Annex II

Monitoring Indicators

Annex 2 – Monitoring Indicators

2.1 – Introduction

One of the main priorities in the planning of activities of the Information Society Program should be to establish a series of *indicators* (quantitative, if possible) to allow for the monitoring of all the initiatives proposed.

The extensive goals proposed for the Program prioritize the selection of indicators that reveal general aspects of each *line of action*. But, on the other hand, the nature of the Program's activities indicates that its impact may be more directly measured through indicators of infrastructure, production and use of specific goods and services in the area of ICT.

In order to illustrate the type of approach we plan to use to select indicators to be used in the Information Society Program, section 2.2 of this annex describes the INEXSK approach, while section 2.3 brings the list of indicators suggested in the *Draft Action Plan* of the eEurope 2002 initiative, recently introduced by the European Union.

2.2 – The INEXSK *(Infrastructure, Experience, Skills, Knowledge*) Approach

This section summarizes passages of Chapter 1 of the book written by Robin Mansell & Uta Wehn (1998).

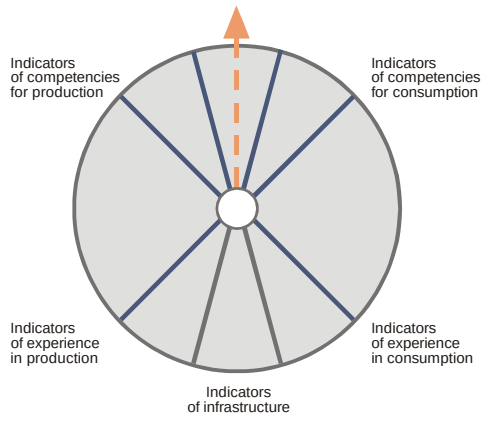
The Basic Model

The analysis of the potential of information and communication technologies IICT) in economic and social development requires a systematic method to collect data and carry out comparisons on the international level.

Such an approach allows us to evaluate how *infrastructure*, *experience* and *competencies* can contribute to development and economic growth through the application of ICT.

The indicators of infrastructure, in the lower half of Figure A2.1, allow us to evaluate how solid (or precarious) is the technological base for the development of experiences (for the production of ICT goods and services) and of competencies (for the employment of ITC). A less developed infrastructure implies in a base much too narrow for the development of the production and consumption of ITC products and services.

Figure A2.1
"Ideal" Indicator



Source: Mansell & Wehn, 1998

Then, indicators of production and consumption are presented, with the understanding that it's a consensus among experts that knowledge is a cumulative process resulting from production or consumption experience.

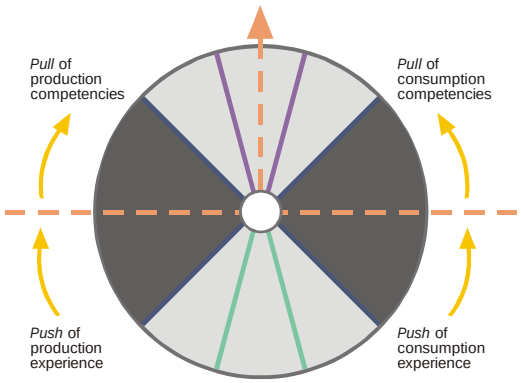
Following that (in the upper half of Figure A2.1), the indicators of competence for production and consumption appear, which will reinforce the indicators of (experience with) production and consumption. Thus, the indicators in the bottom half *render viable* and contribute to the performance of the indicators in the upper half.

Finally, at the very top of Figure A2.1, we find the "ideal" indicator, which indicates at what level information should be and how it should be applied for the economic and social development of a nation. Obviously, the "ideal" indicator serves only as a reference, which is why a group of four levels of indicators is used to make up for the absence of an "ideal" indicator.

"Push" and *"pull"* effects

The relatively simple structure, introduced above, makes it possible to illustrate the *relationship* between experience and competencies, a basic aspect of the development process for the production and use of ITC. Figure A2.2 illustrates this relationship.

