

Academic Research Network (ARN) Programm on Information Society Indicators: Preliminary Results



Farouk Kamoun
Laboratoire CRISTAL

Ecole Nationale des Sciences de l'Informatique
University of Manouba, Tunis, Tunisia

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Framework: Academia Research Network (ARN)

- Network of Academia Created in June 2004 by UNECA
- Objective: Get African Academia involved in the Building of the Information Society
- 5 Groups and research areas:
 - Capacity Building
 - Enabling Environment
 - African Languages + Content
 - ICT Industry and Services
 - Measuring African Information Society

ARN Research Work On Measuring the Information Society: 2 Phases

- **Phase I: 2004-2005 (Focus on Penetration & Usage Ind.)**
 - Review of Existing Initiatives
 - Implementation Results
 - Reference Model
 - Analysis & Comparisons & Recommendations
- **Phase II: 2006-2007 (Expand Coverage to Impact Ind.)**
 - Review of Existing Initiatives on Impact
 - Reference Model for Impact Indicators
 - Propose a Complete Set of Indicators (Penetration, Usage, Impact)
 - Provide an Measurement Guide: Definition and objectives, method of calculation and methodology of measurement & analysis
 - Assist National Statistics Organizations

IS Indicators & measurement initiatives

● Global

- ITU Cyberindicators + Digital Access Index DAI: **e-IUT-DAI**
- World Economic Forum + World Bank + INSEAD: Networked Readiness Index **NRI**
- WSIS Partnership on "measuring ICT for development": **SMSI-P**
- UNESCO: **ORBICOM**

● Regional

- Europe : Statistical indicators for benchmarking the Information Society in Europe:
 - **SIBIS (EU 15), Key SIBIS**
 - **SIBIS+ (NAS)**
- Africa: ECA Initiatives:
 - **Scan-ICT**
 - EA-ITU "Botswana Workshop": **Botswana**

● National

Comparison

● Structure & Hierarchy ✓

● Index Hierarchy ✓

● Domains & Coverage ✗

Hierarchical Structure

Domain level	4	3	2	1	0
Initiatives	Domain Level 4	Domain level 3	Domain level 2	Domain level 1	Indicators
e-IUT				6	25
DAI				5	8
NRI			3	9	48
ORBICOM			2	4	17
SIBIS	3	10	22	44	133
Key-SIBIS	3	10	11	15	34
SIBIS+			6	8	62
SMSI-P				3	42
SCAN-ICT		7	21	68	152
Botswana				13	62

