Space Technology Application Areas for Health in an Inclusive Global Information Society

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Putrajaya, Malaysia, 2011-11-16
Personal background

- Doctoral degrees in computer science and medical informatics
- Professor for medical informatics and telemedicine at universities in Munich (TUM), Germany, and Tromsø (UiT), Norway
- 25 years experience with eHealth R&D projects in hospital and region, and in operative IT service (medical computing center)
- Research fields: eLearning, telemedicine, computer-aided diagnosis, biosensors, cancer, chronic diseases, healthy ageing, global health

Supporting actions of WHO, ESA, EC, UN as eHealth expert:
- WHO Interoperability & eHealth Observatory
- ESA Telemed Working Group 2004
- TTF (ESA, EC, WHO, AUC, AfDB, RECs) Telemed Task Force, since 2006
- Satellite-Enhanced Telemedicine and eHealth for Sub-Saharan Africa Programme (eHSA) (currently)
- UNOOSA Space for Human Security 2011
global situation
enhancing healthcare systems
implementing eHealth
the way forward
World health expenditure is around $ 2.5 \times 10^{12}! That is around 7-8% of the global GDP. Health is one of the main sectors in the modern global economy.

But such expenditure is far from being homogeneously distributed!

<table>
<thead>
<tr>
<th></th>
<th>population</th>
<th>burden of disease</th>
<th>% world income</th>
<th>% total health care expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>medium and low income countries</td>
<td>84%</td>
<td>93%</td>
<td>18%</td>
<td>10%</td>
</tr>
<tr>
<td>high income countries</td>
<td>16%</td>
<td>7%</td>
<td>82%</td>
<td>90%</td>
</tr>
</tbody>
</table>

Source: World Bank 2001, World Development Indicators

(Menabde, WHO, Frascati, 2004, modified)
Child mortality under 5

World Health Statistics 2010
Health Workforce Crisis

Countries with a critical shortage of health workers
(doctors, nurses and midwives)

(World Health Report 2006)

Digital Opportunity Index (DOI) with 11 indicators measuring:

- Opportunity (accessibility to and affordability of ICT services)
- Infrastructure
- Utilization

November 2011
Prof. Dr. Alexander Horsch
The digital divide

Chart 2.1: Global ICT developments, 1998-2008

- Fixed telephone lines
- Mobile cellular telephone subscriptions
- Internet users
- Fixed broadband subscribers
- Mobile broadband subscriptions

Note: * Estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Chart 6.2: IDI and ICT Price Basket comparison

Relation between the IDI and the ICT price basket

Source: ITU.

(ITU 2009, Measuring the Information Society – The ICT Development Index)
global situation
enhancing healthcare systems
implementing eHealth
the way forward
OPPORTUNITIES AND CHALLENGES OF EHEALTH AND TELEMEDICINE VIA SATELLITE

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eHealth for Africa

Opportunities for Enhancing the Contribution of ICT to Improve Health Services


1World Health Organization, African Regional Office
2European Commission, Directorate General Development
3Organisation de Coordination pour la lutte contre les Endémies en Afrique Centrale
4Communauté Économique et Monétaire de l'Afrique Centrale
5World Health Organization, Head Office
6Munich University of Technology, Germany & University of Tromsø, Norway
7African Development Bank, 8European Space Agency
9Medical Research Centre, South Africa & New Partnership for Africa’s Development
10East African Community
Relations between functions and objectives of a health system

Functions the system performs

- Stewardship (oversight)
- Creating Resources (investment and training)
- Financing (collecting, pooling, purchasing)
- Delivering Services (provision)

Objectives of the system

- Responsiveness
- Health
- Fair (financial) contribution

(Menabde, WHO, Frascati, 2004)
A definition of eHealth

**eHealth** is the use of ICT for health at the local site and at a distance (WHO 2004).

Telemedicine mainly is the use of ICT for delivery of healthcare services, where distance is a critical factor (WHO 1997).
Service provision - eCare

eHealth potential through eCare

• Improving access, equity, quality and accountability
• Connecting healthcare facilities and healthcare professionals
• Diminishing geographical / physical barriers
• Less traveling for patients / professionals
• Less medical errors
• High-quality healthcare independent of location
• For citizen / patient new ways to practice self-determination and self-responsibility for own health
• For professional better access to patient data
Financing – eAdministration/eGov

• **eHealth potential through eAdministration**
  – Improving information systems
  – For more effective resource allocation and purchasing

• **Example eGovernance**
  – Electronic pooling and purchasing where conventional infrastructures do not exist or are inefficient and time-consuming
  – Can support transparency and efficiency

World Health Report 2010
Resource generation - eLearning

eHealth potential

– eLearning
  • Internet-based
  • Virtual universities, courses
  • Information & interaction
  • Collaboration & link to other knowledge resources

– Connection of / to existing resources
  • Patient-oriented services
  • Knowledge-oriented services
  • Countries without or with unstable infrastructure
Stewardship – eSurveillance/eGov

• eHealth potential through eSurveillance / eGovernment
  – improving information systems for decision making
  – early response in emergency situations

• Public sector
  – active role in pushing deployment of eBusiness for the health and social services sector
Space for health and human safety

ISS
medical research*
biosensors /BME

Satcom
eCare, eLearning
eAdmin/eGov

Earth Observation
Meteosat
eSurveillance

* vaccines (e.g. malaria, HIV/AIDS)
aging / physiology

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Specific satellite potentials

