New Technologies and Education in Developing Countries

Assessing the application of multimedia to improve education in rural Niger and Burkina Faso

RESEARCH REPORT
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Jechiam Gural

Participants in this research project are Noterik & Doonder Multimedia, SNV (Netherlands Development Organisation) and IICD (International Institute for Communication and Development). A streaming multimedia presentation with respect to the project has been produced. The presentation visualises a number of research topics and is available at the following website: http://www.noterik.nl/nnd2/research/africa/

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ABSTRACT

Education in many West African countries is especially weak in rural areas, where teachers are deprived of up-to-date information and other basic educational resources. New satellite services, which were recently introduced in Niger, are paving the way for improvement of the educational infrastructure in isolated areas. As these wireless services become a reality, advanced content production techniques are required. In fact, content plays a key role in the adaptation and long-term success of these new information architectures. This study by Noterik & Doonder Multimedia for SNV and IICD examined the applicability of new multimedia technologies in the field of education in Niger and Burkina Faso.

Within the framework of our research project, we found a growing interest in the use of new technologies for educational programmes. We demonstrate that the use of audio-visual information in combination with the new XML standard SMIL can help to accelerate the production of attractive and inexpensive multimedia applications. We also point out that educational material can be stored in television and radio archives. The conversion of these archives into digital formats will help develop an inexpensive educational content library, suitable for computers as well as for radio and TV.

Niger is, interestingly, one of the first countries in the world to integrate novel satellite services with rural radio projects, giving rise to cost efficient information architectures in isolated areas.[1] These developments are promoted by RANET, a coalition of organisations that attempts to create awareness of the use of community radio and the Internet in the region. We believe that a pilot project should be conducted in collaboration with RANET to elucidate the conditions under which new technologies can be productive in educational programmes in West Africa and further strengthen the coalition that has been formed around RANET.

The information architecture emerging in West Africa (Niger) is illustrated and described in figure 1. The new satellite services can provide a good basis for sharing valuable content and promoting collaborations in ICT and education in different developing countries.

[1] *Niger is one of the poorest countries in the world according to its ranking in the UNDP Human Development Annual Report 2000.*

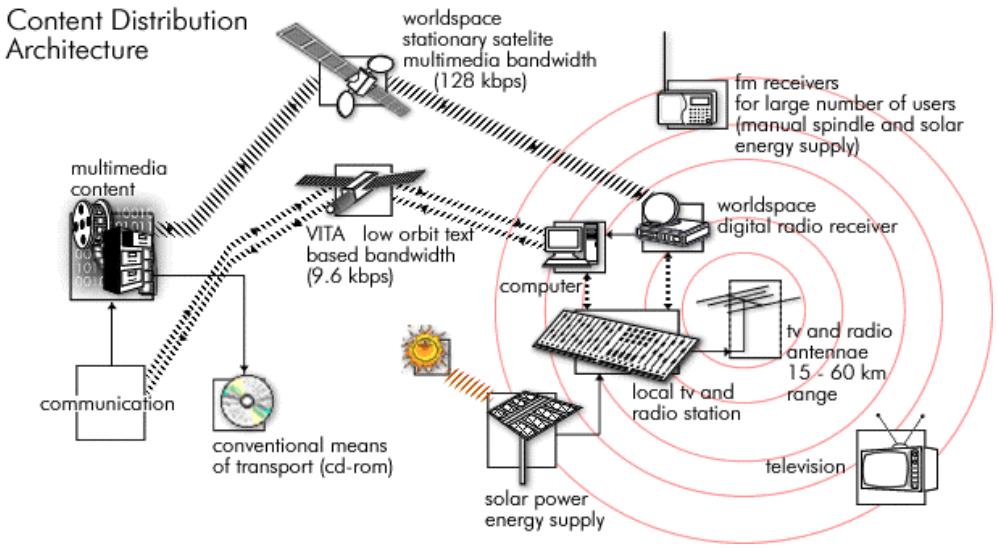

Figure 1: Content distribution architecture

This figure illustrates the currently available architecture for distributing content over satellite networks in West Africa (note; currently only radio broadcasts are supported). The media is delivered at high speeds (128 kbps) through the WorldSpace Direct Media Service (DMS) to the WorldSpace digital audio receiver. The receiver transmits the data to a computer and enables radio operators to access up-to-date information and produce more appealing educational radio programmes. The range of the broadcast varies between the 15 and 60 km, depending on the topography of the area and the transmitter capacity. Radio programmes in local languages can be received through windup-solar radios.

The VITAsat enables two-way Internet communications through e-mail at a bit-rate of 9,6 kbps. With the aid of VITAsat, programme producers can form a virtual network and share valuable knowledge. Power supply is provided by solar energy, which is becoming common in many rural areas. Note that local TV broadcast could be accomplished in a manner similar to the manner in which radio is transmitted. The multimedia programmes can be ported to a television receiver using low cost computer equipment (such as the Matrox G450 dual head).

INTRODUCTION AND OBJECTIVES

While the capacity to distribute and view digital information is increasing each year, the cost for the use of new ICT services is rapidly decreasing. This ongoing process is likely to result in many inexpensive digital communication systems, which may be available for a large number of people in developing countries in the near future (5 to 15 years).

However, the absence of infrastructure in many developing countries makes communication and distribution of information a difficult task. It can take days of rough travel to reach schools in rural areas. Education in these places is poor and often not available at all. Consequently, illiteracy rates are extremely high in West Africa.

Teachers working in isolated schools have no access to additional training or means of communicating with colleagues. Providing new communication and information services will help them to perform their educational task and improve the distribution of up-to-date information into rural communities.

This study emerged from discussions by SNV (Netherlands Development Organisation), IICD (International Institute for Communication and Development), and Noterik & Doonder Multimedia. It reports on a feasibility study on the applicability of multimedia technologies in the field of education in Niger and Burkina Faso. The plan for the research was triggered by recent developments in the field of satellite technologies.

