

# Developing a Contextual Network for Indigenous Communities in Mexico

Mario Alberto Moreno Rocha<sup>1</sup>, Carlos Alberto Martínez Sandoval<sup>1</sup>,  
Cauahémoc Rivera Loaiza<sup>2</sup>, and Ma. Margarita Virgen González<sup>2</sup>

<sup>1</sup> Universidad Tecnológica de la Mixteca, Huajuapán de León, Oaxaca, México  
sirpeto@gmail.com, carlosmtz@outlook.com

<sup>2</sup> Universidad Michoacana de San Nicolás de Hidalgo, Morelia, Michoacán, México  
C\_riveramx@gmail.com, maggy.fismat@gmail.com

**Abstract.** This paper presents the development and results of the Contextual Network project, which took place in two impoverished communities in Mexico. The Contextual Network (CN) project is comprised by a contextual study followed by a usability study of a prototype designed to help these communities in underprivileged circumstances. This paper also includes the results of a study about exposing indigenous users to unfamiliar new technologies and the way in which those developments could be appropriately applied to benefit their community.

**Keywords:** Cross-cultural design, usability, user interfaces, vulnerable communities, Design for social development.

## 1 Introduction

Cultural diversity is an important heritage of countries like Mexico. However, current media policies and strategies regarding television, radio and the Internet fail to address and represent the interests, concerns and issues of a large number of minorities and social groups. Such lack of access and representativeness is a key causal factor behind social exclusion, discrimination and the weakening of the social fabric in general.

There is a need for the ideation, development and deployment of new breakthrough knowledge-based services for cultural diversity [3, 4]. Due to the importance of context in cultural diversity, this project proposes an innovative context-sensitive platform aimed at enabling access and rich representativeness of cultural manifestations in Mexico. We called this context-sensitive platform “contextual network”.

To exemplify its feasibility and applicability we selected one specific group of people as a case study: indigenous communities in the Mexican states of Oaxaca and Michoacán. These groups represent different social, economic, geographic and cultural contexts of Mexico encompassing a complex web of needs and requirements for this project. Also, in the case of Oaxaca and Michoacán they share a large number of indigenous inhabitants, and a high degree of marginalization in their communities.

The locations where the studies took place were Santos Reyes Yacuná, Oaxaca and Capula, Michoacán. These towns belong to different indigenous communities (Mixteco, the first, and Purhepecha the latter), with no historic interference among them. In the case of the Oaxacan community the study was centered in a group of middle-aged women, and in the Michoacán side the focus was in a group of artisans.

This paper is focused in the work done in the State of Oaxaca, although a brief introduction to the Michoacán deployment is shown. (The Michoacán phase is scheduled to be finished in May of 2013).

## 2 Project Background

The CN was born amidst the celebration of a workshop was held in June 2011, where a multidisciplinary and multi-sector group including representatives of the studied social group convened for identifying current problems, social mores, sociocultural beliefs and current communication media used by this population. Throughout the workshop several scenarios were built of use of the Contextual Network for creating low-fidelity prototypes in support of this problem. Also work was made in leveraging current available funding with the support of different institutions and the government.

In that workshop it was established that the two ideal locations for the project were Oaxaca and Michoacán, due to their large indigenous population, easy access to the towns and previous contact of the researchers with the community leaders.

## 3 Methodology

The objective of the Contextual Network project is to develop a useful application for its users and in order to assure its usability, a User Centered Development was used, which involves putting into operation various techniques and methodologies aimed to know the user and his/her needs, likes and wishes. Its first part consisted of the development of a Contextual Study.

User Centered Design (UCD) is a product development approach that focuses on the end users of a given object. The basic philosophy of this technique is that the products are to conform to the users, instead of the user having to adapt the product [1]. There are three principles of the UCD: perfectly understand users and their tasks, development of empirical measures of product usage, and the use of an iterative design [5]. These principles are fundamental to the development of our project, as the CN depends on an adequate understanding of users and all their requirements in order to have a system to give them a technology-based tool to help them have a better way expression in the current context [6].

In the CN project defined two stages of implementation in states of Mexico, one in Oaxaca and one in Michoacán. Choosing both places was due to high levels of marginalization, ready access to sample populations, and researchers' previous contacts with locals. In Oaxaca and Michoacán were applied the same techniques of UCD for the project. It was a time of population ethnographic research, requirements analysis,

development of people, prototyping of high and low fidelity, and finally in-situ testing of the prototypes.

This project included three stages, which were replicated in each state: an ethnographic study, in-situ deployment of the different prototypes that were made, and a Wizard of Oz test with high fidelity prototypes. Next up, we describe the implementation of each stage, beginning with the Oaxacan part.

