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FOR INFORMATION

Question 14/2: Fostering the application of telecommunication in health care. Identifying and documenting success factors for implementing telemedicine

STUDY GROUP 2

SOURCE: RAPPORTEUR FOR QUESTION 14/2

TITLE: REPORT ON TELEMEDICINE PILOT PROJECTS IN DEVELOPING COUNTRIES

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Abstract:

This document comprises a set of case studies of telemedicine pilot projects in developing countries intended to be of benefit to others planning or undertaking similar projects.

Those who know of successful telemedicine pilot projects in developing countries are invited to contact the Rapporteur and to provide details so that other countries might benefit from their experience. For further information, contact the Rapporteur, David Wright, fax: + 44 171 728 1778, e-mail: david_wright@inmarsat.org.

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REPORT ON TELEMEDICINE PROJECTS IN DEVELOPING COUNTRIES:

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1. INTRODUCTION

This document comprises a set of case studies of telemedicine pilot projects in developing countries intended to be of benefit to others planning or undertaking similar projects. This set of pilot projects has been selected by either the Bureau of Telecommunication Development (BDT) of the International Telecommunication Union (ITU) or the Rapporteur's Group in Study Group 2 of the ITU's Development Sector or by the Midjan Group.[1] Preparation of this document is one of the tasks assigned to the Rapporteur's Group as a result of Question 14/2 adopted by the World Telecommunication Development Conference (WTDC) in Valletta, March 1998. Inter alia, the Rapporteur's Group has been asked to:

1. Identify telecommunications solutions to promote health care and to meet its needs, especially in remote and rural areas, for those on the move and for those who might not otherwise have access to the quality of care available in urban hospitals.

2. Take further steps to assist in raising the awareness of decision-makers, telecommunication operators, donors and others about telemedicine and how telecommunications might be able to help solve some health-care needs and provide elements to universal service relating to emergency, health and social services. In particular, support a second World Telemedicine Symposium to be held in Latin America in 1998 and a third Symposium to be held in Asia in 1999.

3. Identify telecommunications pilot projects for telemedicine applications appropriate to developing countries; provide an analysis of project results and help countries to define a policy and strategy in regard to the application of telecommunications to support implementation of telemedicine.

4. Establish a database about the different pilot projects and experience in developing countries, what financing mechanisms and technologies have been used, what services have been provided, what the results of the pilot projects have been, what lessons to learn, what mistakes to avoid.

5. Promote development of telecommunications standards for telemedicine applications in conjunction with the ITU-R and ITU-T Sectors in particular.

6. Develop a directory of companies, institutes, service providers which includes telecommunications facilities and technologies used in telemedicine applications, services and software which would be appropriate and cost-effective in the context of meeting the needs of developing countries. The directory should include, as far as possible, a list of donor institutions in this domain.

This report addresses items 1, 3 and 4 especially.

2. CRITERIA FOR PROJECT SELECTION

[1] The Midjan Group is an association under French law of telemedicine institutes, equipment suppliers, service providers, telecom operators, universities, hospitals, international organisations and ministries of health, all of whom share an interest in facilitating telemedicine pilot projects in developing countries.

The pilot projects described in this report have been selected to serve as case studies for other developing countries. The selected pilot projects are intended to represent examples of telemedicine activity in the different regions of the world (Africa, Asia, Europe, Latin America).

They have been selected according to the following principles:

- The pilot projects should use technologies which make sense in developing countries. Different technologies should be used.
- The pilot projects should be sustainable.
- The pilot projects should involve a diversity of participants, i.e., they should illustrate the multidisciplinary approach required for deployment of telemedicine.
- Organising the pilot projects must be a collaborative, co-operative effort.
- There must be a local "champion" serving as the leader of the pilot project, in other words, someone who is based in the community where the pilot project is being undertaken and who can ensure the project participants remain committed and work well together to ensure the pilot's success.
- The project should take into account the users' needs. The needs should indicate the importance of a policy and strategy. The project should not be technology driven, but should recognise telemedicine as a tool.

In some cases, the projects have involved cooperation between developed and developing countries, but such co-operation is not or has not been a necessary criterion for a successful project.

2.1 SOME TELEMEDICINE APPLICATIONS

Many different types of telemedicine applications may be appropriate for use in developing countries including the following:

- Distance learning, training, continuing medical education (CME), including access to medical sites on the Web and/or other data bases
- Distance diagnosis, treatment and prevention, which may involve image transfer and/or such services as teleradiology, teledermatology, tele-endoscopy, etc., or which may involve only the interpretation of data as in vital signs monitoring
- Tele-consultation, including videoconferencing
- Use of telematics for health care planning and administration

Some of these services may be delivered to primary health care clinics in fixed locations in rural areas, or between urban hospitals, or by a health care professional travelling from village to village or by an ambulance or the proverbial flying doctor.

Some of these applications can be used with relatively simple means of communications, involving the use of low speed data transfer. Other may require more sophisticated videoconferencing and other equipment. The more costly the equipment, however, the more likely it will not be appropriate or affordable in developing countries.

2.2 GUIDELINES FOR PILOT PROJECT PROPOSALS

See Annex 1 for the detailed guidelines used for selecting pilot projects for inclusion in this report. These guidelines may also serve when pilot project participants consider making applications to funding bodies which might be willing to sponsor pilot projects.

3. LATIN AMERICAN PROJECTS

3.1 ARGENTINA – SECOND CONSULTATION

3.1.1 BACKGROUND

The population of Argentina, which is around thirty four million inhabitants, is very unevenly distributed. One third of the population lives in the Buenos Aires metropolitan area, the political and economical centre of the country.

The most important and qualified health centres in every medial area are located in Buenos Aires, which causes thousands of people to travel every year to the capital city of the country in order to have access to the opinion of a top specialist.

Statistics show that only 10% of the people who travel to visit a specialist need to stay in Buenos Aries to receive further treatment. The other 90% of them could have stayed at their original locations, if they had had the chance to see the specialist at their home towns, and avoided travel expenses, loss of work days, and emotional distress.

3.1.2 OBJECTIVES

1. To allow people leaving in major, middle-size and small cities away from Buenos Aires to have access to expert's opinions.

2. To provide doctors all over the country with a system that allows them to interchange opinions on different kinds of difficult cases.

3. To promote an ongoing long distance medical programme based on telecommunications and information sciences.

3.1.3 DESCRIPTION OF PROJECT

The resolution of consultation will be carried out based on store and forward bases. For that reason, initially ten Telemedicine nodes will be installed in middle size cities each one of them including all the diagnostic support acquiring equipment, a dedicated Internet access link and a proprietary software system.

Agreements with top centres and health professionals in Buenos Aires will be signed in order for them to receive and respond the consultation within a period of 48 hours.

3.1.4 PROJECT LEADER

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3.1.5 PARTNERS

ImpSat	
Medlink	
Vistalink International	
Sociedad Iberoamericana de Telemedicina.	

3.1.6 NEEDS AND EXPECTED RESULTS

Measurable savings in unnecessary travel expenses, in most cases taken care of by state (provincial) HMOs.

Equalised possibility of access to expert's opinion for people regardless of their geographical location.

The major need at the present is legislation definitions regarding Telemedicine.

3.1.7 SCHEDULE

Event	***Date***
Agreements with centres abroad	April 1999 (concluded)
Agreements with centres in Buenos Aires	June 1999
Insallation of first nodes	August 1999
Staff training	August 1999

3.1.8 EVALUATION AND SUSTAINABILITY

The National Communications Commission held a public audience in the city of Posadas on April 1999 where it concluded that Telemedicine communications technology should be chosen by private companies in order to assure that competitiveness would provide the best technological option at the lowest possible price.

4. EUROPEAN PROJECTS

4.1 CATAI – TELEMEDICINE SUPPORT CENTRE

4.1.1 BACKGROUND

Two main problems in implementing telemedicine applications, particularly in developing countries, relate to:

1. technology transfer problems;
2. organisational effectiveness and cost-benefit.

Technology transfer scenarios are described in the *Handbook of Telemedicine* (prepared by the CATAI Consortium and edited by O. Ferrer & M. Sosa) and can be characterised as follows:

A) Technology prepared and interested	1) Urgent demand for telemedicine
B) Technology prepared or not able to accept/introduce it	2) No real urgent need

Although the ideal situation is A1, the usual one encountered is B1. To introduce a new technique, we have to take into account:

- clinical adequacy;
- learning effect;
- cost-efficiency;
- ethical principles;

as well the criteria of

- demonstrated effectiveness;
- solution to the relevant problems;
- quality of techniques.

The goals of this pilot project address most of the technology transfer problems and adequacy of the application through the *organisational* and *teaching* aspects of existing and new telemedicine applications taking into account the effort devoted to each individual telemedicine pilot in every country and its involvement in emergency telemedicine support.

4.1.2 OBJECTIVES

To establish a mission telemedicine centre unit (MTCU) providing

1. medical support via telephone;

2. establish co-ordination between Rescue Co-ordination Centres (RCCs) and Telemedicine Support Centres (TSC).

4.1.3 DESCRIPTION OF PROJECT

Pilot design

Located in Las Palomas (Gran Canaria), the mission telemedicine centre will:

- act as a co-ordination unit in the teaching aspects of telemedicine and other communications systems associated with emergency situations;
- provide organisational schemes and telephone support for telemedicine in co-ordination with other RCCs in the world.

The project benefits from the geostrategic situation of the Canary Islands in relation to Africa, Europe and America, together with its special economic fiscal regime.

Telemedicine teaching

The CATAI consortium, comprising 12 partners from 10 countries, has prepared a set of modules about telemedicine which will provide basic theoretical and practical information required for telemedicine practice. The modules cover 12 aspects:

Chapter 1	History of Telemedicine
Chapter 2	Minimal Technical Requirements
Chapter 3	Main Telemedicine Applications
Chapter 4	Basic Technical Knowledge
Chapter 5	Quality Control and Assessment
Chapter 6	Use and Indication of Widespread Telematic Tools in Telemedicine: Internet
Chapter 7	Training, including Distance Training, Teleworking and Teleteaching.
Chapter 8	Data Security and Privacy
Chapter 9	Liability and Legal Aspects
Chapter 10	Health Economics in Telemedicine
Chapter 11	Technology Transfer and Social Aspects
Chapter 12	Emerging Issues

Las Palomas (Gran Canaria), where the telemedicine centre is located, is also the site of the Mission Control Centre (MCC) and the Local User Terminal (LUT) satellite station for the COSPAS-SARSAT satellite system which provides emergency location and identification. The centre is expected to serve Africa where, as yet, there are no Search and Rescue Points of contacts (SPOCs).

The INTA centre in charge of this survey has taken the initiative through the UN Office for Outer Space Affairs to train African countries in regard to the management of distress alerts originated from distress alerting devices used in the COSPAS-SARSAT system.

CATAI is a partner in the Tele-Invivo project, partly funded by the Telematics programme in DGXIII of the European Commission and UNESCO, which provides support to developing countries.

The focus mainly will be to support developing countries in the Mediterranean region as well as in South America, Africa and eastern Europe, particularly within the coverage of the COSPAS-SARSAT satellite system's Spanish Mission Control Centre (see below).

The main tasks of the MTCU in the Canary Islands are as follows:

A.- Training aspects

A1.- Communication systems training, including radio messages through COSPAS-SARSAT

A2. - Telemedicine training

B.- Co-ordination aspects

B1.- Build international co-ordination schemes and co-operation between the CATAI Telemedicine Centre and other telemedicine pilot projects in the area of interest as well as those responsible for health care provision in the RCCs.

B2 Develop into practice the co-ordination schemes and agreements in the main area of coverage.

Main area of influence

1. The COSPAS-SARSAT Spanish Mission Control Centre (SP MCC) provides coverage support for Ascension, Benin, Cameroon, Cabo Verde, Congo, Côte d'Ivoire, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Guinea Equatorial, Liberia, Mali, Mauritania, Nigeria, Central African Republic, Sao Tome y Principe, Senegal, Sierra Leone, Spain, Togo.

