

eHealth: its evolution from Medical Informatics, and its value to Health Care

Invited Presentation
to the
ICML9/CRICS7 Conference
Salvador, Bahia, Brazil

by

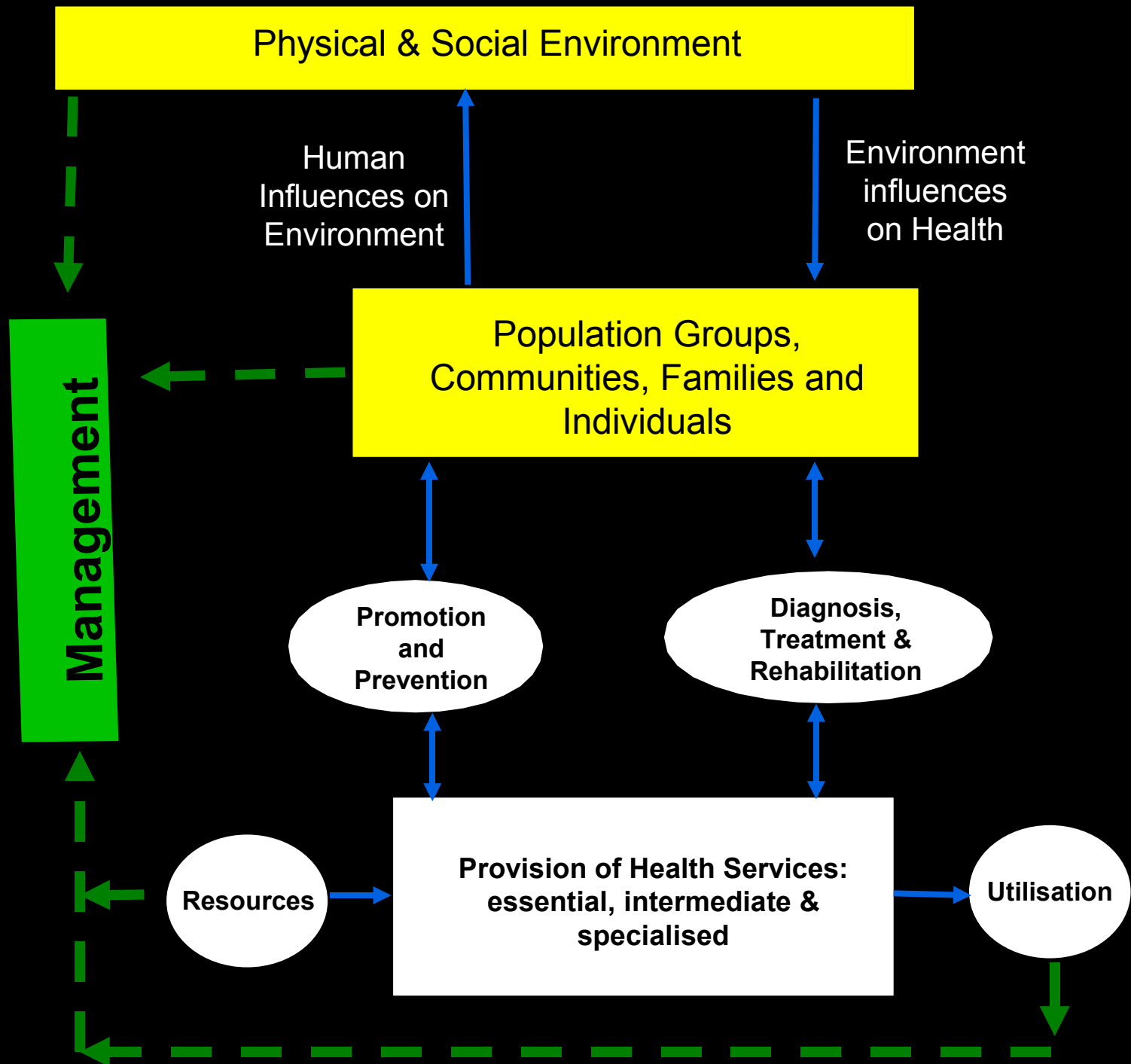
Salah H Mandil, Ph.D.

Principal Consultant
eStrategies & eHealth
Geneva, Switzerland

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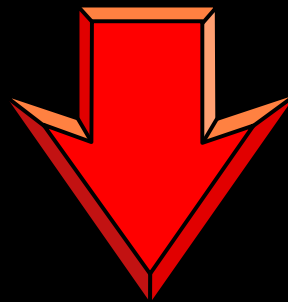
former Director
Health Informatics & Telematics
World Health Organisation
Geneva, Switzerland

September 2005



The Health Sector

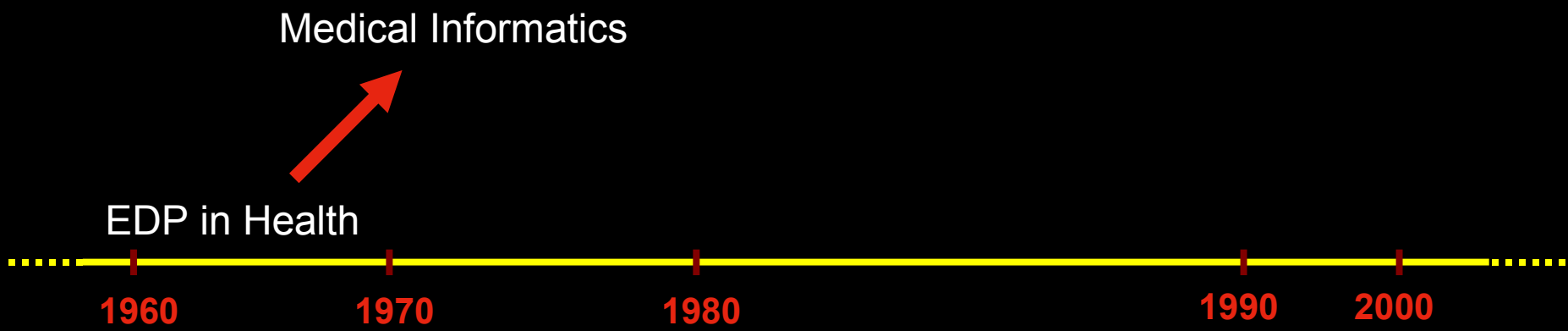
- New Techniques and New Methods
- Specialisation & sub-specialisation
- New Diseases
- Empowering communities & individuals
- Costly institutions
- Costly technologies
- Emergence of a strong Private sector
- More rigorous controls
- eHealth, including changes to old "info systems"
- etc ...



**Health Sector Reform,
with a heavy dose of “eHealth”**

eHealth ?

- An umbrella term to refer to Health and Health Care activities carried out with the aid of electronic methods and tools, particularly Information and Communication Technologies (ICT).
- The term **eHealth** gradually evolved with the evolution of the applications of ICT in Health.



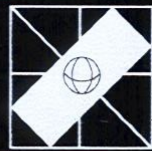
NORTH-HOLLAND

MEDINFO

92

K.C. LUN
P. DEGOULET
T.E. PIEMME
O. RIENHOFF
Editors

PART 1



IFIP



IMIA

From "EDP in Health" to Health Informatics

Mandil, Salah H.

*Chairman, Scientific Programme Committee
and
Director-Advisor on Informatics
World Health Organization
Geneva, Switzerland*

From "EDP in Health" to Health Informatics

The ultimate objective of informatics support to health care is the achievement of the highest possible level of health of an individual, a community, a nation and the world at large. The uses of informatics in health and medical care have been evolving in an impressive manner together with, though not as much as, the informatics methodology and technology. So much so that the terms "health informatics" and "medical informatics" are now widely used in the health and medical circles.

But, what is meant by Health Informatics? In recent years, there emerged a strong consensus, not only between professionals and institutions but even between nations as proven by the globally endorsed resolutions of the World Health Organization on health care, that the term "health" encompasses several professional disciplines which team together for planning, programming, resource-budgeting, delivering, evaluating and re-planning all forms and aspects of health care. The founders of the MEDINFO congresses certainly had that in mind and meant it to encompass the health sector as a whole as is testified by all the MEDINFO Proceedings: 1974 (Stockholm), 1977 (Toronto), 1980 (Tokyo), 1983 (Amsterdam), 1986 (Washington) and 1989 (Beijing and Singapore) - all without exception were a forum of a judicial mix of sessions on informatics for and by the medical, nursing, laboratory, pharmacy, dental, statistics, epidemiology, administration, finance, etc... disciplines. Whereas some may think that it is not quite a science yet, "Health Informatics" is certainly a recognized field that is bubbling with scientific research, applications, applications developments and other creative activities; to refer to that, and as far back as 1981, I had to put forward the following definition for WHO uses:

"Health Informatics is an umbrella term used to mean and to encompass the rapidly evolving discipline of using computing and communications, methodology and technology, to support health related fields such as medicine, pharmacy, dentistry and nursing".

Setting aside the impressive developments of the computing and communications hardware and software products, and how these influenced the specific implementations reported since MEDINFO 74, and even since the first applications of computers in health care some 30 years ago, one can observe a lot of similarity, indeed a fascinating evolutionary continuum over the years of

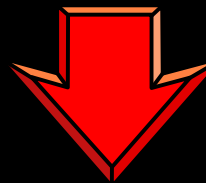
- the problems identified;
- the approaches to finding solutions for such problems; and
- the specific solutions proposed, but not necessarily implemented, at the time.