SNV and IICD intend to improve the conditions of rural community schools as part of the ongoing battle against poverty. SNV does so for example by implementing communication infrastructure in rural areas with the help of community radios ('radio communitaire'). These stations distribute valuable information such as weather forecast, farming news and health issues in local languages.[2] Novel satellite services can support these conventional radio architectures by providing inexpensive channels for the delivery of multimedia content. However, the production of appealing multimedia content requires certain skills and technologies, which until now were fairly complicated and expensive. The Internet based multimedia standard SMIL (Synchronised Multimedia Integration Language, pronounced as 'smile') provides new ways to accelerate the integration of video, audio, images and other - rich - media into one appealing application. See appendix V and VI for more information with respect to a multimedia production checklist and SMIL. In our research, we evaluated the applicability of SMIL for developing educational multimedia programmes in Niger and Burkina Faso.

[2] *The official language in many West African countries is often not mastered in rural areas.*

The following topics were addressed within the framework of this research project:

- Interest in applying new multimedia technologies for educational purpose (SMIL/Realnet works);
- Interest in participating in pilot projects in this field;
- Skill level to adopt new multimedia technologies;
- Possible distribution channels for multimedia content;
- Ability to develop multimedia and educational content;
- Costs for implementing an ICT based educational platform;
- Identifying partners for this platform;
- Sharing of digital educational information and related political issues in West Africa.

RESEARCH ACTIVITIES

The research project encompassed the following activities:

Content Creation: SMIL and Realnetworks

Noterik & Doonder Multimedia produced a basic educational SMIL example. The example was demonstrated and its production procedures were explained to various people in Burkina Faso and Niger. The application was also discussed with multimedia producers and users in the Netherlands, including representatives from Kennisnet, one of the major ICT and education platforms in the Netherlands and APS, a Dutch organisation for the development of educational material.

New Satellite and Radio Applications

Information about new wireless technologies was reviewed and interviews with people working in the field were conducted.

Visiting City and Rural Schools

Primary and secondary schools were visited in Ouagadougou (the capital of Burkina Faso) and rural schools in Niger. Teachers were interviewed and several lectures were attended.

Level of Skill

Courses were given to a number of computer experts at the university of Ouagadougou and ICT representatives from NGOs (Non Governmental Organisations) at SNV in Niger.

Meetings with Educational, Scientific and Development Organisations

Meetings with representatives from a number of educational organisations and NGOs took place, including the ICT department at Ouagadougou university, the Dutch Embassy, Plan International, Aide & Action, INDRAP, ACMAD and UNDP.

Costs

Prices of the hardware and associated services have been described.

RESULTS

Content Creation: SMIL & Realnetworks

SMIL is a new language to describe interactive synchronised multimedia distributed on the Web. It is an easy-to-author XML-compliant (Extensible Markup Language) format similar in syntax to HTML (Hyper Text Markup Language). SMIL 1.0 became an official W3C recommendation in 1998, see also http://www.w3.org/TR/REC-smil.

SMIL provides Web users with:

- Easily-defined basic timing relationships;
- Fine-tuned synchronisation;
- Spatial layout;
- Direct inclusion of non-text and non-image media (rich media);
- Hyperlink support for time-based media;
- Adaptiveness to varying user and system characteristics.

At present Realnetworks provides the best support for SMIL applications. The company started its media services in 1995 and has gained a large number of users. Its new RealSystem iQ supports the delivery of 45 media types, including Flash 4, MP3 and the MPEG video format. The real player is available for Windows, Mac and Unix/Linux platforms. Additional important features of the real system are:

- Support for 12 operating systems;
- Extensible, modular architecture allowing for enhancements;
- QuickTime interoperability;
- High quality compression available through RealAudio 8 and RealVideo 8.

Product Line and Production Guides

Real's basic product line is free and includes encoding, serving and media player software. Real's website provides extensive support, tutorials and courses for creating streaming multimedia applications. The company has a software donation programme for non-profit projects. See for more information http://www.realnetworks.com

Tools

SMIL applications can be coded in text or by using specific production tools. See for an overview of the available tools: http://smw.internet.com/smil/tools/

Storage of Audio-Visual Information

Compression technologies are improving rapidly (see also competitive platforms below), allowing the storage of large amounts of information in relatively small files. The quality of compressed audio and video depends on the media source, the compression's bit-rate and the hardware/software in use. The following table includes some examples typical for Realvideo 8 compression.

Video type	Bit-rate [3]	Quality	Storage on 1 CD-rom
Newscast	100 kbps to 250 kbps	>>VHS	5 to 10 hours
Normal motion	450 kbps	VHS	2.5 hours

Typical modem bandwidths (speeds):
28k8 modem (about 20 kbps)
Cable and DSL modems (250 kbps and higher)

Competitive Solutions

The current Quicktime player (4.0) has limited support for SMIL. Microsoft is implementing SMIL in its new browsers (version 5.5 and 6) under the name HTML+TIME. Microsoft recently claimed its new Microsoft® Windows Media™ Video 8 compression technology can deliver near-VHS Quality at 250kbps and near-DVD quality at 500kbps. Microsoft Windows Media Tools (7) were introduced this year. These tools also support also the advanced production of synchronised media.

http://www.microsoft.com/windows/windowsmedia/en/default.asp

http://developer.apple.com/quicktime/

Evaluation

The SMIL development environment was positively evaluated both by Dutch multimedia producers and ICT experts in Burkina Faso / Niger. SMIL's open and Internet based architecture accommodates accelerated production of multimedia presentations. SMIL applications can be delivered to a wide range of computer platforms and devices, including analogue TV and radio receivers. The production process does not require expensive software, hardware or very high levels of skill. Note that PowerPoint can also be used for producing less complicated, but nevertheless effective, multimedia presentations.

Requirements for playing video on a computer:

Pentium II or equivalent

4 Mb graphic memory card

64 Mb system memory, (recommended 128 MB or higher

[3] *Bit-rate: the number of bits that are transferred per second. 10kbps corresponds to a data transmission rate of 10000 bits per second.*

New Satellite and Radio Services

Satellite systems are becoming common carriers for Internet traffic, particularly in areas were conventional telecom infrastructure is poor or absent. Prices for the use of satellite systems have dropped considerably in recent years, paving the way for Internet access in undeveloped areas.

WorldSpace

Broadband digital broadcasting (one-way information service)

WorldSpace has launched two satellites to date: AfriStar and AsiaStar. AmeriStar, serving Latin America and the Caribbean will be launched within a year. The satellites provide Asia and Africa (including parts of Europe) with digital radio broadcast. In addition, WorldSpace Direct Media Service (DMS) delivers Internet and multimedia content to digital radio receivers.

