

# Multimedia in Chile

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## Abstract

We present an overview of multimedia use in Chile, including infrastructure, local production, social issues, main applications and three case studies. We emphasize on innovative actions and use of technology.

**Keywords:** multimedia, software, WWW, ATM, education.

## 1 Introduction

Chile is located on the southwest coast of South America, spanning over 4300 kms, with an area of 750 thousand square kilometers and 14 million people. Although Chile's economy is mainly based on raw materials (minerals, lumber, fish, fruit), value-added exports are increasing. In particular, software exports were estimated in 56 million US\$ in 1995, up from 38.9 million US\$ in 1994, showing an annual growth greater than 40%.

Chile is a good example of a country with a small and very open internal market and a good technological level, in contrast to other Latin American countries that have larger but less competitive internal markets. Currently, about 1.1% of the GDP is spent on information technology (IT). According to IDC (International Data Corporation), in 1994 Chile spent 40 US\$ per capita on IT, one of the highest in Latin America.

However, as is characteristic of Latin American countries, most of the market is concentrated in the capital city of Santiago, which holds 40% of the population of Chile. The main problems for new specialized industries is the lack of venture capital and the high entry level costs relative to the size of the market.

Although multimedia is in an early stage as an industry in Chile, their development is represented by companies that work in WWW and design information services (about 50 currently). There are some companies that produce multimedia as educative or commercial CD-ROMs, but their number is very small. Some universities have multimedia projects funded by public programs to improve education and use of new technologies.

There are no particular government programs for the multimedia sector. However, there are several infrastructure and innovation programs where multimedia plays an important role. Among them we should mention educational computing and technology transfer programs.

At several local universities there are multimedia research or development projects. Interest was sparked with academic workshops in 1990 and 1992, and now multimedia is being applied in several fields such as education, information services and medicine.

The data gathered for this paper comes from too many different sources, so we do not reference them. For readers interested in information technology in Chile please refer to [1, 2, 6].

## 2 Multimedia Infrastructure

Due to the openness of the market and the privatization of the telecommunication sector several years ago, this sector has seen rapid development. In fact, Chile is now being used by several multinational companies as a testbed for new technology and marketing strategies in a competitive arena. According to ITU (International Telecommunications Union), Chile is ranked 29 in multimedia access technology (only behind Argentina in Latin America). In 1996, Chile had 142 telephones, 230 TVs and 52 PCs per one thousand inhabitants (the later is the highest in Latin America).

In the telephonic sector the number of lines tripled to 2 million in 6 years since 1990, and all the switching is now digital. In 1994 a multicarrier long-distance system started, and 8 companies (half of them foreign) are offering this service. Currently, three local companies share 74% of the international and 90% of the national market. Consequently, prices have lowered significantly (for example, a one-minute call to the USA is less than a dollar, and a one-minute national long distance call is less than 20 cents).

Cellular telephony is available almost everywhere in Chile through three companies, one of them foreign (law allows two companies per region). Basic service costs range from 15 to 50 US\$ per month including a certain number of free calls and a free cellular phone. This market is growing at a rate of 70% per year due to lower costs of the cellular phones. At the end of 1997 a new mobile communication service will start, called PCS (Personal Communication Service). This service will operate in a frequency of 1900MHz (in comparison, cellular telephony uses 800MHz), which allows faster communication, including digital data. Three local companies will compete for this market.

Fiber optic lines have been installed by four different companies from La Serena in the north to Valdivia in the south which are separated by a distance of 1300 km. There is also a fiber optic connection to Mendoza in Argentina, which links to coastal and transatlantic cables. Nowadays, fiber optic lines extend from Arica in the north to Puerto Montt in the south, spanning over 3000km. There are also fiber connections to Perú and Argentina. Around 1997 Chile is expected to have access to the Pacific coastal cables that are currently being installed by various consortia, which will connect North and South America.

Due to certain developments (discussed below), several companies provide data lines, starting from 64 kbps to several Mbps. The Internet in Chile became available in 1992 via two different academic consortia (although electronic mail started in 1986 via UUCP). For the early history of Internet in Chile see [4]. Today the number of providers has jumped to twenty, covering all major cities. The approximate number of hosts was 16000 in January of 1997. It is estimated that at least 150 thousand people had access to the Internet in 1996. The overall international bandwidth of the Internet connections has progressed from 128Kbps in 1992 to several Mbps in 1997. There are more than 30 electronic bulletin board systems (most of them in Santiago). Half of them are on Fidonet and the other half are connected to the Internet.