Probably driven in part by such observation, a school of colleagues active in the international health informatics scene, have been asking the question, "Is health/medical informatics a science?", and the same group are suggesting that if we

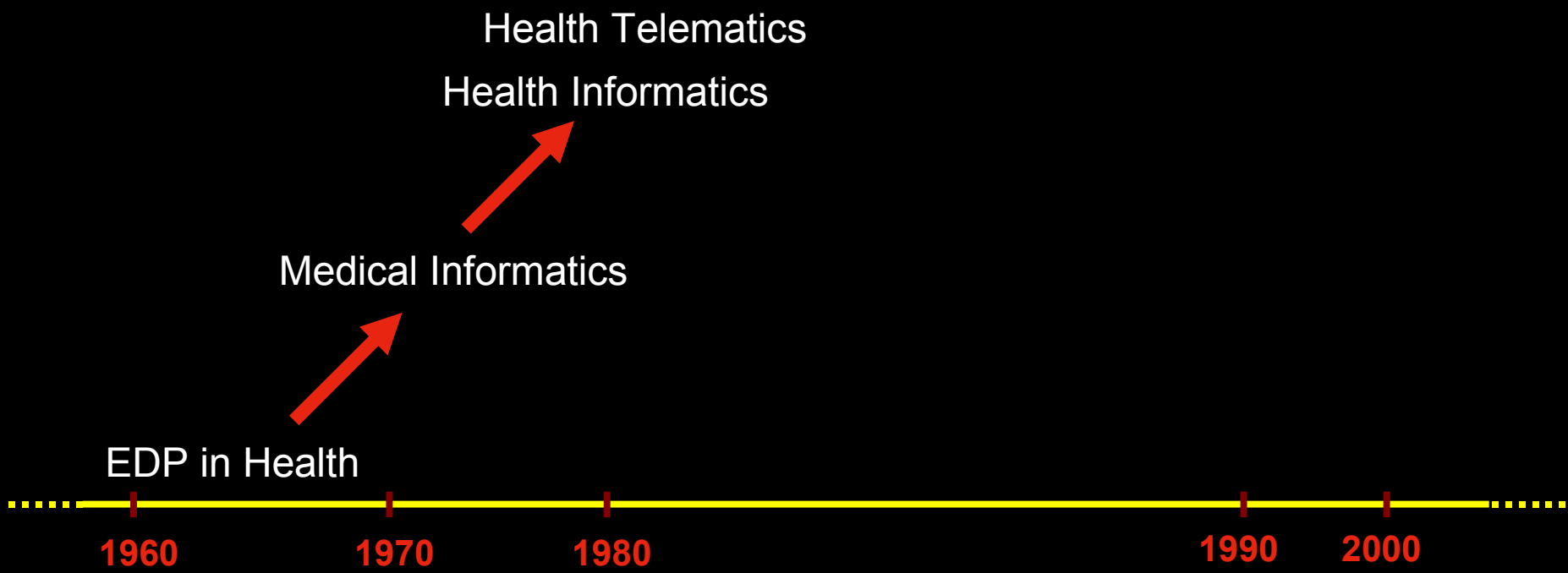
Early Attitudes towards “Computing in Health/Medicine”

- Administration & Finance;
- Statistics & Epidemiology;
- Modelling (“what if?”) based on numerical variables;
- Literature services.

Essentially
copying the
Commercial
Industrial
sectors



with “bold” reluctance
& significant hesitation



INTERNATIONAL CONGRESS SERIES 1055

HEALTH INFORMATICS IN AFRICA



HELINA 93

S.H. MANDIL, K. MOIDU, M. KORPELA,
P. BYASS, D. FORSTER
EDITORS



IMIA

EXCERPTA MEDICA

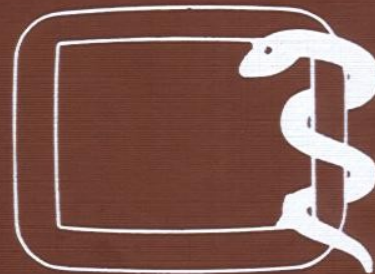


human-computer communications in health care

edited by
h.e. peterson and w. schneider



IFIP IMIA



north-holland

THE RELEVANCE OF IMAGES AND GRAPHICS TO PRIMARY HEALTH CARE

Salah H. Mandil

Division of Information Systems Support
World Health Organization
Geneva, Switzerland

HEALTH FOR ALL BY THE YEAR 2000

"The attainment by all the citizens of the world by the year 2000 of a level of health that will permit them to lead a socially and economically productive life".

GLOBAL STRATEGY FOR "HEALTH FOR ALL"

- Not a separate "WHO Strategy", but rather individual and collective national responsibility for implementation, supported by WHO.
- The strength of WHO's Member States lies in the capacity to work out Global themes together and apply them in their own national situations with appropriate adaptations.

MAIN THRUSTS OF THE STRATEGY

- Develop health system infrastructure, starting with Primary Health Care for delivery of country-wide programmes that reach the whole population;
- Programmes to include measures for health promotion, disease prevention, therapy and rehabilitation;
- Programmes to specify measures to be taken by individuals and families in their homes, measures to be taken by communities, measures to be taken by health services at the primary and supporting levels, and measures to be taken by other sectors;
- Selection of technology that is appropriate for the country concerned - (scientifically sound, adaptable to various local circumstances, acceptable to those for whom it is used and to those who use it, and maintainable with resources the country can afford);
- Social control of infrastructure and technology through a high degree of community involvement.

PROMOTION AND SUPPORT

- Strengthening Ministry of Health as Focal Point for National Strategy;
- Ensuring political commitment at highest level nationally and internationally;

From: "Manual of Basic Techniques for a Health Laboratory"
World Health Organization, 1980

(b) *Patients without nodules*

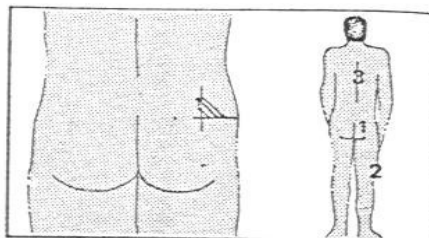
Take the skin specimen from:

- the top of the buttocks (the upper outer part where intramuscular injections are given).

If the examination gives a negative result, take specimens from:

- the calf (upper outer part)
- the back (centre of shoulder-blade).

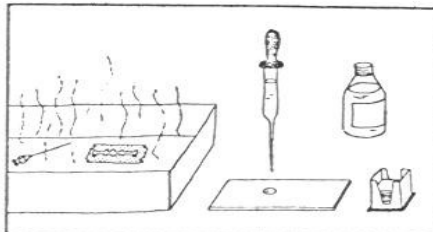
It is recommended that 6 specimens (2 from buttocks, 2 from calves, 2 from shoulder-blades) be examined before reporting a negative result.



COLLECTION OF SPECIMEN

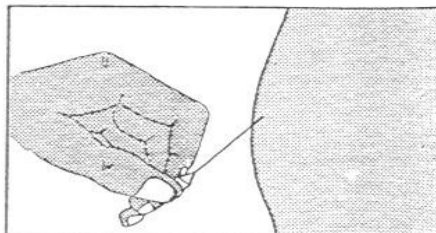
(a) *Preparations*

1. Flame the scalpel (or razor blade) and the needle with ethanol.
2. Place one drop of sodium chloride solution on a slide.
3. Disinfect the chosen area with a gauze pad dipped in ethanol.

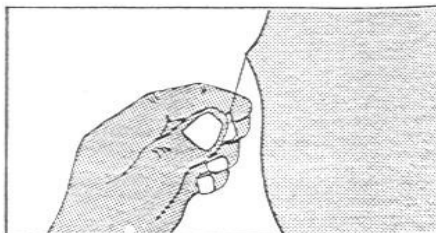


(b) *Method*

1. Using your left hand, pierce the skin with the point of the needle to a depth of 2 or 3 mm.



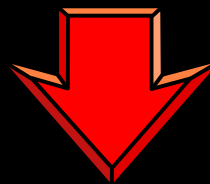
2. Pull the skin away from the flesh with the point of the needle.



Emergence of computer-assisted Imaging & Voice processing

- Imaging
 - Still images;
 - Dynamic images;
 - Colour & Shades of grey.
- Voice

Pulled the main
Causes of doubt
& reluctance off the
Health/medical
sector



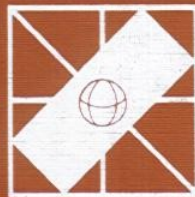
Health/Medical Informatics
“professional disciplines”

The Emergence of a clearer distinction between Information & Knowledge

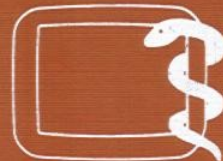
- “Information” almost equivalent to citing or pointing to a source of the knowledge sought.
- “Knowledge” expressed in all the necessary multi-media detail.

computerized natural
medical language
processing
for knowledge
representation

edited by
j. r. scherrer, r. a. côté
and s. h. mandil



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KNOWLEDGE BASES: A PUBLIC HEALTH PERSPECTIVE

Salah H. MANDIL and Lawrence J. GRANT
Division of Information Systems Support
World Health Organization
Geneva, Switzerland

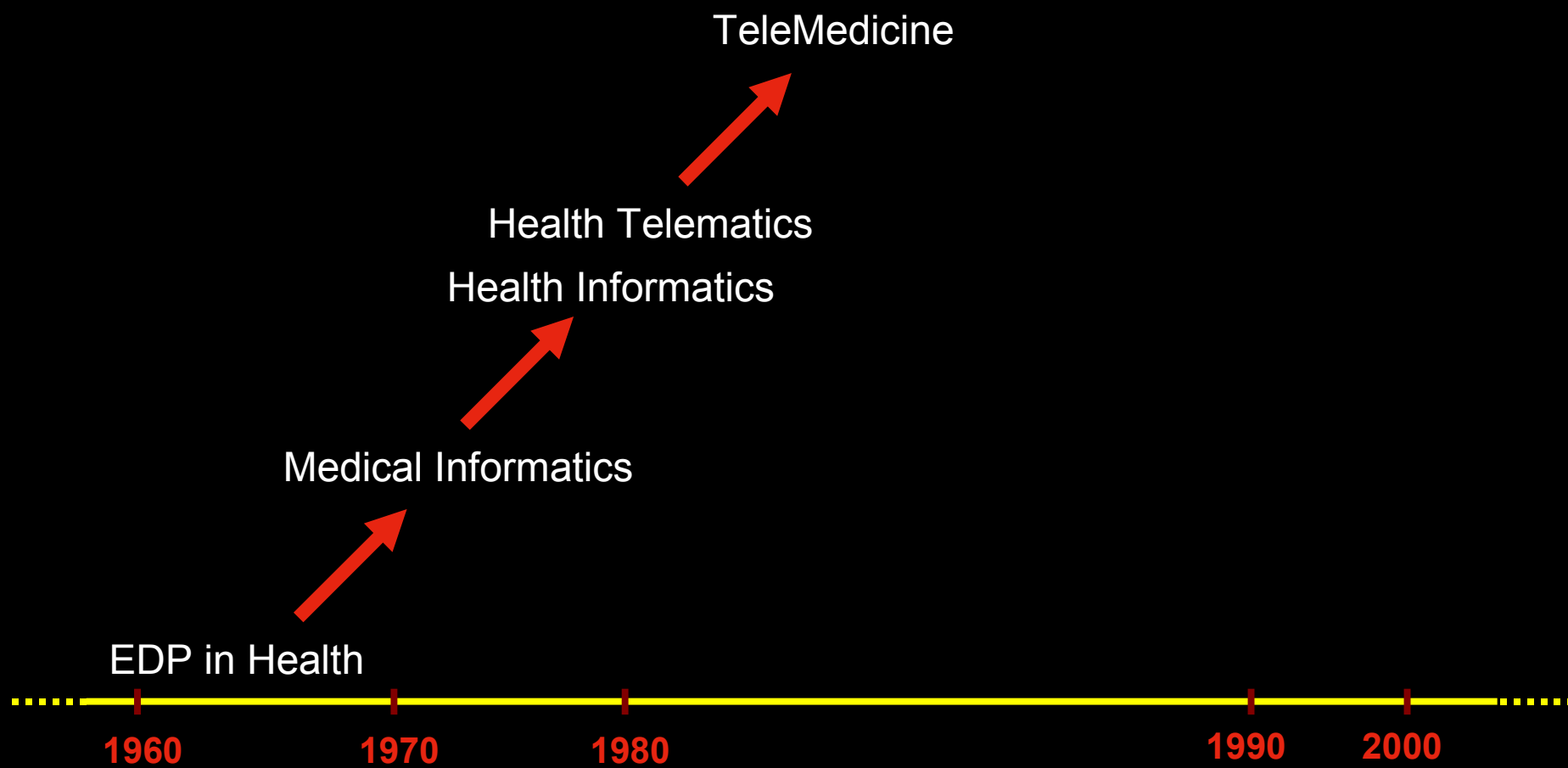
This is an article that proposes a broader scope in the evaluation of the performance of knowledge based systems. In comparison to medical applications, public health implementations are likely to exacerbate the demands on knowledge bases. The nature of these demands are examined with the aim of encouraging research addressed to producing knowledge based systems that would meet the requirements of a public health care system.

