5.

BARANAUSKAS, M. C. C., "Socially Aware Computing". In: **Proceedings of the** VI International Conference on Engineering and Computer Education, ICECE'2009, pp. 1-5.

BARANAUSKAS, M. C. C., HORNUNG, H. H., MARTINS, M. C., Design Socialmente Responsável: Desafios de Interface de Usuário no Contexto Brasileiro. In: **35º Seminário Integrado de Software e Hardware**, SEMISH 2008 - XXVIII Congresso da Sociedade Brasileira de Computação SBC, 2008, p. 91-105.

BARANAUSKAS, M. C. C.; BONACIN, R.; LIU, K. Participation and signification: Towards cooperative system design. **IHC2002 The Fifth Workshop on Human Factors in Computational Systems**, Fortaleza, 2002, p. 3-14.

BøDKER, S. When Second Wave HCI meets Third Wave Challenges. **Proceedings of the 4th Nordic Conference on Human-Computer Interaction, NORDCHI**, Oslo, 2006, p. 1-8.

BøDKER, S., GRøNBæK, K., KYNG, M. Cooperative design: techniques and experiences from the Scandinavian scene. In: **Human-computer interaction: toward the year 2000**, Morgan Kaufmann Publishers Inc., San Francisco, CA, 1995, pp. 157-175.

BONACIN, R., BARANAUSKAS, M. C. C., Semiotic Conference: Work Signs and Participatory Design, In: **Proceedings of the 10th International Conference on**

Human - Computer Interaction, HCI International 2003, Creta. Lawrence Erlbaum Associates, 2003. v. 1. p. 38-43.

BONACIN, R., **Um modelo de desenvolvimento de sistemas para suporte a cooperação fundamentado em design participativo e semiótica organizacional**, PhD Thesis, Institute of Computing, University of Campinas - UNICAMP, SP, 2004, 261p.

BONACIN, R.; BARANAUSKAS, M. C. C. Semiotic Conference: Work Signs and Participatory Design. In: **Proceedings of 10th International Conference on Human - Computer Interaction,** HCI International, Creta, 2003, p. 38-43.

CAPOBIANCO, A.; CARBONELL, N. Contextual Online Help: a Contribution to the Implementation of the Universal Access. In: KEATES, S.; CLARKSON, P. R. **Universal Access and Assistive Tehcnology**. London: Springer, 2002. p. 131-140.

CARD, S.K., MORAN, T.P., NEWELL, A. **The Psychology of Human-Computer Interaction**. Lawrence Erlbaum Associates Inc., 1983.

Casa Brasil. http://www.casabrasil.gov.br. Accessed 12 Feb 2008.

CHAND, A. and ANID, K. D.: Jadoo – a paper user interface for users unfamiliar with computers. In ***Proceedings*** **of the SIGCHI Conference on Human Factors in Computing Systems**, CHI 2006, Montréal, Québec, Canada (2006), p. 1625 – 1630.

COSTA, P. D. P.; DE MARTINO, J. M. **Animação Facial 2D Sincronizada com a Fala Integrada a Conversor Texto Fala**. Primeiro Encontro dos Alunos e Docentes do DCA (EADCA). Campinas, p. 19-20. 2008.

DE MARTINO, J. M.; VIOLARO, F. Benchmarking Speech Synchronized Facial Animation Based on Context-Dependent Visemes. **Proceedings of The 15th International Conference in Central Europe on Computer Graphics, Visualization and Computer Vision'2007**, Pilsen, 2007. 105-112.

DE SOUZA, C. S. **The Semiotic Engineering of Human-Computer Interaction**. Cambridge: The MIT Press, 2005.

DRUCKER, P.: **Sociedade Pós-Capitalista**. Pioneira, São Paulo. Translated from the original "The Post-Capitalist Society" (1993).

EIRIKSDOTTIR, E., NEES, M., LINDSAY, J., STANLEY, R. : User Preferences for Auditory Device-driven Menu Navigation. In **Proceedings of the Human Factors and Ergonomics Society** 50th Annual Meeting (2006).

GAZENDAM, H., LIU, K., The Evolution of Organisational Semiotics - A Brief Review of the Contribution of Ronald Stamper. In: **Proceedings of the 7th International Workshop on Organisational Semiotics**, INSTICC Press, ISBN 972-8865-18-X, 2004, p. 1-11.

GIBSON, J. J. **The Ecological Approach to Visual Perception**. Lawrence Erlbaum Associates, 1986.

HAYASHI, E. C. S., NERIS, V. P. A., ALMEIDA, L. D. A., RODRIGUEZ, C. L., MARTINS, M. C., BARANAUSKAS, M. C. C., **Inclusive Social Networks: Clarifying Concepts and Prospecting Solutions for e-Cidadania**, Technical Report IC-08-029, Institute of Computing, University of Campinas - UNICAMP, 2008.

HAYASHI, E. C. S., NERIS, V. P. A., BARANAUSKAS, M. C. C., MARTINS, M. C., PICCOLO, L. S. G., COSTA, R., **Avaliando a Qualidade Afetiva de Sistemas Computacionais Interativos no Cenário Brasileiro**. In: Usabilidade, Acessibilidade, Inteligibilidade; Workshop do IHC 2008.