Five percent of the total capacity of WorldSpace is reserved for non-profit initiatives in developing countries. The WorldSpace foundation (WSF), a publicly supported non-profit organisation headquartered in Washington, DC, USA, manages this programme. The foundation's mission is to help improve the lives of disadvantaged persons in developing regions of the world by providing access to education and other information broadcast directly to radios from satellites. WSF is referring to its data service as the WorldSpace Foundation Multimedia Service. The foundation's multimedia service in Africa runs at 64 kbps - allowing for about 600 MB of content to be downloaded per day. The new receivers will transfer data at speeds up to 128 kbps, (about 50 Mb/hour). The current transfer protocol limits however data transfer to 3 Mb per file, too small for most multimedia applications. A new protocol has been developed to enable the transmission of large files, suitable for the delivery of multimedia content (50 Mb to 100 Mb). The protocol is expected to be available for testing in June 2001.

See for more information:

http://www.worldspace.com

http://www.worldspace.org

VITA

Low band e-mail services (two-way information service)

VITA (Volunteers in Technical Assistance) helps developing countries by providing access to information and knowledge, strengthening local institutions and introducing improved technologies. Its particular focus is on support to entrepreneurs in the private, public and community sectors and on facilitating connectivity and technical information exchange between and among individuals and organisations. In 2001, VITA brought two HS-2 satellites into orbit. In 2003 one more satellite is expected to be operational. VITAsat supports two-way communication at 9.6 kbps, enabling e-mail exchange on a global scale. The low orbiting satellites will allow e-mail exchange to take place for about 8 to 9 times a day (approximately 10 minutes per session). The transfer capacity is expected to be restricted to 50kb/station/day, corresponding to 25 to 35 pages of text. VITA expects to distribute at least 2000 stations within the next two years.

VSAT

Broadband Internet services (two-way information services)

VSAT, or Very Small Aperture Terminal, is a sophisticated communication technology that supports the use of small fixed satellite antennas in providing highly reliable communication between a central hub and large numbers of geographically dispersed sites. VSATs are taking on an expanding role in a variety of interactive, on-line data, voice and multimedia applications. In the United States a VSAT system is now purchased for less than US $ 200 making this kind of technology available to a large public. However, the service requires an additional monthly subscription fee of at least US $ 70. Additional charges relate to the amount of Internet traffic generated. Such large-scale public services have not yet been reported in developing countries. However, Gilat, a VSAT company, has announced that Ethiopia will be implementing distance learning over its existing rural telephony VSAT network in order to provide enhanced teacher training around the country. The company has also introduced a ground terminal for receiving and transmitting information at high speeds, typically suitable for conditions in developing countries. The terminal is priced at US $ 3,000. The expenses for a central hub system, providing the network connectivity, are about a 1,000,000 US $. See appendix (II) for related links.

Solar Power Supply

Power supply in rural areas is now often provided by solar energy. The use of solar panels is becoming more popular, as prices for solar cells decrease (see also costs section). We have demonstrated a new mobile mono crystalline solar panel, which can charge a laptop battery within six hours, see figure below. For more information on solar energy projects see:

http://www.ttcorp.com/upvg/

http://www.upvg.org/upvg/record/topindex.htm

Figure 2: Mobile solar panels suitcase: single units beginning at US $ 400.

Visiting City and Rural Schools

In Niger many community schools have been set up with the help of SNV. These are often located in remote and isolated areas. Teachers operating in these schools pointed out that the lack of information and communication possibilities is limiting their educational ability. They often do not have additional training programmes and meetings with other teachers in the area are also rare. As far as we could estimate the conditions in city schools are far better.

Level of Skill

The number of computer and multimedia experts in Burkina Faso and Niger is low. However, over the last years notable progress has been made in the use of ICT. Take for example the progress at the University of Ouagadougou where one computer was available in 1997 in contrast to one hundred in 2001. These computers were connected via a wireless network (Intranet) and are used for many Internet related courses. See the appendix for more information with respect to ICT developments in Ouagadougou. In Niger a number of computer experts are operating on behalf of NGOs, such as ACMAD, SNV, Plan International and the private company Gamma Informatique. These experts have formed a NTIC committee (New Information and Communication Technologies Committee) to support ICT initiatives in the region.

Meetings with Educational, Scientific and Development Organisations

ICT projects can help bring together somewhat unrelated organisations into a strong coalition and improve the collaboration between countries in West Africa with regard to education. There is a growing interest within educational, scientific and development organisations to use new technologies for improving the educational infrastructure in rural areas. The satellite services provide new opportunities for inter-regional collaboration in the field of ICT and education in West Africa. Typical regional topics of interest are: environmental issues, peace programmes, human rights, democracy, health, agriculture, and population and family issues.

Ongoing Projects

Ranet

In Niger a variety of partners from development, government, international and other public and private operators have come together under the name of RANET (Radio and Internet for communication of Hydro-Meteorological and Climate-Related Material). The activity started in 1997 and was headed by ACMAD (the African Centre of Meteorological Applications for Development). RANET promoted the use of ICT in the region by introducing FreePlay™, wind-up and solar (no batteries) radios, WorldSpace digital audio receivers and the VITA e-mail satellite service.

RANET plans to integrate new satellite services, which have recently been introduced into some rural areas, with community radio. The radio signals can be received within a radius of 15 to 60 km, enabling farmers for example to receive to important weather forecasts or up-to-date information about grain prices. Providing the station operators with access to advanced information channels, such as WorldSpace and VITA, can ensure the durability of these radio projects and provide a better basis for delivering educational information.

