

# Measuring qualitative and quantitative impacts: Design and implementation of online registration systems for telecentres using Linux platforms

Julián Casasbuenas,  
Omar Martínez and Sylvia Cadena

## Introduction

The registration system for community-based Internet access centres or telecentres that we have developed is now available at our web site <<http://www.colnodo.apc.org/registro>>, together with technical details of the project and instructions for installing each module. For this reason, this article focuses on the research process and on recommendations for telecentre administrators.

During the project, it became clear that telecentres needed a way to monitor physical access (user time) at their stations in order to facilitate invoicing, the design of promotional campaigns and the administration of the centres. This meant that the registration system should not be limited to capturing information but should have additional functions that could be used to support the management and sustainability of telecentres.

The registration system we developed not only allows telecentre administrators to recognize users and their profiles, but also facilitates administration in several ways:

- Graphic presentation of statistics that telecentre managers can readily interpret and understand
- Remote control over all stations of the network from any station in the centre or via the Internet
- “Scalability” in the application (it can support from 2 to 100 computers or more)
- Accommodation of different kinds of administrators with different levels of access for configuring and obtaining information from databases
- Control over the appearance of the interface (font, colour) using an online form

- Capability of translating the registration system interface into any language by changing just one file
- Possibility of adapting the terms found in the data-capture forms to the particular expressions used in each country (e.g.) the word *bachillerato* is used in Colombia for high school level, while the Mexican term is *preparatoria*
- Possibility of installation on Windows platforms (with certain functional limitations)
- Possibility of controlling the duration and cost of promotional strategies to achieve sustainability for telecentres

The research group feels that it is very important to develop new modules for the application that will make it possible to:

- Automate installation of the application and of all the programs needed for it to function properly.
- Compare various telecentres at the local, national and regional levels. The application was designed to allow this module to be developed later.
- Expand the statistical analysis modules so that users of the application (telecentre administrators and researchers in new technologies) can compare variables using simple mechanisms for selecting those needed to construct new indicators.
- Develop a module to make backup copies of the system and facilitate the retrieval of information or of an earlier configuration if it is accidentally modified.
- Distribute the registration system in a way that meets the official requirements of GNU/GPL licences.

### Where did the idea of developing a telecentre registration system come from?

The Latin America and Caribbean region has seen many initiatives for expanding access to new information and communication technologies (ICTs) for communities and low-income groups. By the mid-1990s, access was considered a regional priority. In addition, given the scope of available technology, the deregulation of telecommunications markets in many Latin American countries and the growing community of interested users, there is now a combined need for access to the technology itself and to the information available over the Web. The development of content of interest to the Spanish-speaking community, and of rules for using information and their implications for policymakers and managers, has also become a priority for the coming years, without losing sight of the access question itself.

From this perspective, Colnodo has been working since 1996 on a community Internet access project called Neighbourhood Information Units

(*Unidades Informativas Barriales*, UIB) <<http://www.uib.colnodo.apc.org>>. The main objective of this project is to provide access to ICTs for low-income communities in Bogota and, in this way, to help reduce the divide between those who have access and those who do not. In addition, we have also developed a local information system for each locality, based on its particular requirements and the issues that each organization is working on. Colnodo has also set up a public Internet access booth<sup>1</sup> with seven computers, a dedicated connection and a full-time coordinator. This facility supports the UIB initiatives and serves as an experimental space both for this research project and for other initiatives of Colnodo and the Association for Progressive Communications (APC) <<http://www.apc.org>>.

Under this project, we established three UIBs between 1997 and 1999 in three districts of Bogota (San Cristóbal, Bosa and Suba, located respectively in the southeast, southwest and northwest areas of the city). These places are coordinated by six women belonging to the project's three host organizations.<sup>2</sup> They have an average of more than 15 years' experience in community work in such areas as education, culture, environmental conservation, human rights, conflict resolution and low-income housing, and they are well known in their communities. This team of women has received technical and administrative training for running and maintaining the UIBs. The host organizations for the UIBs have appropriated these initiatives as an integral part of their work and are using them to build relations with a broader community, beyond their immediate activities.

Nearly two years after financing for the project was terminated, the UIBs are now developing local information systems as management support for social organizations, administrative entities in the capital district, and individual citizens, with the technical support of Colnodo in areas such as compiling local directories, databases for bibliographic consultations, geo-referencing systems, online publication of information from each entity, facilitating collaboration between those entities and their members, and other initiatives relating to the topics mentioned above.