1. INTRODUCTION

Published accounts of health-related knowledge bases tend to be confined to descriptions of their development and implementation in the laboratory environment. Typically such a report will describe the domain, knowledge representation scheme, inferencing strategy and provide an evaluation of system performance in terms of specificity and sensitivity derived through a comparison of the system's results with a group of physicians solving the identical problem set. There has been little effort to study the potential impact of knowledge bases within the totality of a health care system, and in particular their role in the delivery of health care to points of need.

This paper attempts to expand the perspective of knowledge base evaluation. It is argued that the relationship between knowledge bases and a public health care system will place additional demands on knowledge base construction. For knowledge bases to become a truly useful tool in health care, developers must explicitly acknowledge their relationship to the public health system. This paper concerns itself with the nature of this relationship: it outlines the components of a typical health care system, indicates potential applications of knowledge bases, and speculates on the interaction of a knowledge base with the health care system.

No solutions are proposed to the potential problems raised. It is recognized that knowledge based system development is an evolving technology with much refinement yet to emerge. The purpose of this paper is to draw attention to the characteristics and demands of public health implementations. The hope is that research also will be directed towards these areas so that the potential of this technology may be fully realized in public health.



TeleMedicine - The Definition

The practice of medical care using audio, visual and data communications.

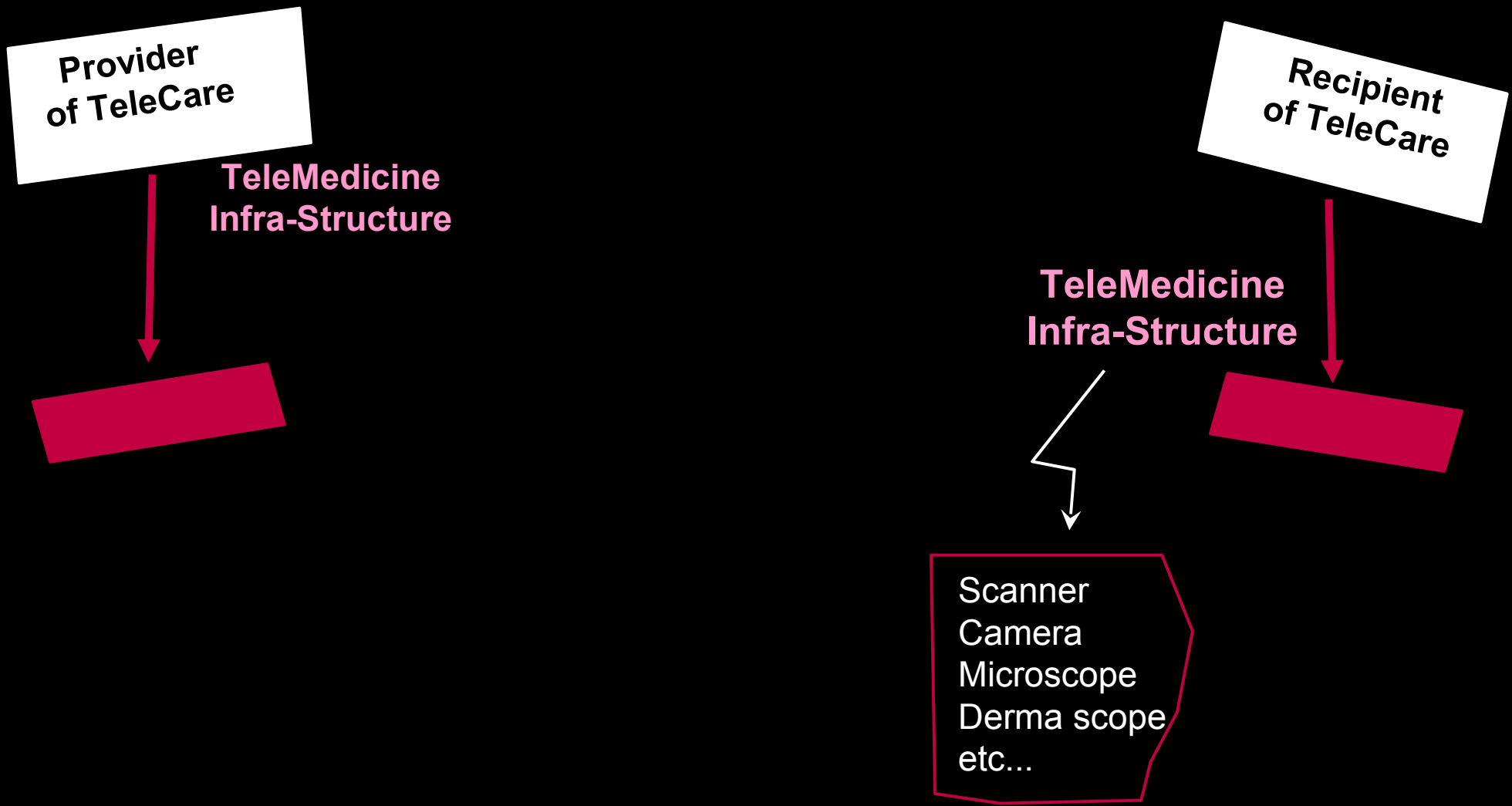
This includes health care delivery, diagnosis, consultation, treatment, education and the transfer of related data.