More information about RANET is available at http://www.ranet2000.org/

World Links

World Links connects and trains teachers and children in developing countries to improve education and employment opportunities. Six schools in Ouagadougou will soon be selected to participate in a World Links programme. Ten computers within each school will be connected to the Internet via Pentium I PC's, and a Linux server (second hand computers)

See also: http://www.world-links.org/

Costs

Costs (Hardware in US $, including VAT)	
Basic Multimedia Studio	
Pentium class system	$ 1,500
DV camera	$ 700
Digital photo camera	$ 400
Storage	
CD (650 Mb)	$ 0.5
Hard disk (20 Gb)	$ 120
Computers (clients)	
Desktop	$ 1,000
Laptop	$ 1,400
Solar energy stations	
Low energy station	$ 400
High energy station	$ 3,000
Community Radio & TV	
Radio station, including training and power supply (Wantok Enterprise)	$ 13,000
Second hand TV transmitters, 350 Watt	$ 4,000
Second hand TV transmitters, Kilo Watt	$ 12,000
FreePlay ™ (Wind-up and solar, no batteries radios)	$ 50
Satellite	
WorldSpace	
WorldSpace receiver	$ 90
Adapter/modem	$ 130
Receiver DMS fee /month	$ 10

WorldSpace Foundation Channel Service (Minimal contribution per year)	$ 10,000
VITAsat	
Ground station (Assembled by Wavix)	$ 2,500
Additional annual charge per station	$ 500

Depending on the final architecture a fully operational infrastructure for an advanced communication centre will cost between the US $ 15,000 and US $ 30,000.

REVIEW AND CONCLUSIONS

In Niger (NGOs) and in Burkina Faso (University of Ouagadougou) there is a growing interest in using new satellite and multimedia technologies for educational programmes, particularly in rural areas. The recent introduction of WorldSpace digital media services (DMS) and VITAsat email exchange services demonstrate that a relatively inexpensive communication network is applicable in these areas. RANET is integrating these developments with community radio stations, giving rise to a cost efficient information architecture.

The use of multimedia content offers interesting opportunities to augment community radios with TV broadcasts. Digital content can easily be converted to TV with reasonable quality, for example using the Matrox dual head G450 graphic card (US $ 150). Second hand TV transmitters (350 W, 15 KM range) can be purchased for US $ 4,000 and many electronic companies have small portable TV receivers available these days. New developments in the field of home entertainment, such as reported by Nokia, Realnetworks and Sony, will provide alternatives for PC's and boost up the delivery of streaming media into user-friendly devices.

Content

As these new services become available, the demand for multimedia content increases. Training programmes and adequate content creation and delivery procedures play a key role in the adaptation and long-term success of these architectures. We have noted that the use of audio-visual information can help accelerate the production of attractive applications. Programmes can vary from basic video presentations to advanced rich media applications based on SMIL or less complicated software such as PowerPoint. Taping valuable courses and skilful instructors can help accelerate the aggregation of interesting content, as well as the digital conversion of audio-visual archives. We have spotted one audio-visual archive at INDRAP (Niger) and expect more valuable archives to exist at other institutions, such as TV and radio stations. The commercial production of educational programmes becomes interesting as more users from different countries obtain access to the network. NGOs and private - computer - companies must be aware of these opportunities.

Multimedia content will help operators of community (radio- and tele-centres) to produce more up to date and attractive radio programmes, including educational items in local languages. A more dynamic and informative environment is likely to improve working conditions at the radio stations and help ensure their long-term success. These conclusions apply to teachers in isolated areas as well. Access to an educational network will make their job more interesting and effective

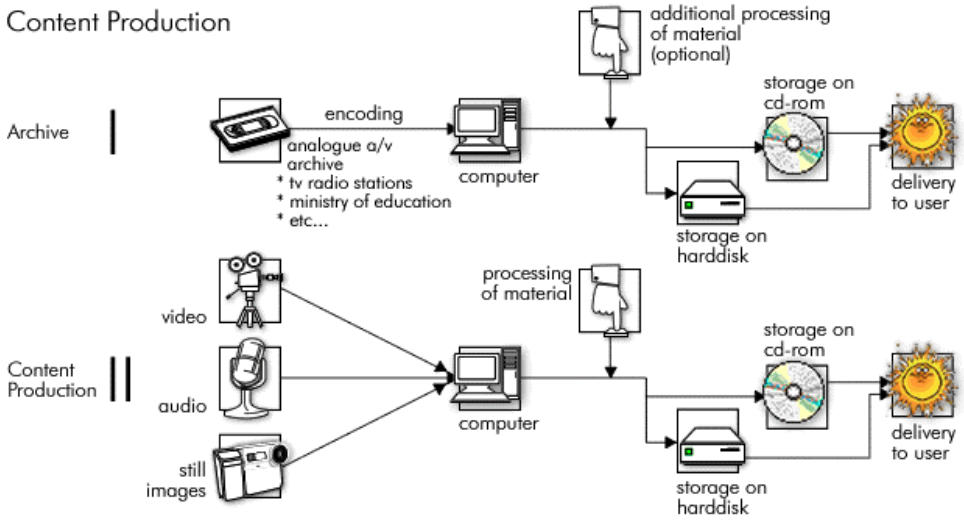

Figure 3: Accumulating content

Conversion of audio-visual archives can help accelerate the realisation of a digital content library (I). The content library should be expanded by new multimedia productions. A training programme will help a number of local computer and video experts to acquire the needed skills. These students can form an expert multimedia group, which will support the ongoing multimedia development in the area (II).

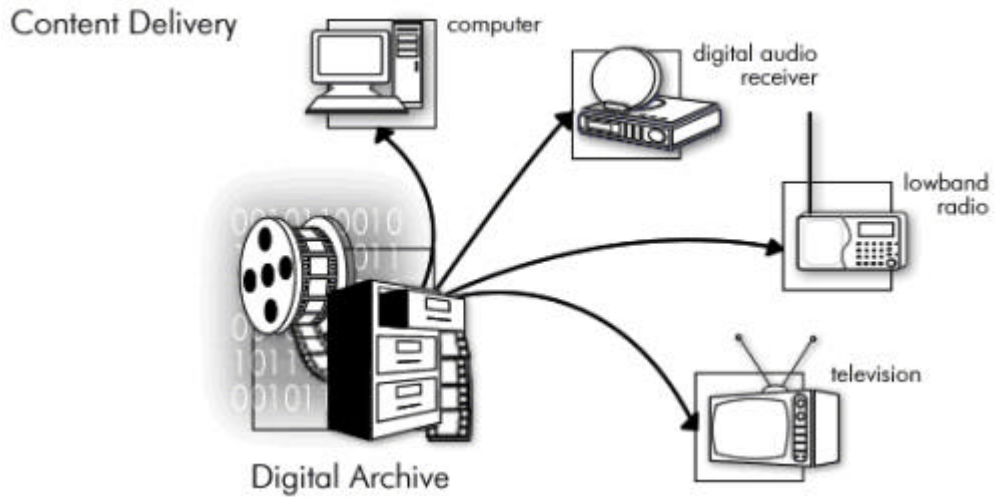

Figure 4: Content delivery

Digital content can be ported – by analogue conversion – to various devices including TV and radio. Second hand TV transmitters can be purchased from US $ 4,000, enabling people within a radius of 15 KM from the transmitter to receive the information. An easy and inexpensive conversion from multimedia applications to TV signals is available for example through the MATROX dual head G450 graphic card (US $ 150).