Prior to the project implementation phase, we decided that we should record a series of activities and procedures that could serve as inputs for subsequent evaluations. We designed several very simple mechanisms (forms, surveys and lists), and from the outset the coordinators in each UIB applied these to users of the centre. These recording methods were intended to monitor development and implementation of the UIBs and to contribute to an evaluation of their impact upon termination of financing for the project, as a requirement of the donor agency, the International Development Research Centre (IDRC).

Although it was recognized as necessary from the outset, having quantitative and qualitative support information was found to be so useful that in 1999 every UIB started working to refine such mechanisms. We found that keeping daily records on each UIB's activities is essential for the following:

- Understanding the information and learning needs of the population served.
- Taking decisions to expand or reduce physical infrastructure and connectivity.
- Establishing access limits to avoid congestion.
- Determining training needs both for users and for coordinators in each UIB.

These mechanisms were applied manually, through personal contact between the UIB coordinator and the user. Problems of continuity arose in collecting data and completing the forms or surveys, which made analysis of the information more difficult.

This situation pointed to the need to design and implement automatic mechanisms for recording activities, uses and lessons learned that would serve to facilitate application of conventional evaluation methods (quantitative), to facilitate the exchange of experience, to promote the use of technology for continual evaluation, and to encourage peer assessment of the day-to-day efforts of the UIB coordinators (qualitative evaluation).

Simultaneously, using the e-mail list for the TELELAC project (coordinated by ChasquiNet-Ecuador), we found that the main problems facing the people and institutions that are sponsoring telecentres in the region relate directly to:

- the development and continual implementation of monitoring and evaluation mechanisms
- lack of venues and methodologies for exchanging lessons learned
- the definition of strategies and methods of self-financing

We feel that the development of registration mechanisms in the UIBs will be of practical interest to all those people who are working directly or indirectly in support of telecentres or any other facilities for allowing public access to the Internet, and therefore we have focused our research on developing interfaces for recording information on activities in the telecentres, such as frequency of use, user profiles, training sessions, and lessons learned, that can be introduced in full or partially.

### What have we achieved to date?

In the course of our research, we designed, developed and tested an interface for recording uses and users (on a Linux platform, but it also works in Windows, with some limitations) that allows the storage of data on the daily workings of the telecentres. In this way, orderly and coherent information, both quantitative and qualitative, on the services provided by each telecentre will be available both to the telecentre administrator and to external evaluators or researchers, donors, universities and governments.

The application we have designed allows every user to record his profile, with information on age, gender, schooling and occupation, among other variables (see the description below of variables for the registration system), at the beginning of the session. At the end of the session, the user will be able to file a report with the telecentre, using another form covering the performance of the centre and the effectiveness of the services offered.

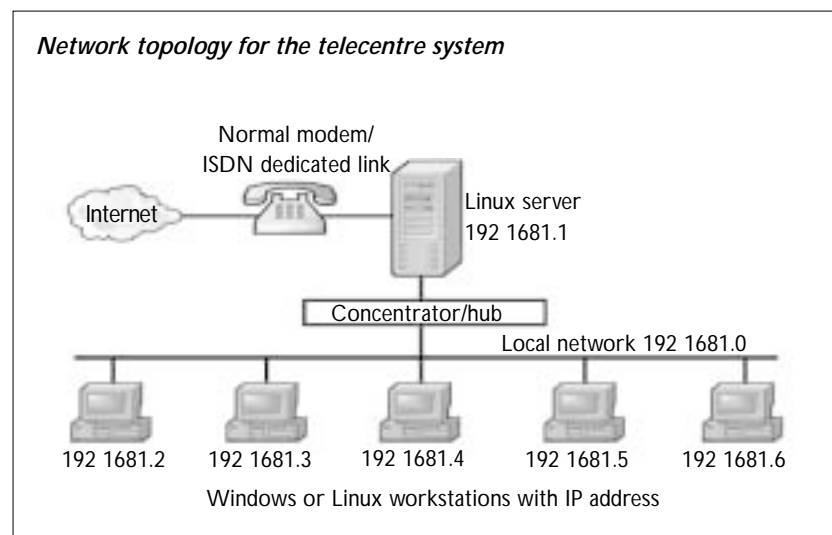
All of this can be done through an online interface, at low costs to the telecentre (which does not have to buy software or pay for licences since the system is distributed under a GNU licence <<http://www.gnu.org>>) and in a simple, user-friendly form. All transactions with the system are done through an Internet navigator.