HAYASHI, E. C. S., NERIS, V. P. A., RODRIGUEZ, C. L., MIRANDA, L. C., HORNUNG, H. H., SANTANA, V. F., PEREIRA, R., MARTINS, M. C., BARANAUSKAS, M.C.C. **Preliminary Evaluation of VilanaRede - An inclusive social network system**. Instituto de Computação - UNICAMP. Campinas, p. 65. 2009. (IC-09-40).

HAYASHI, E. C. S.; BARANAUSKAS, M. C. C. Communication and Expression in Social Networks: Getting the "making common" from people. **Proceedings of the 2009 Latin American Web Congress (la-web 2009)**, Mérida, 2009. 131-137.

HAYASHI, E. C. S.; BARANAUSKAS, M. C. C. Facing the digital divide in a participatory way - an exploratory study. **1st IFIP Human-Computer Interaction**

Symposium (HCIS 2008), IFIP World Computer Congress (WCC 2008), Milão, 272, 2008. 143-154.

HAYASHI, E. C. S.; BARANAUSKAS, M. C. C. **Specifying Meta-communication Mechanisms for Vila Na Rede System**. Instituto de Computação - UNICAMP. Campinas, p. 17. 2009. (IC-09-41).

HAYASHI, E. C. S.; BARANAUSKAS, M. C. C. Understanding Meta-communication in an Inclusive Scenario. In: Proceedings of the 2010 ACM Symposium on Applied Computing, ACM SAC 2010, Sierre, Switzerland, 2010, pp. 1213 – 1218.

HAYASHI, E. C. S.; HORNUNG, H. H.; BARANAUSKAS, M. C. C. **Launching Vila na Rede: First Results of e-Cidadania Project**. Instituto de Computação - UNICAMP. Campinas. 2009. (IC-09-014).

HIPPLER, D.; DE MARTINO, J. M. Virtual Presenter. **VIII Simpósio Brasileiro de Fatores Humanos em Sistemas Computacionais - IHC 2008, Porto Alegre. Anais do Anais do VIII Simpósio Brasileiro de Fatores Humanos em Sistemas Computacionais - IHC 2008**, Porto Alegre, 2008. 296-299.

HOPPENBROUWERS, S.; WEIGAND, H. Meta-communication in the Language Action Perspective. **Proceedings of the Fifth International Workshop on the Language-Action Perspective on Communication Modelling**, Aachen, 2000.

HORNUNG, H. H.; BARANAUSKAS, M. C. C. Towards a design rationale for inclusive eGov services. **(submitted)**.

IBGE (Instituto Brasileiro de Geografia e Estatística). http://www.ibge.gov.br/home/ (2005). Accessed 12 Feb 2008.

Information Society: the Next Steps. In**: Development Gateway Special Report**. Available at http://topics.developmentgateway.org/special/informationsociety/index.do (2006). Accessed 12 Feb 2008.

JAMET, E. and LE BOHEC, O.: The effect of redundant text in multimedia instruction. In: **Contemporary Education Psychology**. Vol. 32, issue 4. Elsevier (2007).

KASHIHARA, A.; NAKAYA, M.; OTA, K. Guided Map for Scaffolding Navigation Planning as Meta-Cognitive Activity in Hyperspace. In: **Proceeding of the 2006 conference on Learning by Effective Utilization of Technologies: Facilitating Intercultural Understanding**, 2006. 465-472.

KEHOE, A.; PITT, I. Designing Help Topics for use with Text-To-Speech. **Proceedings of the 24th annual ACM international conference on Design of communication**, Myrtle Beach, SS, EUA, 2006. 157 - 163.

KENSING, F. and BLOMBERG, J.: Participatory Design: Issues and Concerns. In: **Proceedings of the 2004 ACM Conference on Computer Supported Cooperative Work**, CSCW 2004, Chicago, Illinois, USA, November 6-10, 2004, p. 167 – 185.

LANG, P. J.; BRADLEY, M. M.; CUTHBERT, B. N. **International affective picture system (IAPS): Instruction manual and affective ratings**. The Center for Research in Psychophysiology, University of Florida. 2005. (A-6).

LANZARA, G.F. The Design Process: Frames, Metaphors and Games. In: Briefs, U. , Ciborra, C. , Schneider, L.: **Systems Design For, With and By the User**. North-Holland Publishing Company, Amsterdam, 1983, P. 29-40

LEAHY, W., CHANDLER, P. and SWELLER, J.: When Auditory Presentations Should and Should not be a Component of Multimedia Instruction. In: **Applied Cognitive Psychology 17**, 2003, p. 401-418.

LEE, J.; LAI, K. Y. What's in Design Rationale? **Human-computer interaction**, 1991. Vol. 6, 251-280.

LEE, K. C.; LEE, D. H. Online Help Framework for Web Applications. **Proceedings of the 25th annual ACM international conference on Design of communication**, El Paso, 2007. 176 - 180.

LIU, K., **Semiotics in information systems engineering**, Cambridge University Press, New York, NY, 2000.

MARCUS, A.: Metaphor Design in User Interfaces. In: **The Journal of Computer Documentation ACM/SIGDOC**, New York, NY, May 1998, volume 22, No. 2, pp. 43-57.

MATTELART, A., MATTELART, M., **História das Teorias da Comunicação**, Ed. Loyola, São Paulo, 3.ed., 1999, pp. 220.