Conditions

Two-way communication services play a central role in building up a virtual network. They provide the means of interacting with different community members and monitor processes within the community. In this respect WorldSpace and VITAsat are complementary, offering an adequate information exchange and media delivery system.

The implementation of computer systems in rural areas is not trivial. Extremely hot and wet periods alternate and computer skills in these areas are rare. Nevertheless, appropriate hardware and software configuration in combination with basic instructions and trouble shooting procedures can result in a reliable operation of services. Interestingly, in some cases support could be provided through the available communication system.

Pilot Programme

This report outlines a number of issues, which must be addressed before starting a pilot programme to be developed on the basis of the following criteria: goals, information architecture and project organisation.

Goals

Primary goal: development of new ICT solutions for community radio stations, that will enhance - radio - programme quality and education services *for a large number of people* in rural areas, and investigation of the possibilities of setting up a local TV broadcast using these new media solutions. These centres can develop into local training centres (high-end solution ranging from US $ 15,000 to US $ 30.000 for hardware implementation per station).

Secondary goal: extending the available architecture to teachers in the area of a community radio / TV centre. Testing the possibilities of training teachers (primary education) to work with multimedia applications on a computer (low-end solution using the WorldSpace receiver, solar panels and a computer, (price will be near the $ 2,500 per station). For practical reasons (knowledge sharing, support, etc) the teacher's residence place must be in the vicinity of the tele-centre (<< 20km).

Project Organisation

A number of organisations are involved in the developments described in this report, including: ACMAD / RANET, SNV, IICD, WorldSpace, VITA and Noterik & Doonder Multimedia. The responsibility and tasks should be outlined in detail, for example with respect to finance, training, coaching and project management. Further discussions within the framework of RANET should take place.

Costs

A cost calculation must be drawn up on the basis of the final project definition (hardware, training, management, research, etc). The costs for delivering the media through WorldSpace need to be discussed with WorldSpace Foundation. A list of organisations that can finance the project needs to be prepared, so that the project proposal can be presented to them. Depending on the scale of the pilot project we have made the following rough estimate of costs:

		single location	**multiple locations**
High-end infrastructure & hardware	$30,000	*3 locations	$ 90,000
Low-end infrastructure	$2,500	*6 locations	$15,000
Content production & training	$25,000		$ 30,000
Content delivery (WorldSpace)	$10,000		$10,000
Overhead (20%)	$13,500		$29,000
Total (US)	$ 81,000		$174,000

Content and Training

We have outlined in this report a number of ways of obtaining multimedia content (production and conversion of audio-visual archives). An important part of the pilot project is a multimedia-training programme for computer and AV-experts. The training programme should lead to a local group of multimedia experts who can support ongoing developments in the field of multimedia production. The training programme should be conducted in collaboration with training colleges (for teachers) and other pedagogic institutes (such as INDRAP).

If local TV broadcast is included into the pilot then a basic multimedia course should be proposed to the operators of the tele-centre (radio / TV station). This will allow the operators to produce simple multimedia programmes on the computer for local television broadcasts (for example by adding slides shows to radio programmes and porting these to a TV transmitter). Involvement of teachers within rural radio productions needs to be stimulated. Noterik & Doonder Multimedia can help set up such a programme and coach the participants.

Virtual Network and Commercial Exploitation

The new communication infrastructure will help in the development of a virtual network. A programme should be designed to promote the collaboration between different tele-centre and catalyse the coalitions in the field of education, information and multimedia production. The commercial exploitation of the new telecom infrastructure needs also to be addressed in more detail (e.g. electronic post office, electronic training centre, etc).

Selection

Since the human factor is crucial for the success of these types of projects a thorough selection of qualified tele-centre operators and teachers need to be conducted prior to project implementation. We propose a pilot programme for 1 to 3 tele-centres (high-end infrastructure), with 1 to 3 teacher specific programmes per tele-centre (low-end infrastructure), depending on the available financial resources.

APPENDIX I: ORGANISATIONS

ACMAD - African Centre of Meteorological Applications for Development

ACMAD (the African Centre of Meteorological Applications for Development, a WMO/UNECA Sponsored Institution and partner from the University of Oklahoma. ACMAD is located at Niamey in Niger. Its objective is to contribute to the durable development of the various socio-economic sectors of the African continent through its fields of investigation. Its principal activities are weather forecasts, and the training of the African meteorologists to new techniques and technologies. ACMAD is composed of 53 Member States, the 53 countries of the continent 'Africa'. To ensure its mission, ACMAD functions primarily with detached meteorologists of its Member States.

Contact:	Mohammed Sadek Boulaya (general manager)
Web:	http://www.acmad.ne
e-mail:	acmadem@acmad.ne

ANDDH - Human Rights Organisation Closely Involved in Community Radios (Niger)

Contact:	Soumana Kambeï dou
Web:	http://www.acmad.ne
e-mail:	anddh@internet.ne

ICT Department Ouagadougou University (Burkina Faso)

Contact:	Hamidou Touré, Oumarou Sie (deputy director and tutor respectively at the department for ICT)
Web:	http://www.univ-ouaga.bf
e-mail:	toureh@univ-ouaga.bf, sie@univ-ouaga.bf

IICD

The International Institute for Communication and Development (IICD) assists developing countries to utilise the opportunities offered by information and communication technologies (ICTs) towards realising locally-owned sustainable development. The institute has its background in Europe. The Netherlands Minister for Development Co-operation established it as an independent foundation in 1997.