2. Mediterranean developing countries

3. Any South American countries, particularly for Argentina and Venezuela.

There is a parallel organisational scheme with the global Rescue Co-ordination Centres. There is a requirement for a health care unit in those centres which could co-ordinate with the Telemedicine Support Centres (TSC) and which could be linked with other telemedicine projects. This could provide telemedicine support in rural isolated areas through any source of emergency call.

Four main steps are required for the achievement of the CATAI pilot project:

Step one – Stimulate the involvement of the relevant international organisations, such as ITU, COSPAS/SARSAT, ICAO, IMO, UNESCO, EC, WHO, Inmarsat, ESA, etc., to support the project.

Step two – Teaching activities aimed at assisting in the transfer of technology and know-how, which could be facilitated with funding from telecom operators (for example) for a Chair of Telemedicine as well designing the organisational schemes.

Step three – Put into practice the organisational schemes to co-ordinate RCCs and TSCs in the selected countries.

Step four (which should start in parallel with step one) – Funding source to build and maintain the required infrastructure for a Mission Telemedicine Centre Unit (MTCU) in the Canary Islands.

The project is organised in such a way that each step is self-sufficient with its own goals in the improvement of telemedicine support for developing countries.

4.1.4 PROJECT LEADER

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4.1.5 PARTNERS

Estacion Aeroespacial de Las Palomas INTA (Institute de Tecnica Aeroespacial) Julio Melian Perez-Marin (director)	tel: + 34-28-727120 fax: 34-28-727121 e-mail: marcelloj@inta.es.

Others to be engaged: ITU, UNESCO, ESA, G7-CARDIO, European Commission (DGXIII), COSPAS-SARSAT Committee, UN Office for the Peaceful Uses of Outer Space.

4.1.6 NEEDS AND EXPECTED RESULTS

This pilot project addresses the urgent requirement for co-operation between the RCCs and health care units which could provide telemedicine support.

4.1.7 COSTS

Step one – Convene a meeting of interested international organisations to identify support for the project and its scope. Meeting & working session: 15,000 ECUs

Step two – Teaching activities to prepare adequate technology transfer which would enable African countries to staff their own SPOCs. CATAI would like support for establishment of a Chair of Telemedicine at the University of Laguna which would be focused on effective telemedicine technology transfer schemes. Cost of maintaining a Chair of Telemedicine: 60,000 ECUs per annum.

Step three – Put into practice the organisational schemes to co-ordinate RCCs and TSCs in the selected countries. Co-ordination and one meeting of local co-ordinators. [15,000] ECUs per annum.

Step four – Identification of funding to build and maintain the required infrastructure for the Mission Telemedicine Centre Unit in Canary Islands. The costs of the infrastructure are estimated as follows:

Land acquisition	180,000 ECUs
Infrastructure	96,000 ECUs
Building construction	1,800,000 ECUs

Telematic/inform infrastructure	1,320,000 ECUs
Operational/personal costs	300,000 ECUs

4.1.8 SCHEDULE

Step one

19 Mar 98	SPRINT Science Park SP-415 meeting to identify interest in an EEIG (European Economic Interest Grouping) as an organisational scheme for the Centre. Participants expected from DGXIII, UNESCO, ESA, INTA,G7 Cardiology subproject. To be held in Tenerife.
23Mar-1Apr 98	Project presentation at the ITU-D Malta Meeting
May 98	UN Office for Outer Space Affairs meeting that will join a political, RCC and health representative from each of the countries covered in the SPMCC (see above). Las Palmas. INTA. Canary Islands. Presentation / support demand project
17-24 June 98	Las Palmas-INTA. COSPAS-SARSAT annual joint Committee meeting. To present the project and get support from the institutions as well as from ICAO and IMO.
July 98	Completion of the feasibility study of the SP-415 for the Telematic Centre in Tenerife, Canary Islands.

Step two

- Connections with UNESCO already established, waiting for reply
- Get other sources support in the previous scheduled meetings

Step three

- Get support in the previous scheduled meetings
- Duration: At least two years.

Step four

- Get funding and support from the previously mentioned international organisations and meetings. End feasibility study: July 1998
- Funds required for one year.
- The activity of the Centre will be permanent.

4.1.9 EVALUATION AND SUSTAINABILITY

The project is designed as a permanent co-ordination and training/teaching support for developing countries. It addresses a real co-ordination need. The co-ordination of the Rescue Centres with Telemedicine Support Centres could support rescues. The centre would support development of applications and services for the individual telemedicine centres to assure cost-efficiency. It is designed to run in co-ordination with country-based telemedicine pilot projects.

4.2 EHTO – WEB ACCESS & OTHER HEALTH TELEMATICS INFORMATION DISSEMINATION

4.2.1 BACKGROUND

A key problem for those interested in finding out more about telemedicine is the fragmentation of information. The European Health Telematics Observatory (EHTO) and its network of national language affiliated sites (NLAs) were established to overcome that problem, and to enable a fine tuning of information to the different structures of health care, at national and regional levels.

4.2.2 OBJECTIVES OF EHTO

- To help users to quickly find the best, most up-to-date and validated information for implementing health telematics (using a network of multi-lingual EHTO affiliated sites, installed at national or regional level), including access to educational multimedia software.
- Help producers disseminate data on their bio-medical equipment and services to the right audience (including developing countries).
- To identify and to give access to Web sites expected to be of interest to health care professionals in developing countries.
- To provide information about European telemedicine suppliers.
- To provide information about telemedicine projects.
- To help research projects disseminate their results.

4.2.3 DESCRIPTION OF PROJECT

EHTO is an entry point for access to qualified, classified and categorised information on health telematics (includes telemedicine). EHTO disseminates the latest information on European Commission initiatives, programmes, projects and calls for proposals. Information about existing European expertise and research results in health telematics can be accessed through the diverse PROJECTS home page.

EHTO aims both to help organisations and/or projects to disseminate specific information, documents and results, and to help them to find useful and up-to-date information.

EHTO can be used to search for information on specific domains and key areas using telematics applications or solutions, just by “clicking” on their key-words. Users can ask questions of general interest to the Commission Health Telematics Office or move on to related Web sites.

The EHTO Web site hosts a specific site address for the Midjan Group and gives access to a variety of other related Web sites expected to be of interest to health care professionals in developing countries.

EHTO also acts as an electronic marketplace, displaying information which can be exchanged by health professionals, industries and service providers. The EHTO Web site offers space for discussion groups and for electronic workshops.

Multilingual affiliated sites have been created at national and regional level. Each site is different, with health telematics information in their own language, according to their cultural specificities and to the organisation of local health care services. The EHTO-NLAS Network is intended as a practical implementation of health telematics and a contribution to the Information Society.

EHTO-NLAS Network is fully interactive, and each affiliated site can act as a link to Web sites in other countries speaking the same language (e.g., the existing affiliated sites in France, Portugal, and Spain are establishing links respectively with other countries in the developing world speaking French, Spanish or Portuguese). Other affiliate sites have been installed already in Greece and Finland.

New Affiliated Sites are expected to be created in South Africa, eastern Europe (Romania, Czech Republic, Bulgaria and Ukraine), Germany, Canada and Australia.

The way in which EHTO is structured with its affiliated sites could serve as a model for the decentralisation of information on health telematics in developing countries.

4.2.4 PROJECT LEADER

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4.2.5 PARTNERS

The EHTO co-ordinating partner is Portugal Telecom. Other partners include:

- RAMIT (Belgium)
- CNEH (France)
- IHC (United Kingdom)
- VTT (Finland)
- BIOTRAST (Greece)
- IETT (Spain).

EHTO is a member of the Health-on-the-Net (HON) Strategic Board, of the Midjan Group, and of the affiliated partnership of the Canadian Institute for Health Information.

In addition to the DGXII Health Telematics Unit, EHTO works closely with the Information Society Forum, the TEN-TELECOM Programme (DGXIII), ACTS Programme (DGXIII), and the Telecities Project.

4.2.6 NEEDS AND EXPECTED RESULTS

- To expand the network of multi-lingual affiliated sites.
- To become an independent foundation.

4.2.7 COSTS

For three years, until December 1998, EHTO costs (US $220,000 per annum) were covered by the European Commission. EHTO affiliated sites costs are fully supported by each of the national organisations and the Ministries of Health. Approximate costs per annum for developing countries

are estimated at about US $ 95,000. For developed countries, the cost of becoming an affiliated site is about US $ 220,000.

In future, EHTO costs will be supported directly by members (mainly industries and telecom operators). Portugal Telecom plays a key role through its links with international partners and will be indirectly supported by Health Ministries (through services), the European Commission (as a particular user), advertising and specialised services (organising conferences and electronic work-shops, disseminating information, stimulating private discussion fora, etc.).

4.2.8 SCHEDULE

EHTO already is in full operation.

4.2.9 EVALUATION AND SUSTAINABILITY

The EHTO project was evaluated through the European Commission Annual Technical Reviews. The major success of EHTO is the creation and implementation of its EHTO-NLAS Network which involves both Health Ministries and telecom operators.

Helping rural areas is one of the key objectives of EHTO. Access through the Internet to EHTO (or to one of its affiliated Web sites) will give new opportunities to distant areas. EHTO integrates images and voice and facilitates access to health care information and contacts. Access can be achieved via terrestrial and satellite means. It facilitates participation in practical medical events (remote video conferences could be watched through EHTO), and remote areas can also benefit from educational tools (video, CD-ROM, specific distant symposium or conferences, etc.).

Rural and remote areas could benefit from the existence of a national/regional Affiliated Site, in the whatever language, which could act as an “entry” point to all local health telematics information and be linked via EHTO to any other affiliated sites if more specific information is needed.

4.3 MALTA – TELECONSULTATION VIA VIDEOCONFERENCING

4.3.1 BACKGROUND

The ITU Bureau for Development of Telecommunications requested Telia Swedtel to assist Maltacom plc and the health authorities in Malta to define, plan and implement a telemedicine system for Malta.

Telia Swedtel undertook to support this project by assigning expertise for studying the feasibility, determining standards and specifications for a system and assisting in the overall planning and implementation of the telemedicine pilot project.

Silas Olsson (then with SPRI, now at Telia) and Per Olof Jansson (Telia Swedtel) made the first visit to Malta in November 1997 to discuss:

- Health care needs and priorities in relation to telemedicine in Malta;
- Current telecommunications status and development plans in regard to telemedicine;
- Feasibility of a telemedicine pilot project in Malta;
- Project definition and planning.

4.3.2 OBJECTIVES

The Health Division of the Maltese government identified these objectives for telemedicine development:

- to further enhance the Malta health care system,
- to reduce costs and
- to acquire experience and competence, which can be used for exploiting future business prospects in the region and sub-Sahara Africa.

4.3.3 DESCRIPTION OF PROJECT

The main component of this project is to connect St Luke's Hospital in Malta with the General Hospital in Gozo, an island a few kilometres north of Malta with about 30,000 inhabitants. The aim is to provide dedicated services for high speed data communication between the hospitals.

The existing telecommunications network uses digital transmission over copper wire from the hospital to the nearest exchange. Exchanges are linked by fibre optic cable. The data communication link is established through a cross connect exchange that can aggregate several data links ranging in speed from 2.4 to 64 kbit/s.

Maltacom has the capability to offer data circuits with 2 Mb capacity by utilising HDSL on copper wire. ATM technology is being tested for specific high capacity requirements, as well as utilisation of Frame Relay Nodes. Within the hospital premises at St. Luke's and Gozo, LAN networks at 10 Mb capacity with central servers and routers have been installed under the supervision of Malta Information Technology and Training Services Ltd (MITTS).