In 1995 there were 76 cable TV operators in the main cities, owned by 15 different companies, and reaching about 390 thousand homes (15% of the country, 80% located in Santiago) at an ap-

proximate monthly cost to the user of US\$30. They offer in total more than 150 channels, with 70 locally broadcasted. Foreign signals are mainly from Argentina (where cable reaches 50% of households) and the United States. During 1996 the main four operators merged in two big companies that share 99% of the market, while the number of homes connected reached 600 thousand. This year also DirectTV starts (via satellite). This service will include 60 TV channels and 30 radio channels with a setup cost of US\$500 (including the parabolic antenna) with a monthly basic fee of US\$35 (including the decoder). This service will cover all the country.

Narrowband ISDN services started in 1994 (only in Santiago) and the first ATM network was installed in 1994 at the University of Chile. In 1995, several other ATM networks were installed (Catholic Univ., National Congress, etc.). During 1996 two companies started public ATM networks for commercial purposes.

During 1996 the number of PCs reached 700 thousand with an estimated 10% having multimedia capabilities. This rate is increasing because in 1995 one third of the PCs sold were multimedia systems. At the end of 1996 about 20% of them were home installations. There are several telephonic information and banking services available. CD ROM-based TV game player machines are not yet freely available, but other TV games are very popular.

## 3 Local Production

### 3.1 Hardware

Chile does not have a hardware industry, but according to customs figures, 15% of the 105 thousand PCs imported in 1994 were assembled in Chile (Acer). In 1996 the PC market was shared by Acer (20%), IBM (15%), Compaq (13%), Packard Bell (8%) and Apple (7%), with a total of 146 thousand units. In the middle range computers, about 2100 were imported in 1996, with Sun Microsystems taking one third of the market, followed by IBM.

Regarding software, there are about 20 companies exporting products. Although multimedia software production is still scarce, it is growing rapidly, covering a broad spectrum of uses. The first developments were ad-hoc applications for banking services (for example, automatic tellers using laser discs and audio or live video), hotels and shopping malls (self-service information kiosks). Nowadays, there are also product databases available as well as on-line information kiosks with video conferencing capabilities.

In the marketing arena, multimedia has been used for commercial catalogs, corporative presentations, greeting cards or invitations, and electronic bulletins. In most cases marketing materials are distributed on floppy disks directly to potential customers. Similarly, multimedia has affected the publicity market and its being used in TV and other media.

Another sector with interesting applications is education, particularly the K-12 segment. To a lesser extent, special education software has been used at secondary and tertiary levels. Examples of the software developed for this area are detailed later.

Another story is the boom of WWW servers containing multimedia material, due to the early adoption of that Internet tool. In fact, Chile introduced in 1993 the first WWW server in Latin America, with a total number of servers that will surpass 1000 in 1997. Currently most universities and many public and private institutions have WWW servers. Their main uses are for on-line information and marketing (see [5]).

### **3.2 Human Resources**

Technical education in Chile has always carried a tradition of excellence, especially at the older universities, which have a well-established tradition in education, based upon international teaching standards. In fact these traditional universities include some of the very best in South America. Proof of the quality of education is borne out by the fact that Chile enjoys one of the highest literacy rates in Latin America, and Chilean universities attract many students who wish to conduct graduate research in the region.

Specifically in computer science and information technology, the technical level is good and the market is still absorbing most of the graduates. For that reason, almost all universities in Chile are currently teaching engineering degrees in computer science and other related subjects. Four or six year accredited degree courses are taught at universities. There are currently two kinds of universities in Chile, traditional and private universities. The former, some of which are public institutions, are all at least partially funded by the state. The latter are universities established within the past fifteen years which are managed as businesses, and there, almost no research or technology transfer is being carried out. The main research centers are the Univ. of Chile and the Catholic Univ. at Santiago. Both have been investing heavily during the last ten years in sending their faculties for graduate studies abroad. Currently, Chile has the highest regional publication record per capita in IT-related fields.