Simple Model of a TeleMedicine Link

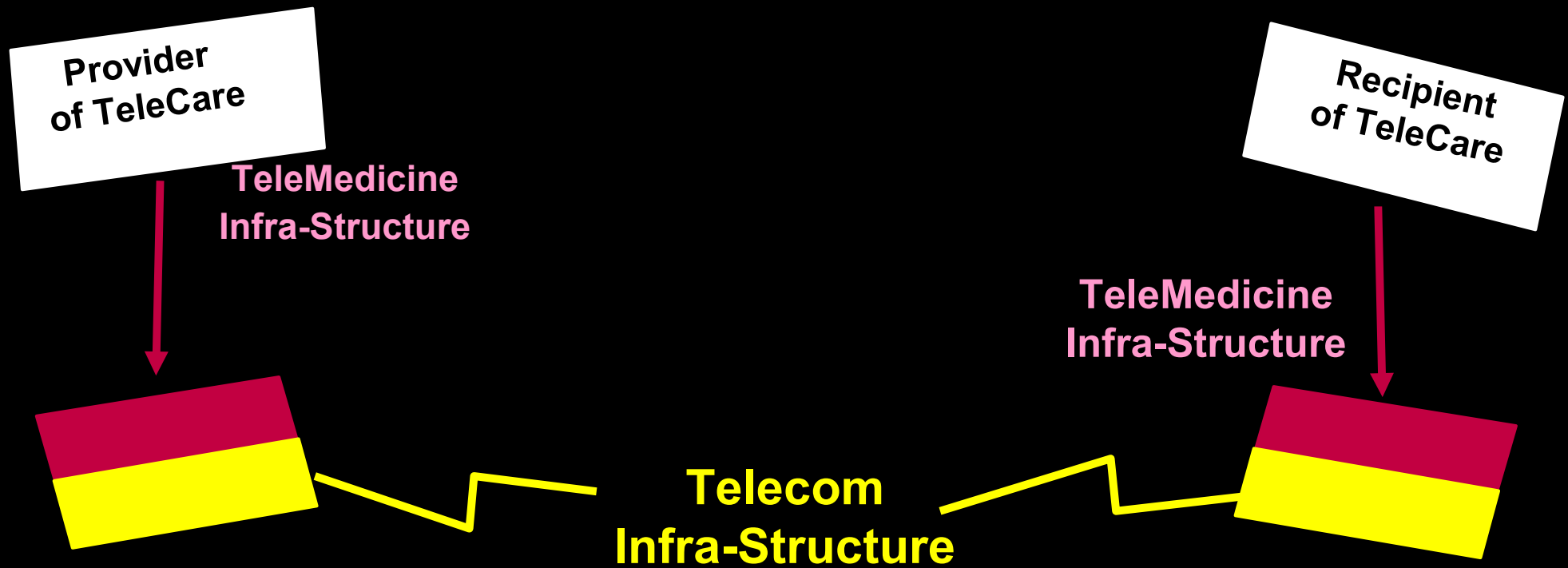
**Provider
of TeleCare**

**Recipient
of TeleCare**

Simple Model of a TeleMedicine Link

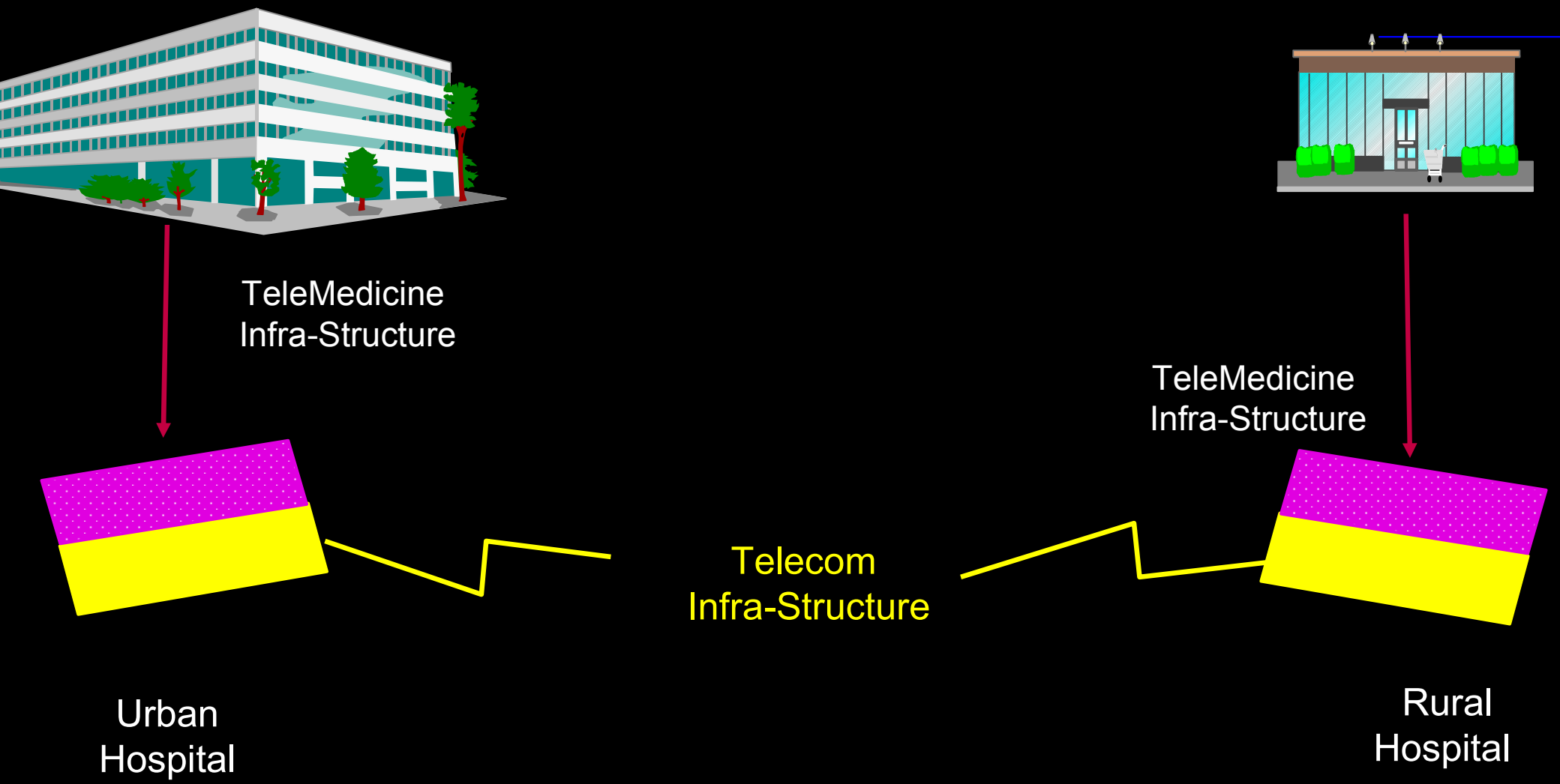


Simple Model of a TeleMedicine Link



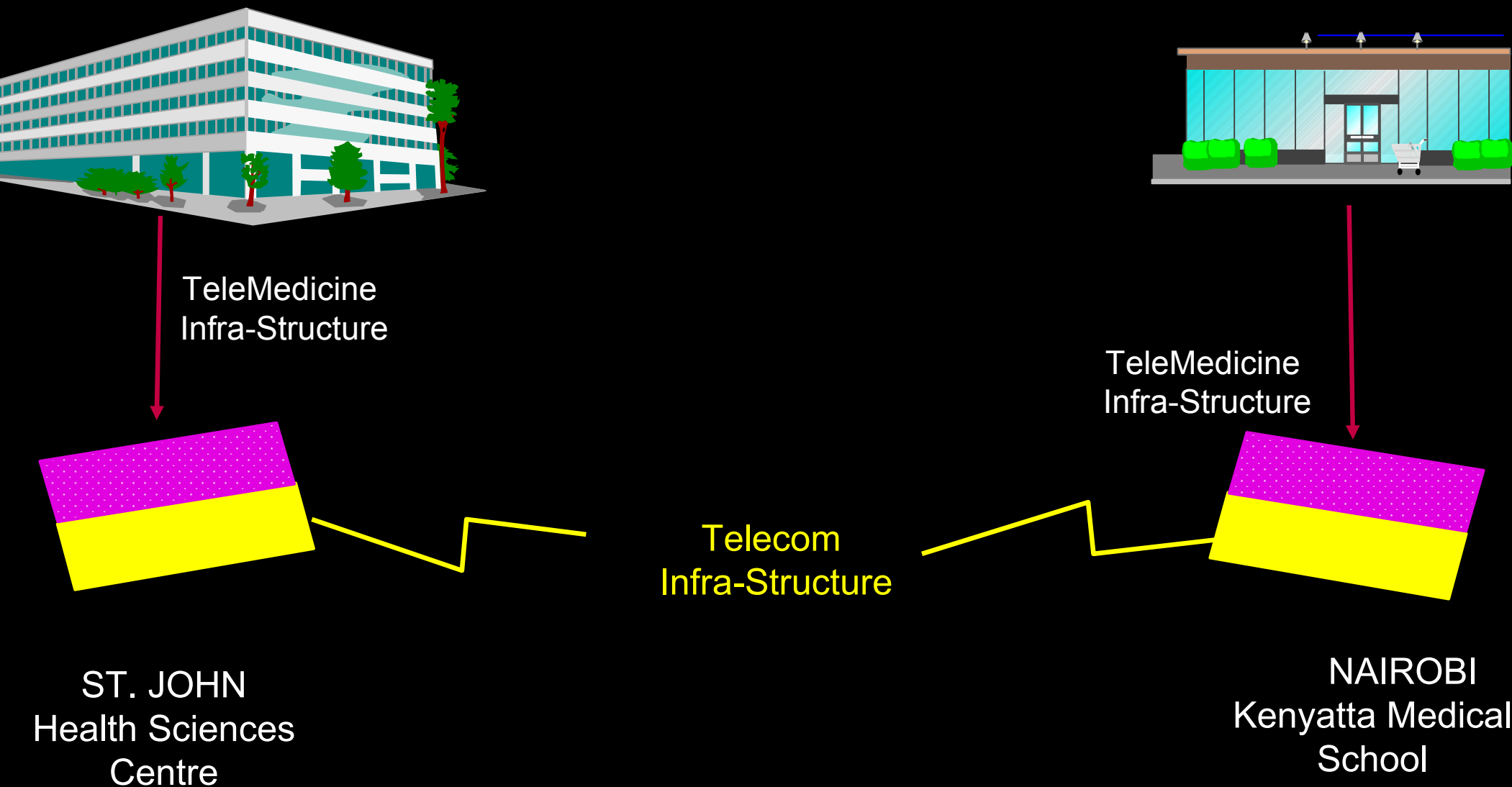
WITHIN A NATION or BETWEEN NATIONS

Simple Model of a TeleMedicine Link



e.g. TeleMedicine WITHIN A NATION

Simple Model of a TeleMedicine Link



e.g. TeleMedicine BETWEEN NATIONS

examples

TeleMedicine Experience
in Developing Countries

TeleMedicine

Practical Experience increasing

- Ten's of examples, in developing countries, that confirm TeleMedicine as a viable cost-effective improvement in the equity of access to quality health care.
- TeleCare, or using telecommunications in health care services is here to stay, grow, evolve and could change many aspects of the conduct & management of services.
- AFRICA, ASIA, LATIN AMERICA :an example from each:
 - Egypt, Ethiopia, Mozambique, South Africa, Tunis
 - Bhutan, China, Malaysia, Saudi Arabia, Taiwan
 - Argentine, Chile, Costa Rica, Cuba, Mexico

TeleMedicine example - South Africa

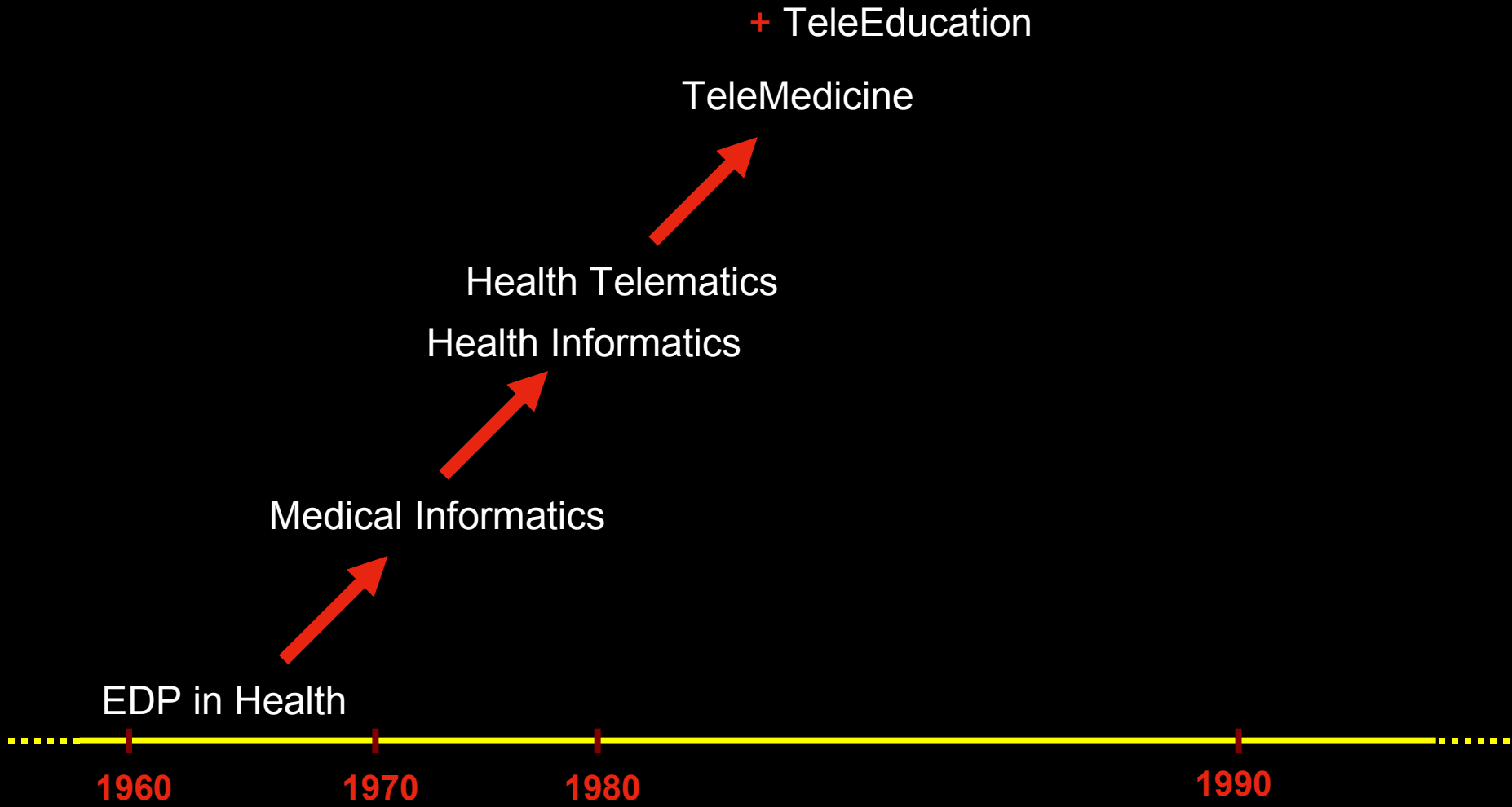
- 1995/96, initial study
BETWEEN
Witts. University Hospital, Johannesburg
AND
Tintswalo Hospital, Northern Province,
ON
TeleRadiology, TelePathology & TeleConsultations
- 1999 Phase One for nation-wide uses:
5 Provinces, 33 sites - operations started April 2000.
TeleRadiology, TelePathology, TeleOphthalmology,
TeleUltrasound and TeleEducation.
74 more sites being developed.