Another component of the project is a telemedicine link between the Special Care Baby Unit (SCBU) at St. Luke's Hospital and Great Ormond Street (GOS) Hospital for Sick Children in London. On an annual basis, St. Luke's refers about 20 to 22 children for open heart surgery at GOS in London. The SCBU has a long established relationship with the London hospital.

The telemedicine link to London provides off-line consultations by transmitting moving images from a colour Doppler echocardiography machine for expert interpretation in London.

A videoconferencing system was established between Gozo and Malta to allow different medical disciplines in Gozo to have peer to peer consultations with St. Luke's in Malta. The videoconference system uses a document camera as well as a free standing camera allowing for patient/doctor consultation procedure with Malta.

At the Gozo end, the telemedicine terminal was located in the library of the Gozo Hospital. At the Malta end, a terminal was to be located near the emergency casualty department. However, this is a busy area with many different physicians and therefore was not the best place to accommodate the telemedicine terminal. Alternative sites were identified.

The telemedicine project in Malta included the following applications.

1. *Clinical case discussions and/or interactive education and training*, by utilising either PC based or small studio based videoconference terminals, one based at St. Luke’s Hospital, Malta and the other unit at the General Hospital, Gozo.

2. *Analysis of ultrasound images of heart and ECG signals*, by digitised data, transmitted from St. Luke's Hospital, Special Care Baby Unit to the Great Ormond Street Hospital, via the Government leased connection to London.

3. *Interactive case discussion and education and training regarding diabetics*, by utilising either

PC based or small studio based video conference terminals, one based at St. Luke' s Hospital, Malta and another at a University Hospital in Sweden.

4.3.4 PROJECT LEADER

Dr Hugo Agius-Muscat Director, Health Information Health Division Government of Malta	Tel.: +356 234915 Fax: +356 235910

4.3.5 PARTNERS

Health Division, Government of Malta

The Health Division is financing the investment cost for the telemedicine system, including associated software. The planning, purchase and implementation of a telemedicine system was the sole responsibility of the Health Division, assisted by Maltacom and MITTS. The Health Division obtained the necessary approvals for initiating the purchase process of system components, as well as ensuring approval and financing of the same. The Health Division arranged and prepared the premises for the optimal location of the telemedicine project between St. Luke's Hospital and Gozo General Hospital. The Hospitals assigned and appointed staff to be responsible for the terminal equipment, premises and evaluation of the project. The Health Division prepared and trained staff on the use of the equipment in co-operation with MITTS.

Maltacom plc

Contacts: Eng. Joseph M. Pace, Eng. Charles Mifsud

Maltacom was responsible for installation of the terminal equipment at St. Luke's Hospital (SLH) and the transmission facilities. Maltacom ensured the provision of all necessary external transmission installations, including the link between the two hospitals participating in the pilot project. Maltacom installed the telecommunications capacity necessary for data and video conferences between SLH and Gozo General Hospital. Maltacom provided the telecom links for data and video conferences.

Telia Swedtel

Contacts: Silas Olsson, Per Olof Jansson

Telia provided all necessary expert assistance to the equivalent maximum amount of US$ 40,000. The visit to Malta in November 1997 was the commencement of the agreed consultancy support. Telia Swedtel provided the international telecommunications capacity for a link between St. Luke's Hospital in Malta and a University Hospital in Sweden. Telia Swedtel prepared specifications for the telemedicine system components, including approximate cost estimates. The basic telemedicine system integrates PC-based and studio videoconference two-way interactive applications, fixed and movable video camera, as well as during a later stage an application for radiology, i.e., a document digitiser, archiving, etc.

Malta Information Technology and Training Services Ltd. (MITTS)

Contact: Mr. Mark Gialanze

MITTS assisted in the purchase and implementation of the system components as well as all supplementary equipment required for the existing hospital LANs. MITTS ensured that the

government leased connection from Malta to the High Commission in London could be used for the transmission of data from the Special Care Baby Unit at St. Luke's Hospital.

4.3.6 NEEDS AND EXPECTED RESULTS

SCBU/GOS link

Sending echocardiograms to Great Ormond Street (GOS) for interpretation lowered the threshold for consultations, allowing for better clinical planning, timing and decisions for surgery. This might not lower the number of referrals from Malta for open heart surgery in London. The aim, however, was to raise quality of care by improving the planning and timing of the individual referrals.

Gozo/Malta link

The physicians in Gozo General Hospital wanted to consult with their peers in different clinics and departments in St. Luke's Hospital in Malta. Among the expressed needs for telemedicine at Gozo General Hospital were the following:

- Medical education: to link with the regular activities held at St. Luke's Hospital. For the training of nurses, a link with the Institute of Health Care would be required.
- Consultation regarding ENT, dermatology and psychiatry, specialities not available in Gozo
- Clinical telemedicine (radiology, pathology)
- Access to Internet
- Access to different databases
- Access to other telemedicine networks

Most of the telemedicine from Gozo involves peer to peer consultation and discussions in different medical disciplines.

4.3.7 COSTS

Telia Swedtel provided up to an equivalent of US$ 40,000 in expert assistance.

The costs of operational-system telemedicine equipment were borne by the Health Division.

The costs of equipment at and telecommunications links were borne by Maltacom.

4.3.8 SCHEDULE

The Gozo/Malta and SCBU/GOS links were operational by the end of February 1998.

Major milestones were the following:

	Maltacom	MITTS	Health Division
15 January 1998		Procurement under way	All procurement approved; all sites identified
31 January 1998	GGH/SLH link in place	New LAN points in place (incl. GOS)	
14 February 1998	SLH/MCC link in place	Peripherals installed	Training of end-users starts

March 1998			Live

4.3.9 EVALUATION AND SUSTAINABILITY

Telia prepared an evaluation protocol for monitoring the use of the telemedicine application for improving and developing the system with regard to experience and competence gained.

4.4 MEDITERRANEAN REGION – DISTANCE LEARNING IN EPIDEMIOLOGY FOR FIELD HEALTH PROFESSIONALS

4.4.1 BACKGROUND

There is not a sufficient number of those able to teach techniques of epidemiological investigation in developing countries. It is too costly and time consuming for specialised teacher to travel to developing countries to provide the training. Similarly, it is too expensive for students from the developing countries to travel to developed countries (where the training is often not directly relevant).

Therefore, the most cost effective method of teaching these techniques to a large number of health professionals through distance learning, using the Internet, telephone and satellite communication.

The training of public health professionals in the techniques of epidemiological investigation will assure the improvement in, effectiveness and durability of health programs in these countries.

This will also stimulate collaboration and the formation of more effective networks than currently exist between health professionals in developing and developed countries. Such collaboration can range from practical public health collaborations, e.g., surveillance, travellers' health issues, local outbreak situations to scientific collaboration on public health issues, e.g., emerging infections, antibiotic resistance, food and water contamination, outbreak investigations.

Specialists in infectious diseases stress that many factors have contributed to the present emergence and re-emergence of infectious diseases. They identify the inadequate resources provided for public health structures and programmes as among the most important factors. They call for a revitalisation of public health practices world-wide including better surveillance, preparedness and control. All of these subjects are part of the distance learning epidemiology programme and will help to respond adequately to the threat of emerging and re-emerging diseases.

A distance learning programme is currently being developed by the Centre Pensières of the Merieux Foundation. Training in techniques of epidemiological teaching is an expertise already developed at the Merieux foundation by a collaborative group of health professionals in charge of the yearly training sessions in applied and clinical epidemiology.

4.4.2 OBJECTIVES

1. Develop a distance learning programme in epidemiology for public health professionals in developing countries with a focus on countries in the Mediterranean region and thereby contribute to the development of a Mediterranean network of health competencies aimed at improving health in specific areas of priority needs of the population.

2. Develop a centre for those wishing to learn techniques of epidemiological investigation in developing countries as well as for the transmission of distance learning information to other locations. Eventually this centre will become a centre for consultation and expertise in epidemiology and public health for developing countries.

3. This centre is expected to become a clearing house for consultation on problems in public health as a logical complement to its role as a centre for distance learning in public health.

4.4.3 DESCRIPTION OF PROJECT

Training modules are made available in written form as well as on the Internet. Using telecommunications, the modules are interactive as are problem solving and consultation sessions. The training modules can be provided to multiple sites at the same time, permitting not only interaction with the central site, but between other sites.

In particular, this method of teaching provides an effective means of follow-up after the courses are taught, to provide continuing training, advice and even supervision.

The Resource Centre for Distance Learning for Health at the Merieux Foundation has a studio equipped with videoconferencing equipment. The centre transmits programmes to various parts of the world. The centre has experts available to teach methods of distance teaching. The centre has created a resource bank for material for distance learning for developing countries which is available on the Internet as well as by other means. It has developed a clearing house system for answering questions and providing consultations to those in developing countries.

In the first phase of the project, the Merieux Foundation:

- demonstrated a session of interactive distant learning in the field of epidemiology from the training centre to a distant health centre in the Mediterranean region;
- presented the rationale and expected impacts of such teleteaching and training required to implement such a programme to other locations in developing countries.

The demonstration included a videotape showing the rationale and the important steps of distant learning. It also included a live distance learning session presenting a specific case study and using it as a problem-based learning to exemplify techniques of applied epidemiology and the interactive work between distant students, facilitators and local teacher.

4.4.4 PROJECT LEADER

4.4.5 PARTNERS

This project involves a multidisciplinary team including the following partners:

Pr J. B. McCormick Epidemiologie - Direction Médicale Institut Pasteur 26 rue du Dr Roux 75724 Paris France	tel: + 33 1 40 61 37 01 fax: +33 1 40 61 30 19 e-mail: jbm@pasteur.fr
Mme C. Chevanet Manager for Open and distance learning projects France Telecom	tel: + 33 4 78 63 91 50 fax: +33 4 78 63 93 51 e-mail : catherine.chevanet@francetelecom.fr

direction de la Communication 141 cours Gambetta 69 424 Lyon 3 France	
Dr Caroline Dupuy Medical director Fondation Marcel Merieux 17, rue Bourgelat 69002 Lyon France	tel : +334 72 73 77 78 or +331 4640 7563 (Paris) fax : +334 72 73 79 93 e-mail: dupuy@cismsun.univ-lyon1.fr

Other partners include: RNSP, Université Claude Bernard Lyon1, IUSI, Ecole veterinaire.

4.4.6 NEEDS AND EXPECTED RESULTS

This project is aimed at health professionals in the field. The training of public health professionals in developing countries in the techniques of epidemiological investigation should improve the effectiveness and durability of health programmes in these countries.

The most cost-effective method of teaching these techniques to a large number of health professionals is through distance learning.

The development of a group of health professionals with a solid methodology and a common scientific language will facilitate communication and an integrated approach to health problems and priorities.

The project is expected to lead to improvements in:

- development of skilled health professionals in the field;
- enhancement of efficiency of action toward specific health issue by

  improved handling of problems with efficient techniques

  communication of results and sharing of information

  avoidance of repetition and loss of work

  enabling and facilitating the process to transfer research results into action;
- resource reallocation;
- the health of the population.

4.4.7 COSTS

The project is currently receiving some financial and other support from the Fondation Marcel Mérieux, the Institut Pasteur, France Telecom and other partners. Additional necessary financial support is being sought from the European Commission's information society programme and the MEDA programme.

4.4.8 SCHEDULE

Feasibility study.

The following steps have been completed :

- constitution of a pilot group;
- teaching programmes have been identified;
- partners have been identified which will enable trans-European and Mediterranean collaboration;
- a survey has been made of the main competencies and interests, human and material resources.

The pilot phase has been prepared and will include the following events:

- transmission session exercise (Dec 97)
- design of the first case study transmission (Dec 97)
- first distant transmission (Jan 98)
- distant transmission to a developing country (Feb 98).

4.4.9 EVALUATION AND SUSTAINABILITY

This program will be evaluated for the number and quality of people who are instructed by it with a cost and resource comparison with traditional methods of providing similar instruction. It will be evaluated by its cost effectiveness compared to traditional methods of teaching.