## 4 First Phase of the Project

In the first stage, the CN was deployed in the southern state of Oaxaca. Oaxaca truly exemplifies the paradox that Mexico is: a land with great cultural diversity, a rich and varied geography and excellent weather year round, but with some of the lowest levels of Human Development in the nation (currently occupying the 30 of 32 spots in Mexico [7]).

A team belonging to one of the universities to where this article authors belong to, Universidad Tecnológica de la Mixteca (UTM) had been working with the community of Santos Reyes Yucuná (population 1332 inhabitants [8]). This fact gave us a lot of leverage in determining the needs of the population. After that, the UTM team taught a Human Development course to the women participants, which evolved into a Productive Project (the Ita-Viko project). Currently, the participants in the Ita-Viko project successfully produce diverse types of flowers and earrings made of cornhusks.

All of these women are bilingual (Spanish/Mixtec), but the eldest ones possess a very low level of Castilian comprehension. Generally they are mothers of families with an average of six children who work as homemakers, with the exception of one. Together with their families they look for economic income alternatives in other states of the republic in various periods of the year, but they always return due to family ties, customs, traditions, and the care for their personal assets.

Once the necessary aptitudes of the women from this community have been developed the team members will have to gradually separate themselves, due to the fact that the projects must be handed over to its participants. In this way the predicament to be resolved by means of Contextual Network is created: How shall the women of Ita-Viko continue forward with their project without the help and presence of the UTM team?

### 4.1 Project Definition

With the information provided by the UTM team and after a debate, the group of researchers from the project of Contextual Network defined the gradual separation of the UTM team from the women of the community as a problem, the indigenous women of Ita-Viko were defined as users and the community of Santos Reyes Yucuná was established as context. To reach a complete solution to the predicament encountered, the development of a base prototype of low fidelity was outlined and then handed over to the members of the UsaLab (Usability Laboratory) for their subsequent development in the Mixtec region previously described. The said interface would permit

the women to continue their training, education and communication with the SIFE team despite the fact that they were no longer in their community.

## 4.2 Identification of Objectives and Users

To continue the development of the project, a methodology that allows us to define the objectives and the type of users that would normally make use of the system was employed[2]. In this way, we can set the specific tasks that the users would desire to carry out themselves, and posterior evaluation will show us what we can improve.

It was necessary to observe the users in their respective contexts of use. For this reason, an ethnographic study was elaborated in two places, in the community of Santos Reyes Yucuná, Oaxaca (to observe the users in their respective contexts of use) and in the city of Oaxaca (to observe the users making use of technology similar to that which would be implemented in the project and that we could not carry to the community). The studies were realized from 21 to 29 July 2011.

Also five on-site interviews were conducted in the community inside the users' houses. The users were asked to show us the technology they use daily and to utilize an iPad. See Figure 1 below.



**Fig. 1.** Users interacting with the iPad in the community of Santos Reyes Yucuná, Oaxaca, Mexico. She was given a simulation with a printed magazine to show her how to use it.

## 4.3 Contextual Study Results

From the observations made and the subsequent interviews that were conducted, the following conclusions that guided the successive development of the system were defined:

- The users use and accumulate domestic technology (television sets, stereos, cellular phones) in their daily life.
- The users have not seen the technology that is intended to be used.

- Although they are not familiar with the proposed technology, there is no rejection, rather a careful approach to it, awaking considerable interest.
- The utilization of videos for instruction is feasible, besides the fact that the use of headphones for individual activities is equally useful for a greater understanding.
- The layout of a table top interface welcomes the interaction of multiple people in a task, while in the vertical arrangement, the users expect to use contents.
- Due to the fact that the users do not know how to read or write or their primary language is Mixtec, the use of interfaces without text is recommended.

#### 4.4 Development of Usability Tests

Two designs of the sought after system interfaces were developed based upon the previous conclusions. In order to assure that the appropriate system was being developed, they were shown to the users in the community by means of an iPad and they were asked what significance they would give to each graphic element. This was developed 20 August 2011. The first design towards iconographic use that we thought the users would recognize was obtained from its environment and from the activities carried out daily.

#### 4.5 Results of Usability Tests

Using the obtained results a functional Flash prototype was created and Wizard of Oz tests were designed, where one of us performed the functions of the computer. Due to the fact that the project made use of an interactive table, a 40" Samsung LCD, Full HD 1080p was utilized, connected to a laptop utilizing Windows 7. We asked the users (in groups of three or four, depending on the previously considered demographic characteristics) to make use of the equipment. The tests were completed in the communal lounge of Santo Reyes Yucuná on 29 August. The following images (2 and 3) show the development of these tests and the prototype evaluated:



**Fig. 2.** User evaluation of the prototype through the Wizard of Oz method in their community center



**Fig. 3.** Main screen of the system tested, after repeated improvements

## 5 Second Phase of the Project

During the last quarter of 2011 formally began the implementation phase Contextual Network in Michoacán. Through meetings with various governmental and state educational defined three potential sites for our study: Capula, Zinapécuaro and San Nicolás Obispo.