Information captured is stored in a database that automatically generates cumulative percentages as the basis for constructing indicators for classifying users by age, gender and level of schooling. The cumulative database and the results from applying the indicators can be used to support research into future telecentre initiatives.

As well, because information from the registration system can be shared among all telecentres using the system, it will be easy for any community interested in running a telecentre in Latin America and the Caribbean to learn about the negative and positive impacts of new ICTs.

Although the registration system has a built-in form for tabulating the variables, these can be presented to users in different ways so that questions are expressed in the appropriate vocabulary and in terms that the user will understand.

In February 2001 we began publishing the results, procedures and lessons from each proposed activity at <<http://www.colnodo.apc.org/registro/>>.



The application was developed using tools that are freely available over the Internet. These include:

- a SQUID proxy system (cache) that allows an Internet connection to be shared with a local network
- an Apache web server
- a MySQL database handler
- programs to control station access (ipchains) and for running commands (sudo)
- a program for analyzing the user log file for the proxy server (Webalizer)
- modules developed by Colnodo in PHP (dynamic web pages) for system administration and for presenting statistics from the user log file

While the application was developed and documented for a Linux platform, it can also be used on the Windows platform with some limitations. Our intent here is to ensure that telecentres using Windows will have no problem in running the application. Those parts of the process that change between the Linux and Windows platforms have to do with controlling the sending of Internet packets from stations to the Internet, i.e. where there is not full control over Internet access from stations so that users can use the system even if their session has ended. There are also some problems in graphics presentation in the Windows version of the statistics module. The Linux version allows Internet access stations to be blocked until the registration form is completed.

We developed a graphic design that can be personalized by whoever is using the application. Basically, this allows changing of the language (from the initial Spanish to any other language) as well as fonts and colour.

We have made progress in our research into tools for analyzing statistics for the SQUID proxy server (Webalizer <<http://www.mrunix.net/webalizer>>) so as to analyze statistics on the most frequently visited sites in the telecentres. For statistical analysis of the variables contained in the initial and end-of-session forms, we designed applications with PHP modules that can show the results in graphic and table formats.

### **Description of variables for the registration system**

The e-mail address list of the TELELAC “Telecentros” project was used to circulate the basic structure of the form that the user must fill out at the beginning or end of the session at the telecentre station.

The basic structure had been developed by the research team, the UIB coordinators and the external evaluator of the UIB project (Maria Quintero). The structure was refined on the basis of suggestions and comments received. The final structure shows:

- which data have to be registered only once
- which data must be registered repeatedly
- frequencies of registration
- the part of the process to which each type of registration applies
- the data that can be registered without intervention by the user or a third party

### Structure of the initial form

The initial form appears in the registration system at the time the user starts to use the station.

#### User profile

The following variables relate to the identity of the user. They are intended to facilitate the definition of personal profiles for the population served by each telecentre for use in defining strategies and targets for promotional campaigns, according to sex, age, level of schooling, occupation and distance between home and telecentre.

##### *1. Name*

Optional. This is recorded only once. The system stores it in a database and the next time the person registers he will merely be asked for his identity (ID). This variable can be used in the future to personalize some of the telecentre services.

##### *2. ID document*

Required. It is recorded the first time a user accesses the service. If the system finds the data from the ID document in its database, it will allow the session to begin immediately. The system allows the user to update his data (i.e. to modify his user profile).

##### *3. Type of ID documentation*

Required. This is recorded the first time the user accesses the service. The type of the document can be edited (birth or citizenship certificate, ID card, passport) depending on the type used and the location (this document has different names in each country), but the field remains the same in the database.

##### *4. Gender*

Required. This allows the user log to be broken down into male and female users. This information is useful when it comes to measuring equity of access, establishing user times by gender or promoting gender-specific services.

#### 5. Age range

**Required.** This is recorded the first time the user accesses the service. The age intervals are under 10, between 10 and 18, between 19 and 25, between 26 and 30, between 31 and 40, and over 40. The selection menu allows only one range to be selected. The administrator of the telecentre can refine the age range for example, instead of “over 40” the menu could include more age brackets in order to differentiate older adults (e.g. “over 60”) but the categories created must always fall within the ranges described above to ensure that information is comparable between different centres.

