CAPACITY BUILDING FOR CYBERCARTOGRAPHY: THE CYBERCARTOGRAPHY FOR THE AMERICAS PROJECT

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Abstract

The Cybercartography for the Americas project was a two-year project funded by the Inter-American Development Bank and the Governments of Brazil, Mexico and Canada and administered by the Pan American Institute of Geography and History. The financial support of these governments and agencies was approximately $1 million US and is gratefully acknowledged. The project was completed in June 2000 and had several components including the production of a web based Cybercartographic Atlas of Water in Latin America, a CD-ROM Continental Atlas of Water in Latin America, national web and CD-ROM interactive atlases, a Tactile Atlas of Latin America, the creation of metadata clearinghouses, and the development of local capacity in cybercartography in the eight Latin American nations participating in this project: Argentina, Brazil, Chile, Costa Rica, El Salvador, Mexico, Panama and Peru. This paper will discuss the important capacity building component of this project and the education and training approach used.

Cybercartography

Cybercartography was introduced in the keynote address to the ICA Conference in Stockholm in 1997 and consists of the following components:

- Cybercartography is highly interactive and engages the user in new ways
- The development of multi-dimensional cartography using multimedia formats as an integral part of an informational/analytical package rather than a stand alone product
- In organizational terms Cybercartography sees new partnerships being created among national mapping agencies, research centers, the private sector, non-governmental organizations and educational institutions
- Cybercartography products are likely to be compiled by teams of individuals from different disciplinary and professional perspectives working together
- The utilization of an increasing range of emerging media formats and telecommunications networks such as the Internet and the World Wide Web
- The application of cartography to a much wider range of topics

Cybercartography was the central concept in the capacity building component of the project. It has been applied in the creation of a number of products such as the Canadian Geographic Explorer (Taylor 1997) and the Electronic National Economic Atlas of China (Taylor, Liu and Chu 1996), which was subsequently further developed into Data Atlas@China (IQMedia 1998)

The role of the Atlas and web site within the Project

The Latin American region has a long tradition in the elaboration of paper Atlases. However in 1998, the concept of cybercartography had reached neither the academic nor the governmental communities. On the other hand, although the Internet was already a known tool among scholars and government officials, the clearinghouse concept and the use of interactive maps on the Web was rather scarce.

The situation among the eight participating countries varied in terms of data availability and access to technology. However, a considerable amount of geo-spatial data for both the Web and the CD Atlas was already in place. Most of the institutions had access to computer and Internet technology and the mapping knowledge was also in place. In some cases it became necessary to digitize existing paper maps and in a few cases new geo-spatial material was created.

It is important to mention that the overall access to computers and Internet in the region is far behind countries like the U.S. and Canada. All of the cartographic institutes involved had some computer infrastructure but Costa Rica and Panama did not have access at all to Internet technology.

The development of concrete products that could respond to the immediate needs of different countries as well as the incorporation of high technology components became an attractive idea for the cartographic institutes of the countries involved in the project. Although some countries such as Chile and Mexico already had some previous experience in digital atlases, the new cybercartography and clearinghouse concepts were viewed as refreshing components for future efforts.

The main challenges for the elaboration of the cybercartographic products included both conceptual and technological issues. Conceptually, cybercartography clearly expands the traditional representation of the geographical landscape by providing other means for understanding geo-spaces. Moreover, the atlas allows the user to take advantage of computer technology to navigate through the product and to interact with the maps. The traditional geometry elements (points, lines and polygons) are transformed into “hyper-elements” that then, transform the one-dimensional map into a multidimensional product. It’s also worth noting that Multimedia cartography is but one more element of cybercartography.

Special attention was given to the methodological aspects related with the design of all the cybercartographic products. A qualitative approach (Reyes, 1998) was applied in designing the format for the professional and institutional interaction among actors, to assure that the products would respond to the interests and problems in each of the countries and for the continent as a whole. As part of this exercise, as will be explained below, user requirements analysis was undertaken, using workshops and meetings.