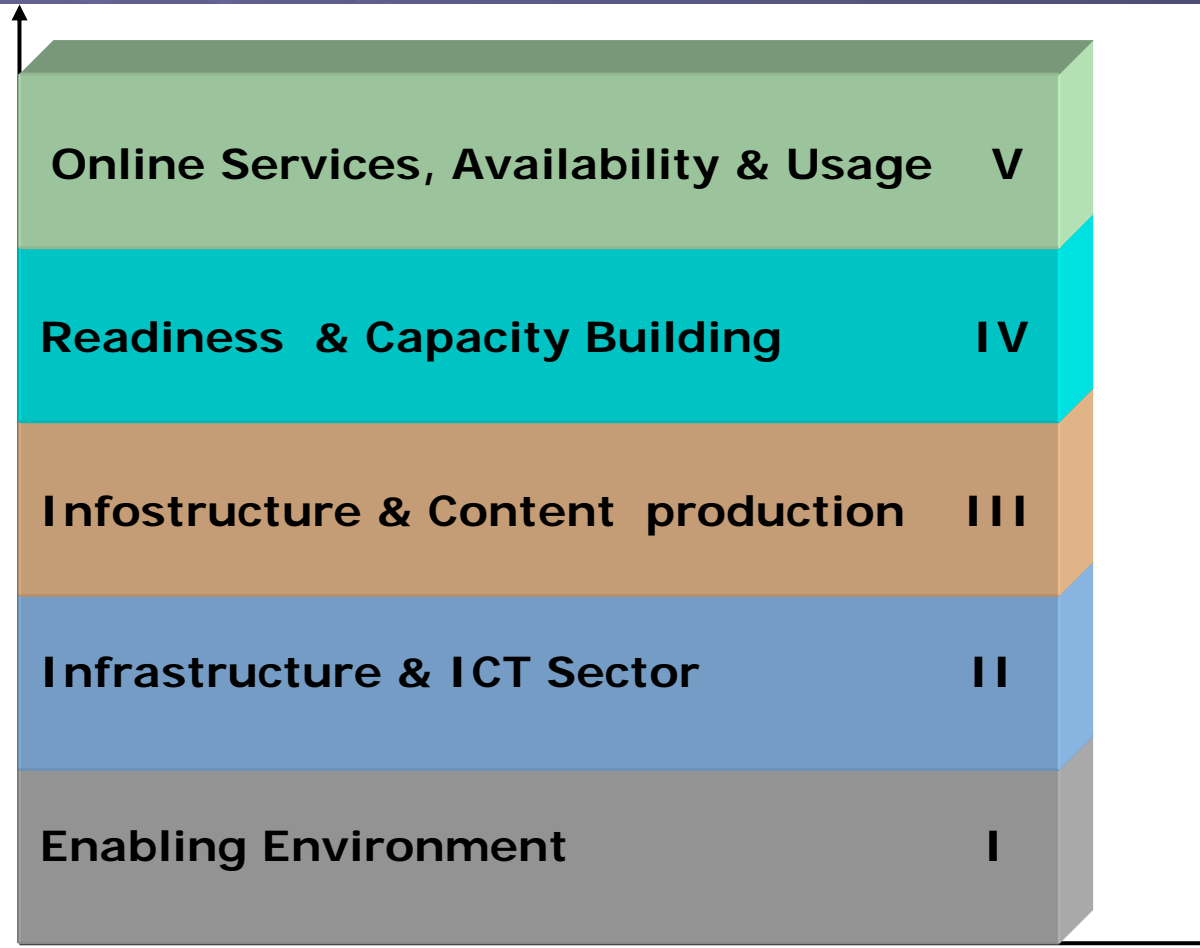
Index Hierarchy

Level		4	3	2	1	0
Initiatives / Level	Global	Compound	Compound	Compound	Compound	Indicators
e-IUT					1	25
DAI	1				5	8
NRI	1			3	9	48
ORBICOM	1				2	17
SIBIS					5	133
Key-SIBIS					1	34
SIBIS+						62
SMSI-P						42
SCAN-ICT						152
Botswana						62

Remarks

- Lack of standard definitions and terminologies!
- Different Focus
 - Enabling Environment
 - Infrastructure
 - Usage
 - Etc.
- Difficult to Compare
- A Reference Model is Required