MELO, A. M. and BARANAUSKAS, M.C.C.: An Inclusive Approach to Cooperative Evaluation of Web user Interfaces. In: **Proceedings of the 8th International Conference on Enterprise Information Systems**, ICEIS 2006, vol 1, p. 65 – 70.

MINOCHA, S.: Requirements Development in User-Centred System Design. In: **IEE Colloquium on Making User-Centred Design Work in Software Development** 1999, pp. 7/1-7/4.

MULLER, M. J. Participatory design: the third space in HCI. **The human-computer interaction handbook: fundamentals, evolving technologies and emerging applications**. Hillsdale, NJ, USA: L. Erlbaum Associates Inc., 2002.

MULLER, M. J., HASLWANTER, J. H., DAYTON, T., Participatory Pratices in the Software Lifecycle. In: M. Helander, T. K. Landauer, P. Prabhu (eds.), **Handbook of Human-Computer Interaction**, pp. 255-297, Elsevier Science, 2 ed., 1997.

MULLER, M.J.: **Participatory Design: The Third Space in HCI**. IBM Watson Research Center. Technical report 2002.

NERIS, V. P. A., ALMEIDA, L. D. A., MIRANDA, L. C., HAYASHI, E. C. S., BARANAUSKAS, M. C. C. Baranauskas, Towards a Socially-constructed Meaning for Inclusive Social Network Systems. In: **Proceedings of the 11th International Conference on Informatics and Semiotics in Organisations**, ICISO 2009, Beijing, 2009, p. 247-254.

NERIS, V. P. N.; BARANAUSKAS, M. C. C. Interfaces for All - A Tailoring-based Approach. **Proceedings of the 11th International Conference on Enterprise Information Systems (ICEIS 2009)**, Milão, 2009. 928-939.

NORMAN, D. A.: **The Design of Everyday Things**. Currency and Doubleday, New York, 1990.

NORMAN, D. **Emotional Design:** Why we love (or hate) everyday things. New York: Basic Books, 2004.

PICARD, R. W. **Affective Computing**. Cambridge: MIT Press, 2000.

PURCHASE, H.; WORRILL, J. An empirical study of on-line help design. Features and principles. **International Journal of Human-Computer Studies**, v. 56, p. 539–566, 2002.

RAMACHANDRAN, D., KAM, M., CHIU, J., CANNY, J. and FRANKEL, J.: Social Dynamics of Early Stage Co-Design in Developing Regions. In: **Proceedings of the SIGCHI conference on Human factors in computing systems**. California, 2007, pp. 1087 – 1096.

REEVES, L.M., LAI, J., LARSON, J.A., OVIATT, S., BALAJI, T.S., BUISINE, S.,COLLINGS, P., COHEN, P., KRAAL, B., MARTIN, J.C., McTEAR, M., RAMAN, T.V., STANNEY, K.M., SU, H., WANG, Q.Y.: Guidelines for Multimodal User Interface Design. In: **Communications of the ACM**. Vol 47, no 1, 2004, 57-59.

RIBERITO, V. M.: **Letramento no Brasil: reflexões a partir do INAF 2001**. Global, São Paulo, 2003.

ROCHA, H.V., BARANAUSKAS, M.C.C.: Design e avaliação de Interfaces Humano-Computador. NIED/UNICAMP, São Paulo, 2003.

ROGERS, E., Communication and Development: The Passing of Dominant Paragidm, **Communication Research**, 1976, vol. 2, n.2 (apud Mattelard and Mattelard, 2000).

SALTER, A., LIU, K., Using Semantic Analysis and Norm Analysis to Model Organisations. In: **Proceedings of the 4th International Conference on Enterprise Information Systems**, ICEIS 2002, pp. 847-850.

SÁNCHEZ, J., FLORES, H.: Memory Enhancement through Audio. In: **Proceedings of the 6th international ACM SIGACCESS conference on Computers and accessibility**, ACM, Georgia, 2004, pp. 24 – 31.

SANFORD, D.; ROACH, J. W. A Theory of Dialogue Structures to help Manage Human-Computer Interaction. **IEEE Transactions on Systems, Man, and Cybernetics**, v. 18, n.4, Julho/Agosto 1988.

SBC The Brazilian Computer Society (2006). Grand challenges in computer science.http://sistemas.sbc.org.br/ArquivosComunicacao/Desafios_ingles.pdf. Accessed 12 Feb 2008.

SHNEIDERMAN, B.: Universal Usability - pushing human-computer interaction research to empower every citizen. In: **Communications of the ACM**, May 2000, vol. 43, no. 5, 2000, p. 84–91.

SILVEIRA, M. S.; DE SOUZA, C. S.; BARBOSA, S. D. J. Semiotic Engineering Contributions for Designing Online Help Systems. In: Proceedings of the 19th annual international conference on Computer documentation, SIGDOC'2001, Santa Fé, 2001, pp. 31 – 38.

STAMPER, R. Major Defects in Current IS Methods and How to Rectify them. **Proceedings of the Eighth CAiSE/IFIP8.1** International Workshop on Evaluation of Modeling Methods in Systems Analysis and Design, EMMSAD 03, 2003.

STAMPER, R., ALTHAUS, K., BACKHOUSE, J., MEASUR: Method for eliciting, analyzing and specifying user requirements. In: Olle, T., Verrijn-Stuart, A. and Bhabuts, L. (eds). **Computerized assistance during the information systems life cycle.** Elsevier Science Inc., NY USA, pp. 143–163.