From a technological perspective, although GIS, mapping and multimedia software was available in the market, atlas and the WEB products demanded integrated and user friendly solutions. Some of the countries were well advanced in the use of commercial products while others had not had access to this type of software. The Environmental Systems Research Institute provided the project with the necessary software so that at least one institution in each country had the basic software resources to proceed with the project. Arc/View, MapObjects and ArcIMS were used as the basic tools to develop the products.

Metadata concepts were incorporated in both the atlas and the Web site. Using as a basis the standard developed for the US government by the Federal Geographic Data Committee, a format that responded to atlas users was designed. In the final products, a metadata description was attached to each of the geo-spatial elements.

The key knowledge and training elements behind the idea of the production of the atlas and Web site included:

- The concept of cybercartography
- A demand driven approach in the design of cartographic solutions for each of the countries and the continent
- Emphasis on methodological aspects in geomatics
- Team work
- Clearinghouse concept (including metadata)
- Continent, country-wide and regional natural resources, environmental and sustainability issues
- Understanding of user friendly needs for geomatics products
- Technical expertise in using commercial software and in combining different software solutions
- Computer programming skills
- Technical expertise in developing applications for the Internet

Education and training approach

There have been significant efforts for over two decades in geomatics education. However, even at the international level there are some shortcomings of the existing programs. For example, in a white paper prepared by the Atlantic Institute (Atlantic Institute 1996) it is noted that specialists in geomatics come from backgrounds in different fields of knowledge and disciplines such as computer science, mathematics, engineering, planning or geography without a clear definition of what the acceptable basic background should be considered as a minimum requirement for a professional in this field. So there is still a debate regarding the "ideal" composition or mix of knowledge for what the courses geared at preparing human resources in geomatics should be.

Other problems mentioned frequently are: The lack of resources for maintaining an up-to date computer infrastructure, the scarcity of staff with academic background and professional experience and the sustainability of the programs. These factors have led to the creation of alliances and joint projects whose essential purpose is to share experiences, make up for shortcomings, and achieve continuity for human resource education and training in geomatics.

The most relevant conclusion regarding the curricular design in geomatics is that we are today in the process of discovering the best possible practices and that we need to emphasize scientific aspects of knowledge without overlooking technical aspects and experience. We are facing the challenge of stepping up our pace in order to achieve, in the medium term, competitive solutions that properly meet society's demands.
In a two year project like the one of cybercartography in the Americas, the time constraint forced the team to design an approach that would contribute in Latin America to the overall education and training effort and at the same time obtain short term practical results.

An initial diagnosis of the situation of Latin American countries as a whole in terms of education in geomatics showed that across the countries there is a "small" group of well-educated people at the graduate level in computer science, geography, cartography, geographic information systems, image processing and planning. On the other hand, Latin American education usually allows people with bachelors degrees to easily achieve technical training.

For these reasons, the agenda of the workshops included three different components: a) The transfer of knowledge in methodological aspects related with the design of cartographic solutions; b) The discussion of cybercartography and clearinghouse concepts; and c) technical training in the use of clearinghouse, mapping and multimedia software.

The profile of the participants included both people with strong academic backgrounds and people with computer technical expertise. During the first sessions of the weeklong workshops, the group first worked together and adapting to the situation, the group was then divided into two sub-groups throughout the remaining sessions. The group as then brought together for a final concluding session. The first sessions were oriented towards methodological issues while the later sessions were dedicated to technical training.

During the first set of workshops the Canadian and US teams led the sessions. But they were progressively replaced and by the second year of the project the Latin American team, having developed an increased understanding of the new concepts of cybercartography and clearinghouses, took over the leadership of the capacity building component.

The teaching approach was non-traditional in the sense that the attitude of the education and training teams was always that of a facilitator, allowing highly participative groups to build together a common view of cybercartography and then seek solutions to specific problems in each country.

In the final result, the team in each country found its own specific solutions while at the same time, the overall team found some common ground in its view of the potential uses of cybercartography and its importance in sustainable development.

Among the key factors identified for the success of the capacity building component of the project are:

- An emphasis on transmitting the knowledge and “know how” rather than on the resulting final products.
- The will of all the participants to share new knowledge and to learn from each other.
- The very difficult task of establishing human networks.
- An orientation towards teamwork, both within and among countries.