4.5 UKRAINE – CONSULTATIONS FROM MOBILE CLINICS

4.5.1 BACKGROUND

The worst nuclear accident in world history took place on 26 April 1986 in one of the four reactors of the Chernobyl nuclear power station in Ukraine. It resulted in the release of large amounts of radioactive nuclides to the surrounding area.

The continued release of radioactive nuclides over a period of several months and their spread in the environment posed major problems to the population in the areas surrounding the nuclear plant. Evacuation of all residents within 50 km of the power station took place within several days.

Large-scale programmes of medical surveillance were initiated for the population of the contaminated areas, and still continue.

Assistance in dealing with the impacts of the disaster has come from several sources. The Government of Japan offered the largest cash contribution for implementation of an International Programme on Health Effects of the Chernobyl Accident (IPHECA) administered by the World Health Organization. Japanese non-governmental organisations provide humanitarian aid to the population residing in the contaminated areas and first of all to children. The necessity to continue these activities has been unanimously recognised by the scientists and practitioners concerned.

4.5.2 OBJECTIVES

To improve access to health care for the population residing in the radio-contaminated area suffering from the Chernobyl nuclear disaster by providing mobile satellite communications between the mobile medical laboratory and the central hospital in Kiev.

4.5.3 DESCRIPTION OF THE PROJECT

The Ministry of Health of Ukraine has two buses equipped with medical apparatus in order to check the health of people, especially children, living in rural areas surrounding Chernobyl. These buses are a donation from the Sasakawa Memorial Health Foundation of Japan.

It is possible to improve the efficiency of these mobile medical laboratories by providing a telecommunications link between them and Kiev. In this project, Inmarsat satellite-phones will be used for administrative purposes and remote medical consultations, including transfer of medical data from remote sites to Kiev.

4.5.4 PROJECT LEADER

The project manager is Leonid Androuchko of ITU-BDT. On-site co-ordination is handled by Hospital No. 2 in Kiev.

4.5.5 PARTNERS

Telecommunication Development Bureau of the ITU.
Contact: Leonid Androuchko.
Tel: + 41 22 730 5433.
Fax: + 41 22 730 6449.
e-mail: androuchko@itu.int.

- General management and supervision of the project.
- Co-ordination with local authorities in Ukraine.
- Participation in the evaluation and monitoring of the telemedicine service during the pilot project.

Basic Association of Japan

- Mobilisation of funds for project implementation
- Co-ordination with other partners from Japan.
- Co-ordination for shipment of Inmarsat-phones from Japan to Kiev.
- Participation in the evaluation and monitoring of the telemedicine service during the pilot period.

Inmarsat

Contact: Tai Ogunderu. E-mail: tai_ogunderu@inmarsat.org.

- Project engineering.
- Provision of the required space segment capacity (free or at reduced rate) for the duration of the pilot demonstration or during a pre-determined period.
- Technical and operational assistance to solve possible connectivity problems.
- Participation in the evaluation and monitoring of the telemedicine service.

Ministry of Health of Ukraine, Hospital No. 2 in Kiev

- Co-ordination of all medical aspects concerning specialised assistance during the pilot operational period.
- Identification of appropriate telemedicine applications.
- Preparation of application for the operational licence.
- Administrative and logistic support in Ukraine (local transport, storage of equipment, material, etc.)
- Participation in the evaluation and monitoring of the telemedicine service during the pilot period.

Ukrtelecom

- Participation in the project engineering.
- Technical and operational assistance with interconnection to PSTN.

Ukrspace/National Space Agency of Ukraine

- Project engineering.
- Interconnection to the PSTN.
- Assistance in the preparation of the application for the operational licence.
- Putting system into operation.
- Participation in the evaluation and monitoring of telemedicine services.

Ukrainian State Centre of Radio Frequencies

- Provision of the operational licence (free of charge).
- Assistance in the frequency allocation and any other associate matter.

4.5.6 NEEDS AND EXPECTED RESULTS

4.5.7 COSTS

	Partners		***Amount*** *(SF 000)*
1	Basic Association	cash	85
2	BDT	cash in kind	8 25
3	Inmarsat	in kind	20
4	Ministry of Health/ Hospital No. 2 in Kiev	in kind	12
5	Ukrtelecom	in kind	25
6	Ukrspace/National Space Agency of Ukraine	in kind	25
7	Ukrainian State Centre of Radio Frequencies	in kind	15
	TOTAL		215

4.5.8 SCHEDULE

	Action	*Responsible*	*Time*
1	Preparation of project documents	BDT	Oct-Nov 96
2	Network design	Inmarsat	Nov 96
3	Delivery of Inmarsat-phone from Japan to Kiev	Basic Association	Mar-Aug 97
4	Delivery of other associated equipment from Japan to Kiev	Basic Association	June- Sept 97
5	Customs clearance	Ukrtelecom, Ministry of Health	Mar-Aug 97
6	Revision of project document	BDT	Oct 97
7	Update of network design	Ukrtelecom, Ukrspace, Inmarsat	Nov 97
8	Licence for operation	Ukrtelecom, Ukrspace, Ministry of Health, Ukrainian State Centre of Frequencies	Nov 97
9	Installation	Ukrtelecom, Ukrspace	Nov-Dec 97
10	Commencement of service	All partners	Jan 98

4.5.9 EVALUATION AND SUSTAINABILITY

5. ASIAN PROJECTS

5.1 CHINA – CONSTRUCTION AND EVALUATION OF TELEMEDICINE NETWORK

5.1.1 BACKGROUND

As an important application of future information highways, telemedicine has been widely developed in the United States, Europe, Japan and other countries. Telemedicine services using networked multimedia techniques can overcome the traditional limitations in providing health care services in rural areas. Telemedicine has excellent prospects for further rapid development. At present, the use of telemedicine in China is just beginning.

China is a country of wide area, huge population and an inadequate telecommunications infrastructure (although improvements are being made rapidly). There is a big difference in the level of development between the coastal areas of the country and rural areas in western China. The health resources are relatively well developed and easily available in the coastal areas while there are serious shortages of medical care and drugs in the poor and rural areas. Patients in rural areas often cannot get good medical care on time. If they can travel to get medical care, they will incur a heavy financial burden.

Telemedicine can be used to change this situation. It will improve access to medical care and result in significant savings for the patients as well as China's health care system. More than 200 hospitals in our country have said they are very interested in telemedicine, and expressed a need to connect by writing and calling to Shanghai Medical University (SMU) for access to the medical and information technology resources of SMU.

5.1.2 OBJECTIVES

This pilot project proposes to use the medical and information technology resources of Shanghai Medical University, to provide telemedicine services to rural hospitals in Tibet, Yunan, Hainan and Jiangxi provinces. The purpose of the project is

- to assess the cost-benefits of delivering telemedicine services to rural areas;
- to determine which telemedicine services are most useful and the demand for particular services;
- to evaluate the feasibility of using satellite and other means of communications to deliver health care in a more cost-effective manner than otherwise would be possible by conventional means.

The project is expected to serve as a model for the configuration of telemedicine services in other rural areas of China. The pilot project will build on and expand the existing network.

The main objective of the project is to determine the feasibility of using telemedicine techniques to provide medical and health care, and to improve the health of people in rural areas by fully using the medical resources of SMU and its affiliated hospitals.

The proposed pilot project will be set up as an experimental (pre-operational) network linking SMU and co-operative hospitals in Tibet, Yunan, Hainan and Jiangxi Provinces. The cost-benefit and feasibility of the network will be evaluated and it will provide a model for a large scale deployment of a China Telemedicine Network. There is not a real CTN now because of the insufficiency of communication in some rural and remote areas of China.

This project will use modern information and communications technologies to provide medical consultation and help to less developed areas of the economy, solve the difficulty in getting medical care in rural areas, raise the quality and efficiency of health service, improve people's health status, adjust the imbalance in levels of medical care and education available to those in urban and rural areas, and make optimum use of existing resources.

5.1.3 DESCRIPTION OF PROJECT

The pilot project will be used by SMU and its affiliated hospitals to provide remote diagnosis, specialist consultation, information services and on-line examinations to those in rural areas. Consultations between medical specialists and professors will take place using videoconferencing techniques as well as simple voice telephony and low speed data communications. The telemedicine project will make use of the already existing campus communications network of SMU (see Fig 1: Topography of the campus network), which has optical fibre, satellite and microwave communication facilities.

The key tasks to be carried out under this pilot project include:

1. construction of a telemedicine network management system,

2. installation of a videoconferencing system for remote diagnosis, consultation and study in each of the designated locations,

3. setting up a multimedia database for case history retrieval and processing which could be shared by each consulting hospital. The multimedia database must accommodate text, images and audio-video information. It will be used for consultation and teaching. Medical and health care data will be shared by means of the World Wide Web after legal users and passwords will be checked.

4. training 20 technicians and operators of the telemedicine service at the consulting hospitals or at SMU. The companies which supplied the equipment will train the operators and technicians of the consulting hospitals how to operate and maintain the equipment. SMU will provide the training for them how to apply the consultation, how to access and manage the information of consultation and diagnosis, etc.

A key element in the configuration of the pilot project will be a Consultation Management Centre, the duties of which will include:

- Management and maintenance of the consultation network, including installation of the communication facilities (point-to-multipoint and multipoint-to-point), configuration of various network lines (DDN and satellite) and protocols. Multipoint-to-point is considered because the patients in rural hospitals can get advice from different specialists in SMU affiliated hospitals at same time. Multipoint-to-point and point-to-multipoint capabilities will be very useful for telemedicine in China.
- Dispatch of the remote consultation requests on the network and the centralised settling of accounts among the various consultation stations.
- Provision of database maintenance, sorting, statistics, backup and retrieval service.

- Development of application software, including the management of consultation and multimedia databases of case history and images.

The pilot project will use Inmarsat mobile earth stations (MES) which can be hand-carried to rural and remote areas with inadequate telecommunications so that local health care personnel can immediately contact regional hospitals for consultation or training. Inmarsat mobile earth stations support high-quality telephone, fax, telex and high speed data (HSD) at 56/64 kbit/s.

Four MESs will be equipped in the project. Three MESs will be installed at No.2 People's Hospital (250 beds) of Tibet Autonomous Region, the county hospitals (about 200 beds) in Yunan and Hainan provinces. One will be installed at the management centre of SMU that already has connected to its affiliated hospitals via the optical fibre and microwave communication facilities. As other means of communication for medical consultation, DDN will be considered. Two videoconferencing units will be installed at county hospital in Jiangxi and also at the management centre of SMU. Consultation services can be provided by specialists at SMU and the affiliated hospitals, and clinical tele-education and advanced study services can be offered.

5.1.4 PROJECT LEADER

This pilot project will be led by Shanghai Medical University (SMU), which is a comprehensive university with the task of medical treatment, teaching and research and has several thousand students. The technical capability of SMU is of high reputation in China. The departments in SMU's clinical colleges are well equipped and some departments are ranked the best in the country. SMU has participated in and set up a Medical Information Network. SMU has also set up a co-operative relationship with other universities and health care centres. SMU provides continuing education in medical techniques, training, on-the-job study programmes, teachers' training for many hospitals, including some in Tibet, Yunan, Hainan and Jiangxi Provinces.

SMU has been involved in the development of telemedicine in China since 1994. In 1995, SMU was the first in China to put telemedicine into practice by using common dial-up telephone lines and low bandwidth satellite communications according to the communications status in China. It has made demonstrations of the telemedicine applications on the network. This pilot project, however, would move from the demonstrations which have already been made to a pre-operational telemedicine service to selected rural areas, with the intention of assessing the benefits and feasibility of an operational service available via the modern information and communications technologies.

A Pilot Project Steering Committee will be set up after the project has been approved to ensure the project is well planned, organised, co-ordinated, carried out smoothly and completed on time. The committee will be composed of a chairman, vice chairman and members. Professor Chen jie will be the chairman of the committee and the leader of the project. A subordinate project office (Professor Partners Zhao jiao, director of the project office) will be in charge of daily management affairs of the project.