There are several two-year M.Sc. programs and two Ph.D. programs (Catholic University and U. of Chile, both in Santiago) in computer science. Most computer engineering careers include one or two courses in multimedia, including an applied workshop. At the Catholic University, one or two multimedia courses have been included in the curriculum of engineering, instructional design, journalism, education, medicine and psychology. Although there are no special degrees on multimedia, computer engineers have adapted easily to the market offerings in this segment. Nevertheless, the lack of formal studies leads to many people to trivialize the field.

Since multimedia is an interdisciplinary field, teams of that nature are needed. These include designers, librarians, and journalists. The few specialists available are sufficient for now but in the future more will be needed. Multimedia specialization courses are being offered for design and journalism careers. In November of 1995, the Chilean School of Librarians hosted a conference on information issues with emphasis on digital media.

### **3.3 Business and Finance**

Chile does not have an internal market that can justify the development of multimedia products. For example, a single multimedia CD-ROM may cost more than 150,000 US\$ to develop. This requires at least 15% of all the multimedia PC owners to buy that CD-ROM just to break even. Thus, many small companies work on specific custom. As a result, these companies are not very specialized (due to a wide range of customers) and may not have much commercial stability, since they are simultaneously attempting to introduce new technology while they obtain the experience and financial maturity necessary to compete in external markets.

However, some companies have defined clearly their goals for the international market, producing Spanish and English language versions of their products. They are very competitive and well financed, and anticipate high returns in the future (see case study). Another financial resource have

been several governmental programs to promote the Chilean export industry or cultural activities. Although not particularly focused on multimedia these promote technology transfer between industry and the academy, productive innovation for small and middle sized companies, improvement of the quality of public education and technology applied to art.

A related problem is that most companies do not differentiate between the use of the technology and the multimedia contents, doing both things. That is, there are computer aspects (hardware, software, networking) and content aspects which are related to the application field. In the future, greater cooperation between content creators and technology companies is necessary through joint ventures.

### **3.4 Utilization Platforms**

Customs reports indicate that the main platforms used in Chile are DOS, Windows 3.1/95, Mac-Intosh and Unix. DOS/Windows systems make up nearly all installations. Windows'95 represents about 40% of the Windows installations. Macintosh makes up about 10% of the installed PC base. OS/2 and Windows NT are less common and run in less than 5% of PCs, although the penetration level of the latter is increasing.

Unix in some of its flavors is used for medium-sized and large servers (usually in a client-server scheme with PCs). The main providers are IBM, DEC, Sun and HP. There are estimated to be at least 15 thousand of these machines. Systems with proprietary operating systems are uncommon in Chile. For ad-hoc multimedia systems, like kiosks, PCs are most common. The annual growth of the hardware market is around 20%.

### **3.5 Distribution**

Currently, software distribution is usually done directly to the user. There are few chains of software distribution, mainly associated to international publishers. Off-the-shelf computer supermarkets are also scarce, being less than 10 and only located in the major cities. Distribution has been one of the main problems faced by local software companies in Chile and the rest of Latin America.

Currently there are few CD-ROMs published in Chile (about 30), and half of them are multimedia. The non-multimedia products are related to scientific, commercial and legislative databases. The multimedia CD-ROMs, detailed later as applications, are mostly oriented to education. One curiosity are CD-ROMs for soccer, including the most popular teams (as in many other countries in the world, soccer is by far the most popular sport). Most other applications are distributed on floppy discs or via the Internet. Currently, there are at least 7 companies that can produce a CD-ROM master, but none provides massive production at competitive prices.

## **4 Social Issues**

According to several studies, software piracy is still high in Chile, mainly due to lack of knowledge of the benefits of legal software coupled with money savings. Software producers have addressed this issue by educating users, lowering prices and taking legal actions. These measures have decreased piracy to 66%, but losses due to piracy are still significant (estimated by software companies at 65 million US\$ per year). Currently, there is no copyright legislation specific to software, so generic

copyright legislation is used (only modified to include software). In 1993 specific penalties for several computer related crimes were legislated, in particular regarding copyright infringement.