Figure A2.2
Push/Pull Process in the INEXSK Model



Source: Mansell & Wehn, 1998

Experience with production and consumption allows technologies to take on the role of giving a little "*pus*h" for the generation of knowledge. However, neither production nor consumption, on their own, are able to convert infrastructure and experience into the generation of knowledge. This requires a "pull" on the part of the competencies for production and consumption, represented by the lines in the upper half of Figure A2.2.

Organizational Capacity

As shown in the darker sections of Figure A2.2, there is comparatively greater space in the center of the diagram, denoting greater distance between the indicators of experience and those of competencies than between the indicators of experience and infrastructure.

This reflects the inherent difficulty in coordinating the "*push*" of experience with the "*pull*" of competencies to assure a positive result. A large part of the challenge of integrating ICT with development lies in the difficulty of mobilizing tactical knowledge and organizational capacity in order to effectively use experience and competencies in the construction of knowledge-based societies.

The Detailed Model

For the infrastructure indicator, the traditional measure is the size and the expansion of resources of the *telecommunications* area and of the installed *computer* base. In telecommunications, the diffusion of telephone lines, though not an ideal indicator, is still the best alternative. In the case of computers, the diffusion of *personal computers* is also a good indicator.

In order to understand the role experience plays, one can examine the production and demand of the *electronic industry*. To gauge the contribution made by *competencies*, it's crucial to utilize measures that indicate the level of preparedness of society for an expansion of the use of information to produce knowledge. A fundamental indicator of such level of preparedness is the *literacy* rate of a society. On the other hand, it's important to include measurements of the specific capacity to produce and adapt ICT. Here, the number of *university graduates* in engineering, mathematics and computer science courses is relevant.

Finally, it's a good idea to add indicators of the current level of dissemination of the *Internet* and of *television sets* in a society, as approximate measures of society's level of immersion in these convergent medias.

The eight indicators selected, and an explanation on how they are computed, are illustrated in Chart A2.1.

Three factors were important in the construction of these indexes, as shown below:

i. In the case of infrastructure and competence measurements, it's necessary to make adjustments according to the size of a nation. A country with a larger territory will frequently have greater infrastructure and a greater number of technicians in absolute terms, which doesn't mean they are is a better position in comparison to a smaller nation, with smaller absolute numbers.
ii. When defining indicators for experience in production and consumption, it's necessary to take

Chart A2.1
Indicators Employed

Indicators	Variables Involved	Calculation Used	Country with 100
1 Personal Computer Index	Personal Computes (PCs) / Population	PC *per capita*	New Zealand
2 Telephone Line Index	Telephone Lines / Population	Telephone lines *per capita*	Sweden
3 Electronic Production Index	Production Earnings / GDP	Share of earnings in the GDP	Ireland
4 Electronic Consumption Index	Market for electronic products / GDP	*Per capita* consumption relative to the *per capita* GDP	Ireland
5 Technical Graduates Index	College graduates in Computer Science and Math, plus all the Engineering courses	Total number of college graduates per 1000 inhabitants	Holland
6 Literacy Index	Percentage of the population that is literate	Simple percentage	None (100% = 100)
7 Internet Hosts Index	Number of Internet Hosts / Population	Internet Hosts per 1000 inhabitants	Denmark
8 Television Set Index	Number of TV sets / Population	TV sets per 100 inhabitants	Great Britain

Source: Mansell & Wehn, 1998

into consideration the relative significance of the numbers (relative to the *electronics* sector in the economy) in the economy as a whole, measured by the GDP.

iii. It's necessary to place different countries on a common scale.

One country should be selected as the "extreme" point, or that at the highest level, to which all other nations are compared, in each category of index. The country "considered as 100" isn't, usually, the one with the highest rate for that index in the world. This is evident in Table A2.1, in the case of Technical Graduates. Four of the five countries have rates for this index that surpass that of the Netherlands, the country considered as 100. Great Britain is the country considered 100 for the index on TV sets, though the U.S. and Japan have higher indexes in this area.