5.1.5 PARTNERS

SMU, its affiliated hospitals, WHO, ITU and the Chinese Inmarsat signatory are envisaged as participants or partners. Their contribution to the project would be as follows:

Shanghai Medical University

- management of telemedicine service;
- training the operators and technicians;

- Evaluation of the project;

Affiliated hospitals

- response of medical consultation;
- response of medical training;

Ministry of Health

- Setting up a telemedicine network in China according to the model of the telemedicine service if it is feasible to China.

Ministry of Posts and Telecommunications

- DDN and communication service;
- waiver of licence fees and customs duties on imported equipment

WHO

- supporting funds;
- getting report from SMU about the development, feasibility and cost-effectiveness of telemedicine in China;

ITU

- supporting funds;
- getting report from SMU about the development, feasibility and cost-effectiveness of telemedicine;

Inmarsat and Beijing Marine Communications and Navigation Company (MCN)

- supporting the Inmarsat mobile earth stations (MESs);
- supporting the cost of communications of MESs.

Midjan Group

- advice and guidance with regard to project formulation, sustainability, etc.

World Bank

- supporting funds from the InfoDev programme.

5.1.6 NEEDS AND EXPECTED RESULTS

The telemedicine service to be provided by this pilot project will demonstrate a new mode for the provision of medical care. It will raise the medical/technical capabilities of those using the service. It will improve the quality of life and, in particular, the quality of medical care of the patients.

The pilot project is expected to provide valuable information in regard to the development, feasibility, utility and cost-effectiveness of telemedicine in China.

5.1.7 COSTS

Implementation of this pilot project will require external funding which could come from the WHO and the ITU as well as any other interested partners. The budget for the project has been calculated as follows:

1. Equipment

- Four sets of Inmarsat mobile earth stations (MESs) and personal computers, estimated at a total of US$ 150,000. The equipment will be installed at SMU, Tibet, Yunan, Hainan. These hospitals in rural areas just have telephone lines which are not good enough for medical consultation and medical information service.
- Two videoconferencing units, estimated at US$80,000. To be installed at SMU and at county hospital in Jiangxi province.
- One Cisco router, estimated at US$50,000.

2. Communications

- Satellite communications, to be provided by Inmarsat and its Chinese Signatory, Beijing Marine Communications and Navigation Company (MCN). Budgeted requirement: 300 minutes a month (10 minutes a day). A charge of $US 10 a minute for an Inmarsat-B ISDN circuit is assumed. MCN is invited to waive these charges or to provide such service at a reduced rate for this pilot project.
- DDN communications, estimated at US$ 20,000 for the duration of the pilot project.

3. *Application Software*

- Development of applications software for the telemedicine and management, estimated at US$ 50,000.

4. Staff Training

- The operators and technicians of the consulting hospitals will be trained in Shanghai. The total fees of travel, accommodation, teachers, materials and practice for training, estimated at US$ 30,000.

5. Installation

The total fees of the travel, accommodation and communication for the technicians who will install the system are estimated at US$ 30,000.

6. Evaluation and Research

Item	US$
Travelling Expenses	14,000(500/hospital*2*14)
Material, Communication	4,000(2,000/area*2)
Expert Advising	5,000(2,500/area*2)
Statistical analysis	10,000
Evaluation Report	3,000
Other	2,000
Sub Total	38,000

7. Total Budget

Equipment	US$ 280,000
Communication Cost	US$ 20,000 + Inmarsat
Application Software	US$ 50,000
Staff Training	US$ 30,000

Installation Expense	US$ 30,000
Evaluation and Research	US$ 38,000
Total	US$ 448,000 + satellite services charges estimated at US$3,000 a month.

We would like to see the World Bank, WHO and ITU share the $448,000 cost. We hope Beijing Marine Communications and Navigation Company could support the communication fee of Inmarsat MESs.

By means of this application, SMU is proposing that the funding for this pilot project be shared by the World Bank, World Health Organization and the International Telecommunication Union. Additional support (in-kind or in cash) could come from Inmarsat or its Signatory shareholder or manufacturers, since it is proposed to use Inmarsat terminals to provide the means of communications to rural locations where currently there is no means of communications.

5.1.8 SCHEDULE

It is proposed that the partners involved in this project have a "kick-off" meeting at SMU to review the project plan, the schedule and critical success factors.

The first stage of the pilot project will involve requirement analysis, system design, hardware installation, debugging and the development of software.

Requirement analysis and software development	3 months
Hardware debugging	3 months

The second stage will involve operation of the telemedicine network (SMU will provide services of consultation, continuing education, on-the-job study programmes and teachers' training via the network) over a period of 12 months. The evaluation of the project will be finished at the same period.

5.1.9 EVALUATION AND SUSTAINABILITY

Technology assessment for the project is to evaluate the potential side effect of technology while assessing the benefits and effectiveness. The pilot project will be evaluated in several different ways.

A "before and after" comparison will be made based on the difference which the telemedicine services makes in health status of patients, economic burden of disease, illness or injury, and quality and efficiency of health care. A comparison will be made between the telemedicine-concerned patients and the non-telemedicine-concerned patients. Patients incur two types of economic burden: direct (such as medical cost, travel fees, nutrition cost) and indirect (such as loss of working time and loss to families resulting from the patient's disease, disability or death).

The users of the telemedicine service will be health care professionals, not computer specialists. While developing and installing the telemedicine service, SMU will do its best to make it a user oriented and easy to use system. This aspect will be evaluated.

The evaluation will also include the following elements:

- Forecasting and evaluating the need and demand for telemedicine;
- Promptness, accuracy and validity in diagnosis and treatment;

- Effectiveness and impact on cure rate, improving rate, length of cure, rehabilitation, quality adjusted life year (QALY), disability adjusted life year (DALY), social ability, patient satisfaction;

Cost-benefit or cost-effectiveness (utility) analysis:

- To evaluate the overall effectiveness of the telemedicine services provided;
- Feasibility of developing telemedicine in China;
- Based on a comparison of the use of telemedicine services in different wards and diseases, to select the appropriate wards and diseases;

Social impact:

- to evaluate the availability, accessibility and acceptability of telemedicine.

The results of evaluation will contribute to the feasibility study of setting up a telemedicine network in China. Ministry of Health (MOH) will be interested in the evaluation report, and encourage the application of better cost-effectiveness technology.

PARTICIPANTS IN THE PROJECT

Steering Committee

Chen jie	Chairman
Wang weiping	Deputy Chairman
Jin pihuan	Deputy Chairman

plus sponsors to the pilot project (World Bank, WHO, ITU, etc.)

Researchers

Chen jie	Leader
Wang weiping	Deputy Leader
Zhao jiao	Deputy Leader (director of the project office)
Xu yixin	Computer Network Information Centre (SMU)
Gu yudong	Huashan Hospital
Jiang jingen	Zhongshan Hospital
Jia hongli	Children Hospital
Wang shengzi	EENT Hospital
Wu yi	Cancer Hospital
Hung minli	Gynaecology and Obstetrics Hospital
Cao jianwen	Pubic Health School (SMU)
Ding shiteng	Computer Network Information Centre (SMU)
Song zhijian	Computer Network Information Centre (SMU)
Xia zhiyuan	Computer Network Information Centre (SMU)
Luo xiaozhen	Computer Network Information Centre (SMU)

Zhou xinyu Computer Network Information Centre (SMU)
Hu guanghong Computer Network Information Centre (SMU)
Tu honglei Computer Network Information Centre (SMU)
Li yungang Computer Network Information Centre (SMU)

6. AFRICAN PROJECTS

6.1 ETHIOPIA – TELERADIOLOGY AND RURAL CONSULTATIONS

6.1.1 BACKGROUND

Ethiopia suffers from a severe shortage of health care professionals, especially in remote and rural areas. People need improved communications to link remote clinics and hospitals with urban hospitals or with the main Hospital in Addis Ababa. In Ethiopia, there are 5 - 9 radiologists for almost 60 million people. There are 21 radiological centres, so specialists must travel from centre to centre to examine patients. An alternative is to connect local doctors with medical specialists outside the country. Ethiopia also needs improvements in the administration of its health care sector. It needs improvements in the provisioning of rural clinics and hospitals with pharmaceuticals and other medical supplies. They need to minimise the number of patients referred to distant hospitals who may already be overwhelmed. They need to raise the level of awareness about health care practices.

Ethiopia also suffers from a poor communications infrastructure, great distances between cities and villages and a lack of doctors, specialists and medical equipment.

The basic demographic data of Ethiopia are as follows

Population	
Urban	11.3 million
Rural	45.5 million
Total	56.9 million
Average persons per household	4.3
Natural rate of increase	3.1 %
Infant mortality rate	
Female	98.3
Male	112
Mortality rate for under age 5 per 1,000 live births	
Female	154.1

Male	165.7
Both	159

Health facility to population ratio		***WHO Standard***
Hospital : Population	1 : 646,330	
Hospital Bed : Population	1 : 5,678	1 : 3,000
Health Centre : Population	1 : 293,787	1 :100,000
Health Station : Population	1 : 22,242	1 :10,000

A telemedicine pilot project was proposed for the Tigray region of Ethiopia[2]. Tigray has a total of six hospitals with 640 beds. These hospitals are responsible to the Ministry of Health (MOH). Tigray has 18 health centres with 220 beds (Ministry of Health) and 142 health stations (132 MOH and 8 others).

6.1.2 OBJECTIVES

- to improve access to health care for people in remote areas of Ethiopia;
- to organise telemedicine demonstrations to show the possibilities and benefits of telemedicine applications such as teleradiology, ultrasound and laboratory information to doctors, specialists, government, the Ministry of Health and Ethiopian Telecom; also, to demonstrate successful collaboration between the participants;
- to initiate new, high quality project proposals based on the needs of Ethiopia;
- to initiate and co-ordinate the telemedicine project in Ethiopia with other international development programmes such as COPINE in East Africa;
- to make available European expertise to the developing world, and to identify the best practice, using the lowest cost, most appropriate equipment, software and services.

6.1.3 DESCRIPTION OF PROJECT

The project will include a teleradiology application. The medical and communications equipment will be installed in one or two local clinics in Tigray region.

Two configurations are envisaged. The first is to connect one health clinic with the Black Lion hospital in Addis Ababa. The second is to connect a doctor travelling from village to village with the Region Hospital in Tigray. The Inmarsat system will be used to provide communications between the rural areas and the Tigray hospital.

The equipment to be supplied for the project will include the following items:

Telemedicine equipment

- analogue X-rays will be converted into digital form by using a Lumiscan 20 CCD film digitiser
- diagnostic workstation

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[2] The war between Ethiopia and Eritrea has resulted in the postponement of the project in Tigray region.

- portable ultrasound system
- personal computer

Satellite equipment

Two Inmarsat B HSD mobile earth stations, to be supplied by Inmarsat for three months. An Inmarsat-phone would be most appropriate for the travelling doctor.

When the sick patient visits the local clinic:

The doctor or the nurse prepares an X-ray or ultrasound image. The doctor converts the image into digital form by using a digitiser and stores the images in a database. The doctor sends the X-ray or ultrasound images via Inmarsat to a specialist in the central hospital. The specialist stores and examines the image and send the results and recommendations back to the doctor in the local clinic.

6.1.4 PROJECT LEADER

Jaroslav Liska Bilton Poljanovova 3241 143 000 Prague 4 Czech Republic	E-mail: Jaroslav Liska <bilton@mbox.vol.cz> tel: + 420 602 310 064 fax: + 420 401 5008 Inmarsat: +00871-761470210, 761470215

6.1.5 PARTNERS

The project co-ordinators will organise the installation of equipment, training, on-site trouble shooting in the event of problems. They will be the interface with the authorities responsible for licensing, Ethiopian Telecommunications Corporation (ETC), Ministry of Health and all partners in this project. The co-ordinators will be Jaroslav Liska (Bilton), Ethiopian Telecom and Dr. Milliard (Ministry of Health, Ethiopia).