Hardware and software companies are integrated in an association called ACTI (Asociación Chilena de Empresas de Tecnologías de la Información). In 1988, software distributors (four international including Microsoft and two local) established the ADS (Asociación de Distribuidores de Software) association, which plays an active role in software protection. Fourteen small and medium-sized local software companies have formed CEES (Comite de Empresas Exportadoras de Software). Companies exporting multimedia products also intend to form a committee. The last two committees are partly supported by ProChile, a government department for export promotion.

Another important legal issue is related to telecommunications. In recent years the sector has been completely deregulated, with special laws for open local, cellular and international telephony. The laws regulate how many companies can share service in each case and the maximum market share that can be achieved by any one company.

## 5 Application Examples

### 5.1 Education

Clearly, education is the main application currently. The scarcity of Spanish titles has resulted in the importation of English titles (especially from the USA) or translations produced in Spain. During 1995, less than ten CD-ROMs were published, including a Chilean geographic atlas, educational titles which are detailed in one of the case studies. Two companies specializing in multimedia applications are Unlimited (see case study) and Multibrain. The latter produces educational software including geography, biology, soccer, native history, astronomy and mathematics, as well as statistical data. They develop for PCs and Macintosh in Spanish and English and are now targeting the Argentinian market as well as the Chilean. At universities there are several developments of educational software based on hyperstories, auto-guided courses and museums. Some of them are prototypes of research projects, others are WWW-guided material available via the Internet.

For example, the software La Plaza has had an international impact on K-12 education, being awarded in 1995 a prize by Apple for premier educational applications. This software was developed as part of the Ministry of Education's Enlaces project, whose main goal is to deploy a network of schools in a rural area of southern Chile, and soon throughout the country. This project was extended during 1996 to secondary education in about half of the country. La Plaza is a metaphor for a public city square, an important meeting place in Ibero-American culture. In this environment a child has easy access to electronic mail, news, educational material, and so forth, through a very friendly and simple user interface. As a result, more than 100 schools can share ideas and experiences, while at the same time it improves the technological level of education in Chile.

One example of new multimedia applications for education is software oriented to blind children developed at the school of psychology of the Catholic University. These multimedia software have been designed to help the number and letter symbolization process of blind children under five years old. As supposed, these software have a special emphasis in sound issues, but they also use colorful pictures (around 90% of blind children can see something) and animation in order to motivate both children and educators. This university has developed about fifty different multimedia courses, including areas as medicine and architecture.

Another use of multimedia related to education is a CD-ROM produced by the Univ. of Chile to inform new students about the university and the different careers. Other multimedia application is training software at tertiary level. An example is a multimedia software to train bank employees located in the branches all over Chile, controlled and monitored via a network.

A recent project that uses the ATM network installed in 1994 at the Univ. of Chile is Aula 21. Aula 21 will use the network for remote education in different campuses at Santiago, including video conferences, information services through, multimedia centers and specialized teaching rooms.

## 5.2 Services

Many institutions that in the past have provided information services are now exploring digital methods, including banking, economic data, telephone books, the stock market, commercial information, tax information, exports and imports, and science. These are available via the Internet, telephone, or floppy disks and CD-ROMs.

Banks have been very aggressive in the adoption of new technologies, in particular for automatic teller machines and user information kiosks. The most recent development (1995) is the virtual or interactive bank, which connects the customer with a bank attendant using real-time video conferencing (at least two banks have this service which is available at any time). On the other hand, EDI was introduced in 1994, but has not been used as much as expected. Banks have also begun providing software and services such as on-line access to checking accounts commenced in 1995. Currently, 8 banks provide home banking through Internet. There are no public estimates of the number of customers using this system yet. Electronic cash through smartcards is planned by a group of banks for 1997.

Nowadays there are several magazines and newspapers available via WWW or telephonic service. This trend exploded in 1996, reaching 60 WWW servers nowadays, including newspapers, magazines, radio and TV. There is also one electronic magazine sponsored by the Chilean Computer Science Society (SCCC). Currently, there are no local magazines specific for multimedia, but there is one for Internet.

## 5.3 Telemedicine

In 1994 the first experimental telemedicine application appeared, intended to provide expertise to sectors with fewer resources. Using an ATM network, the hospital of the Catholic University at Santiago is performing telediagnosis. This system was scheduled to be fully operational by the end 1995. The Health Ministry is planning a nationwide narrowband system for telemedicine.