SUGIMOTO, L. Faces Virtuais falam por si. **Jornal da Unicamp**, Campinas, disponível em: http://www.unicamp.br/unicamp/unicamp_hoje/ju/junho2008/ju401pag4.html (Acesso em Outubro, 2009), n. 401, 30 de junho a 13 de julho 2008.

TARDINI, S., CANTONI, L., A semiotic approach to online communities: belonging, interest and identity in websites' and videogames' communities. In: Pedro Isaías, Piet Commers & Maggie McPherson, e-Society 2005, **Proceedings of IADIS International Conference**, Qawra, Malta, 2005, pp. 371-378.

Unesco. Towards knowledge societies: UNESCO world report (2005). Available at: http://publishing.unesco.org/default.asp. Accessed 12 Feb 2008.

VARIAN, H. R.: Universal Access to Information. In: Communications of the ACM. October 2005, vol. 48, no 10, 2005, pp. 65 – 66.

WILLIS, M. Building Effective Help System: Modeling Human Help Seeking Behavior. **Proceedings of the 18th Australia conference on Computer-Human Interaction: Design: Activities, Artefacts and Environments, OZCHI'06**, Sydney, 2006. 433 - 436.

World Bank, http://devdata.worldbank.org/external/CPProfile.asp?PTYPE=CP&CCODE=BRA, 2006. Accessed 12 Feb 2008.

YETIM, F. A Meta-Communication Model for Structuring Intercultural Communication Action Patterns. **ACM SIGGROUP Bulletin**, Konstanz, v. 22, n. 2, p. 16-20, Agosto 2001.

YIP, A. The Effects of Different Types of Site Maps on User's Performance in and Information-Searching Task. **Proceedings of the 13th international World Wide Web, WWW 2004**, New york, 2004. 368 - 369.

Apêndices

Apêndice I

Ferramentas de Comunicação e Expressão em Redes Sociais Inclusivas: Design Rationale

1. Introdução

O desenvolvimento deste mecanismo de Meta-comunicação foi baseado na metodologia adotada pelo projeto e-Cidadania (Baranauskas, 2009; Bonacin e Baranauskas, 2003). Neste modelo, os usuários participam ativamente de todas as etapas do projeto, influenciando o seu resultado diretamente. Desta forma, conseguimos sistemas que refletem a realidade e que fazem sentido para as pessoas que irão utilizá-los. Assim, a ideia do mecanismo proposto foi construída em conjunto por pesquisadores no papel de designers e usuários finais e passou por várias modificações até chegar ao seu estado atual - que certamente poderá ser alterado de acordo com contextos específicos.

Os processos de decisão do design da ferramenta não apenas envolveram as atividades Semio-participativas (Bonacin e Baranauskas, 2003) com os usuários, como também contaram com ponderações dos pesquisadores em relação às questões de acessibilidade e usabilidade, conhecidas da literatura ou da experiência. Em alguns casos, ajustes foram feitos considerando a tecnologia disponível na maioria dos Telecentros e lares brasileiros; mas sempre que possível, optando pelas possibilidades mais atuais.

O objetivo deste relatório técnico é retratar as principais tomadas de decisão de design que ocorreram ao longo da pesquisa. Além de documentar o projeto, este *Design Rationale* (DR) pode servir como fonte de inspiração para outros designers interessados na construção de interfaces de usuário para sistemas de apoio inclusivos.

Conforme Lee e Lai (1991), um dos propósitos do DR é justamente permitir o reuso do conhecimento e da reflexão crítica adquiridos durante um processo de design. Usualmente, DR pode ser entendido como uma maneira de se registrar o histórico das análises feitas

sobre um determinado artefato, articulando e representando as razões que direcionaram a escolha adotada no design e especificação deste artefato (Lee e Lai, 1991). A primeira abordagem de DR ocorreu com o IBIS de Rittel, 1970 (apud Dutoit, McCall, Mistrík e Paech, 2006) – seguida pelo gIBIS (Conkling e Bergman, 1987) - na qual a ferramenta Compendium (Shum et al., 2006) foi baseada.

Foi com esta ferramenta Compendium que as figuras apresentadas neste relatório foram feitas. A partir de uma questão (um problema, um ponto que gera controvérsias ou que apresenta várias possibilidades), outras questões ou ideias de solução podem surgir. Para cada uma delas, argumentos (positivos ou negativos) são apresentados antes de se chegar a um acordo. A Figura A.1 ilustra este fluxo.

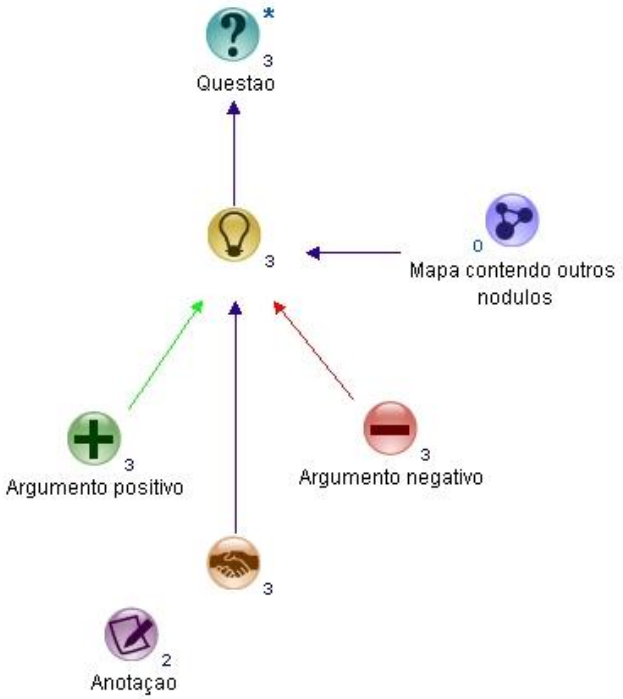

Fig. A.1 - Exemplo de Rationale usando Compendium.