Model-Basic Components



Model Dynamics

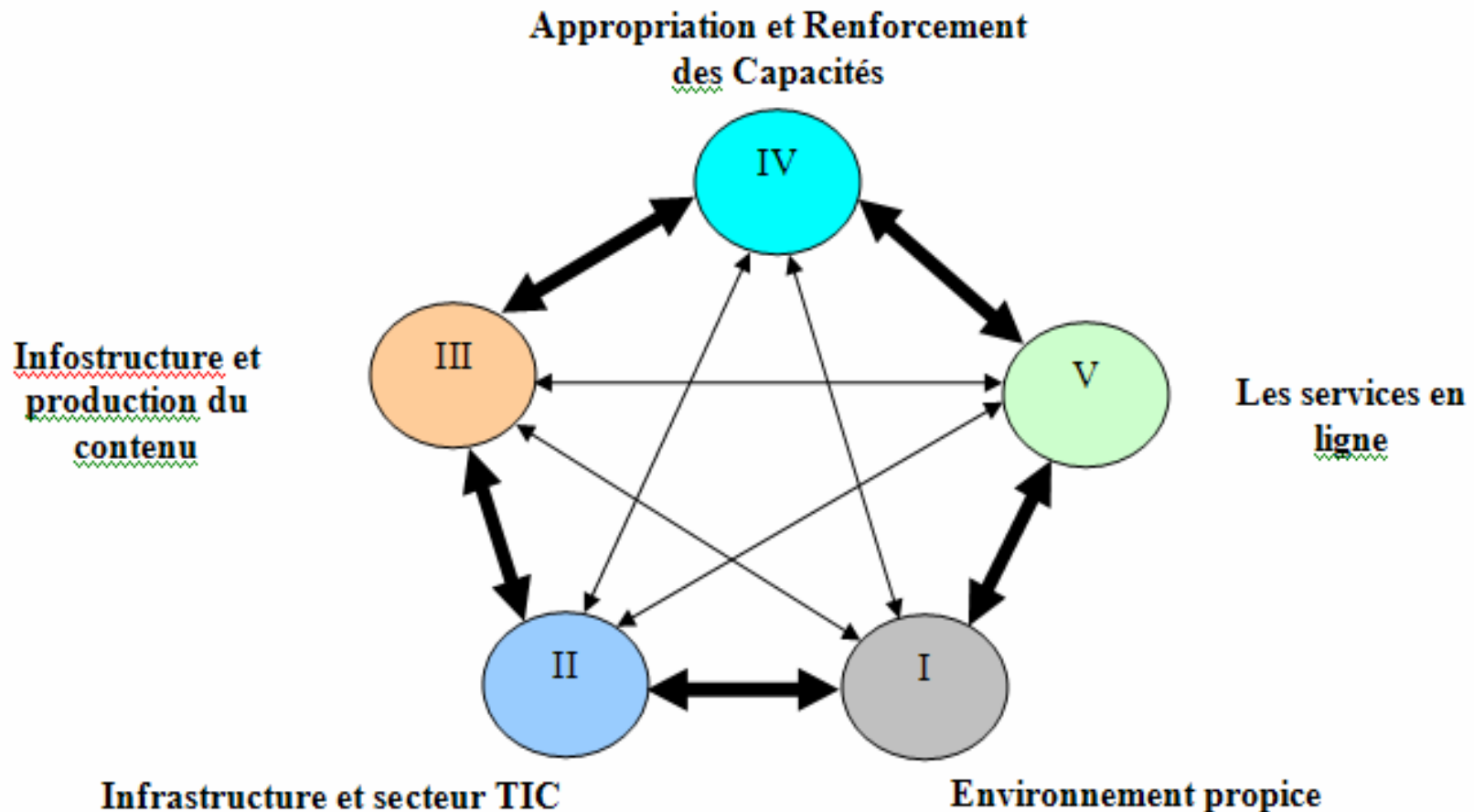


Fig.V.2 Liens entre les composants de la construction de la société de l'information

CSI	CSI Domaines
A/ Environnement Propice	A-0/ Caractéristiques du pays A-1/ Cadre juridique et légal A-2/ Environnement économique et de marché A-3/ Cadre Institutionnel A-4/ E-Stratégie A-5/ Environnement de l'éducation et de la recherche
B/ Infrastructures et secteur TIC	B-1/ Téléphonie fixe et sans fils B-2/ Infrastructure informatique B-3/ Internet B-4/ Sécurité B-5/ Secteurs des TIC
C/ Infostructure et production du contenu	C-1/ Médias classiques et en ligne C-2/ Gisements d'information C-3/ Production du contenu
D/ Appropriation et Renforcement des Capacités	D-1/ Appropriation (Digital Literacy) D-2/ Réceptivité, confiance, barrières pour l'usage des TIC D-3/ TIC dans l'éducation D-4/ TIC au service de la recherche D-5/ Formation des spécialistes en TIC D-6/ Recherche et Innovation en TIC
E/ Les services en ligne, disponibilité et usage	E-1/ E-gouvernement E-2/ E-business E-3/ E-Travail E-4/ E-health E-5/ E-Agriculture E-6/ E-Loisir E-7/ E-Environnement et gestion des ressources naturelles

Component Coverage

CSI	e-UIT, DAI	NRI	SMSI P	ORBICO M	SIBI S	SIBIS +	SCA N-ICT	Botswana
A/ Enabling Environment	3	25	1	2	-	11	21	5
B/ Infrastructure & ICT sector	12	15	25	13	29	17	59	22
C/ Infostructure & content production	2	3	4	2	10	1	12	7
D/ Readiness & capacity building	2	-	-	-	43	15	22	7
E/ Online services, availability & usage	6	5	12	-	51	18	38	21
TOTAL per initiative	25	48	42	17	133	62	152	62 ¹²

Proposal of A Set of Indicators

- Must Include SMSI-P Indicators (42)
- More Evenly Balanced Over The 5 Components
- Take Into Account USAGE
- Select Indicators from ECA Initiatives
- Adapt some Pertinent Indicators from SIBIS and Others

A- Enabling Environment

A-Enabling Environment

A-0\Country profile

- Proportion of households with electricity
- Gross Domestic Product (GDP)

A-1\ Legal System

- *Quality of the legal and administrative system*
- *Laws & regulations relating to ICTs*

A-2\Economy & Market environment

- *Competition in the ICT sector*

A-3\Institutional System

- ICT Institutional Framework

A-4\E-Strategy

- *Existence of vision, strategy, implementation status*

A-5\Educational and Research

- *Adult literacy*
- *Combined primary, secondary and tertiary school enrolment level*