Table A2.1
Indexes for Industrialized Nations

Index Rates	France	Germany	GB	EUA	Japan
Personal Computers	60	74	60	147	68
Telephone Lines	82	72	74	92	72
Production of Electronics	19	19	27	32	44
Consumption of Electronics	32	32	46	54	43
Technical Graduates	114	87	165	104	121
Literacy	n.d.	n.d.	n.d.	n.d.	n.d.
Internet Hosts	27	60	78	238	22
TV sets	95	90	100	127	101

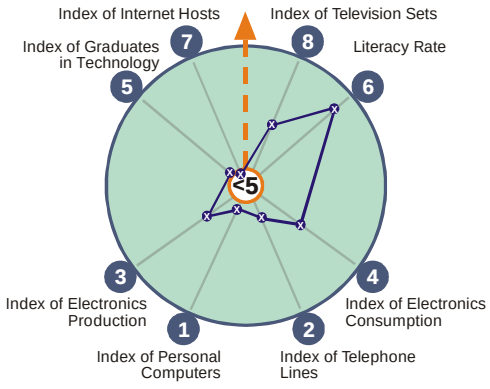
Sources: Mansell e Wehn, 1998 (ITU STARS, 1996; Elsevier, 1996; Unesco, 1995)

The "IT Footprint"

By employing the indicators described above, the diagram of Figure A2.3 allows us to compile the IT "footprint"of a nation

The IT "footprint" of a nation is outlined by *connecting the points* corresponding to the values of the indexes of this nation. In the middle of the diagram in Figure A2.3, the value of each index is *zero*, while

Figure A2.3
The "IT Footprint"



Source: adapted from Mansell & Wehn, 1998

the value at the edge of the circle is 100. When the value of an index is below 5, it will be represented by the small circle in the center of the diagram, in order for it to be visualized in the whole.

In all the diagrams, the "Ideal Indicator" is included to symbolize the fact that this analysis is temporary, and that better measurements of the impact of infrastructure, experience and competencies in initiatives aimed at an information society are needed.

2.3 – Indicators of the eEurope 2002 Initiative

This section is a transcrip of the Annex to the eEurope 2002 document – "*An Information Society for All, Draft Action Plan, European Commission*"..

Indicative List of Indicators for eEurope 2002 (April 2000)

1. Cheaper, faster and more secure Internet

a) Cheaper and faster access to the Internet

- Level of penetration of the Internet (residences connected, Internet users, high-speed access);
- Cost to access the Internet.

b) Faster Internet for researchers and students

- Speed of interconnections and services, available between and within the national research networks (within the European Union and worldwide);
- Number of domestic high-speed networks established in *campi.*

c) Secure networks and intelligence cards

- Percentage of the population that uses intelligent cards for access and/or transactions;
- Level of penetration of the IPsec market.

2. Investing in skills and people

a) European Youth for the digital era

- Number of computers per 100 students;
- Percentage of primary and secondary schools on the Internet;
- Number of hits to web servers of schools and the public educational system.

b) Working in a knowledge-based economy

- Percentage of workforce that has skills in the use of computers;
- Proportion of the workforce involved with teleworking.

c) Participation of everyone in a knowledge-based economy

- Number of computer terminals of public access to the Internet per 1,000 inhabitants;
- Number of centers of excellence connected to the *design-for-all* network.

3. Encouraging the use of the Internet

a) Accelerating electronic commerce

- Percentage of e-commerce websites with secure trademarks, safety seals and other certificates;
- Number of consumers aware of the existence of ADR;
- Percentage of enterprises that carry out more than 10% of their business through electronic means;
- Number of computer terminals of public access to the Internet per 1,000 inhabitants;
- Number of centers of excellence connected to the *design-for-all* network.

b) On-line government: electronic access to public services

- Percentage of *on-line* interactions carried out in basic public services;
- Percentage of government purchases carried out *on-line.*

c) On-line health care

- Percentage of renders of primary and secondary health care services in a regional network;
- Existing number of European websites related to health care with evaluation by pairs.

d) Digital content for worldwide networks

- Percentage of European Union websites among the top 20 most visited domestic websites;
- Number of multilingual European portals.

e) Intelligent systems of transportation

- Percentage of phone calls in Europe to the 112 services, with data on localization;
- Percentage of large at European cities with traffic and travel planning services;
- Percentage of European highway structure (per total extension of the network), equipped with information systems on traffic congestion, as well as for administrative purposes.