Este relatório está organizado da seguinte maneira: a seção 2 apresenta o *Design Rationale* representando graficamente as principais decisões tomadas ao longo da pesquisa; na seção 3, ponderamos o que foi possível tirar de aprendizado nesta jornada e concluímos.

2. *Design Rationale* do mecanismo de Meta-comunicação

As características iniciais pensadas para compor o mecanismo de meta-comunicação, conforme descrito em (Hayashi e Baranauskas, 2009), incluíam uma área específica para apresentação de conteúdo multimídia, sempre na coluna da direita das páginas do *Vila na Rede*. Tal característica se manteve, porém algumas modificações foram introduzidas, de acordo com *feedback* recebido dos usuários finais e também de ponderações quanto a questões de acessibilidade e usabilidade. A Figura A.2(a) ilustra a tela do mecanismo conforme proposto em (Hayashi e Baranauskas, 2009); e a Figura A.2(b), a tela atual.

Nesta seção, descrevemos graficamente o processo de tomada de decisões que trouxeram esta e outras alterações na interface de usuário planejada para este mecanismo.

(a) (b)

Fig. A.2 – Imagens das interfaces planejadas para o mecanismo de meta-comunicação: (a) imagem conforme proposta em (Hayashi e Baranauskas, 2009); (b) proposta atual.

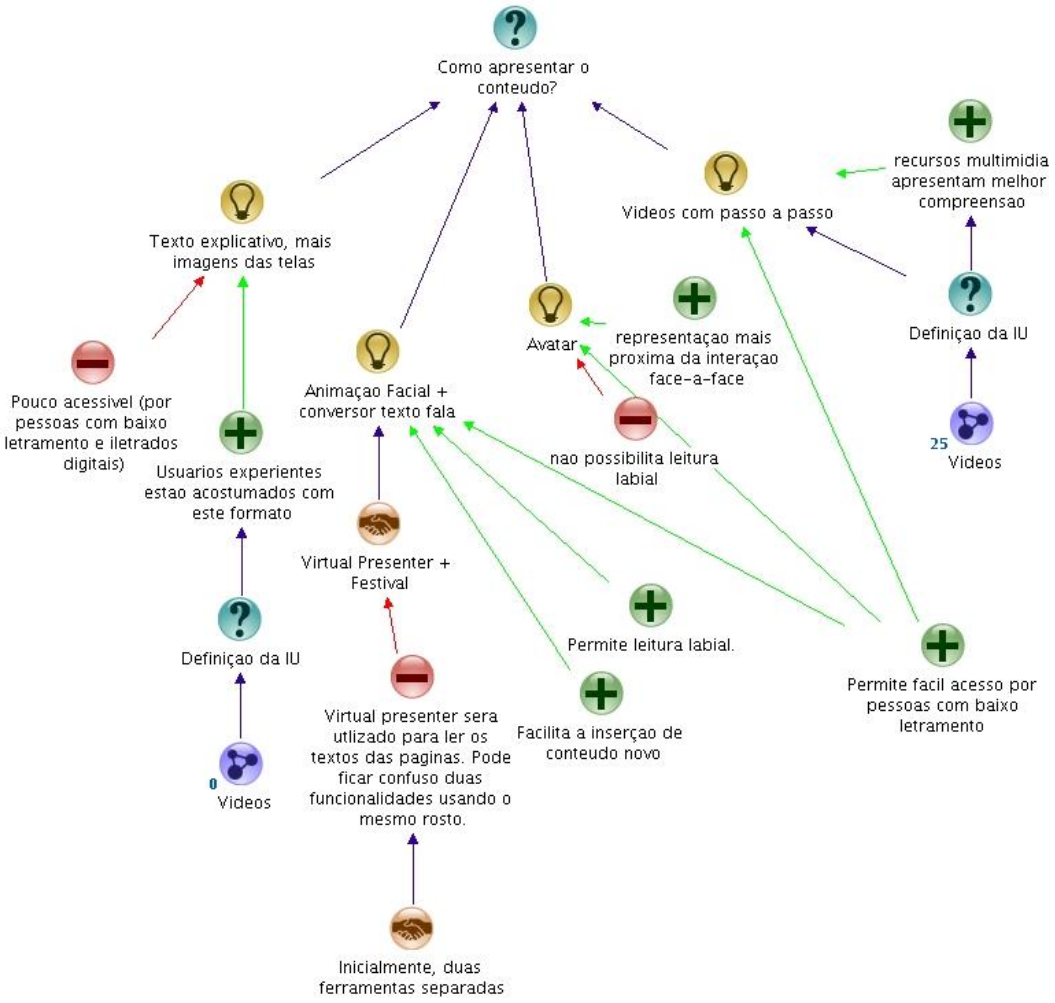

Fig. A.3 - Design Rationale: apresentação do conteúdo

Inicialmente, pensou-se na dupla Animação facial + conversor texto-fala para a apresentação do conteúdo da meta-comunicação. A vantagem desta solução está no fato que a animação facial permite a leitura labial, além de dar um aspecto mais humano à interface.