The following are the partners in the project and the tasks to be performed by each.

Co-ordinators & Bilton

1. Provide funding for equipment.
2. Liaise with other parties involved in the project.
3. Participate in the project engineering.
4. Establish and maintain contacts between the Ethiopian Telecommunications Corp, Ministry of Health and other authorities responsible for regulatory issues.
5. Establish and maintain contacts with all Ethiopian staff involved, both at the management level and at the local level.
6. Install office and mobile communication and medical equipment and manage the activation process in co-operation with suppliers.
7. Provide maintenance and repair services for the equipment in co-operation with suppliers.
8. Write progress reports re problems encountered, etc. Report to be submitted to all principals of the project.
9. Provide training and guidance for local doctors, specialists and nurses.

10. Analysis of the requirements of the staff involved in this project.

11. Monitor and control project progress (activities, milestones, deadlines).

12. Provide final report with conclusions.

13. Report any problem immediately to the responsible authorities and try to achieve solutions.

Inmarsat

1. Supply two Inmarsat-B HSD satellite terminals to ETC for three months for the tele-radiology project.
2. Engineering and technical advice.
3. Assist other parties with information regarding network related issues.
4. Direct support to co-ordinators in case of technical, network related problems.
5. Help the co-ordinators prepare letters to authorities responsible for Inmarsat use in Ethiopia.

ITU

1. With the co-operation of other partners, provide funding for the medical equipment involved in this project to the value of US $52,000.
2. Fund the visit of a telemedicine expert familiar with teleradiology for a week or two during the start of the project in Ethiopia. The expert should provide advice for the configuration of the application and training in regard to use of the teleradiology equipment.
3. Support the project through communications with the authorities of Ethiopia.

[Inmarsat Land Earth Station Operator – to be determined]

1. Provide free satellite time for the Inmarsat-B and Inmarsat-phone terminals used in this project.
2. Discuss with Ethiopian Telecommunications Corporation ways of improving telecom costs.

Ethiopian Telecommunications Corporation (ETC)

1. Provide funding for personal computers in co-operation with local partners valued at US$ 6,700.
2. Participate in the project engineering.
3. Technical assistance.
4. Co-operation with the Ministry of Health.

6.1.6 NEEDS AND EXPECTED RESULTS

The pilot project is expected to meet real needs for health care services in Ethiopia.

6.1.7 COSTS

Item Nr.	Description	Amount US $	Quantity	Total Amount
1	PC Computer Pentium 160	2400	2	4800
2	Laptop	1900	1	1900
3	Nera Worldphone	3000	1	3000

4	Inmarsat B HSD Terminal	25000	2	50000
5	Portable ultrasound system	10000	1	10000
6	Lumiscan 20 CCD film Digitiser	10985	3	32055
7	Tele-Radiology Package	3000	3	9000
			Total	110755

Specification of services supplied by co-ordinators:

Item Nr.	Description	Amount US$	Quantity	Total
1	Declaration, pre-installation of the equipment in AA Office based on 24 hours.	1500	1	1500
2	Installation of equipment in remote areas, based on 8 hours per installation	500	4	2000
3	Training doctors, specialists and other people in use and maintenance of the system (based on 4 sessions of 4 hours) (manpower)	500	4	2000
4	Training program of 1 week in Ethiopia, training staff in use, maintenance and use of the system (manpower)	2000	1	2000
5	Travel and expanses during installation and training period plus six additional visits for supporting doctors in case of unforeseen problems and meetings.	4300	1	4300
6	Provide funding for one satellite telephone	3000	1	3000
	Total cost of services supplied by Bilton		US $	14800

Specification of services supplied by Inmarsat:

Item Nr.	Description	Amount US$	Quantity	Total
2	Lend two Inmarsat B HSD terminals for 3 months	20000	2	40000
2	Support the project with one person during initial training and installation of the equipment including tickets, hotel, visa. etc.	3000	1	3000
3	Transport of satellite terminals to the office of Ethiopian Telecom	3000	1	3000

	Total cost of services supplied by Inmarsat		US $	46,000

Specification of services supplied by Land Earth Station Operator (to be determined):

Item Nr.	Description	Amount US$	Quantity	Total
1	Free limited traffic via Inmarsat B-HSD for 3 months (25 minutes x 22 days x 3 months = 1650 min)	18000	1	18000
2	Other costs	3000	1	3000
	Total cost of services		US $	21000

Specification of services supplied by Ethiopian Telecom:

Item Nr.	Description	Amount US$	Quantity	Total
1	Provide funding for laptop computers with modems	6700	1	6700
2	Other services and costs	2000	1	2000
	Total cost of services supplied by ETC			8700

Specification of services to be supplied by the ITU:

Item Nr.	Description	Amount US $	Quantity	Total
1	Provide funding for medical equipment in this project	52,000	1	52000
2	Visit by teleradiology expert			
	Total cost of services supplied by ITU			52 000

To avoid the high cost of travel and to provide quick response to reported problems, the computers must be equipped with modems for remote support. This would allow access to Lumisys or any other software company in case problems cannot be resolved by the co-ordinators.

6.1.8 SCHEDULE

The pilot is proposed to run for six months, however, the dispute between Ethiopia and Eritrea has resulted in delays in initiating the project. During the first month of the program, Bilton envisages weekly progress and status meetings with the local clinics and hospitals. Monthly meetings will continue after the first month of this pilot project. Progress reports will be submitted to all partners indicating the status of each medical unit and the benefits realised from this project. A final report will be provided to all members within six months of the project completion. This report will include an evaluation of the documented benefits realised during the project.

6.1.9 EVALUATION AND SUSTAINABILITY

The evaluation of the project will be done one month after the end of this project by a meeting of all project sponsors and participants. The main result expected of this project will be the improvement of health care in rural areas of Ethiopia and the evaluation must be done especially for the Ethiopia Ministry of Health and Ethiopian Telecom. Bilton plans to continue the telemedicine services in Ethiopia and wants to open a special office for telemedicine services in Ethiopia. If the project will be successful, a similar telemedicine service could be offered to other rural clinics and hospitals in Ethiopia and could connect the Black Lion Hospital in Addis Ababa with others engaged in telemedicine internationally.

6.2 MOZAMBIQUE – TELERADIOLOGY AND SPECIALIST CONSULTATION

6.2.1 BACKGROUND

6.2.2 DESCRIPTION OF PROJECT

The first phase of the telemedicine pilot project was establishment of a teleradiology link connecting Maputo and Beira Central Hospitals, a distance of more than 1,000 kms. The pilot project was one of the first trials of telemedicine in a developing country.

6.2.3 OBJECTIVES

- To provide teleradiology and consulting advice.
- To install videoconferencing equipment at participating locations.

6.2.4 PROJECT LEADER

Per Olof Jansson, Telia Swedtel.

6.2.5 PARTNERS

Telia Swedtel

Contact: Silas Olsson and per Olof Jansson, Regional Manager for Africa & Latin America.

Telia was responsible for the planning of the project.

Telia Publicom

University Hospital, Maputo.

Regional and Central Hospital, Beira, Mozambique.

Telecomunicacoes de Mozambique

University Hospital, Lund, Sweden

WDS, Geneva, Switzerland

Contact: Ronald Welz.

6.2.6 NEEDS AND EXPECTED RESULTS

6.2.7 COSTS

Telia cover costs incurred in connection with the planning and co-ordination of the project.

6.2.8 SCHEDULE

6.2.9 EVALUATION AND SUSTAINABILITY

The Prime Minister of Mozambique has announced his intention that the telemedicine pilot project is to be extended with the aim of developing a comprehensive telemedicine program for Mozambique. His Excellency Dr Pascoal Manuel Mocumbi, Prime Minister of the Republic, announced the second phase of a telemedicine pilot project in a recent letter to Hamadoun Touré, the Director of the BDT.

The Prime Minister described the pilot project as "a very successful undertaking, resulting in clear benefits to both the medical community and the public."

On the basis of this experience, the government is evaluating the possibility of extending the project to cover other medical disciplines and other parts of the country. Telecomunicaçoes de Mozambique has agreed to allocate part of its 1999 investment budget to carry out the second phase of the project. One of the main goals of this phase will be to extend the teleradiology link to Nampula, Mozambique's third largest city.

"We strongly believe that applying proven best practices of telemedicine, through the widespread use of low cost technologies, will make a decisive contribution to the well-being of our citizens and significantly improve our human development indices," said Dr Mocumbi.

The Prime Minister also said the government intended to prepare a comprehensive telemedicine program for Mozambique, a document which could be used to procure financial support from international institutions such as the World Bank and other development-oriented bodies.

6.3 SENEGAL – TELE-OBSTETRICS, DISTANCE LEARNING

6.3.1 BACKGROUND

Senegal is situated at the extreme west of the African continent, with a North Atlantic coastline of 531 km; its frontiers with Gambia, Guinea, Guinea-Bissau, Mali and Mauritania extend for 2 640 km. Covering an area of 196 190 km^2, Senegal is generally flat and consists mostly of savannah with considerable variation between the north (semi-desert) and the south (semi-wooded). The territory is subdivided into ten regions, each of which comprises three departments.

As of 31 December 1996, Senegal had a population of some 8,446,000, the great majority being young people: 45% of the population are under 15 years of age and only 3% are over 65. The rate of population growth is in the region of 3% per year and 70% of the population live in rural areas. In addition to French, which is the official working language, six national languages are recognised as well as a large number of local dialects.

Average life expectancy is 55 for men and 58 for women.

In the social sector, health expenditure has declined by 20% over the past two decades. Unemployment has worsened, with a growing number of layoffs since 1986. According to a survey of priorities, 30% of Senegalese households live beneath the poverty line. Children are worst affected, followed by households whose head is unemployed, women and young job seekers.

The National Plan of Action against Poverty focuses on creating conditions conducive to growth based on a more egalitarian distribution of wealth and better provision for the basic needs of the population.

Following the devaluation of the CFA franc in 1994 and the adoption of adjustment measures, economic activity picked up, with an annual growth rate in the region of 6%. However, its benefits have been slow to make themselves felt through better living conditions for the majority of the population.

Since January 1997, the local authorities -- consisting of regional councils, municipal councils and rural councils -- have been exercising full management responsibility. Decentralised State structures (governorates, prefectures, sub-prefectures) ensure that this responsibility is exercised in conformity with the country's legislation and policies.

Health pyramid

The ten medical regions, which constitute the apex of the health pyramid, are divided into 45 districts containing health centres and health posts. The health post network is supplemented by health booths and rural maternity units. Each district caters for, on average, between 150,000 and 250,000 persons.

Distribution of health infrastructure

In terms of coverage, the following figures -- public and private sectors combined -- were recorded for the country as a whole in 1993:

- one hospital for every 465,000 inhabitants;
- one health centre for every 155,000 inhabitants;
- one health post for every 11,000 inhabitants;
- one health booth for every 6,400 inhabitants.

In general, health facilities are heavily concentrated in Dakar and other urban areas.

Coverage ratio of medical personnel

The following coverage ratio of medical personnel, which is far below WHO standards, was recorded in 1993:

- one doctor for every 13,550 inhabitants;
- one midwife for every 2,844 inhabitants;
- one State registered nurse for every 7,565 inhabitants;
- one health officer for every 6,211 inhabitants.

Training facilities for the health system are heavily concentrated in urban centres.

The mortality rate associated with birth complications is very high in Senegal. During the period 1979-1992, some two out of every five cases of death in women aged from 15 to 49 years were associated with pregnancy, birth or post-natal complications. In the same period, the maternal mortality rate is estimated to have been 510 deaths per 100,000 (this figure can be as high as 1,000 deaths per 100,000 live births in certain African countries).