As a final remark, it should be noted that closing the time gap between the introduction of an innovative scientific idea in a developed country and the adoption of that idea in developing countries is usually considerable in the area of geomatics. It was only in 1997 that Taylor elaborated the cybercartography concept, and yet by the year 2000, at least eight countries in Latin America were already applying it.

Capacity building experiences

As mentioned above, the concept of cybercartography was an entirely new one to the Latin American participants in the project and the first step was to demonstrate its relevance to the key players in the project. An initial meeting was held in Mexico with two representatives from all eight countries to introduce people to the project as a whole and to involve them in the project planning process. This was followed by two workshops designed to "train the trainers". A group of 15 individuals, mainly from Mexico and Brazil, received intensive training utilizing mainly Canadian instructors. This team was then used to instruct eight national level workshops held sequentially over the period of a year with one workshop for each country .The didactic approach and the materials used changed constantly as evaluation and feedback from each country’s workshop was used to improve the next one. To be effective, education and training must be culture specific and both the language and

approach used by the training teams varied considerably from that utilized in North America and Europe. These differences will be discussed below. Outside involvement in the teaching of the workshops was steadily and dramatically reduced over time as the Latin American training team gained knowledge, competence and confidence. Concepts and materials were both developed in Spanish and the training teams took strong ownership of the project. Interestingly the training teams were predominantly made up of women where as the participants in the workshop were mainly, but not exclusively, men. This made for an interesting set of educational dynamics, especially because many of the workshops were held in military establishments.

In the educational approach, special attention was given to the definition of participant's professional profiles for the project. Approximately twenty persons participated in each workshop. The main thematic emphasis varied according to the country's profile and interest. For example, in El Salvador people's well being is related strongly with water resources this was therefore fully discussed during the meetings while in Panama the environmental impact and the ownership issues of the Canal were the main focus of the discussion. The educational component drew mainly on Latin American specialists, with help from Canadians.

The capacity building process involved training over 300 individuals in the eight participating countries. Methods of measuring the success of the capacity building process included the formal evaluation of each workshop and each instructor by the participants and this was overwhelmingly positive. Success can also be judged by the quality of the subsequent work produced by those trained. Excellent contributions by teams in all eight nations were made to the Continental Atlas on the web (www.atlaslatinoamerica.org) and every nation has produced its own national atlas. The progress in this respect in nations such as El Salvador, Panama, Argentina and Chile, has been quite remarkable.

Lessons learned

Among the good practices derived from the project and the most important lessons learned one finds that (Reyes, 2000:Taylor 2000)

- Human networking and personal relationship building are key factors in the development of adequate Geomatics solutions for the region.
- Capacity building has better results when local professionals are heavily involved in the process.
- Knowledge bridges between users and producers of geo-spatial data should be strengthened.
- The region needs more investment in information and communication infrastructure.
- Projects and programs that strengthen the "information culture" in the region should be promoted.
- To obtain demand driven products at the regional and local levels, the involvement of regional and local people is a key element. The traditional approach of international organizations imposing fixed schemas usually jeopardizes the success of their projects.
- In Latin American culture personal interactions are fundamental and complex motivators. Enough resources should be put in place to allow as many workshops and working meetings as necessary to build these relationships.
- Healthy competition resulted in a positive motivational force among countries.
- Short cuts can be found to shorten the time lag for dissemination of scientific and technological knowledge and infrastructure within the Latin American Continent.
- The exchange of scientific knowledge and experience among all American countries is a positive driving force for sustainable development.

As a result of this project, new developments are found in the participating countries as a consequence of the involvement of universities and cartographic institutions of the region. Such is the case of the continuing human networking process, new regional knowledge in cybercartography, the promotion of new local research groups in geomatics, the strengthening of relations between North and South American countries and the recognition of the United Nations through a resolution of the need to promote capacity building in geomatics in Latin America .

Final remarks

Specific thematic topics for future development in cybercartography have been identified. These include environmental and natural resource management as well as risk, vulnerability and natural and social disaster issues. The overall conclusion is that future international projects in cartography and geomatics should be strongly promoted and sustained within the Americas if Latin America is to become more competitive in this important area of the knowledge-based economy.

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