These three towns have a long tradition in pottery craft, each with its own style. Moreover, geographically located near Morelia (San Nicolás Obispo and Capula belong to the municipality of Morelia). After evaluating factors such as accessibility, feasibility study and implementation of recognition outside of their craft, they chose to work with artisans of Capula.

Capula, Michoacan is a town located in the municipality of Morelia, about 20 minutes from the metro area. It is considered to be located on the edge of the area of influence of the Purepecha region, founded in 1550. This town is known for its pottery production, primarily utilitarian (dishes, pots, etc.) Capula's population in 2010 was about five thousand inhabitants [10].

The situation of pottery in this population is going through a critical stage. Traditionally dependent on two key dates for the sale of their products: Easter and Christmas. In those seasons was common tourist arrivals and buyers of wholesale merchandise who made the journey by road to Capula. However, the uncertainty in the national roads has made many of those trips are canceled. To this must be added the overwhelming arrival of foreign goods, mostly from China, which has reduced its sales further.

Despite all this, Capula artisans still working and looking for new ways of marketing, mainly at craft fairs. All this is done with resources primarily funded by the artisans themselves.

It is noteworthy that the exhibition and sale of their products through electronic media is virtually nonexistent (although artisans are aware that it exists).

Up until early 2013, all the usability test have been done, replicating the test that were applied to the Oaxacan women. We expect to finish this project in May 2013.

## 6 Conclusions

As previously mentioned, the proposed development was very close to that which the users need to resolve their needs once the UTM team has left the locality. Their approach to the technology was as expected and their reactions were of surprise and happiness.

Developing projects for marginalized communities, and consequently, managing to directly assist these people, has always been the primary interest of our university, and therefore, of our laboratory.

For this reason, our participation in the Red TIC's Contextual Network project has been one of the occasions on which we pride ourselves, not solely because of the development achieved, but due to the fact that the project was carried out in a community in Oaxaca.

We profoundly thank the women of the Ita-Viko project from the community Santo Reyes Yucuná, as well as all the Red TIC researchers, the members of the SIFE teams, the UsaLab and the KadaSoftware participants in this project. Special thanks to the Universidad Tecnológica de la Mixteca.

## References

1. Courage, C., Baxter, K.: Understanding your users, a practical guide to user requirements. Morgan Kaufmann, Amsterdam (2005)
2. Crespo García, D.: 'Mobile phones' potential to address information and communication needs of healthcare workers in isolated rural areas in Peru, working paper (2008), <http://www.gg.rhul.ac.uk/ict4d/workingpapers/crespo.pdf>; (accessed on February 15, 2011)
3. Cultural, D.: CuéntameloTodo / Movimiento Nacional por la Diversidad Cultural
4. [http://www.diversidadcultural.mx/index.php?option=com\\_content&view=article&id=53:cuenta-portada&catid=40&Itemid=60](http://www.diversidadcultural.mx/index.php?option=com_content&view=article&id=53:cuenta-portada&catid=40&Itemid=60)
5. Del Álamo, Ó.: IIGC, Esperanza tecnológica: Internet para los pueblos indígenas de América Latina (2010), [http://www.quadernsdigitals.net/datos/hemeroteca/r\\_1/nr\\_510/a\\_7070/7070.pdf](http://www.quadernsdigitals.net/datos/hemeroteca/r_1/nr_510/a_7070/7070.pdf)
6. Gould, J.D., Lewis, C.: Designing for usability: Key principles and what Designers Think. Communications of the ACM 2, 300–311 (1985)
7. Harindranath, G., Sein, M.K.: Revisiting the role of ICT in development. In: Proceedings of the 9th International Conference on (2007)
8. Social Implications of Computers in Developing Countries. São Paulo, Brazil
9. Information and Communication Technologies for Development
10. <http://www.ict4d.org.uk/>; (accessed on April 13, 2011)
11. Programa de las Naciones Unidas para el Desarrollo, México. Informe sobre Desarrollo Humano México 2011 (2011), [http://www.undp.org.mx/IMG/pdf/Informe\\_sobre\\_Desarrollo\\_Humano\\_Mexico\\_2011.pdf](http://www.undp.org.mx/IMG/pdf/Informe_sobre_Desarrollo_Humano_Mexico_2011.pdf)
12. Secretaría de Desarrollo Social. Catálogo de localidades. Capula, Municipio de Morelia, Michoacán, y Santos Reyes Yucuná, Oaxaca, <http://www.microrregiones.gob.mx/catloc/LocdeMun.aspx?tipo=cllave&campo=loc&ent=16&mun=053>