The Importance of broadband services in lifelong learning in the rural areas

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Lifelong learning (definition from Wikipedia, in part)

- A topic much talked about, especially as a realisation of the dynamic needs in skills in today’s economies
  - **Formal learning**
    - typically concentrated in earlier stages of life
    - can no longer sustain an individual throughout their life.
  - **Lifelong learning**
    - "lifelong, lifewide, voluntary, and self-motivated" pursuit of knowledge for either personal or professional reasons.
      - enhances social inclusion, active citizenship and personal development and competitiveness
Lifelong learning (definition from Wikipedia, in part)

- Learning not confined to childhood or classroom, but takes place throughout life, from anywhere, and in a range of situations.

- Recent constant scientific and technological innovation and change had a substantial effect on learning needs and styles.
  - Learning can no longer be divided into
    - a place and time to acquire knowledge (school)
    - a place and time to apply the acquired knowledge (the workplace).
Lifelong learning

- Why is lifelong learning important?
  - Knowledge-based economy and society depend on innovative, well-educated, skilled and adaptable people.
  - Enables people to participate and prosper in this ever-changing knowledge-based economy and society.

  - Training and education for adults is even more important when we consider the changed employment market.
    - There is rarely a job for life now; most of us will need to change our jobs several times with a need to re-skill at each stage.
    - The need for a commitment to lifelong learning is emphasised.
  - Lifelong learning is much more.
    - It is also about understanding the value of learning for personal satisfaction, health and well being (i.e. sense of autonomy, acceptance and competence), and for being active and responsible citizens.
Lifelong learning political views of

- 2006 EC published a Communication entitled "Adult learning: It is never too late to learn."
  - suggests lifelong learning is the core of ambitious Lisbon 2010-process, in which whole of EU should become a learning area.
    - urged member states to establish a lifelong learning culture.
- 2008, OECD published an article entitled "Recognition of non-formal and informal learning in OECD countries: A very good idea in jeopardy?"
  - advocates a pragmatic approach to formal recognition of informal and non-formal learning.
- These days buzz word is on metacognition - thinking about thinking
  - “ability to think beyond what others do .... with the ability to access the internet for the plethora of information that is not only written, complements the learning experience and enables anyone and everyone to practice lifelong learning - formally and informally".
Rural areas –some facts

- **Definition:** (Wikipedia)
  - **Rural** areas (referred to as "the countryside") are **large and isolated areas** of a country, often with **low population density**, and often ‘underdeveloped’
    - E.g., in the US today, 75 percent of its inhabitants live in suburban and urban areas, but cities occupy only 2 percent of the country
    - About 90 percent of the rural population now earn salaried incomes, often in urban areas, so travelling to the ‘big’ cities is still necessary
  - suffer from remoteness and isolation, shortage of resources, lack of expertise.
  - rate of development low and employment opportunities scarce.

- As such, **economies of scale** are **rarely present**, and also, often the terrain is inhospitable
  - **Infrastructure** (e.g. electricity, water, gas, roads, telephone, internet access and services) often **not as developed** as in cities
Life-long learning and need for Broadband access

- Broadband strengthens the life-long learning process and enables ‘students’ to obtain:
  - real-time education from qualified teachers in areas where that instruction may not be available.
    - students can access alternative educational resources and be exposed to new forms of educational content
  - enables higher quality Internet services - streaming media, e.g. a video of the class lecture, VoIP (Internet phone), gaming, and real time interactive services
  - facilitates inter-institutional collaboration
Broadband access leads to benefits

- **access** to high speed internet through "broadband" connections
  - leads to "information society" and "knowledge society".
- **lack of access** to broadband connections
  - leads to "digital divide", which describes gap between individuals, businesses, and territories in terms of access and use ICTs.

- **Governments**
  - recognised impact that broadband may have on everyday lives
  - committed to ensuring its benefits made available to all, including rural.
Recognition of need for broadband services for all

- EU through several directives (more later)
- Many countries, including
  - Finland: Broadband is a Legal Right
    - by July 2010, every Fin will have access to a 1 Mbit/s broadband connection, and by end of 2015 to a 100 Mbit/s broadband connection
  - The UK Government promised everyone will have speeds of 2 Mbits/s by 2012

- However, at the moment people in rural areas are missing out because it is not worth it for Internet operators to put in super fast broadband in more remote places
Broadband internet status

Based on published EU reports

- Sweden and Netherlands best EU performers when it comes to broadband internet, while Bulgaria and Cyprus come last.
- On average, only 36 percent of EU households have high-speed internet access, although the figures vary widely among the member states.
- The EC aim is "to make broadband Internet for all Europeans happen by 2010," EU telecoms commissioner Viviane Reding