#### 6. Level of schooling

**Optional.** The ranges used are none, basic primary school, basic secondary school, technical education, university, and postgraduate (indicate complete or incomplete). This is recorded the first time the user accesses the service at the telecentre. Only one level is to be selected from the menu. The administrator of the telecentre can refine the levels: for example, instead of “basic secondary education” the menu could include “preparatory”, but the categories created must always fall within the ranges described above to ensure that information is comparable between different centres.

#### 7. Occupation

**Optional.** This is recorded the first time the user accesses the service. One category is to be selected from the menu. The telecentre administrator can remove from the drop-down list any items that do not apply to the user population. For example, in a school the list could be limited to “students” and “teachers”.

#### 8. Distance from home to telecentre

**Optional.** This is recorded the first time the user accesses the service. A range is to be selected from the drop-down menu. The administrator of the telecentre can refine the selection: for example, instead of “barrio” the menu could include “district”, but the categories created must always fall within the initial ranges to ensure that information is comparable between different centres.

#### 9. Communications access at home

**Optional.** The options included are telephone, television, radio, and press. It is recorded every time the user accesses the service, and answers from the previous session are retained so that when the question is posed at the next session it can be determined whether the use of ICTs has enhanced the user’s capacity to access other communication media. There is a menu that allows several of the options to be selected.



### Description of the session

The variables listed below allow the system to measure the length of each session for each user of a telecentre computer. This will allow accurate invoicing for computer use. In this respect, the system includes a module to establish a fee structure based on user time.

As well, it allows the user to monitor the time he has spent at the computer and to programme his consumption to avoid unpleasant surprises when it comes time to pay. This information is useful for calculating the average length of sessions at the centre, for purposes of planning and upgrading its facilities, for programming business hours and for designing promotional strategies to encourage users to stay online as long as or longer than the average.

- 10. *Date session begins*
- 11. *Time session begins*
- 12. *Date session ends*
- 13. *Time session ends*
- 14. *Duration of session*
- 15. *Cost of the session.*

The date and time the session begins and ends are recorded by the system, and the duration and cost of the session are determined by the system.

### Identification of the telecentre

#### 16. *The telecentre code*

This is activated only when the telecentre is registered as a user of this application. Using this code implies that the telecentre will share the data produced by this research project. Colnodo will assign a serial number for monitoring who is using the registration system and for compiling data and producing statistics on the telecentres registered in the programme (by region, country, typology, etc.). The intent is to produce consolidated statistics by groups of telecentres, either within the same chain (e.g. a national access programme, an Internet café company, a public schools network or a network of independent centres that collaborate voluntarily).

#### 17. *User number*

This is generated automatically by the system when the user accesses the service the first time: this makes it possible to determine how many people have benefited from the service. If the system finds the user data already stored, it will not assign a new number but will use the existing one. This does not refer to the number of total sessions in the telecentre, but rather to the number of individuals who have used it.

## Structure of the final form

At the end of the session, the system will ask the user to complete a very simple closeout form. The telecentre administrator will use the information from this form to determine the degree of customer satisfaction and to identify and address any problems that users may experience. For example, if there are problems with connection speed, the centre will need to find a way of broadening its channel or changing the form of connection (e.g. switching to satellite access from telephone dial-up). If the problems have to do with the speed of the computers, the centre will have to expand the memory and disk space of the computers. If the problems have to do with users' skills, the centre could offer courses or workshops and invite specifically those users to participate.

In this last portion, the user can enter comments about the centre, about the quality of service or about the registration system itself. This information is stored in the registration system's administration module, where it is freely available to the telecentre administrator.

Users do not normally make entries in open text fields of this kind; but if they do, this information must be taken into account, and a decision will have to be made as to whether to implement the suggestions. It is important that users be able to see whether their comments have been taken into account, perhaps through a bulletin board where the centre can announce, for example, that it has decided to expand hours of service at the suggestion of users.

## Access to information and knowledge

The variables can be used to determine the quantity and quality of each user's access to information and knowledge through conventional communication media. They can also be used to determine the reasons why users choose to access the Internet through a telecentre and how to meet their needs most efficiently. As well, they can identify the services most in demand so that infrastructure can be adjusted accordingly and marketing strategies can be adapted to promote underused services. This information is of great importance in structuring the way the centre will advertise itself and for defining local information systems.

### 18. Uses

Optional. The options included here are navigation, e-mail, chat groups, FTP (file transfer protocol), music, video, telephony, word processing (text), data processing (electronic pages), page design, graphic design, games, multimedia courses, printing documents, scanning documents, and other. Each time a user accesses the service, his use will be recorded. There is a menu that allows several options to be selected, and an inventory of services offered is provided.