TeleMedicine example - MEXICO

- 16 Rural Hospital, Chiapas, S.E. Mexico
AND
"20 November" Hospital, Mexico City
- Consultations between GP's and Specialists, using still & dynamic images
- Exclusively Satellite Links, with full two-way Video.

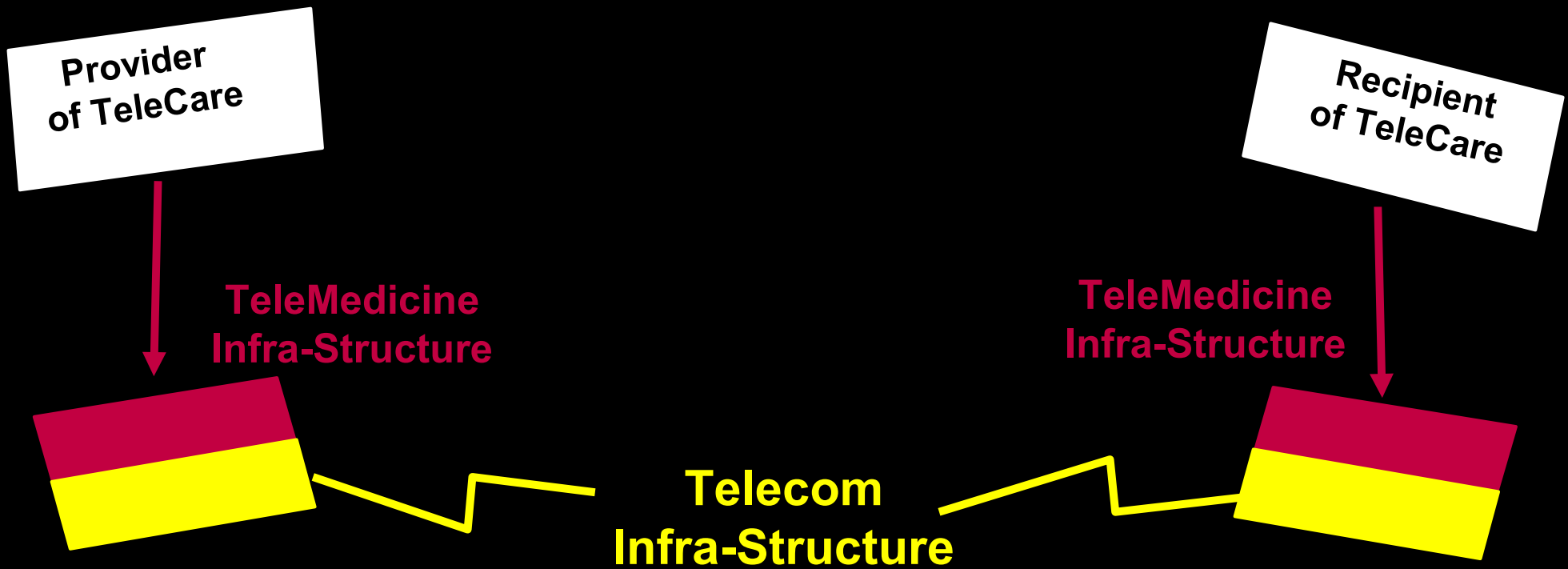
TeleMedicine example - Mozambique

- **BETWEEN**: Beira General Hospital
(about 1000 kms North of the capital)
AND
Maputo Hospital
- TeleRadiology readings
- Telecommunication link: a mix of satellite, terrestrial and Microwave.



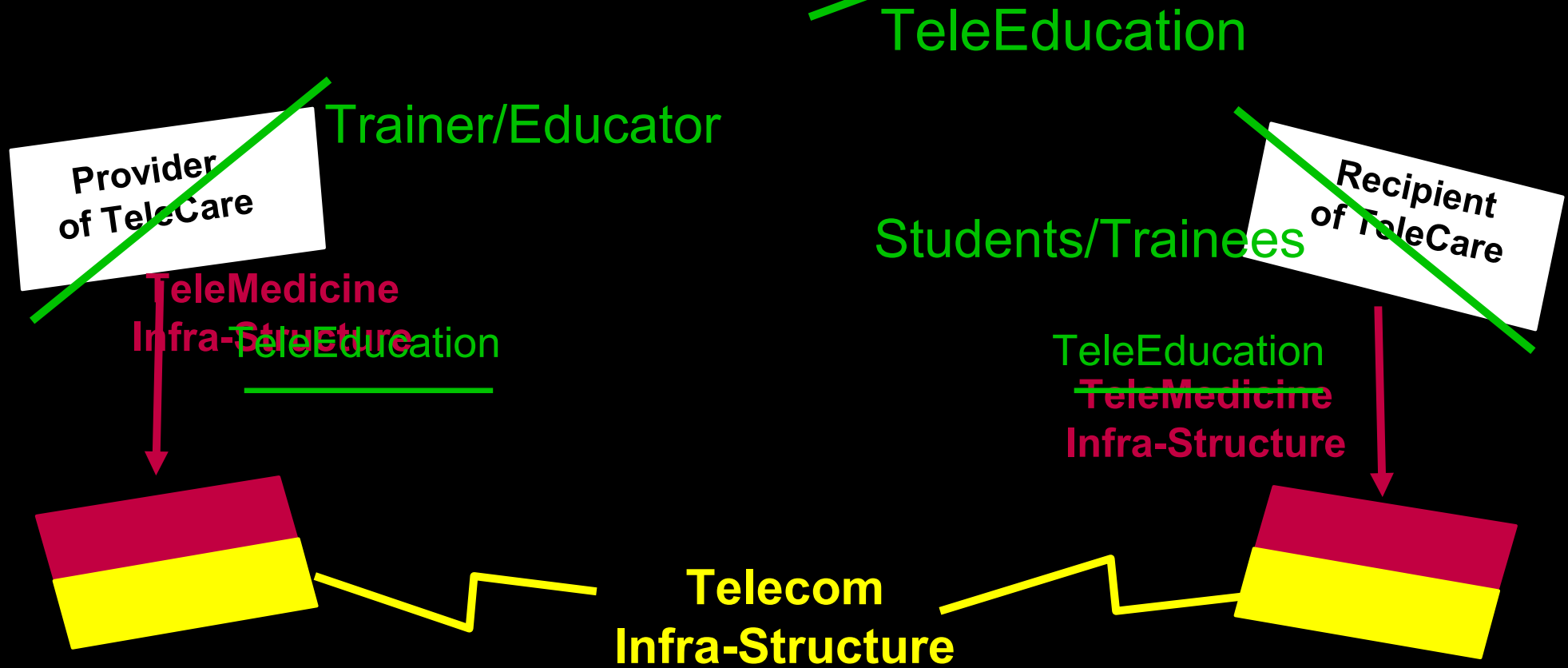
Relationship between TeleMedicine and TeleEducation

Simple Model of a TeleMedicine Link



WITHIN A NATION or BETWEEN NATIONS

Simple Model of a TeleMedicine Link



WITHIN A NATION or BETWEEN NATIONS

africa — dot — edu

IT Opportunities and Higher Education
in Africa

Editors

Maria A. Beebe • Koffi M. Kouakou
Banji O. Oyeyinka • Madanmohan Rao



- Continuous Education
- Basic Education

Project Globe

on

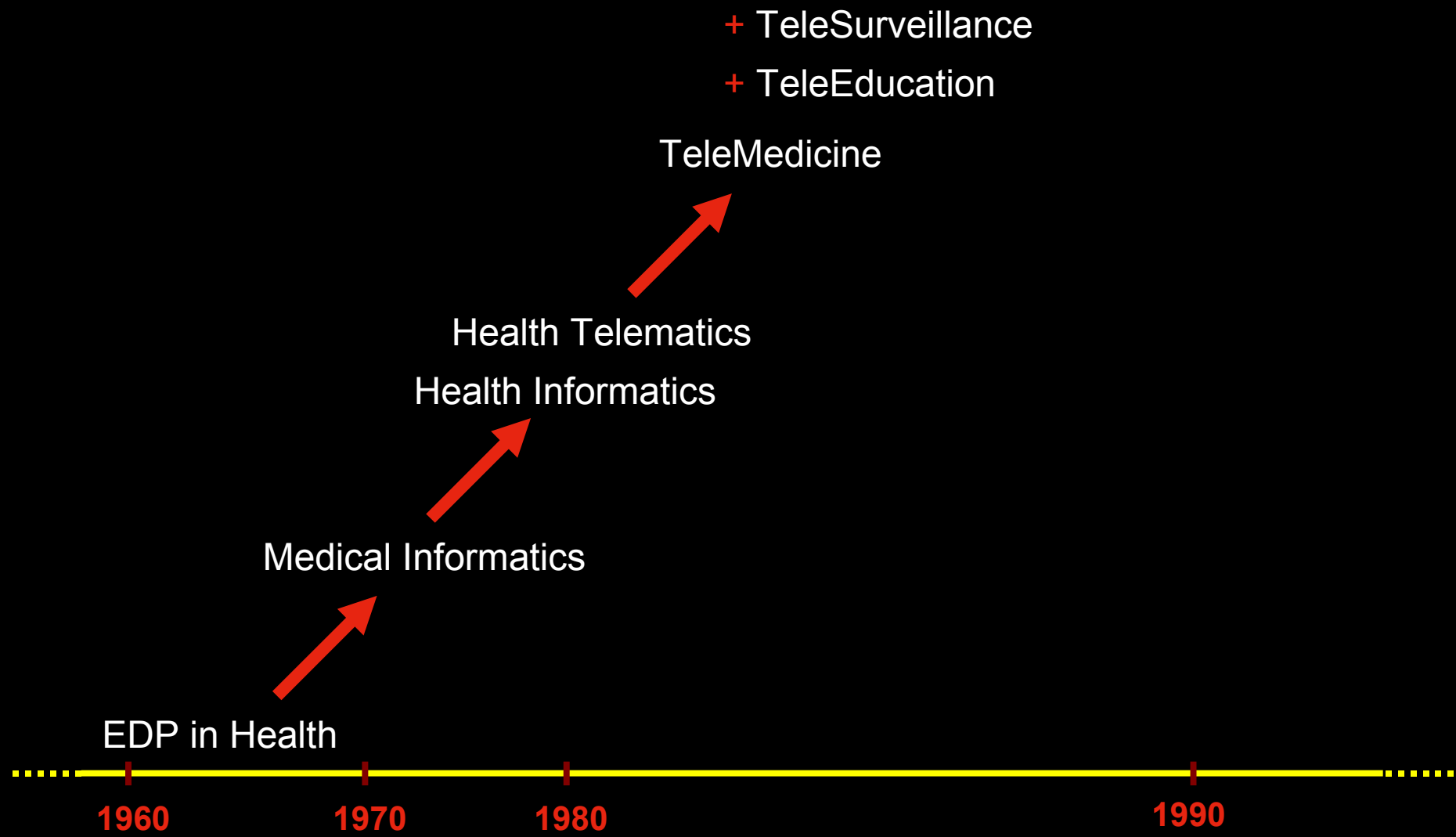
Continuous Professional Development,
including Continuous Medical Education