- Enabling factors, according to the EC
  - a favourable socio-economic context,
  - availability and use of advanced services
  - competitive environment that has ensured affordable prices and high speeds.
Broadband internet status

- **Broadband Performance Index (BPI) in EU**
  - **Huge disparity** between Sweden, Netherlands, Denmark, UK, France, Norway who come on top, while Poland, Romania, Cyprus, and Bulgaria come last.
    - "Their performance is limited in most dimensions by the socio-economic context and by high prices" in some of the countries.
    - Poor competition, lack of digital skills and limited PC penetration are among the other cited factors.

- BPI according to EU based on a series of factors, including
  - speed
  - rural coverage
  - affordability
  - innovation
  - socio-economic dimensions
## Broadband coverage for rural areas

The size of the gap

Table 1: Broadband coverage of population by urbanity, December 2007 (EU27, NO, IS) – in part

Data source: IDATE Study “Broadband Coverage in Europe 2008”

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<th>Urban</th>
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<td>SK</td>
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<td>84%</td>
<td>39%</td>
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- I do not believe this to be a true reflection of the current situation, however there is a need for a higher take-up of broadband connections in the rural areas.
- Currently about 150 communities in CY do not have access to broadband connections.
Broadband Technologies

- Broadband access can be delivered by a variety of platforms:
  - Wired and wireless broadband
    - **Wired broadband delivers services over some type of wire connection.**
      - Digital Subscriber Lines (DSL) - 80% of total broadband lines
      - Cable - 18%
      - Leased lines (T1)
      - Broadband over Powerline (BPL)
      - Fiber optic cable
    - **Wireless broadband uses the electromagnetic spectrum and does not require a wire running to your premises.**
      - Fixed wireless
      - Wi-Fi for Local Area Networks
      - Satellite
      - Broadband Wireless (Wi-Mesh and Wi-Max)
The technological solutions

- **combinations of communications network technologies** (“platforms”) needed:
  - Each technology has particular features and a different impact on the overall network capacity and capability.
  - **Wireless broadband promising**, but **need sufficient spectrum**
  - Need **more efficient and flexible forms of management** of this scarce radio resource
- Exploiting synergies between the constructions of ICT, energy, water, or transport infrastructures.
  - savings in civil engineering costs for passive infrastructure
Broadband services and benefits

- Broadband can provide access to a **wide range of resources, services, and products** that can enhance your life in a variety of ways, including:
  - **Education, Culture, & Entertainment**: overcomes geographical and financial barriers to provide access to a wide range of educational, cultural, and recreational opportunities and resources. E.g.
    - Tele-education and video conferencing, virtual class, remote class, remote lecturer, educate teachers
  - **Telehealth & Telemedicine**: facilitates provision of medical care to unserved and underserved populations through remote diagnosis, treatment, monitoring, and consultations with specialists. E.g.
    - Medical school training, training ENT surgeons, training eye surgeons
  - **Economic Development/E-Commerce**: promotes economic development and revitalization through electronic commerce (e-commerce) by creating new jobs and attracting new industries and providing access to regional, national, and worldwide markets. E.g.
    - Amazon.com
  - **Broadband Communications Services**: access to new telecommunications technologies such as Voice Over Internet Protocol (VoIP) allowing voice communication using the Internet. E.g.
    - Triple-play, Digital libraries, e-learning platform, web-casting services, video on demand and IPTV
Life-long learning and Broadband access

- Broadband strengthens the life-long learning process and enables students to obtain real-time education from qualified teachers in areas where that instruction may not be available.
- Students can access alternative educational resources and be exposed to new forms of educational content.
- It enables remote educational services, e.g. remote classroom and teacher concepts, video-conferencing.
Many policies, with stated implementation dates and goals, E.g.

- **Lifelong learning Policy**
  - New strategic framework identifies four long term strategic objectives:
    1. Making lifelong learning and mobility a reality;
    2. Improving the quality and efficiency of education and training;
    3. Promoting equity, social cohesion and active citizenship;
    4. Enhancing creativity and innovation, including entrepreneurship, at all levels of education and training.
  - **By 2010** average participation of working adults population in lifelong learning should rise by at least 12.5%.
  - **By 2020** an average of at least 15% of adults should participate in lifelong learning

- **European Economic Recovery Plan**
  - EU adopted a Communication on how to improve access to ICT in rural areas.
  - Many rural areas in the EU still suffer from lack of access to internet and reduced provision of ICT services.
  - As a response, the European Commission sets the priority fields for investment and development of ICT.
  - Member States and regions are encouraged to develop new ICT services and infrastructure in rural areas according to local needs and priorities.
- **Broadband gap policy** (2009) concerned with geographical aspects of digital divide among EU regions.
  - seeks to bridge gap of access, speed, quality of service, and price in broadband between urban and rural/remote areas.