*19. Why? (What brought you here today?)*

Optional. The options offered are work, entertainment, study, friendship, business, research, and other. A record is made each time a user accesses the service, and the responses from the previous session are stored and compared to see whether the reasons are the same or have changed. The menu offers several options for selection.

**Efficiency and level of satisfaction***20. Did it work as you hoped?*

Optional. At the end of the session, the user is asked to record his level of satisfaction by simply choosing yes or no.

*21. Did you find what you were looking for?*

Optional. At the end of the session, the user is asked to indicate his level of satisfaction by choosing yes or no.

*22. Observations*

Optional. Open text field.

**Statistical analysis**

From the user profile variables, we selected three for statistical analysis of the information stored in the databases. These variables are sex, age range and level of schooling. They were selected because of their relevance and the need to determine the impact that ICTs may be having in relation to the gender, age and education level of users.

The analysis module in this application compares the percentages derived from the data compiled for the other variables with the three selected variables, and automatically generates columns of data and graphics (pie and bar graphs).

**What does cross-comparison of variables tell us?**

We describe below the variables used and an analysis of the information that can be extracted by crossing each of those variables with the three variables selected for comparison (gender, age and level of schooling).

**Occupation**

In the “occupation” variable, we distinguish between those requiring a university degree (in careers such as architecture, art, business administration, education, health, economics, humanities, law and politics, natural sciences, social sciences, engineering), student, military and trade.

*Gender versus occupation*

If the telecentre administrator knows which occupations are most common among men and women, for example, the centre's initialization pages can be designed to include content relevant to those occupations. Training workshops in the use of Internet tools (navigators and search engines) can be tailored to the information of greatest interest for these groups. Information on occupation will also give the administrator an idea of the level of complexity that users can handle in terms of graphics and reading comprehension.

*Level of schooling versus occupation*

By checking whether a user's occupation is related to his level of schooling, we can learn much about the labour market in our countries, where many people with university degrees are not working in their areas of training but in other areas. This could allow for more effective management of applications such as "employment grants", academic refresher courses, completion of studies, etc. Knowing the average education level of the community served by the centre can help to identify specific educational needs.

*Age versus occupation*

Comparing occupations against age ranges can show what the most traditional occupations are in the community and what changes that community is experiencing in terms of purchasing power, retaining young people, etc.

**Distance**

The "distance" variable distinguishes whether users live in the neighbourhood where the access centre is located, in the same sector, in another one nearby or further away, or in another city.

*Gender versus distance*

Determining whether men or women live closer or further with respect to the access centre can be used to determine the centre's radius of coverage and influence; to determine the distribution cost of promotional flyers and posters; to structure accompaniment programmes for people who live further away (e.g. for young women in areas where crime rate is relatively high); and to define the hours of training workshops so that women and youngsters who live further away can attend without having to go home too late at night.

**Uses**

The "uses" variable distinguishes services relating to Internet navigation, e-mail, chats, file transfer, music, video, voice-over-Internet Protocol (IP), word processing, data processing, page design, graphic design, games, multimedia, and printing and scanning documents.

*Level of schooling versus uses*

A user's level of schooling may indicate to the administrator the complexity of the services he would use. Online research or advanced search options might be less used among a population that has not completed elementary school. In this case, the centre's administration would need to make greater efforts to help each user cope at a higher level of complexity.

**Access to communication media**

This variable distinguishes between the traditional media: telephone, radio, television, press and magazines.

*Age versus access to communication media*

With these variables, we can determine the degree of isolation from information and knowledge according to age within the local community. "Media access" also includes the Internet option, which could serve to determine the degree of importance that Internet access has for the community (e.g. whether it is higher than for the conventional media). This variable can also be used to determine how "oral" that community's culture is: this may suggest that information needs to be accessed through audiovisual services, which will require better connectivity. That might imply permanent expansion of the centre's connectivity channels or the search for new connectivity options that are swifter and more efficient but will also cost more – on the other hand, they may encourage more frequent use of audio and video services, and since this normally requires more connection time it may well generate higher revenue for the centre.

**Why? Motivation for using the centre**

The "why?" variable distinguishes between those who use the centre's services for work, entertainment, study, business, friendship, research, and others to be specified. Knowing the motivation of those who visit the centre can be useful in designing promotional strategies targeted, for example, at people with relatives living outside the country or in another city who want to maintain contact in the most economical way and may decide to use voice-over-IP services (Net2Phone, DialPad, among others).