Em atividades realizadas com usuários finais na comunidade-alvo, algumas pessoas acabaram tendo acesso ao sistema de desenvolvimento do *Vila na Rede* e tiveram um contato informal com o software que converte texto em fala. A reação destes usuários foi muito positiva e assim decidiu-se pela implementação desta ferramenta no *Vila na Rede* que apresentaria funcionalidades similares às de um leitor de tela: o usuário poderia digitar o texto (ou copiar e colar da página) e ouvir o texto. No futuro, esta ferramenta poderá ser

integrada ao mecanismo de meta-comunicação. Porém, no momento, como se tratam de propósitos independentes, consideramos que seria mais apropriado não utilizar a mesma imagem (rosto da apresentadora virtual) nas duas ferramentas, evitando assim possíveis confusões por parte dos usuários.

2.2 Pontos de acesso

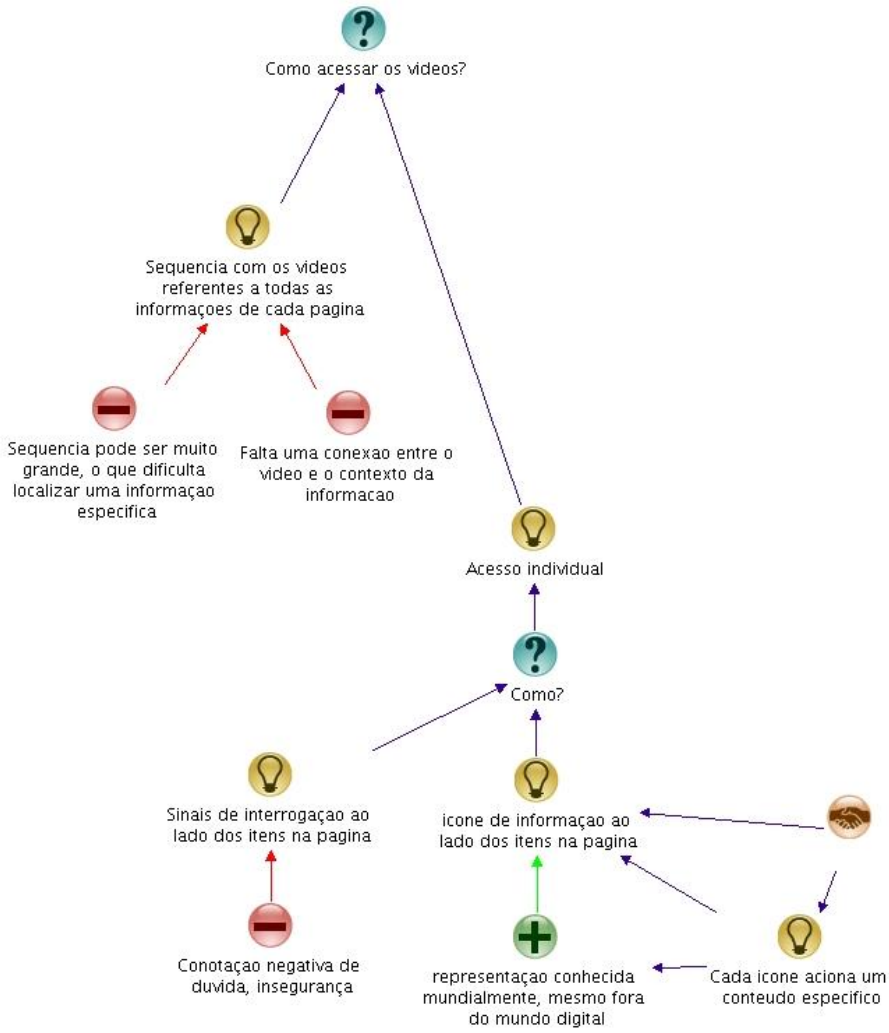

Fig. .A.4 - Design Rationale: pontos de acesso

O uso do "i" (símbolo gráfico representando "informação", utilizado internacionalmente para indicar quiosques de informações em aeroportos e outras instalações) foi recebido positivamente pelos participantes de uma das atividades realizadas com usuários na comunidade-alvo. Apesar da maioria não ter reconhecido prontamente o ícone, esta decisão

de design se manteve, tal como foi apresentada em (Hayashi e Baranauskas, 2009). A razão está no fato de se tratar de um símbolo conhecido mundialmente. Desta forma, mesmo que os usuários não reconheçam de imediato a funcionalidade na imagem, a interface estaria colaborando no aprendizado de seu significado geral.