B- Infrastructure & ICT Sector 1

B- Infrastructure & ICT Sector

B-1\Fixed & Mobile Phones

- Fixed telephone lines per 100 inhabitants
- Mobile cellular subscribers per 100 inhabitants
- Percentage of population covered by mobile cellular telephony
- Mobile cellular tariffs (100 minutes of use per month), in US\$, and as a percentage of per capita income
- Proportion of households with a fixed line telephone
- Proportion of households with a mobile cellular telephone
- Proportion of individuals with use of a mobile telephone

B-2\Informatics Infrastructure

- Computers per 100 inhabitants
- **Proportion of households with a computer**
- Proportion of individuals that used a computer (from any location) in the last 12 months

B- Infrastructure & ICT Sector 2

B- Infrastructure & ICT Sector

B-3\Internet

- Internet subscribers per 100 inhabitants
- Broadband Internet subscribers per 100 inhabitants
- International Internet band width per inhabitant
- Percentage of localities with public Internet access centres (PIACs) by number of inhabitants (rural/urban)
- Internet access tariffs (20 hours per month), in US\$, and as a percentage of per capita income
- **Proportion of households with Internet access at home**
- Proportion of individuals that used the Internet (from any location) in the last 12 months
- Location of individual use of the Internet from all locations in the last 12 months
- Internet activities undertaken by individuals in the last 12 months
- Proportion of households with access to the Internet by type of access from home
- Frequency of individual access to the Internet in the last 12 months

B- Infrastructure & ICT Sector 3

B- Infrastructure & ICT Sector

B-4\Security

- *Concerns regarding online security*
- *Presence of information security policies*
- *Tools for information security*

B-5\ICT-Sector

- **Proportion of total workforce involved in the ICT sector**
- Value added in the ICT sector (as a percentage of total value added)
- ICT goods imports as percentage of total imports
- ICT goods exports as percentage of total exports

C- Infostructure & Content Production 1

C- Infostructure & Content production

C-1\Media and on-line availability

- Radio sets per 100 inhabitants
- Television sets per 100 inhabitants
- *% of newspapers online*
- Proportion of households with a radio
- Proportion of households with a TV

C-2\Type of Online Content

- *Size of digital journal collections*
- *Staff providing electronic library services*
- *Local internet content (Typology of local hosts, Number and % of hosts with indigenous cultural information)*
- *Usage of on-line information sources per type of information (science, health, agriculture...)*
- *Scientists' access to on-line information sources*
- *Usage of Internet-based data collection and data analysis methods*

C- Infostructure & Content Production 2

C- Infostructure & Content production

C-3\ Content production

- *Publications available via the Internet*
- *Number and % of websites developed in local languages*

D-\ Appropriation & Capacity Building 1

D-\ Readiness & Capacity Building

D-1\ Digital Literacy

-Participation in ICT-related training

-ICT training qualifications

-ICT user experience in the labour force

-Skills in the use of the Internet

D-2\ Perception, confidence, barriers for the access and usage of ICT

-Share of population who feel very confident in using the Internet

-Concerns regarding on-line security

-Concerns regarding on-line privacy

-Perceptions regarding affordability of the Internet

-Psychosocial barriers to Internet use

D-\ Appropriation & Capacity Building 2

D-\ Readiness & Capacity Building

D-3\ ICT in Education

- Average Internet bandwidth per enrolled Student (in primary, secondary schools and tertiary institutions)*
- Percentage of ICT-qualified teachers in primary and secondary schools*
- Percentage of primary and secondary schools having Internet access for students for study purposes*
- Percentage of students enrolled in tertiary education having Internet access for students for study purposes*
- Enrolled Student to PC ratio (in primary, secondary schools and tertiary institutions)*
- Percentage of tertiary education institutions with e-learning courses*
- For what purpose do students/teachers use computers/Internet (% for E-mail, research, employment opportunities, application software, etc.),*

D-\ Appropriation & Capacity Building 3

D-\ Readiness & Capacity Building

D-4\ ICT for Research

- *Quality of scientists' computer equipment*
- *Internet skills for scientists*
- *Core usable backbone capacity on a national RN*
- *Computer- mediated social communication for R&D purposes*
- *Usage of collaboration applications*
- *Involvement in international R&D collaborations*
- *Percentage of co-authored scientific articles*

D-5\ Training ICT personnel

- *Percentage of students enrolled in tertiary education in an ICT field or an ICT- dominated field (of the total number of students) by gender*

D-6\ R&D in ICT

- *Total and % of researchers in ICT*
- *Total and % budget in R&D in ICT*

E-/ Online Services 1

E-\ On-line services

E-1\ E-Government

- *On-line availability of government services for citizens*
- *usage of online Government services by citizens*
- *Citizen preference for on-line government services*
- *Availability of on-line government services for businesses*
- *Business use of on-line government services*
- *Business preference for on-line government services*