# 6 Case Studies

## 6.1 Unlimited

It is not unusual to find innovation being led by startup companies. This is the case for multimedia in Chile. The most serious efforts in multimedia have been accomplished by such a new company, Unlimited, which was founded with clear future goals but in risky times. Unlimited was established to create high value-added Chilean products, particularly educational multimedia software, mainly

aimed at foreign markets. Funded in 1994 by former Apple Chile executive Alfonso Gomez, and belonging to a powerful economic group (Quintec), Unlimited is defined as a company of "contents" that uses computer technology and CD-ROM support to educate in entertaining ways.

In its short but successful existence, Unlimited has published two educational multimedia CD-ROMs. *Busy People of Hamsterland*. is structured as an interactive book aimed at children between 3 and 8 years old. The main goal is to satisfy children's natural curiosity about the world. The main characters are hamsters, small rodents that form a community and work at several tasks. Using the "adventure" paradigm, children can explore the daily life of the characters, in particular the different activities that they perform (for example, train and city transportation). This exploration can be done in any order, as usual in hypermedia software.

The development team includes more than 25 people, including designers, engineers, and musicians. The software includes novel tools, including a magic wand that provides access to more than 800 animations, a magnifying glass to see details and a magic eye to see through things. The user interface has very good graphics using hidden buttons and several unexpected actions that reinforce the curiosity of the children. The price of this product is around 50 US\$.

*Journey to Life* is the other title which examines human reproduction. This product is oriented towards youngsters, showing in a didactic way the overall process that originates a new human being. The seriousness of this work is emphasized by the team that provided the educational material, which was led by a well-known expert on artificial fertilization who worked with the production team for over a year. Using real images of the human body, the developers generated three-dimensional models that were used to animate the biological processes. The user interface here also shows great creativity, including user tools such as a microscope for detailed viewing and a scalpel.

The first version of these CDs are for Macintosh, although the Windows version was 60% complete at press time. The distribution strategy used by Unlimited was to engage an international partner who was involved in interactive multimedia applications. After an active negotiation and evaluation period, a deal with BMG Interactive Entertainment was struck. Hence, BMGie will distribute Unlimited's product on the international market for at least three years starting from 1995.

The level of creativity achieved by Unlimited has been highly praised and demonstrates the qualities necessary to be successful on the world market. The deal with BMGie has expanded the target market, and now Japanese, German, French, Portuguese, Dutch and Italian versions of *Busy People of Hamsterland* are being developed.

## **6.2 AccessNova Project: ATM Experiments in Chile**

Throughout its history, the University of Chile (UCHile) has contributed to the country's development in diverse ways. In particular, its Faculty of Mathematical and Physical Sciences has played a key role in the development of local scientific and technological know-how, especially in the area of data networks and distributed computer systems. From operating the country's first mainframe in the early 1960's to inaugurating Latin America's first ATM (asynchronous transfer mode) multi-campus MAN (metropolitan area network) in 1994, the University of Chile has played a pioneering role in the region.

In this context, UChile has a cooperative research agreement with Nippon Telegraph and Telephone Corporation (NTT). Under the terms of the AccessNova Project, which became official during President Frei's visit to Japan in November 1994, NTT will support UChile in formulating a strategy for the introduction and development of B-ISDN (Broadband Integrated Services Digital Network) in Chile, by proposing a plan to jointly carry out testing and experiments on high-speed networks and broadband applications. The project is aimed at completing a next-generation telecommunications network and services in Chile during the period 1995-98 by installing super-high-speed, large-capacity experimental transmission lines (2.4 Gbps) in its ATM backbone network. This experimental network commenced operation at the end of 1995.

The initial aim was to build an experimental ATM network that will allow full ATM capabilities on the workstation level. In fact, through an Andes Foundation grant, the project acquired several workstations and servers as well as a high capacity server (Sun Sparc 1000) with 4 parallel processors, 128 MB RAM and a 21GB hard disc, plus a FORE ATM node and ATM cards. NEC has also donated two ATOMIS-5 ATM nodes that are interconnected with the FORE and ALCATEL nodes, creating an heterogeneous network. In addition, as part of the SunSITE equipment donated by Sun Microsystems in 1995 to the Dept. of Computer Science (DCC) to install the first Latin American SunSITE (<http://sunsite.dcc.uchile.cl>), which includes a Sun Sparc 1000 and 40GB of disk space, there are also Sun ATM cards so the researchers are now ready to test the effects of broadband desktop capability. Recently, Sun extended this cooperation with a large equipment donation for the following three years. Also, the government approved a technology transfer grant from Fondef for this project between 1997 and 1999.