**Additional functions**

The following is a description of additional functions of the registration system.

*Graphic presentation of statistics*

During development of the statistics module, we found that people have difficulty understanding statistical information if it is presented only in table format. We experimented with a graphics generation package. If the research user wishes, however, he can still consult the tables.

*Remote control over all workstations via the Internet*

One of the problems facing telecentre administrators is how to maintain control from their workstations over the use and duration of use of the terminals under their responsibility. This is manageable if the centre has fewer than 10 computers, but in larger centres a single person will be overwhelmed by the task. This module allows various functions to be controlled from one workstation.

*Scalability in the application*

Many networking solutions available on the market are designed for a certain number of terminals. The dynamics of telecentres suggest that they will increase their capacity as demand rises. The idea of making the application scalable (i.e. it can function properly with as few as 2 and as many as 100 or more computers ) is intended to allow for the expansion of installed capacity without having to modify the registration system and to install and configure it all over again.

*Defining different types of administrators with different levels of access*

When we started our research, we assumed that the telecentres would have the freedom to decide with whom to share information captured through the registration system. In this way, if in the future we develop a module for sharing information among centres, each one will be able to decide who can access its databases and to what depth.

*Controlling the appearance of the interface (logo, font, colour)*

Many telecentres have developed their own corporate image, or they belong to organizations or programmes that have predefined corporate colours. If the registration interface cannot be adapted to these designs, it may discourage use of the registration system by centre administrators.

*Capability of translating the registration system's interface into any language*

Translating applications is one of the most difficult tasks facing community access providers. An error in digitization can disconfigure the entire application, and it will take much time to restore it and may require shutting down the service for some time. For this reason, we introduced a feature that allows the entire interface to be translated by modifying just one file.

*Possibility of adapting terms in the forms to expressions peculiar to each country*

During the initial stages of our research, thanks to the cooperation of the virtual community Somos Telecentros, it became clear that the terms used for certain concepts vary from one country to another. For this reason, we designed a module that allows changes to the "external values" (names of the variables) that appear in the forms to be completed by the user, while retaining certain categories within the structure of the database. This means, for example, that when a user in Mexico is asked about his level of education

he can respond “*preparatoria*”, while a Colombian user would reply “*bachillerato*”, and the database will record both answers under the category “basic secondary education” for the variable “level of schooling”.

Other additional features are the possibility of installation on a Windows platform, although with certain functional limitations, and the possibility of monitoring the duration and cost of promotional campaigns to ensure that the telecentre is self-sustaining.

### Recommendations to telecentre administrators

1. Develop mechanisms for automated installation of the application and of all programs required for it to function properly (plug and play), since in its current form the application requires several hours of work and specific technical knowledge to install it satisfactorily.
2. Conduct consolidated comparisons of several telecentres at the local, national and regional levels. The application was designed to allow subsequent development of this module to include an ID code for the telecentres among the identification variables. This module will be very useful for examining the functioning and performance of large or small telecentre networks belonging to the same project or organization, financed by the same donor, serving the same community, operating in the same city or country, or those that have decided to share information on their functioning and to work together.
3. Expand the statistical analysis modules so that application users (telecentre administrators and researchers in new technologies) can make new cross-comparisons of variables and use simple mechanisms for selecting the variables needed to build new indicators. During our research, we recognized that the number of indicators that can be derived from statistical tables depends on the objectives and scope of the research in question. The idea of this module is that researchers can select the variables they want for building research-specific indicators, using a very simple form.
4. Develop a module that allows backup copies of the system to be made and that facilitates the retrieval of information or of the previous configuration if it is accidentally modified.
5. Distribute the registration system in accordance with the official requirements of GNU/GPL licences. Meeting these requirements is essential if this application is to be included in GNU/GPL distribution programmes like Linux Red Hat. Unless all the standards are met, this application would not be recommended by the best-known suppliers of free distribution programmes and applications.

## Acknowledgements

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## Notes

1. Planeta Colnodo <<http://uib-teusaquillo.colnodo.apc.org>>.
2. Fundación Programa de Educación para Adultos del Suroriente PEPASO, San Cristóbal <<http://uib-pepaso.colnodo.apc.org>>; Fundación Teatral Kerigma, Casa de la Cultura, Bosa <<http://uib-kerigma.colnodo.apc.org>>; Fundación AVP para el Desarrollo Social, Suba <<http://uib-favp.colnodo.apc.org>>.