- **European Economic Recovery Plan:** EC aims to achieve 100% high-speed internet coverage for all citizens by 2010
  - EUR 1 020 million should be made ... with a view to developing broadband Internet in rural areas and to strengthening the operations related to the priorities laid down ... obligation to submit revised rural development programmes by 15 July 2009
  - Rural areas often lack broadband infrastructure both small and large scale. ...
Policies examples (EU)

- **Geographical eInclusion**, (part of eInclusion policy, 2008)
  - EU committed to ensuring that the more remote and economically disadvantaged regions get the support they need to share in the benefits of economic growth.
  - Digital technologies such as broadband internet access can play their part in narrowing disparities between regions and help to promote social and economic cohesion. The European Commission supports actions to develop an inclusive Information Society which embraces those who live in geographically less accessible areas.

- **Inclusive Information Society**, 2006, Riga Declaration signed by Europe’s Ministers
  - increase the social and economic well-being of remote regions with the help of Information and Communication Technologies (ICT).
  - potential already exists for broadband internet connections to bridge digital divide between urban and rural areas
  - give to rural inhabitants access to goods and services without need to travel great distances
  - target that requires broadband coverage for at least 90% of Europeans by 2010. Funding through Structural Funds
  - address issues related to access, speed, quality of service and price
under way

- Policy discussion for the establishment of **broadband national strategy**

- currently two initiatives:
  - **Establishment of satellite services:** this project aims to offer the 151 rural communities in Cyprus that are not currently covered by the existing terrestrial broadband networks basic connectivity to the Internet.
  
  - **Establishment of broadband terrestrial infrastructure:** As a future – proof solution, install fiber optic infrastructure in the same 151 rural communities in Cyprus that are not currently covered by the existing terrestrial broadband networks.
key priorities (and what should we be doing?)

- Need to **develop adequate and reliable broadband infrastructure in rural areas.**
  - At EC level, efforts endorsed by
    * European Economic Recovery Plan, where investments in new and existing **fibre networks** were promoted and an **additional amount of €1 billion** has been proposed by the Commission (MEMO/09/35).
    * Further elaborated in the Recovery Package proposed by the Commission (IP/08/1771, MEMO/08/735).

- Also, need to **develop services and appropriate applications**
  * central to boosting demand for, and take-up of, on-line public services and broadband in rural areas.
  * Demand stimulation measures will enhance rural economies and help drive efficiency gains.
Barriers

- Many barriers that hinder the full deployment and use of e-infrastructures in outlying regions.
- What are these barriers and how to overcome them has been widely studied with recommendations for actions.

  However, progress has been extremely slow ...
So,

- We have the need
- We have policy documents
- We have the technology
- We have commitment
- We have the desire
- There are barriers, but can be surpassed
- There is some funding, but not enough

**What can we do to provide broadband and services to the rural areas?**
What are we (CYNET) doing?

- Recognise need to do something
- In the microcosm of research and education CYNET has proposed to the Ministry of Education an ambitious plan to provide cheap broadband services to the academic and research community, including ADSL and wireless broadband:
  - initiated a pilot, in collaboration with Open University and UCY (open to all academic partners and service providers) to assess broadband wireless technologies
  - development of advanced e-services
- CYNET seeks the collaboration of all actors, including e-infrastructure providers, municipalities, etc... to provide cheap broadband access to all education and research users
CyNet

- Founded in 2000 by the Council of Ministers as an Independent Institution. Founding members: University of Cyprus, Planning Bureau, Research Promotion Foundation

- Aims:
  - Create an advanced network infrastructure for research & education.
  - Interconnect all academic and research institutions in Cyprus (NREN) and interconnect with the European NRENs and beyond
  - Offer advanced network services to the research and education community.
  - Perform networking and services research.