Contact:	Tjalling Vonk
Web:	http://www.iicd.org/
e-mail:	tvonk@iicd.org

INDRAP- Institution National Document Research Animation Pedagogic (NIGER)

INDRAP is in charge for developing educational material for primary and secondary schools.

Contact:	Boulama Boukar (deputy director)
Web:	http://www.issco.unige.ch/staff/andrei/formRIFAL2000/textes/htm_zarma/zarma_lexique_math_1.htm
e-mail:	Indrap@intnet.ne

Noterik & Doonder Multimedia

Noterik & Doonder Multimedia is a full service consultancy- and production agency for Internet and Multimedia projects. The company is based in Amsterdam, The Netherlands and accommodates a unit that specializes in rich media applications and broadband developments. The company operates often on behalf of non-profit organisations.

Contact:	Jechiam Gural (consultant)
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e-mail:	gural@noterik.nl

RANET

RANET is a co-operative effort of many national to international organisations that have come together to provide resources and technical expertise in order to improve access to climate and weather related information throughout Africa by developing a distributed network. Proceeding: http://www.ranet2000.org/flyeren.pdf

Contact:	Mohammed Sadek Boulaya (general manager ACMAD)
Web:	http://www.ranet2000.org/
e-mail:	acmadem@acmad.ne

REFSAD - Reseau Africain de Formation a Distance

The French organisation Resafad operates through multimedia centres located in the capitals of the country-partners, which are Burkina Faso, Guinea, Mali, Togo since 1997, Benin starting January 1999, and in a short term, Madagascar and Senegal. A co-ordination centre is established in Paris in the premises of ADPF. These centres are interconnected via the Internet, forming an African on-line training network that trains local executives in the use of new technologies for educational processes.

Contact:	Tierry Lairez (senior consultant)
Web:	http://www.bf.resafad.org/
e-mail:	Tierry_lairez@liptinfo.bf

SNV

SNV is a Netherlands development organisation that flexibly mobilises expertise in marginal areas of Africa, Asia, Latin America and Eastern Europe. SNV develops and shares knowledge and skills with local organisations with the aim of better equipping them for their work in structurally alleviating the poverty of both men and women.

Contact:	Hans van Oosten, Dambadji Adamou (director SNV Niger, from September 2001 director SNV Cameroon and ICT consultant SNV Niger respectively)
Web:	http://www.snv.nl, http://www.snv.ne
e-mail:	hans.oosten@snv.ne, dambadji@snv.ne

UNDP

UNDP is the development arm of the United Nations. It works to reduce poverty in Least Developed Countries through a variety of innovative approaches in both local governance and micro-finance initiatives. The UNDP supports community radio programmes in Niger.

Contact person:	Djilali Benamrane (deputy director)
Web:	http://www.undp.org
e-mail:	djilali.benamrane@undp.org

VITA

For over four decades VITA has empowered the poor in developing countries by providing access to information and knowledge, strengthening local institutions and introducing improved technologies. Its particular focus is on support to entrepreneurs in the private, public and community sectors and on facilitating connectivity and technical information exchange between and among individuals and organizations.

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e-mail:	garyg@vita.org

World Links

World Links connects and trains teachers and kids in developing countries to improve education and employment opportunities. E-Learning and the Internet are the tools to make this happen. World Links combines three key components to realise its goals, designed to have the greatest demonstration and multiplier effect:

Contact:	Cheick Kante (region manager)
Web:	http://www.world-links.org/english/html/
e-mail:	info@world-links.org

WorldSpace

The WorldSpace mission is to create information affluence by using new audio technology to deliver programming to the three-quarters of the world's population that today lacks adequate radio reception and programme choice, and that desires, deserves and demands news, knowledge and entertainment of the highest quality at an affordable cost."

Contact:	Ahmed Kassam, Bade Faye, Jerome Soumagne (manger DMS for Africa, sales manager and system manger respectively)
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	bfaye@WorldSpace.com
	jsoumagne@WorldSpace.com

WorldSpace Foundation

WorldSpace Foundation is a publicly supported 501(c)(3) non-profit organization headquartered in Washington, DC, USA. Our mission is to help improve the lives of disadvantaged persons in developing regions of the world by providing access to education and other information broadcast directly to radios from satellites.

Contact:	Lisa Slifer (deputy director), Kelly Sponberg (technical manager)
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APPENDIX II: RELATED LINKS

Radio & TV Products

http://www.wantokent.com
http://www.codan.com.au
http://www.ccc-can.com
http://www.freeplay.net

SMIL

http://www.realnetworks.com
http://smw.internet.com/smil/tools
http://www.streamingmedia.com
http://www.w3.org/TR/REC-smil

Solar Energy

http://www.ttcorp.com/upvg/
http://www.upvg.org/upvg/record/topindex.htm
http://www.solarenergy.com/

VITA

http://www.vita.org
http://ww.wavix.com

VSAT

http://www.gilat.com
http://www.web-sat.com
http://www.tiscat.com
http://www.spaceway.com
http://www.skybridgesatellite.com
http://www.astro-link.com
http://www.teledisc.com
http://www.gvf.com
http://www.cyberstar.com
http://www.ses-astra.com

WorldSpace

http://www.worldspace.com
http://www.worldspace.org

APPENDIX III:
ICT DEVELOPMENTS IN OUAGADOUGOU UNIVERSITY

1997 1 computer in the university campus

2000 12 schools in Ouagadougou participate in a project sponsored by OXFAM to connect schools located at the same GMT region (marking the millennium change). The project was not considered a success. The teachers were not well trained and found it difficult to work with Internet.

2001 100 computers in the campus, including a 2 MB wireless network, connected to an ISP with a 64 KB line, which makes the connection to the Internet to slow. Network specifications: Linux, Win NT, NOVEL and PC's (win 98).

Seventy people graduate from the first multimedia course in Ouagadougou University. However, the programme took twice as much time then was estimated. It was set up in cooperation with a French University (Mons) and based on a project called Webcity. At the end of 2001 about 100 persons in Ouagadougou are expected to complete a webcourse, which will enable them to create and manage basic websites. The first course appeared to be too complex and lasted for almost a year. In May 2001 a new course for 60 students is scheduled. Ministries currently employ most of the students.