The AccessNova Project is based in the present CTC (Chile Telecommunications Corporation) ATM-MAN backbone, which is a public service network with two ALCATEL 1000AX ATM Switching Systems. At present, this network has only a single customer (UChile) but it is a shared vision of CTC and UChile that other public and private organizations and companies will link to it in the future (it is currently linked with the Internet and the public telephonic network). The AccessNova Project will significantly contribute to the realization of this vision by creating an experimental ATM platform that will allow testing of the network performance and new applications, first within UChile and later on a continuously expanding basis.

AccessNova is the first B-ISDN project involving NTT outside of Japan. The high-speed multimedia experiments that Chilean and Japanese researchers will jointly perform (first locally, then transcontinentally), will be authentication of the full potential of global broadband networks that will allow collaborative work remotely (telework) on a planetary scale. At present, a group of 14 researchers, (7 in each country) has begun active collaboration to establish the AccessNova Tokyo-Santiago Virtual Laboratory for the implementation of the project. Other applications include remote education, video on demand and high-definition TV. For more information on this project see [3].

### **6.3 Emprenet**

Emprenet is a service center to support new companies on information technology regarding hardware and software, as well as contents. In a similar fashion to traditional incubators, Emprenet gives several commercial services using Internet as distribution tool. In this way, people interested in creating new businesses can receive help through Internet, with less limitations of time and/or

space. This project is a joint effort of INTEC Chile (government), AccessNova (see previous section) and Tecnonáutica, a WWW oriented company. The project is initially funded for two years starting in 1997 by the FONSIP program of CORFO (government agency to promote new businesses).

The virtual incubator system will develop services through Internet, including:

- Consulting and learning skills for entrepreneurship capabilities, strategic design, project management, funding processes, guide to funding opportunities, legal issues, and basic consulting.
- Support for electronic marketing to distribute, sell and show products or services through WWW. This should improve the business, as well as attract new investors.
- EmpreNews: An electronic business newspaper which includes an electronic fair with the results achieved by the incubated companies, job opportunities, etc.
- Network of service providers to new companies.

There will be an initial center with about 30 companies for two or three years inside the Engineering faculty of the Univ. of Chile. The virtual incubator has as main goal the use of Internet as a new way to do business. Th/is should create innovative ideas and technological franchises that can result in new products, many of them that do not exist today. The philosophy of the incubator is expressed through two actions: to link and associate companies which look at the Latin American market to create regional companies based in local expertise and know-how.

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Ricardo Baeza-Yates received the bachelor degree in CS in 1983 from the University of Chile. Later, he received also the M.Sc. in CS (1985), the professional title in electrical engineering (1985) and the M.Eng. in EE (1986) from the same university. He received his Ph.D. in CS from the U. of Waterloo, Canada, in 1989. In 1992 he was elected president of the Chilean Computer Science Society (SCCC) until 1995, being elected again in 1997. During 1993, he received the Organization of American States award for young researchers in exact sciences. Currently he is full professor at the CS department of the University of Chile. He is co-author of the 2nd edition of the Handbook of Algorithms and Data Structures, Addison-Wesley, 1991; and co-editor of Information Retrieval: Algorithms and Data Structures, Prentice-Hall, 1992, between other publications. His research interests include algorithms, text retrieval, and visualization applied to databases.

Andres Benavides has a bachellor and a professional title in Industrial Engineering from the University of Chile (1993 and 1995, respectively). As a student he was involved in early WWW projects, including information services and a multimedial tour of the Univ. of Chile. Later, he managed the multimedia group of the central computer services of the same university. He has been a consultor for several multimedia projects and he currently manages the Aula 21 project of the Univ. of Chile, which has as main goal, remote education using Internet and broadband networks. He is also a partner and director of Tecnonáutica, a company specialized in Internet; and is a member of the board of Emprenet, a virtual incubator.