TeleMedicine: its meaning to the Industrially Developing Countries

- Equitable Access to services (in some cases, "the only means")
- Improve Quality of services
- Economies in
 - expanding or availing the medical services
 - improving the management of the services
- Economies in providing training and education to the staff of the health services, especially the provision of Continuous Professional Development (CPD) including Continuous Medical Education (CME)

Relevance to a “typical” developing country ?

- Pockets of fine quality medical care, and related facilities.
- A remarkable growth in the quality, and geographic coverage, of the Telecom services including Wireless/Mobile.
- BUT, really poor Health Care services, especially outside main cities: poor equity, poor quality, and quite “expensive” to the citizen and to the Health Services.



Traditional Health Statistics & Surveillance

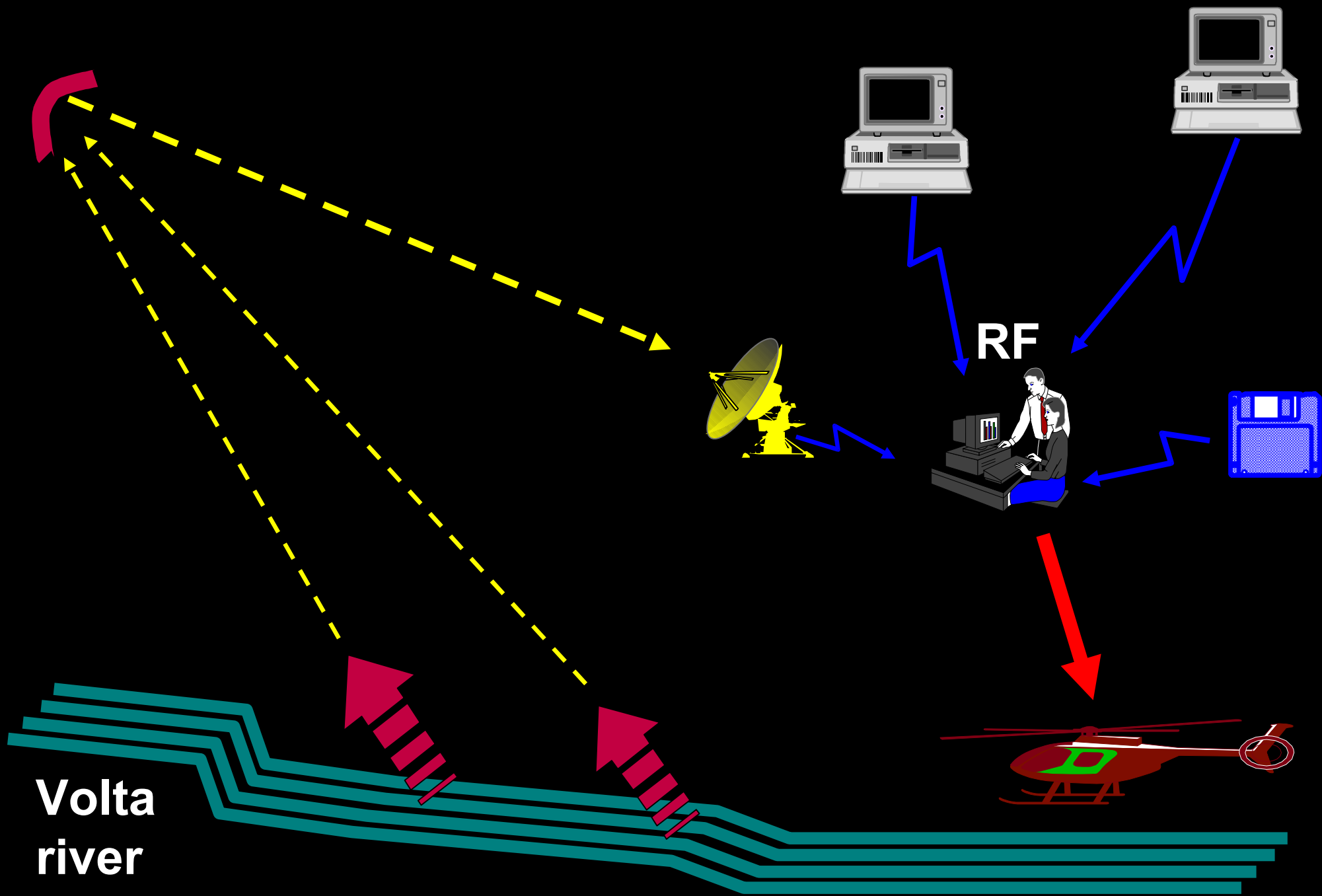
- 60%-75% of a national "health information" budget goes into a:
 - health statistics, or a
 - surveillance unit.
- often with a total disregard to other uses, e.g. management information systems, and decision support systems.
- Health Statistical Reports (by country) with rare uses for Management, and very rare mix with other countries' health data.
- Profound Need: re-think, revamp & modernise the statistics/surveillance units, and their methodologies.

“Data Collection” Alternatives

- 1) TeleSurveillance
- 3) “Remote Sensing” (e.g. imaging from outer space) for detection of infected areas and delimitations of such areas.
- 5) Natural by-product of other “information systems”, e.g. Hospital MIS.
- 7) Mix of the above modern analytical techniques and some traditionally selected data, for Early Warning on infections.

TeleSurveillance

the example of
"River Blindness" in West Africa
(Onchocerciasis Control Programme)



**Volta
river**

RF

TeleSurveillance

- Statistics, Epidemiology & Surveillance:
Need for a dramatic improvement in the cost-effectiveness of present practices, which are the main consumers of most national “health information” budgets;
- Onchocerciasis-like TeleSurveillance are viable alternatives and should be promoted.

The Lessons suggest:

- Surveillance in Health can learn a lot from the Human Genome Project and adopt some of its methodologies and international organisation.
- Trend Analysis and Pattern Recognition, enabled through a Global eHealth approach, could impact Health as Bioinformatics impacted Molecular Biology at large and the Human Genome Project in particular;
- The cost-effectiveness of eHealth/TeleSurveillance;
- Time is ripe to adopt a Global eHealth approach.
- How? and to what extent?

How?

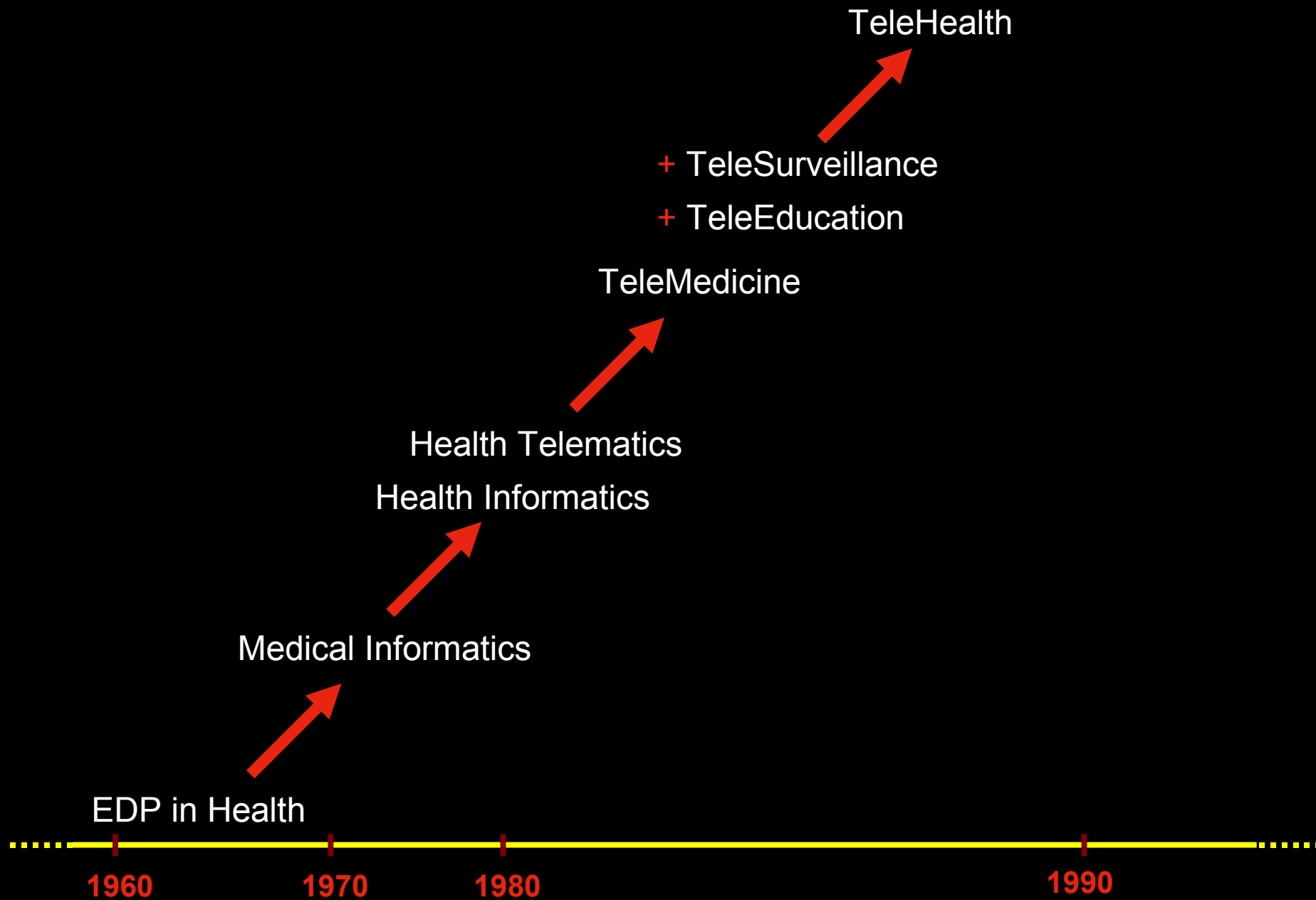
- Global/Regional pooling of surveillance efforts;
- Global/Regional pooling of surveillance data;
- Global/Regional pooling of processing workload;
- Global/Regional posting & sharing of routine and ad hoc surveillance results & outcomes.
- Adoption of the necessary, and largely available, Global Standards?
- **IN BRIEF**, start with the equivalent of the “Human Genome Project” for Health Systems Surveillance, and expand onto a Global Approach to eHealth in general.