2.3 Definição da Interface de Usuário

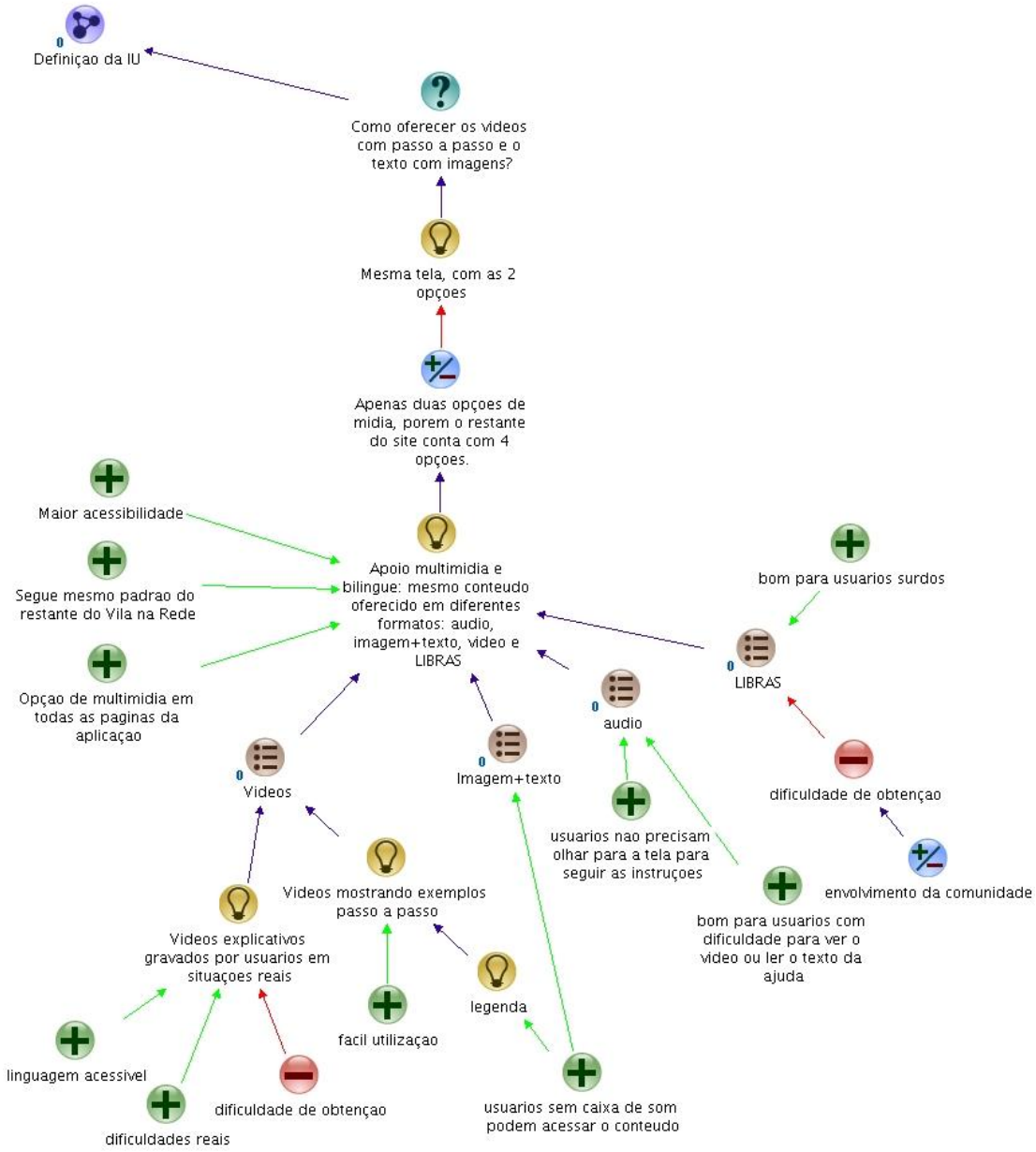

Fig. A.5 - Design Rationale: Definição da IU

A ideia de apresentar o conteúdo da meta-comunicação em quatro diferentes formatos (imagens+texto, áudio, vídeo e LIBRAS) forneceu ao mecanismo maior acessibilidade, além de dar um aspecto mais consistente com o restante do site - utilizando os mesmos botões para as mídias já encontradas em outras páginas. A única dificuldade seria gravar o conteúdo em LIBRAS. Para isto, contamos com o apoio de um aluno surdo que participou no projeto pelo VIII Ciência & Arte nas Férias, promovido pela UNICAMP.

Com a vivência com este aluno, pudemos compreender que apenas fornecer legenda para os vídeos pode não resolver o problema de acessibilidade dos surdos, visto que, em sua maioria, os surdos possuem dificuldade para entender textos em língua portuguesa. Da mesma forma, softwares como RIBENA[13] ou o uso de dicionários LIBRAS-português também não são suficientes, por gerarem o que podemos chamar de português sinalizado, muito diferente da LIBRAS.