To support and promote the research and education activities in Cyprus.
CyNet current network and future plans

- **Infrastructure**
  - 17 research and academic institutions
  - 2 external connections
    - Total: 310Mbps soon to upgrade to 2.5 Gbps

- **Network infrastructure connects to:**
  - The European Research and Education Backbone, GEANT
  - The Mediterranean Research and Education Backbone, EUMEDCONNECT (PoP for Syria)
  - The Cyprus Internet Exchange, CYIX

- **Current plans to**
  - upgrade external connections to **2.5 Gbps** (GN3) and beyond
  - interconnect institutions at very high speeds via a **local backbone network** (preferably fiber-based) with resiliency
  - develop advanced network services
CyNet network (contd)

Interconnects all public and private Universities / colleges and major research centers to the Internet (GEANT)

Also, CyNet is collaborating with the Ministry of Education in implementing a network infrastructure for public schools.
Connected to the Research and Education Community of Europe and the rest of the World

CYNET is in the process to secure bandwidth at **2.5Gbps** as per the procurement currently running through the GN3 project.
What next for life-long learning

- CYNET vision to create, or stimulate the creation, of the necessary e-infrastructure, on which lifelong learning can flourish
- offer tools and services, based on open platforms (part of CYNETs strategic plan) to enhance the user experience
- raise awareness
  - actively promote research and e-infrastructures for the rural areas.
Challenges for providing the e-Infrastructure in rural areas

- **higher cost-benefit** for providing broadband to the rural areas, especially using fixed infrastructures.
  - costs could be much lower for providing wireless broadband, but this still needs to be assessed
- a different **policy** for broadband to the rural areas needed?
  - initiative by Cyprus Ministry of Communications and Works step in the right direction
- both financial and administrative reasons hinder the regional network connectivity for life-long learning
  - bandwidth cost prohibitively high
  - must be socialised at the political level.
Conclusions

- Knowledge-based economy and society depend on innovative, well-educated, skilled and adaptable people.
- Lifelong learning enables people to participate and prosper in this ever-changing knowledge-based economy and society.
- Lifelong learning is the key to developing appropriate skills and maintaining employability.
- Training and education for adults is even more important when we consider the changed employment market.
  - There is rarely a job for life now; most of us will need to change our jobs several times with a need to re-skill at each stage.
  - The need for a commitment to lifelong learning is emphasised.
Conclusions

- **Broadband strengthens rural communities** by enhancing opportunities for **improved life-long learning** and access to a competitive business environment.

- Without the ability to be ‘connected’ to the global economy, **young people** will continue to **leave rural places**.

- High-speed access can provide an additional tool and **incentive to help attract and retain young people**.

- Therefore, it would seem that broadband technology and the provision of e-learning broadband services promise a solution to rural sustainability, both socially and economically.
Wired Broadband Technologies

- **Broadband Over the Telephone Network (DSL):**
  - Currently the **most widely used broadband technology**.
  - **Advantages:**
    - Works with **existing telephone wiring**. The only equipment needed is a modem plugged into an existing phone jack.
    - **speeds of Mbit/sec**
    - Reliable broadband service for residential and small business customers but is unlikely to be adequate for large businesses.
  - **Disadvantages:**
    - Inability to deliver the service further than a **few Kms** from the central phone office, making it limited for rural areas.
Wired Broadband Technologies

- **Broadband Over the Cable Network (Cable Modem)**
  - The second most widely used broadband technology
  - **Advantages:**
    - Availability to all customers of cable companies in communities where the cable network has been upgraded to deliver cable modem service
    - **High connection speeds** (Mbits/sec)
  - **Disadvantages:**
    - Lack of cable service beyond the edges of the larger towns making this service limited to rural areas and remote regions
    - The connection speed may vary greatly at different times of the day
Wired Broadband Technologies

- **Broadband Over the Electric Network (BPL)**
  - Broadband over Powerline is a relatively new entry in the delivery of broadband service.
  - Allows customers to simply plug a special modem into any outlet in their home to access high speed Internet.
  - **Advantages:**
    - Use powerlines decreasing cost of installing new infrastructure and ability to connect a modem to any electric receptacle.
    - Sends and receives data at the same **high speed**.
  - **Disadvantages:**
    - A major hurdle for BPL in rural areas is the **cost** of equipping the powerlines to carry the broadband signal.
    - Financial analysis of several pilot projects determined that there would need to be between 4 and 6 homes/per transformer to deliver broadband service at prices equivalent to DSL or Cable Modem service.
Wired Broadband Technologies