“Remote Sensing”

- Mapping the earth surface is routinely used to accurately detect and distinguish different minerals and products such as oil.
- Successfully used to detect water-borne vectors and certain forms of air pollutants, and to collect related data: types, density, distribution, frequency, rate of movement, etc...

Surveillance for Early Warning

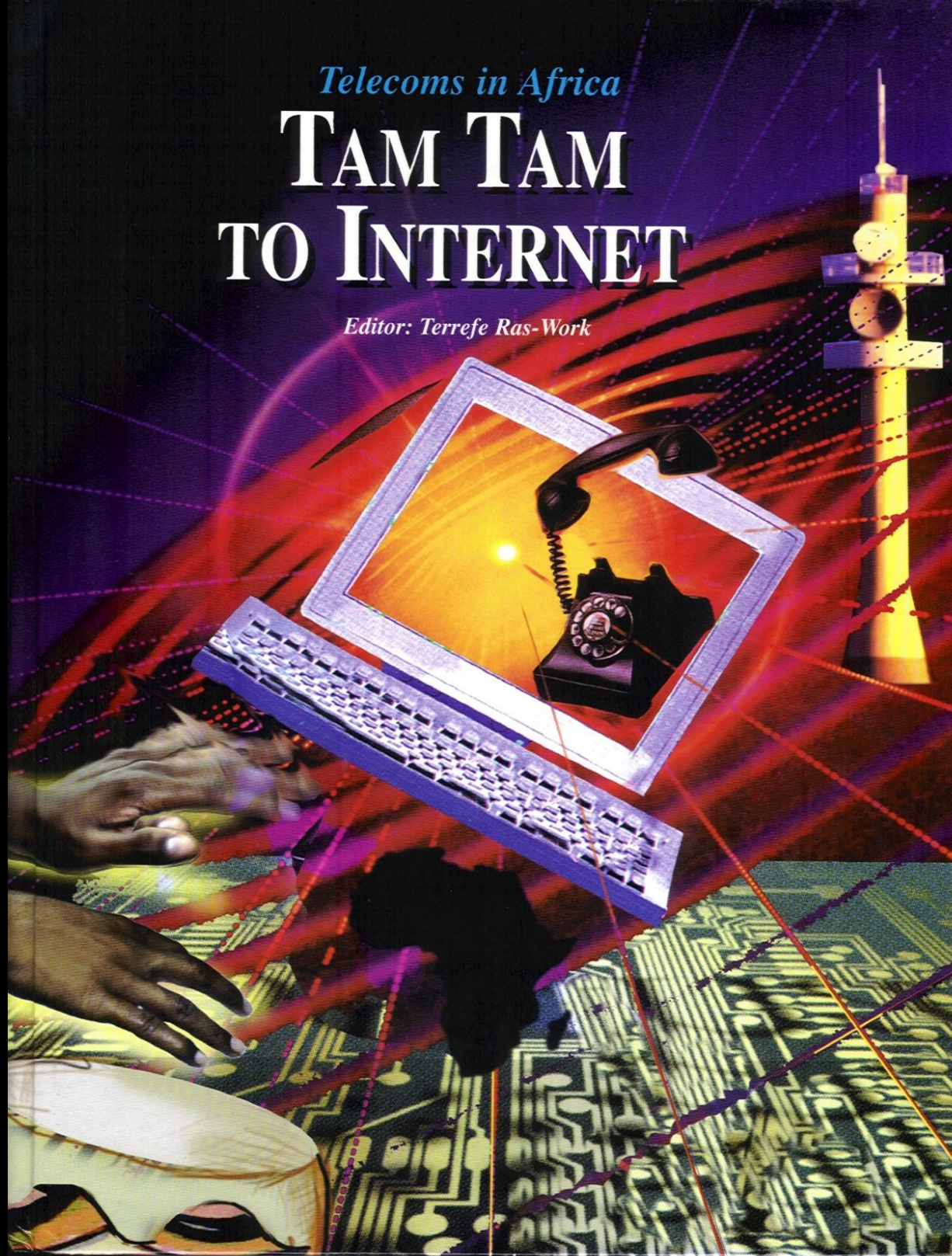
- University of Toulouse, France: Knowledge of the conditions, e.g. climatic conditions, that could lead to the start of certain epidemics;
- Detection of any build-up of similar “conditions” would serve as “Early Warning”.
- Mix of traditionally collected data, and data collected through the above modern techniques, analysed and matched against certain “conditions”, point to Early Warning signals on certain infections and epidemics.
- Proved in an epic project on the breakout of Dengue Fever in the south of Saudi Arabia in 1998; in collaboration between the University of Toulouse, and the Public Health authorities in Saudi Arabia.



Telecoms in Africa

TAM TAM TO INTERNET

Editor: Terrefe Ras-Work



TeleHealth in Africa: Status and Prospects

By *Dr Salah H Mandil, PhD*
World Health Organisation

1. Introduction

The spirit and the reality underlying the catchy title of this book, "Tam Tam to the Internet", is best captured in mankind's second greatest public health success story: the control of the river blindness in West Africa. It is recognised as second only to the 1986 certified eradication of smallpox from the face of the earth. The river blindness or Onchocerciasis Control Programme (OCP) relied on its teams walking, cycling, driving vehicles and flying helicopters; and on communications by face-to-face voice communications and by old-fashioned but reliable radio transmitters/receivers; and on data collected by sensors placed along river streams taking real-time readings and automatically transmitting to a satellite that bounced the data to the main collecting station in Ouagadougou, Burkina Faso, which is linked to desktop computers for storage, processing and computing the optimal spraying by the helicopter squad. The Onchocerciasis Control Programme covered 11 West African countries, and achieved its success in about 14 years. OCP is discussed further in para (4.3) of this chapter.

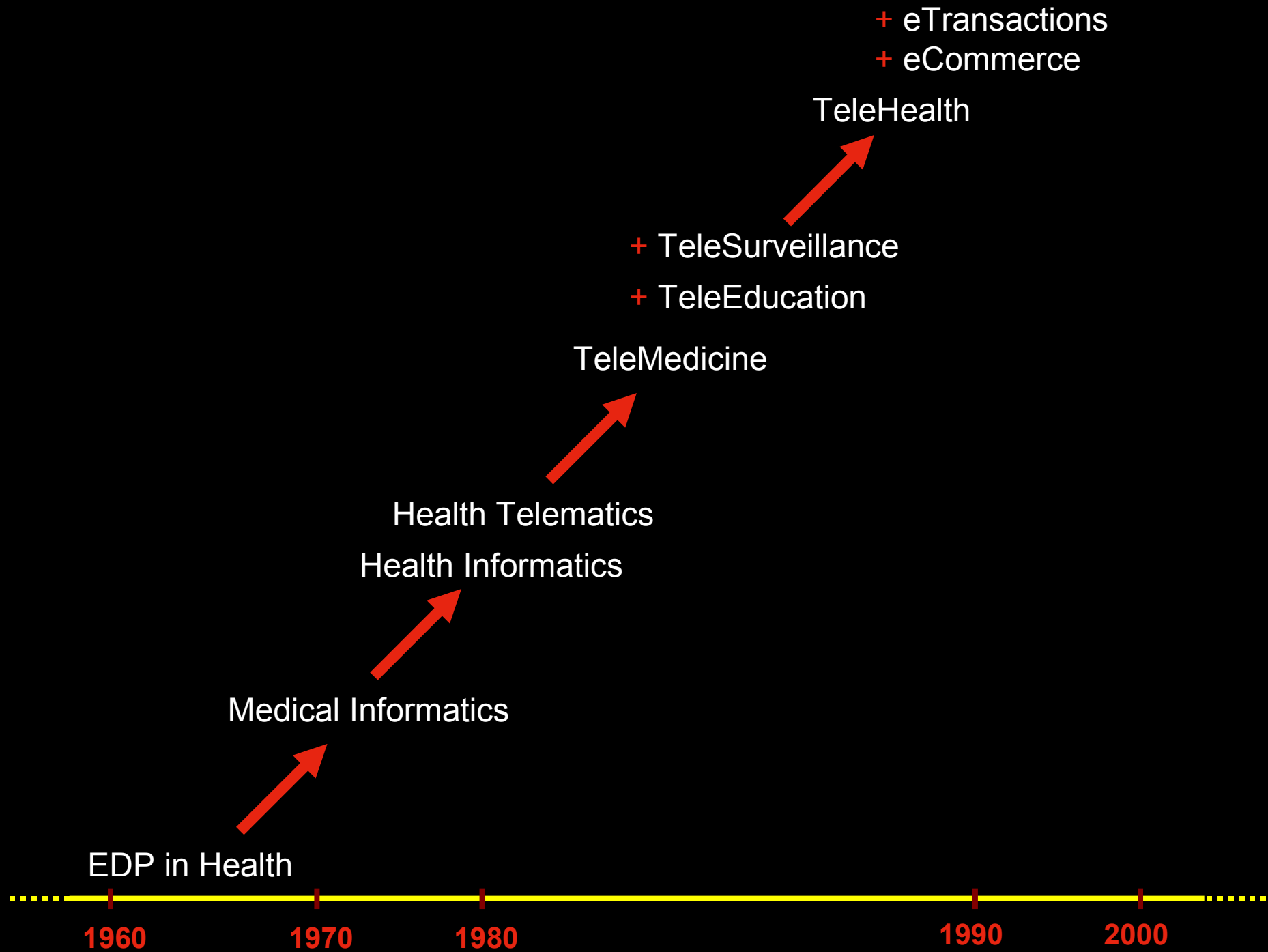
It is a success story that relied on old-fashioned ways and traditional means, combined with the information and space-age technologies – as if the centuries between the tam tam and the Internet are squashed into those 14 years of OCP's battle and victory. OCP is a

real-life example of the phenomenon, that is "From Tam Tam to the Internet", which certain pockets in Africa are living today and which, if spread and managed cost-effectively, could help propel our African nations out of the vicious circle of poverty, ill health, dependence on aid, poor economies, poor infrastructure ... poverty.