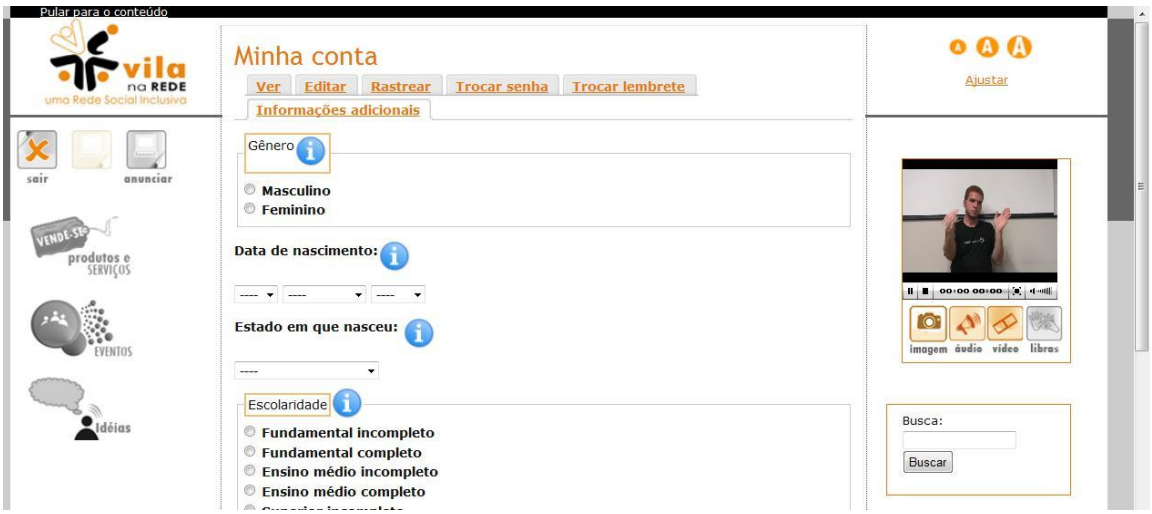

Fig. A.6 - Imagem de uma tela do *Vila na Rede*

3. Lições aprendidas e conclusão

As pessoas estão sempre se aprimorando, aprendendo coisas novas, em um contínuo processo de mudanças. Um sistema inclusivo deve se adequar não somente aos diferentes perfis de usuários, como também às diferentes versões de um mesmo usuário (por exemplo,

[13] http://www.rybena.org.br/rybena/produtos/webplayer.htm

uma pessoa iniciante que aprendeu conforme o uso do sistema, chegando aos níveis mais avançados).

Da mesma maneira, um sistema que busca refletir a realidade de seus usuários, também passa por constantes ajustes, principalmente durante a sua fase de concepção.

Tal como argumenta Hornung e Baranauskas (submitted), como as decisões de design são diretamente influenciadas pelo seu contexto de aplicação, apresentar um DR pode ser mais proveitoso que apresentar uma lista de *guidelines* fixos. Assim, as anotações das decisões de design podem ser úteis não apenas para o projeto do designer, como também para outras pessoas, que podem buscar inspiração ou aprender com os resultados obtidos. Como cada contexto é diferente e cada sistema é único para seu público, escolhemos indicar o caminho percorrido e os fatores que foram considerados, ao invés de delimitar *guidelines*.

Apresentamos neste relatório o *Desing Rationale,* que indica graficamente as decisões tomadas durante processo de desenvolvimento do mecanismo de Meta-comunicação do Vila na Rede. Este relato possibilita uma visão ampla do progresso ocorrido ao longo desta pesquisa, fornecendo uma compreensão das razões ou motivações existentes por trás do design da IU.

Também pudemos constatar a eficácia das oficinas semio-participativas ao longo do projeto. Estes encontros foram de vital importância para o desenvolvimento da pesquisa, quando foi possível colocar em contato direto pesquisadores e comunidade alvo, permitindo um aprendizado mútuo. O conhecimento proporcionado pelos resultados das oficinas garantiu à ferramenta uma maior proximidade da realidade de uso, refletindo a cultura e considerando as habilidades dos participantes. É importante que os usuários dos sistemas possam se reconhecer e fazer sentido das ferramentas através de suas interfaces de usuário.

Conforme mencionado anteriormente, um sistema vivo como os presentes na Internet tendem a continuar se aprimorando e se adaptando para refletir a realidade de seus participantes. Desta forma, o mecanismo poderá sofrer alterações de acordo com contextos específicos.

Agradecimentos

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Referências

Baranauskas, M.C.C. Socially Aware Computing, In: Proceedings of the ICECE'2009, pp. 1-5.

Bonacin, R.; Baranauskas, M.C.C., Semiotic Conference: Work Signs and Participatory Design, In: Proc. 10th International Conference on Human - Computer Interaction, London: Lawrence Erlbaum Associates, 2003. v. 1. p. 38-43.

Conklin, J. & Begeman, M. L., gIBIS: a hypertext tool for design deliberation. In: Proceedings of the ACM Conference on Hypertext, pp. 247 – 251, 1987.

Dutoit, A.H.; McCall, R.; Mistrik, I.; Paech, B. (Eds.), Rationale Management in Software Engineering: concepts and techniques. In: Rationale Management in Software Engineering, pp. 1-43, Springer, 2006.

Hayashi, E.C.S; Baranauskas, M.C.C, Meta-Communication and Inclusive Scenarios: Issues and Alternatives. To be submitted.

Hayashi, E.C.S; Baranauskas, M.C.C, Specifying Meta-communication Mechanisms for Vila Na Rede System. Relatório técnico IC-09-41, UNICAMP, 2009.

Hornung, H. H.; Baranauskas, M. C. C. Towards a design rationale for inclusive eGov services. Submitted.

Lee, J.; Lai, K.Y., What's in Design Rationale? In: Human-computer interaction, 1991, vol. 6, pp. 251-280.

Shum, S.J.B.; Selvin,A.M.; Sierhuis, M.; Conklin, J., Haley, C.B.; Nuseibeh, B., Hypermedia Support for Argumentation-Based Rationale: 15 Years on from gIBIS and QOC. In: Rationale Management in Software Engineering, pp. 111 - 129, Springer, 2006.

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