- **Fiber Optics**
  - Carry digital information in the form of light pulses.
  - The Internet backbone runs across the world on fiber optic cable.
  - Fiber does not lose quality with distance.
    - Its **range** can be up to **100s of kms**, without repeaters.
  - **Advantages:**
    - can deliver a lot more **bandwidth** than other broadband technologies at a **lower cost of maintenance**.
  - **Disadvantages:**
    - cost of installing and lighting the fiber cable make this service limited to rural areas and remote regions.
    - Fiber can be very expensive, compared with the costs for DSL or cable modems – costs are constantly coming down.
Wireless Broadband Technologies

- **Satellite Broadband Service**
  - Provided through the same small dishes used to deliver video services, such as DirecTV and Dish Network.
  - **Advantages:**
    - Ubiquity
    - Particularly promising for remote rural or sparsely populated areas.
    - Promise to offer broadband services regardless of location or geography.
  - **Disadvantages:**
    - Offers lower broadband connection speeds than typical DSL, Cable modem and terrestrial wireless broadband services.
    - Support of real time services difficult, due to long propagation delays
    - Upload speeds are also relatively slow on most systems.
    - Satellite broadband costs more to install and monthly fees are usually higher than wired broadband.
Wireless Broadband Technologies

- **Broadband Over Wireless Networks**
  Two basic types of wireless networks.
  - First is a small *wireless local area network*, commonly known as a Wi-Fi Hotspot.
    - These networks are *designed for indoor use* with a broadcast range of several hundred feet and include both public and private networks.

Access points wirelessly transmit data to and from network devices, connect wireless devices to the wired LAN, and the internet.
Wireless Broadband Technologies

- The second is WiMAX, designed to increase geographic coverage and connections speeds, and also as a wireless alternative to DSL for ‘last mile’

- Hybrid **wide-area broadband wireless networks** – Promising for rural areas?
  - This type of network is designed to serve very large coverage areas, typically using a
    - point-to-multipoint network topology and broadcasts wireless data up to tens of Kms (could be based on WiMAX technologies).
    - Uses a group of access points to cover a large outdoor environment such as a neighborhood, shopping mall or campground (could be based on **Wi-Fi mesh** technologies)
Broadband services examples

- Tele-education and Video Conference Services
  - Highly equipped classrooms to support teleeducation
  - Video conference equipment in key points in all campuses
  - Multiuser Conference Unit that support 12 video conference connections.
Broadband services examples

Video conferencing and virtual class participation
Broadband services examples

- Remote class
  - Lecture and study through the Network
Broadband services examples

- Remote Lecture
  - Web Camera, Projector, IP Telephone, Microphone, Speaker
  - Video, Audio, Chattering, Presentation
Example practices

- Greek Department of Education uses Broadband services to educate, yearly, Greek teachers around the world.
  - On Line Classes through Video Conference and Video webcasting that reach hundreds in every session.
    - e-Learning platform to support the teachers asynchronously
    - e-Learning platform to support the students of the department
Example practices

- Medical School. Training of hospital personnel in “Clinical Infection Control” an INTERREG III project.
  - Webcasting synchronously to 7 Hospitals in Crete and 5 in Cyprus
  - More than 500 trainees on every session
  - Attendees could see Video, Slides as well as chat
Example practices

- Training of ENT surgeons. A TEMPUS TransMedEast project.
  - Communication of operating rooms using high bandwidth Video Conference
  - Surgeons will follow instructions to perform eight (8) different surgical operations in one year period
Example practices

- Video conference for eye surgery summer school.
  - Live video from the operation room to the amphitheatre
  - Communication of students and surgeons
  - Simultaneous connections with professors from India and Spain
Example practices

- Development of a triple play (voice, data, video) platform that supports:
  - Live and Video on Demand Services through:
    - Desktop PC
    - Set Top Box Connected to TV and LAN
    - IPTV
- VoIP with SIP for audio and Video calls
Broadband services examples

- **Digital Library**
  - Multimedia Information Database
  - Easy retrieve, save, delete, backup, restore
  - Easy and sophisticated retrieval
  - Categorize and index

[Diagram showing connections between a computer, library, knowledge, and geographic information systems (GIS).]
Broadband services examples

- **E-Learning platform** based on Moodle available to all departments, e.g. in University of Crete:
  - The platform supports rich media through the combined use of the video server
Broadband services examples

- **Webcasting services**
  - An in house developed application that supports all video broadcasts of the university
  - More than 180 live webcasts of:
    - Lectures
    - Presentations
    - Seminars
    - Student Musical events
    - Sport events
Video on Demand and IPTV

application that organises video content and provides:

- Video Viewing
- Organising and Searching for video titles
- Video Metadata management
- Web.2.0 services like personalising, groups
- Management, user favorites, video groups sharing.

– Multi-channel IPTV Support