6.3.2 OBJECTIVES

The emergence of new information technology have led to a considerable change of approach in health, medical tuition and therapeutics. The health sector occupies a prominent position in the economies of the world. Technological progress has contributed and will continue to contribute to the remote performance of medical activities developed by telemedicine.

Sonatel, in the interests of keeping Senegal abreast of technological progress, especially in the medical field, has launched a pilot telemedicine awareness project in collaboration with the Medical Association and the health sector.

The purpose of this application is to provide the population of Saint-Louis and its surroundings with an ultrasound service intended mainly for pregnant women. By means of prenatal screening, it is possible to anticipate complications which may arise at the time of birth and act accordingly at the health care level.

The project aims to develop a telemedicine network among the country's district hospitals, with the help of French reference hospitals.

The ongoing remote training of health professionals constitutes one of the key elements of this application.

To ensure that all members of the population have access to modern telecommunication services, as tools in the development process, this project will be implemented in low-income urban and suburban areas and in rural and isolated areas.

6.3.3 DESCRIPTION OF PROJECT

Videoconferencing equipment makes it possible to create a shared visual environment (everybody sees the same images) and a shared aural environment (everybody hears the same sounds) for a number of distant sites. Distance training for health professionals is a key to the success of this application.

Training occurs in remote health centres through videoconference systems adapted to the medical environment which are connected by remote links to national or international hospitals.

The Lille Regional University Hospital (CHRU) and the European Institute of Telemedicine in Toulouse have considerable experience in videoconferencing and are prepared to assist in distance training. At the Lille CHRU, medical staff specialising in obstetrics have a routine session every Tuesday morning, during which pathological pregnancy cases are discussed by a panel of experts. Other medical meetings in gynaecology are planned.

In view of the socio-economic and geographic environment, the following sites were chosen for the pilot project:

Saint-Louis Hospital because it belongs to Senegal's telemedicine pilot project and because it is twinned with Lille Hospital. Furthermore, Saint-Louis and the Lille CHRU have been co-operating in a mother-child programme since 1994. A steering committee brings the French and Senegalese

participants in the partnership together on a regular basis. This will facilitate not only South/South but also North/South development in the area of telemedicine.

It is planned to extend the Saint-Louis initiative to the whole of the region, particularly to Ndioum whose primarily agricultural population lives along the banks of the Senegal river.

In Dakar, the Clinique du Cap, which specialises in obstetrics and gynaecology, is the correspondent of Saint-Louis Hospital.

Saint-Louis Hospital and the Clinique du Cap will be connected by a telemedicine link. The establishment of such a link may prove beneficial for the clinic, for education and, more generally, as a means of promoting a spirit of collaboration among medical institutions.

The operator in Saint-Louis moves the probe on instructions from the expert in Dakar and the transfer of images occurs in real time. It will also be possible to send a case file from one site to another.

The two sites are linked by means of ISDN circuits. Signals are transmitted between Dakar and Saint-Louis via a codec which digitises and compresses the ultrasound images; in Dakar the procedure is reversed: decompression and analogue conversion of the signal which is viewed on a television screen. A videoconference connection permits close co-ordination between the doctor and the operator.

As a second stage, a link between Dakar and Saint-Louis is envisaged to enable remote obstetrical examinations to be carried out, with the help of CHU Lille. An expert situated in a private clinic in Dakar will thus, via the network, be able to provide a second opinion to a local doctor in Saint-Louis operating an ultrasound scanner. A number of participants questioned the medical feasibility of such an arrangement, pointing out that the Loginat project in Lille operates rather on a "video-staff" basis, whereby doctors examine pre-recorded case images. This has yet to be verified.[3]

The scenario with respect to the link between Dakar and the hospital in Toulouse remains to be defined, but the theme of the training has already been identified.

Videoconferencing networks will rely on ISDN.

6.3.4 PROJECT LEADER

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6.3.5 PARTNERS

Medical equipment, video equipment in Dakar and Saint-Louis, codecs, ISDN interfaces and connections.

[3] This technique is in fact already in use in Languedoc-Roussillon (Maternet project), and is therefore feasible provided the image quality is sufficiently high.

*CHU Lille***,** Mr. Tiers, Ms. Piton

Equipment in Lille and medical expertise.

*Thomson-CSF health***,** Mr. Chaines

*IET-CHU Toulouse***,** Professor Louis Lareng

Equipment in Toulouse and medical expertise.

France Telecom

International communications.

The project's prospects of success will be greatly enhanced if it is conducted as part of a concerted multidisciplinary and multisectoral community development initiative. It must also be jointly monitored and evaluated. Telemedicine is a relatively new field. A large number of companies and organisations must collaborate to ensure that it succeeds in practice. To that end, a steering committee chaired by the Medical Association has been established during the current preliminary project study phase. The committee comprises:

- Ministry of Health
- Medical Association of Senegal
- Saint-Louis Hospital
- Regional District of Saint-Louis
- Rural community of Ndioum
- Fann Hospital
- Dantec Hospital
- Grand Yoff Hospital
- Clinique du Cap
- Sonatel.

6.3.6 NEEDS AND EXPECTED RESULTS

Hospitals which depend on the public health service or on the regions and municipalities have major requirements in terms of services, content and systems related to the use of new technology and communication networks for remote medical care.

These requirements include in particular:
- assistance in diagnosis or tele-expertise requirements;
- detection of high-risk pregnancies;
- improvement of services to the general public;
- action against practices that are damaging to health;
- information for women on reproductive health;
- dissemination of survival techniques for maternal and child health;
- circulation of information within and outside hospitals;
- initial and in-service training for medical, paramedical and technical staff;
- home-based hospitalisation;
- access to information;

- incorporation of global solutions in existing communication architecture.

Studies have shown that maternal and child health care requirements are still on a large scale. Senegalese women are still faced with enormous problems at all levels: illiteracy, **high maternal mortality rate**, overwork, etc. Action to promote maternal and child health and to eradicate certain practices that are damaging to health has become a major development challenge. For that reason, our project focuses on obstetrics and training based on videoconferencing and real-time exchanges of ultrasound images.

The project is expected to produce a variety of results:
- detection of high-risk pregnancies;
- lowering of the infant mortality rate;
- lowering of the number of deaths among pregnant women;
- possibility for the authorities to solve priority problems and fulfil their potential for development in the twenty-first century;
- monitoring of patients while at the same time reducing travel expenses for patients and doctors;
- immediate access to specialised installations for treating patients in a critical condition;
- promotion of health monitoring facilities within communities;
- reduction of inter-hospital evacuation requirements;
- greater equality of health care.

6.3.7 COSTS

The project will be implemented in two phases: during the first phase the Saint-Louis - Dakar link will be established and during the second phase it will be extended to Ndioum.

First phase

Equipment in Saint-Louis	**Quantity**	**Unit price (FF)**	
Ultrasound: Two-probe colour Doppler ultrasound (1 x 6.5 MHz vaginal probe; 1 x 3.5 MHz vaginal probe)	1	350,000	estimated
Codec	1	150,000	
Camera	1		included in the codec price
Monitor	1		included in the codec price
Imux	1	10,000	
Consumable goods	1	10,000	
Room camera	1	12,000	
Modem	1	1,500	
Microcomputer	1	15,000	
Equipment in Dakar			
Codec	1	150,000	
Camera	1		included in the codec price
Monitor	1		included in the

			codec price
Imux	1	10,000	
Modem		1,500	
Microcomputer		15,000	
Training/Installation/Configuration		15,000	
Total cost of project (first phase)		**735,000**	

Second phase

Equipment in Ndioum	**Quantity**	**Unit price (FF)**	
Ultrasound: Two-probe colour Doppler ultrasound (1 x 6.5 MHz vaginal probe; 1 x 3.5 MHz vaginal probe)	1	350,000	estimated
Codec	1	150,000	
Camera	1		included in the codec price
Monitor	1		included in the codec price
Imux	1	10,000	
Consumable goods	1	10,000	
Room camera	1	12,000	
Modem	1	1,500	
Microcomputer	1	15,000	
Total second phase		**549 000**	

Sonatel will be responsible for installing the requisite infrastructure on its telecommunication network for the transport of all information resulting from this application.

6.3.8 SCHEDULE

6.3.9 EVALUATION AND SUSTAINABILITY

The sustainability of the project will depend, in part, on the technical assistance provided by Lille and Toulouse in the form of regular meetings held within the framework of the existing co-operation programmes, for example, the "mother and child" programme between Lille and Saint-Louis. The study must also take into consideration links between the district hospitals and local clinics, as well as the financing of the operation.

This project, when implemented, will respond to the needs of health professionals for training, diagnostic assistance and access to medical information and expertise throughout the world, while at the same time reducing health costs.

The pilot project was designed with the effective assistance of actors who will most likely contribute to its subsequent implementation. As a result, they developed a framework that is as

comprehensive as possible. Obviously, all the strategic components of the pilot project that have been identified will not be implemented with the sole support of BDT; the participation of other partners who share the same objectives is essential. However, it is important for BDT to approve substantial investment over a period that is long enough to implement the project, evaluate its results and draw useful conclusions for the introduction of telemedicine in the developing countries as a whole.

7. ARAB REGION PROJECTS

7.1 JORDAN – CARDIOLOGICAL MONITORING

7.1.1 BACKGROUND

The Ministry of Health operates 23 major hospitals in Jordan. These hospitals provide 2,673 beds for a population of four million. The majority (55.5%) of these beds are in Amman, Zarqa, Irbid, & Salt, leaving many populated areas medically under-served. Hence there are geographical disparities in the distribution of medical resources. In addition to the above mentioned hospitals, the MoH provides three kinds of medical services which lack tertiary care:

- comprehensive medical centre (30) equipped with basic medical equipment and staffed by qualified medical personnel, with an EKG service until 4pm;
- primary health centres (313) equipped with basic medical equipment and staffed by residents, which have no ECG service
- secondary health centres (263) lack both basic medical equipment and staff.

Even though chest pain is the leading physical complaint that may be symptomatic of heart disease or of disease of the lungs, other sources of chest pain may also be musculo-skeletal, gastrointestinal, or psychological. In fact, statistics and various studies indicate that over 60% of chest pain are non-cardiac in nature. Some of the studies subscribing to this fact are the following:

A study in Al-Salt Hospital done during the period October 1994 to September 1995 showed that 159 patients out of 275 (57.8%) admitted to the CCU, were experiencing chest pains of non specific nature & hence unrelated to the heart.

This is further supported by a study completed at the Al-Bashir Hospital during October 1992 to December 1992 showing that 50% (60 patients) of daily emergency department admittance's are patients suffering from non-specific chest pain. All these cases had originated from MoH clinics all over the Kingdom. Out of the 60 patients only 10% needed admission for further observation and treatment to the CCU. Hence 90% are being dismissed with chest pains of non-cardiac origin. The remaining cases that are in need to be admitted to the CCU are being delayed because of the unnecessary cardiac referrals crowding the already limited facilities and qualified medical specialists.

Another Al Bashir study (1994) shows that only 30% of acute MI patients are eligible for Streptokinase therapy mainly because they are admitted later than 6 hours from the on-set of the MI.

7.1.2 OBJECTIVES

Heartbeat Jordan undertook a study at the behest of the Ministry of Health to assess the deficiencies of the public sector health provider. A three-month pilot project was designed to address these deficiencies, to prove the benefits of telemedicine in general and specifically the use of tele-EKG(s) within the parameters of a public health sector provider.

7.1.3 DESCRIPTION OF PROJECT

The Heartbeat Centre is an established medical ground station for the transmission of medical data in general and specifically electrocardiograms (EKG/heart images). With the use of Heartbeat portable medical terminals, vital medical data can be sent through any telephone, cellular phone, air phone, or HF/CB radio from anywhere in the world to the Heartbeat Center's medical ground station.