2001 September 2001, Worldlinks programme (Financed by World Bank). Six schools in Ouagadougou will be selected and connected to the Internet. Infrastructure is based on second hand Pentium I pc's, including one Linux server. Ten computers and one server will be provided for each school. There seems to be some problems regarding the selection of schools by the ministry.

2002 There is a collaborative programme scheduled with the university of Groningen (NL), (sponsored by NUFFIC) to set up an Intranet system for Ouagadougou university which will help develop virtual courses for the students.

APPENDIX IV: RICH AND STREAMING MEDIA

'Streaming media' refers to listening to or viewing digital media – mainly audio or video – on your computer in real-time as it comes across the network. In the past, one had to wait up to an hour to hear or see a few minutes of downloaded audio and video. But with streaming media one can view content and information within a few seconds anything from an ordinary telephone line to a broadband connection or office LAN.

The Difference Between 'Download-and-Play' Versus 'Real-Time' Streaming

Experiencing Internet media via the download-and-play method means exactly that your computer downloads a compressed media file, such as MP3, from the Internet to your hard drive. Once that file has downloaded completely, the media starts to play. With real-time streaming, on the other hand, the media is broadcast directly to your computer from a server and played back as the information is received from the server. HTTP Streaming (download-and-play), also known as progressive streaming. This method takes a compressed media file and downloads it to your computer's hard drive before playback using any Web server such as Apache, Roxen, Microsoft Internet Information Server or Netscape. Real Time Streaming Real-time streaming is broadcast to your computer directly from a server and played back as the information is received from the server, without waiting for the file to download. Real-time servers include the RealSystem Server, Windows Media Streaming Server and QuickTime's Darwin streaming server.

Requirements for Streaming

To stream media via the Internet one first needs some 'content', such as audio or video, images, text or animation. Then this content must to be converted into a digital format (e.g. avi for video or .wav for audio) using a capture card. Next it must be compressed with an encoder so it can travel efficiently over the network.

Important Elements in Streaming Media

Capture Card: This is a special piece of hardware, such as the Osprey 100, or Wintv go, installed on a computer that can translate video and audio input from a video source, such as a camcorder (digital video camera), into digital format and write it to the hard disk in a number of formats, some of which can be compressed and streamed. A sound card is usually sufficient for converting the signal from an audio source (like a microphone or tape recorder) into a compressed file for streaming or download.

Encoder: High-quality audio and video files can be very large. In order for the data to stream efficiently over the Internet to a range of targeted bandwidths, they must be compressed into small information packets. This compression is done with encoding software, often called an 'encoder', such as RealSystem Producer or Windows media tools.

Server: A Server can refer to both hardware and software. A server is a computer (hardware) that contains the files (sometimes called "content") to be delivered. This server also houses the technology (software) to deliver these files over a network such as the Internet.

Player: A player is any software application-such as RealPlayer or Windows Media Player-that receives streaming (digital) media from a Web or intranet server, decodes it and plays it back on your computer.

What Kind of Files can be Streamed?

The streaming server software determines the types of digital media-such as WAV or AVI files-it can stream. RealSystem Server can stream over 45 different data types, mainly different formats of video and audio:

Video Content RealVideo, AVI, QuickTime

Audio Content RealAudio, WAV, AU, MPEG-1, MPEG-2, MP3

Others RealPix, RealText, GIF, PNG, JPEG, SMIL, Flash

Broadband Versus Narrowband

'Broadband' and 'narrowband' are terms used to describe the type of connection you have to the Internet, based on your connection speed. Broadband usually refers to high-speed connections of 200Kbps or higher (such as DSL or cable-modem connections), and narrowband refers to connections of less than 200 Kbps (e.g., a regular dial-up modem using your phone line).

What are Codecs?

Whenever you encode some content, you're utilising a codec. 'Codec' is an abbreviation for compression/decompression. A codec can be either a software application or a piece of hardware that processes media through complex algorithms, which compress the file for streaming and then decompress it for playback. Unlike other kinds of file-compression packages that require you to decompress a file before viewing or listening, codecs decompress the media on-the-fly, so your audience can view or listen to a file from its original compressed format. Your audience sees your content immediately with minimal loss of quality from the original.

Making Streaming Presentations More Dynamic

Using a technology called SMIL (Synchronised Multimedia Integration Language, a W3C standard for Web media) you can combine different media types-audio, video, text, still images, Flash, etc. in the order you want them to appear, and place them where you want them to appear in your player. It is one thing to simply show a video on the Web, but more effective when you can create a fully interactive presentation featuring multiple media types.

Tip: Whenever you begin creating your source material (recording sound, shooting video, etc.), keep in mind that it will be encoded for the Internet and proceed accordingly. Avoid things like busy backgrounds, lots of fast action or very loud volume settings.

APPENDIX V: MULTIMEDIA PRODUCTION CHECKLIST

The production of multimedia requires a number of important conditions:

A Hardware
B Software
C Training
D Internet connectivity, support, knowledge sharing
E Translation software
F Media transport

A: Hardware

Multimedia Computer, Minimal Configuration

Pentium III class system

256 MB RAM

20 GB Hard disk

Windows 98 SE / Win 2000

Video capture card, digital (Firewire) or analogue (for example: WinTv Go,

http://www.hauppage.com/)

Note: Multimedia applications demand an optimal configuration of the computer's operating system. The system should carry up to date video and audio drivers, allowing the best possible hardware and software performance.

Recorders

Digital photo camera

Digital video camera, Microphone

http://www.sony.com, http://www.canon.com, http://www.panasonic.com

B: Software

There are many tools for editing audio and video and producing multimedia. In this section a number of popular tools is listed, both for the home and professional market. The selection of the tools should be based on the producer's level of skill; home market tools for low levels of skill, professional tools for high levels of skill.