- Ubiquitous medical education services for patients and professionals
- Enable public authorities to contain service costs and improve prevention strategies
- Enable broadband services in rural areas, reducing digital divide
- Healthcare services enhance the safety of citizens
- Most robust way to provide healthcare emergency services in disaster situations
- Provide early warning systems to predict health threats and alert populations
Trauma, Emergency, Disaster

- Increase chance to save lives
- Save costs in the long term
- Reduce administrative overhead
- Ensure proper care at the site of trauma or disaster
- Improve the care during the “Golden Hour”
- Create evidence based medicine at the site
- Share acquired experience

Mobility of People

Example air travels

- Flight attendant 1st aid
- Airline medical kits
- Telemedical support

Less diversions
Better care on board

("Please pay attention, as the stewardess shows you our procedure for drunken passengers."

(ESA Telemed Working Group, 2004)
Surveillance and Early Warning

**EARTH OBSERVING SAT**
Ocean conditions
earthquake activity
volcanic activity

**METEOSAT**
Meteorological conditions

**ENVIRONMENT MONITORING SAT**
Moisture, rainfall, greenness, temperature, etc.

EWS revealing any alarming data or trend change

Integration and archiving of data to create models for:
- communicable diseases
- evaluation of volcanic risk
- evaluation of earthquake risk
- dangerous meteorological events

Rapid communication of the alarm to appropriate centres, institutions, persons

- Saving lives, reducing post-traumatic consequences
- Prediction / prevention instead of care afterwards
- Decreasing costs for severe diseases / injuries

(ESA Telemed Working Group, 2004)
Cost Benefit Analysis of Satellite-Enhanced Telemedicine and eHealth Services in Sub-Saharan Africa

November 2008

(PricewaterhouseCoopers)

**eCare in the Clinic:** IKON in Mali

**eCare in the Village:** Uganda Health Information Network

**eLearning:** Kenyan Nurses; and Réseau Afrique Francophone de Télé médecine (RAFT)

**eSurveillance:** Nigeria Malaria Surveillance

**eAdministration/eGovernance:** Rwanda TRACnet; and Pharmaceuticals Tracking
Cost Benefit Analysis of Satellite-Enhanced Telemedicine and eHealth Services in Sub-Saharan Africa
November 2008

Differences in Lifetime value are attributed to the differences in target populations the programmes are designed to address.

<table>
<thead>
<tr>
<th>Sub-Saharan Africa health impact</th>
<th>Lives Saved p.a.</th>
<th>One Year Value</th>
<th>Lifetime Value(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>eCare in the Clinic</td>
<td>16,800</td>
<td>$680 million</td>
<td>$746 million</td>
</tr>
<tr>
<td>eCare in the Village</td>
<td>151,800</td>
<td>$259 million</td>
<td>$2,576 million</td>
</tr>
<tr>
<td>eLearning</td>
<td>85,100</td>
<td>$145 million</td>
<td>$1,444 million</td>
</tr>
<tr>
<td>eSurveillance</td>
<td>644,100</td>
<td>$1,248 million</td>
<td>$55,902 million</td>
</tr>
<tr>
<td>eAdministration/ eGovernance</td>
<td>477,900</td>
<td>$934 million</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,375,700</strong></td>
<td><strong>$3,266 million</strong></td>
<td><strong>$60,668 million</strong></td>
</tr>
</tbody>
</table>

Differences in Lifetime value are attributed to the differences in target populations the programmes are designed to address.
Telemedicine initiative for sub-Saharan African pilot projects proposed

20 Mar 2007

Satellite solutions delivering information and communication technologies can help improve health in sub-Saharan Africa; this was the main conclusion of a dedicated telemedicine task force which met recently in Botswana. To make these solutions a reality, some short-term, concrete actions have been suggested in a pilot projects proposal. Three activities are proposed: one focussing on the health workforce (scaling-up numbers, improving performance, increasing quality); a second on clinical services (increasing health service coverage, reaching isolated areas) and a third aimed at strengthening the intelligence gathering capacity of health systems and their ability to use information for decision making.

These demonstration projects will be used to inform and to help develop a framework for extending eHealth, which should be considered part of the European Union Strategy for Africa commitment to utilise Information and Communication Technologies (ICT) to enhance interconnectivity in Africa. The potential of this greater interconnectivity, which will be supported under the tenth European Development Fund (EDF), to extend the reach of health services will be tested and demonstrated through these proposed projects.

Held in Gaborone, Botswana on 1 March 2007, it was the third meeting of the Telemedicine Task Force, which is composed of the main relevant African organisations, the World Health Organization, the European Commission and the European Space Agency. It was set up after a workshop held in Brussels in January 2006 that highlighted the potential of satellite telecommunication technology to support health systems in Africa. One of the key tasks of its mandate was to develop a complete picture of telemedicine opportunities in the sub-Saharan region and to formulate recommendations for future action.
The eHSA programme includes thematic areas such as eCare, eLearning, eSurveillance, and eGovernance/eAdministration. It also encompasses horizontal studies on Governance, Regulatory Aspects, Interoperability: System of Systems, and Sustainability, Liability, Business.
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Vision or goal?

MDGs and beyond: Health for ALL

- space bridges national and regional borders
- health services accessible and affordable for everyone
- global surveillance and response
- satcom includes all remote populations
- sufficient number of health professionals
Questions?

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