The medical data and in particularly the electrocardiograms are then analysed by qualified specialists, evaluated and the appropriate professional advice is given. Currently Heartbeat Jordan is servicing the Kingdom by providing this state of the art medical service to mainly primary physicians, corporations, cardiologists, internists, clinics, hospitals and individuals. The Heartbeat Centre studies each client segment carefully, analyses its needs and provides a solution.

In March 1998, Heartbeat launched a 3-month Ministry of Health/Heartbeat pilot project in the district of Madaba. The Governorate of Madaba was chosen for this experiment because of its closeness to the capital Amman, and because of the high number of Primary and Secondary Health Care Centres within the governorate.

Sixteen Heartbeat monitors were placed in the peripheral clinics of Madaba. Heartbeat Jordan received 515 EKG calls in a period of almost four months due typical and atypical chest pain.

The number of readings sent via telephone to Heartbeat Jordan during this period was 515 cases.

Sixty-five percent or 335 of the 515 EKG calls were non-pathological and hence non-cardiac in nature. They were treated on the spot at the clinics and either discharged or referred to the appropriate non-cardiac specialist. Without the Heartbeat Solution, 90 % of the 335 EKG patients would have been referred to Nadim Hospital to rule out cardiac complications. Resulting in unnecessary cardiac referrals crowding the already limited facilities and qualified medical specialists in Nadim Hospital.

Thirty five percent or 180 of the 515 EKG calls were pathological and hence needed further cardiac consultation. Treatment was immediately initiated. They were referred to Madaba Nadim Hospital. Out of these 180 EKG calls, some of the significant results were as follows:

- 51 cases of stable angina
- 19 cases of unstable angina
- 14 cases of myocardial infarctions 26 cases of tachycardia
- 23 cases of bradychardia

The financial burden and the unfeasibility of implementing the above left the MHO in a dilemma. A Heartbeat solution was developed after careful analysis to solve this predicament. The solution consisted of placing Heartbeat Cardiac Monitoring in the following:

- Comprehensive Medical Centres
- Primary Health Centres

- Secondary Health Centres

7.1.4 PROJECT LEADER

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Jordan

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7.1.5 PARTNERS

Ministry of Health

Heartbeat

7.1.6 RESULTS

The experiment started on 7 February 1998 and ended on the 31 May 1998, that is, a total of 113 days. If Fridays, public and religious holidays are excluded, and two inoculation periods during the experiment duration, the actual days of the experiment were 81 days only.

The Madaba Pilot Project was able to prove beyond a doubt the effectiveness of telemedicine in meeting the public health sector needs of developing countries by accomplishing the following:

- Offer better access to its population.
- Improve both the economic & clinical efficiency of the system.
- Raise the quality of its delivery system.
- Prompt diagnosis of cardiac problems in medically under-served areas and hence offering cardiac consultations by specialists via telephone.
- Early detection of cardiac disorders enabling the use of non-invasive medical techniques and hence reduced healthcare costs.
- Eliminate a minimum of 50% of unnecessary cardiac referrals, which will alleviate pressure on mho specialists, hospitals & clinics and hence reduced healthcare costs.

Reiterating the Public Health Sector's objection centres falsely on cost. Without the Heartbeat Jordan service, an additional 335 cases would have been referred to Nadim Hospital. These cases would have incurred the following for further cardiac Evaluation: Specialist, X-ray, Lab, EKG and other miscellaneous charges would amount approximately to USD 500 per referral. 335 cases X $500 = $ 167,500 in a period of *three* months in just *one* district.

Other cost reductions are more difficult to calculate:

- Rapid diagnosis which allows the patient the option of non-invasive treatment and hence reduced healthcare costs. Essential in cases of Myocardial Infarction, when the first 6 hours are the most critical in administering the necessary medication to dissolve any clot and thus limit the damage to the cardiac muscle.
- Burden of disease on society.
- The value of a life.

7.1.7 COSTS

Public health sectors in developing countries tend to dismiss technology driven solutions due to cost. In the case of telemedicine, this proves to be a fallacy. Telemedicine, in most of these cases, is the only viable effective economical solution.

7.1.8 SCHEDULE

7.1.9 EVALUATION AND SUSTAINABILITY

8. CONCLUSIONS AND RECOMMENDATIONS

The Rapporteur's Group came to these conclusions and recommendations as a result of discussions within the group and from its review, examination and analysis of selected telemedicine projects.

Factors for success

- Assessment of user needs – those who use the telemedicine technologies, including telecom operators and service providers
- Getting the support of decision-makers, policy-makers
- Commitment of beneficiaries – patients, clients

It is desirable to establish a national steering committee to develop and oversee the implementation of a telemedicine strategy.

A national telemedicine strategy needs high level support, including that from the Minister of Health and Minister of Communications.

A national strategy should be based on certain principles such as the right of all citizens to adequate health care, implementation of telemedicine services which will do the most good for the greatest number of citizens, etc.

Projects should be reviewed by an ethics committee. Users consent should be obtained in advance.

9. ANNEX 1 - GUIDELINES FOR PROJECT PROPOSALS

9.1.1 BACKGROUND

What is the current situation with regard to the provision of health care in the rural areas to be involved in the project? What are their needs? Why is this project being undertaken? What are morbidity rates?

9.1.2 OBJECTIVES

What are the objectives of the pilot project? Be as specific as possible in order to evaluate results.

9.1.3 DESCRIPTION OF PROJECT

A brief description of the telemedicine application(s) to be used in the pilot project. Include a schematic drawing, if possible. Identify as precisely as possible the equipment and services to be included in the project. Where exactly will the equipment be used and what service(s) provided?

9.1.4 PROJECT LEADER

Identify who the project leader will be, the person who will be in charge of organising the pilot project and its day-to-day management.

9.1.5 PARTNERS

Provide the names and contact details of all those people who will be involved in the project in some way or other. Identify what each participant/partner will contribute to the project. Each partner should confirm in writing his commitment to the project.

9.1.6 EXPECTED RESULTS

Will the pilot project meet real needs? What benefits are expected from the proposed configuration of the telemedicine application(s)? Is the proposed configuration of equipment and services the most cost-effective? How will health care be improved?

9.1.7 COSTS

How much will the pilot project cost? Identify capital and operating costs. Who will share those costs?

9.1.8 SCHEDULE

What are the main milestones for planning and implementing the pilot project? How long will the pilot project last?

9.1.9 EVALUATION AND SUSTAINABILITY

How will the project be evaluated? What are the measures of success for the pilot project? Are there any benchmarks statistics (before and after)? What lessons can be learned from the pilot project? Is the project or service sustainable? After the pilot project, what will happen next? Are there plans for continuing the service? If the project is successful, can it be expanded to include other rural areas?

10. ANNEX 2 – GUIDELINES FOR THE PROJECT MANAGER

(extracts from UNDP and International Labour Organisation (ILO) guidelines)

THE CONTENTS OF A PROJECT DOCUMENT

The elaboration of a project document should aim at providing answers to a set of basic questions. These are reflected in the contents of a project document, as follows:

Context and justification	What is the situation that gives rise to the project? Identify the nature and extent of the problem and describe **who** is affected by it. What is the socio-economic context in which the project will take place? How does it fit in with development (economic, social, political) priorities?
Target groups and institutional framework	For whose benefit is the project undertaken? Who are the partners? What are their responsibilities? Is the division of labour clear? a thorough assessment of the existing structure and staffing, managerial, financial and technical capacity of the partner organisations.
Development objective, immediate objectives and indicators of achievement	What are the changes the project itself is expected to bring about or contribute to? How will success be assessed?
Outputs, activities and inputs	What will the project produce and deliver? What will the project staff do? What funds, expertise, equipment, etc. are needed?
Assumptions and prior obligations	Can we control everything? What are the external factors that may affect the implementation and the performance of the project? What conditions must be satisfied by the partners before the project starts?
Reporting, monitoring and evaluation plans	When will the project be evaluated and by whom? How will the partners be informed and involved?

PROJECT DOCUMENT FORMAT

Example of table of contents

A. Context

A1. Description of sub-sector (its major characteristics)

A2. Host country strategy (for the sub-sector)

A3. Prior or ongoing assistance (directed to the same sub-sector)

A4. The institutional framework for sub-sector

B. Project justification

B1. Problem to be addressed; the present situation

B2. Expected situation at the end of project

B3. Target beneficiaries

B4. Project strategy and implementation arrangements

B5. Reasons for assistance from…(Indicate the concerned Organisation or financial Institution)

B6. Special considerations

B7. Co-ordination arrangements

B8. Counterpart support capacity **(sustainability**)

C. Development Objective

C1. Development Objective

D. Immediate Objective (s), outputs, and activities

1. Immediate objective 1

1.1 Output 1 - **Output:**

Activities

1.1.1 activity 1

1.1.2 activity 2

1.1.3 activity 3

etc.

1.2 Output 2

Activities

1.2.1 activity 1

1.2.2 activity 2

1.2.3 activity 3

etc.

1.3 Output 3

Activities

1.3.1 activity 1

1.3.2 activity 2

1.3.3 activity 3

etc.

2. Immediate objective 2

2.1 Output 1

Activities

2.1.1 activity 1

2.1.2 activity 2

2.1.3 activity 3

etc.

2.2 Output 2

Activities

2.2.1 activity 1

2.2.2 activity 2

2.2.3 activity 3

etc.

3.

etc.

E. Inputs

E1. Inputs

F. Risks

F1. Risks

G. Prior obligations and prerequisites

G1. Prior obligations

G2. Prerequisites

H. Project reviews, reporting and evaluation

H1. Reviews

H2. Reporting

H3. Evaluation

I. Legal context

I1. Legal context

J. Budgets

J1. Budgets

K. Annexes

K1. Work plan

K2. Time schedule of project reviews, reporting and evaluation

K3. Training Programme

K4. Equipment requirements & specifications

K5. Job description (if required)

K6. Framework for effective participation of national & international staff

SOME DEFINITIONS

1. **The institutional framework for sub-sector**: a thorough assessment of the existing structure and staffing, managerial, financial and technical capacity of the partner organisations

2. **Target beneficiaries: identification** and **description** of who are the people for whose benefit the project is undertaken

3. **Project strategy:** justify the choice of the strategy which must make clear **what to do, for whom, with whom and how**

Development Objective: the development objective essentially describes the ultimate reason for undertaking the project

4. **Immediate Objective (s):** the immediate objective describes the situation that is expected to exist at the end of the project - As far as possible, an immediate objective should be stated in quantifiable or verifiable terms

5. **Output:** outputs are the products which result from the project activities

6. **Activities:** activities are the actions undertaken by a project to produce the planned outputs

7. **Inputs:** resources necessary to carry out the activities and produce the outputs of the project: personnel, fellowships, equipment, supplies, etc.

8. **Risks:** any factors that are beyond the control of project management and may seriously delay or prevent the production of the planned outputs or the achievement of the objectives

9. **Reviews:** a project may require the establishment of a co-ordinating mechanism such as a **steering or advisory committee** to review the project

10. Evaluation: **Evaluation assesses the effects and impact of project performance, focusing on the analysis of the progress made towards the achievement of the project's objectives. Types of evaluations:**

Timing: Interim evaluation, Terminal evaluation, Ex-post evaluation

Responsibility ("Who evaluates"): Self-evaluation, Independent evaluation (can either be: **internal**, or **external)**

PROJECT APPRAISAL CHECKLIST

(*The check l list is a tool served as a reminder to the appraiser for a certain key questions. The list of questions is to be completed by the user according to her/his priorities)*

Some issues not to be ignored:

items	yes	no	comments
Sustainability: Is the project sustainable?			
Gender issues: Does the project take account of the participation of women?			
Technology: Is the technology adapted to the country?			
Beneficiaries needs: Does the project take account of the needs of the beneficiaries?			
Schedule of project reviews, evaluation and reporting: has monitoring, technical reviews, evaluation and reporting been identified and organised? If so, has financial provision made to cover this in the budget?			
Ethics: Have you introduced the important ethics aspects concerning the World Health Organisation?			
Etc.			