Multimedia Software

Home market tools

Ulead: http://www.ulead.com

Avid: http://www.avid.com

Pinnacle: http://www.pinnaclesys.com

Professional Tools

Premiere (video): http://www.adobe.com/products/premiere

Soundforge (audio): http://www.sonicfoundry.com

Cleaner: (streaming) http://www.terran.com

Photoshop (image) http://www.adobe.com

Fireworks and Dreamweaver (image and web) http://www.macromedia.com

Avid: http://www.avid.com

Pinnacle: http://www.pinnaclesys.com

SMIL tools

http://www.realnetworks.com/

http://smw.internet.com/smil/tools/

http://www.microsoft.com/windows/windowsmedia/en/

C: Training

Training is a key element in the successful production of multimedia applications. Students should understand and resolve the constraints inherent in the production of multimedia projects (online/streaming or offline/downloadable). A course should familiarize the student with real practices in multimedia, including the rules and new standards governing visual communication. The course should promote the development of a capacity to work methodically and precisely, to encourage the expansion of skills in order to apply the creative process to the resolution of problems by using on line resources.

Course Elements

- Introduction to Visual Language and Observation Drawing
- Introduction to Computer Graphic Design
- Visual Design and Esthetics for Multimedia
- Digitalisation and Digital Image Processing
- Interactive Multimedia Applications
- Digital Video & Audio Editing
- Digital Image Retouching for Multimedia
- Interactive Scriptwriting and Flowchart Design
- Integration of multimedia with web compliant technologies (Web pages)

D: Internet Connectivity, Support, Knowledge Sharing

Internet connectivity provides access to many useful on-line resources. Examples can be downloaded, support can be obtained through e-mail and knowledge bases, tutorials can be viewed, etc. Producers with basic multimedia skills will find the Internet an indispensable resource to increase their level of skill.

E: Translation Software

Many on-line resources are in English or in other languages that are not well mastered in developing countries. Translation software can help people in these countries to access valuable information resources.

For example: http://www.systransoft.com/

F: Media Transport

Multimedia information can be delivered in different ways:

1. Downloadable file: delivered by CD-ROM, DVD or broadband network such as WorldSpace. Note that CD-ROM recorders are common these days and that DVD recorders will be available for the mass market within a few years.
2. Streaming: delivered through a broadband network such as WorldSpace or VSAT.
3. Porting to TV. The media can be distributed in a conventional (non-interactive way) through television. Digital TV and setop-boxes may provide some additional possibilities in the future.

APPENDIX VI: SMILL

SMIL is a new language for describing interactive synchronised multimedia distributed on the Web. It is an easy-to-author XML-compliant (Extensible Markup Language) format similar in syntax to HTML (Hyper Text Markup Language). SMIL 1.0 became an official W3C recommendation in 1998, see also http://www.w3.org/TR/REC-smil

When your streaming presentation contains multiple clips — such as a slideshow and a video played together — you use Synchronised Multimedia Integration Language (SMIL) to coordinate the parts. Pronounced 'smile', SMIL is a simple but powerful markup language for specifying how and when clips play.

A SMIL file is not required to stream just one clip. But when you have multiple clips, SMIL's simple markup language specifies how and when the clips play. There are many advantages to using SMIL:

- Use clips in different locations
- Time and control a presentation
- Stream clips in multiple languages
- Reach viewers at multiple bandwidths
- Put together custom zed presentations

Creating a SMIL File

You can create a SMIL file using any text editor or word processor that can save output as plain text. If you are familiar with HTML markup, you will pick up SMIL quickly. In its simplest form, a SMIL file lists multiple clips played in sequence:

```
<smil>
<body>
<audio src=”audio/one.rm”/>
<audio src=”audio/two.rm”/>
<audio src=”audio/three.rm”/>
</body>
</smil>
```

Markup Start with <smil>and End with </smil> The SMIL markup must start with a <smil>tag and end with the </smil> closing tag. All other markup appears between these two tags:

```
<smil>
...all other SMIL markup...
</smil>
```

Body Section is required but header section is optional A SMIL file can include an optional header section defined by <head>and </head>tags. It requires a body section defined by <body>and </body>tags:

```
<smil>
<head>
...optional section with all header markup...
</head>
<body>
...required section with all body markup...
</body>
</smil>
```

Laying Out Multiple Clips

If your presentation plays only one clip at a time, you do not need to create a layout. Each clip automatically plays in the main RealPlayer window, the window resizing automatically for each new clip. If you want to keep the playback area the same size as successive clips play, or if your presentation displays several clips at a time, you need to define SMIL regions.

To Define SMIL Regions

In the SMIL file header, define the layout between `<layout>` and `</layout>` tags.

In the layout section, define a root-layout region that sets the overall size of the RealPlayer main window.

Define the sizes and locations of any number of named playback regions.

In the SMIL file body, use `region` attributes to assign source clips to the named playback regions.

A SMIL file that includes a layout therefore takes the following form:

```
<smil>
 <head>
  <layout>
   <root-layout      ...defines     the     overall     window     size...     />
   <region id="name1" ...defines a named playback region within root-layout...
/>
   <region id="name2" ...defines a named playback region within root-layout...
/>
    …
  </layout>
 </head>
 <body>
  <ref  src="..."  region="name1"  ...assigns  a  clip  to  a  region  by  name... />
  <ref  src="..."  region="name2"  ...assigns  a  clip  to  a  region  by  name... />
  …
 </body>
</smil>
```

IICD PROFILE

The International Institute for Communication and Development (IICD) assists developing countries to realise locally-owned sustainable development by harnessing the potential of information and communication technologies (ICTs). The driving force behind IICD activities is that local 'change agents' themselves identify and develop proposals for realistic ICT applications - local ownership forms the essential basis for sustainable socio-economic development.

Acting as a catalyst, IICD's three-pronged strategy is mainly delivered through a series of integrated Country Programmes.

First, IICD facilitates ICT Roundtable Processes in selected developing countries, where local stakeholders identify and formulate ICT-supported policies and projects based on local needs.

Second, working with training partners in each country, Capacity Development activities are organised to develop the skills and other capacities identified by the local partners.

Third, IICD draws on its global network to provide information and advice to its local partners, also fostering local information exchange networks on the use of ICTs for development. The best practices and lessons learned are documented and disseminated internationally through a Knowledge Sharing programme.

In support of these activities, IICD invests in the development of concrete partnerships with public, private and non profit organisations, thus mobilising knowledge and resources needed by IICD and its local partners.

Country Programmes are currently being implemented in Bolivia, Burkina Faso, Ghana, Jamaica, Mali, Tanzania, Uganda and Zambia.