Dr Salah H Mandil

Good quality and geographically spread communications have been key factors in the economic success of several Asian and Latin American nations. Furthermore, telecommunications has been and is key to the globalisation process and to the sustenance of its outcome. This chapter is concerned with the uses of telecommunications in health, or TeleHealth, with particular emphasis on TeleMedicine and how these are beginning to be practised within countries and between countries. This chapter also stresses that TeleHealth and TeleMedicine could eventually constitute a main sector of co-operation and trade between African countries, and with the rest of the world.



eTrade and eCommerce

(eTransactions including ePrescriptions)



UNITED NATIONS

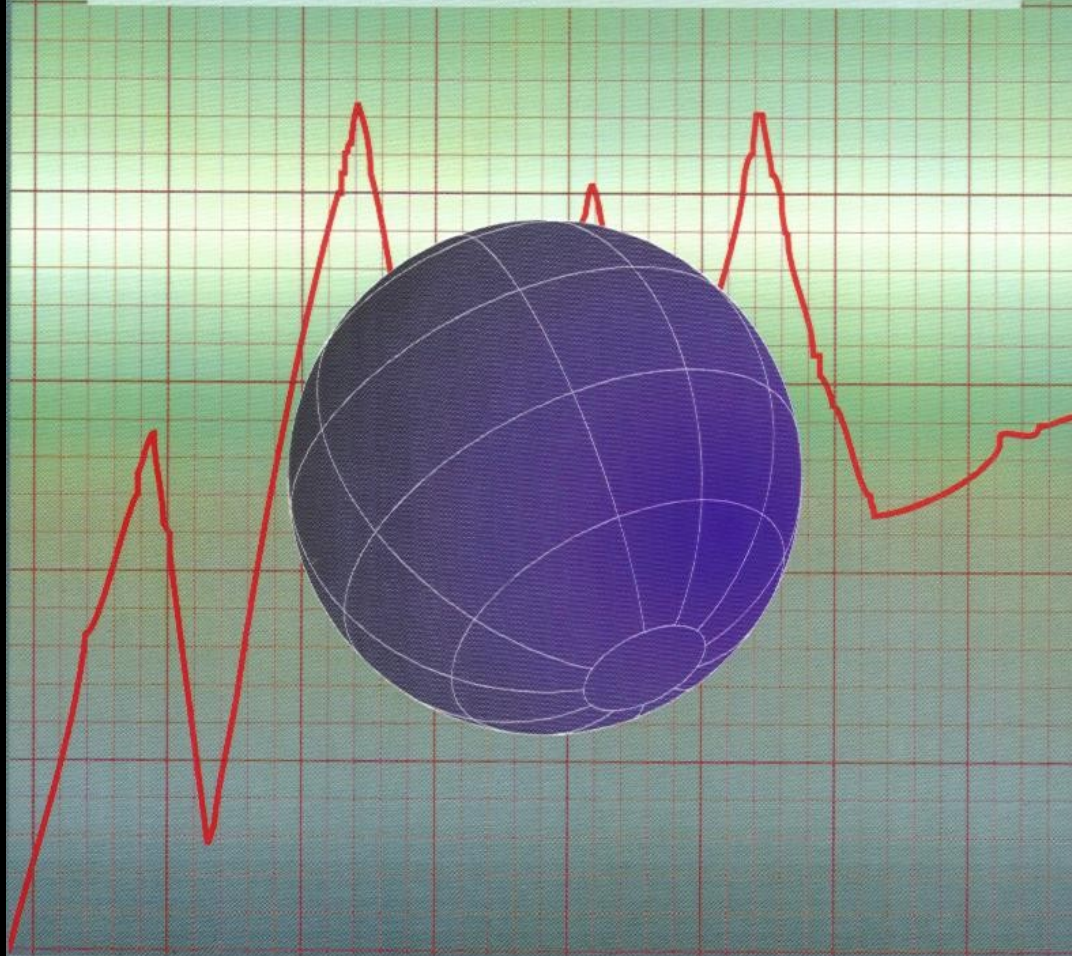


WHO

INTERNATIONAL TRADE IN HEALTH SERVICES

A development perspective

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT



6. TELEHEALTH: WHAT IS IT? WILL IT PROPEL CROSS-BORDER TRADE IN HEALTH SERVICES?

Salah H. Mandil

Telecommunications is a key to the globalization process and to the sustenance of its outcome. This chapter is concerned with the role that telecommunications play in the evolving impact of globalization on the health sector, and the resulting current trends and issues. In particular, it is concerned with the uses of telecommunications in health, or TeleHealth, with particular emphasis on TeleMedicine and how these are beginning to be practised in differing countries. This chapter also stresses that TeleHealth and TeleMedicine could eventually constitute a main sector of international cooperation and trade, subject to certain impediments being overcome.

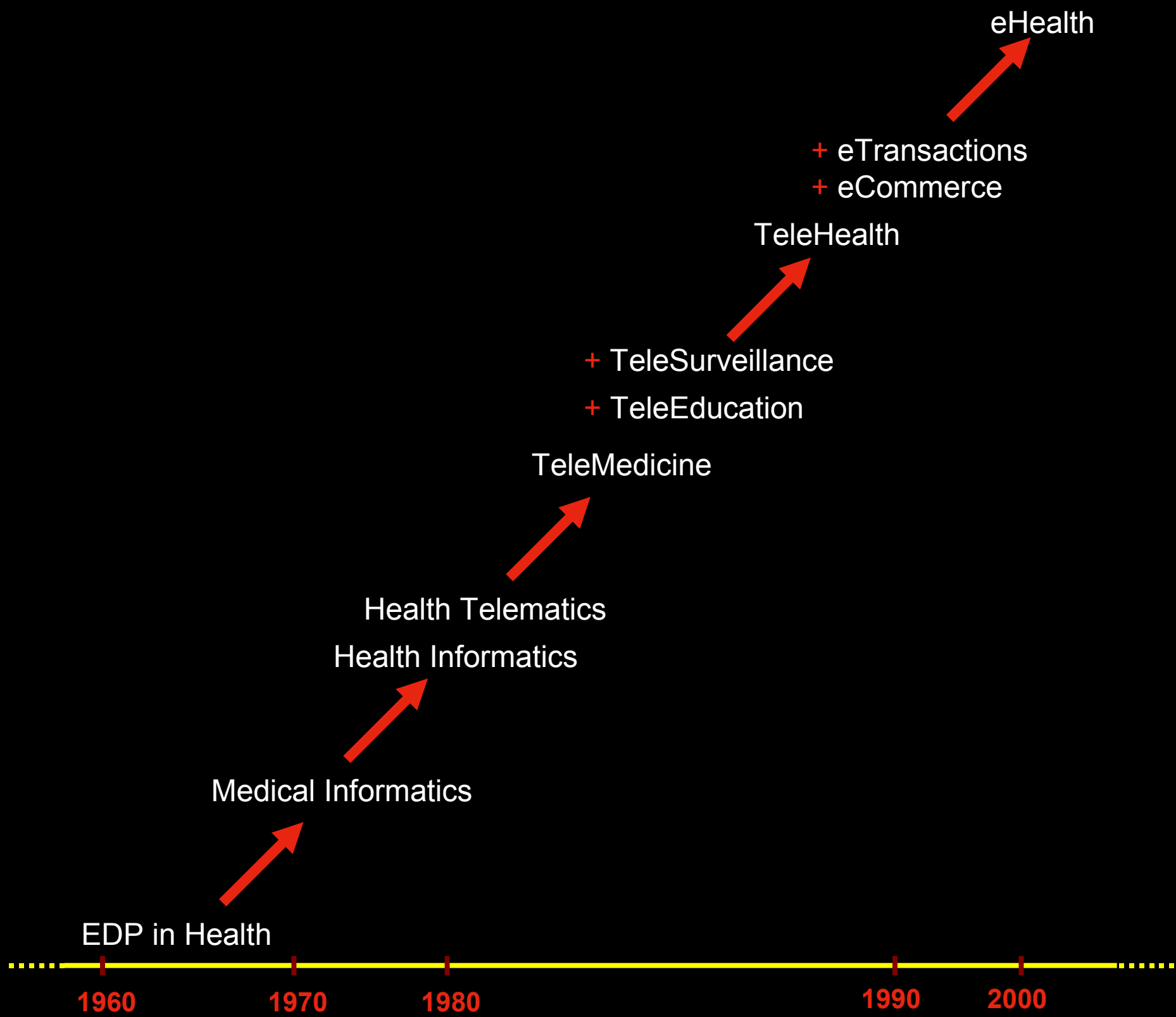
Throughout this chapter, the terms TeleHealth and TeleMedicine are written as such, consistent with the author's past publications on the subject¹, to emphasise the author's belief that, in the near future and for some countries within a matter of five years, the wide and sophisticated uses of telecommunications in health will be routine, so much that the prefix "Tele" could and would be dropped to re-stress the basic objective of Health and Medicine.

I THE IMPACT OF GLOBALIZATION

Globalization has been recognised as a "process" by which persons, concepts, images, ideas, values, capital and traded goods diffuse across national boundaries, thus steadily increasing global socioeconomic and political interdependence and integration². Whereas this has been most evident in trade,

¹ S. H. Mandil, Telematics support to health care in Africa. Invited Plenary Address to International Conference of the International Telecommunications Union, AFRICA TELECOM 94, Cairo, April 1994.

² A. Hurrell, and N. Woods, Globalization and Inequality. *MILLENNIUM: Journal of International Studies*, Vol. 24, No. 3, 1995.



eHealth ?

- Clinical care of the individual: **TeleMedicine**
- Home health care: **TeleHome care**
- Management of clinical care: e.g. **EHR, ePrescriptions, ...**
- Monitor & control Public Health: **TeleSurveillance**

- Education of the Public: **TeleCasting** for Health
- Human resources development: **TeleEducation**

- Governance of Health Services (includes administrative & financial transactions, and routine services, e.g. those requiring form-filling & submission): **health-related parts of eGovernment, and eTransactions**

- Commercial transactions, **eCommerce** in medical commodities

- ICT Support to Research

The next technology boost to eHealth: Sensor Technology

- Temperature
- Pressure
- Texture/feel
- Shape
- Smell
- etc...

Interesting Indicator: AMD Telemedicine reported that its highest sales in 2004/05 were in Remote/Home Monitoring devices.

Related References

(authored or co-authored by Salah Mandil)

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Further contact:

Salah H. Mandil
Geneva
Switzerland

tel: +41 79 425 4742

e-Mail: salah.mandil@bluewin.ch