E-2\ E-Business

- Proportion of businesses using computers
- Proportion of employees using computers
- Proportion of businesses using the Internet
- Proportion of employees using the Internet

E-/ Online Services 2

E-\ On-line services

E-2\ E-Business

- Proportion of businesses with a website
- Proportion of businesses with an intranet
- Proportion of businesses receiving orders over the Internet
- Proportion of businesses placing orders over the Internet
- Proportion of businesses accessing the Internet by modes of access
- Proportion of businesses with a Local Area Network (LAN)
- Proportion of businesses with an extranet
- Proportion of businesses using the Internet by type of activity (Internet e-mail, Getting information, Performing Internet banking or accessing other financial services, Dealing with government organisations/public authorities, Providing customer services, Delivering products online)

E-/ Online Services 3

E-\ On-line services

E-3\ E-Work

- *Home-based teleworking,*
- *Feasibility of teleworking,*
- *Mobile teleworking*
- *Tele-cooperation*
- *Self-employed teleworkers in SOHOs*

E-4\ E-Health

- *% of health institutions using ICTs, (by type of health institution: private clinic, government, university hospital, etc... and type of ICT)*
- *geographic distribution of health institutions with computers, telephone and Internet connectivity*
- *% of doctors that use ICTs for medical purposes(research, tele-medicine, e-mail, etc...)*
- *% of population that have used or use the Internet for health information*

E-/ Online Services 4

E-\ On-line services

E-4\ E-Health

- *Principal purposes for the use of ICTs by health institutions (tele-medicine, email, - research, health promotion, health information, database, software application)*
- *Number of local hosts with local medical information*
- *Availability of local language health information with typology*

E-5\ E-Agriculture

- *% of agricultural population and extension workers involved in the exploitation and deployment of ICTs to the sector*
- *Typology of usage of ICTs in the agricultural sector (% in R&D, business, weather, prices, etc...)*

E-/ Online Services 5

E-\ On-line services

- *Type of online entertainment services*
- *% of internauts using online entertainment*

E-7\ E-Environment & Natural Resources Management

- *Number of institutions in the area of NRM that use ICTs (by type of ICT) for the purpose of NRM (Natural Resource Management))*
- *Principal purposes for the use of ICTs in NRM (geomatics, research, email, database, software application)*
- *% of local hosts with NRM/env. Information*
- *Typology of environmental information content*

Proposal Component Coverage

CSI	SCAN-ICT	FK-JC	SMSI-P	NRI	ORBICOM	e-IUT DAI	ESCWA
A/ Enabling Environment	21	9	1	25	2	3	14
B/ Infrastructure & ICT sector	59	29	25	15	13	12	33
C/ Infostructure & content production	12	13	4	3	2	2	22
D/ Readiness & capacity building	22	24	--	--	--	2	68
E/ Online services, availability & usage	38	35	12	5	--	6	41
Total	152	110	42	48	17	25	178

Summary

- Reference Model for Penetration & Usage Indicators
- Selection and Adaptation of a Set of Indicators
- Need to Provide an Measurement Guide:
Definition and objectives, method of calculation
and methodology of measurement & analysis

DONE

- Need to Validate Through Tests:
Scan-ICT!!

- Next: Impact Indicators

Work on Impact Indicators

- Review of Existing Initiatives on Impact Indicators
- Reference Model for Impact Indicators
- Propose a Set of Impact Indicators
- Provide a Measurement User's Guide:
 - Definition and objectives
 - Method of calculation
 - Methodology of measurement & analysis

Remarks on types of Indicators

- 3 types are commonly used in the literature:
 - Penetration (ICT density, connectivity, by gender, groups)
 - Usage (of basic ICT services, online services,...)
 - Impact (ICT investments, income, jobs, telework, society transformation, sectoral changes: education, business..., on poverty reduction....)
- Insufficient: need to introduce 2 more:
 - Environment (country characteristics, enabling environ't..)
 - Capacity (cap building, readiness, Ict literacy,...)
- Some of Previous Initiatives Included Impact Indicators

Review of Existing Reports On Impact Studies

● Global

- ITU (World Telecommunication/ICT Development Report 2006)
- World Bank
- UN (Global e-Readiness Report)
- UNCTAD (E-commerce & Development Report 2004)
- OECD (Several reports)

● Regional

- Europe (e-europe 2010)
- ECA (Scan-ICT phase 1 & 2)

● National

- France, Finland

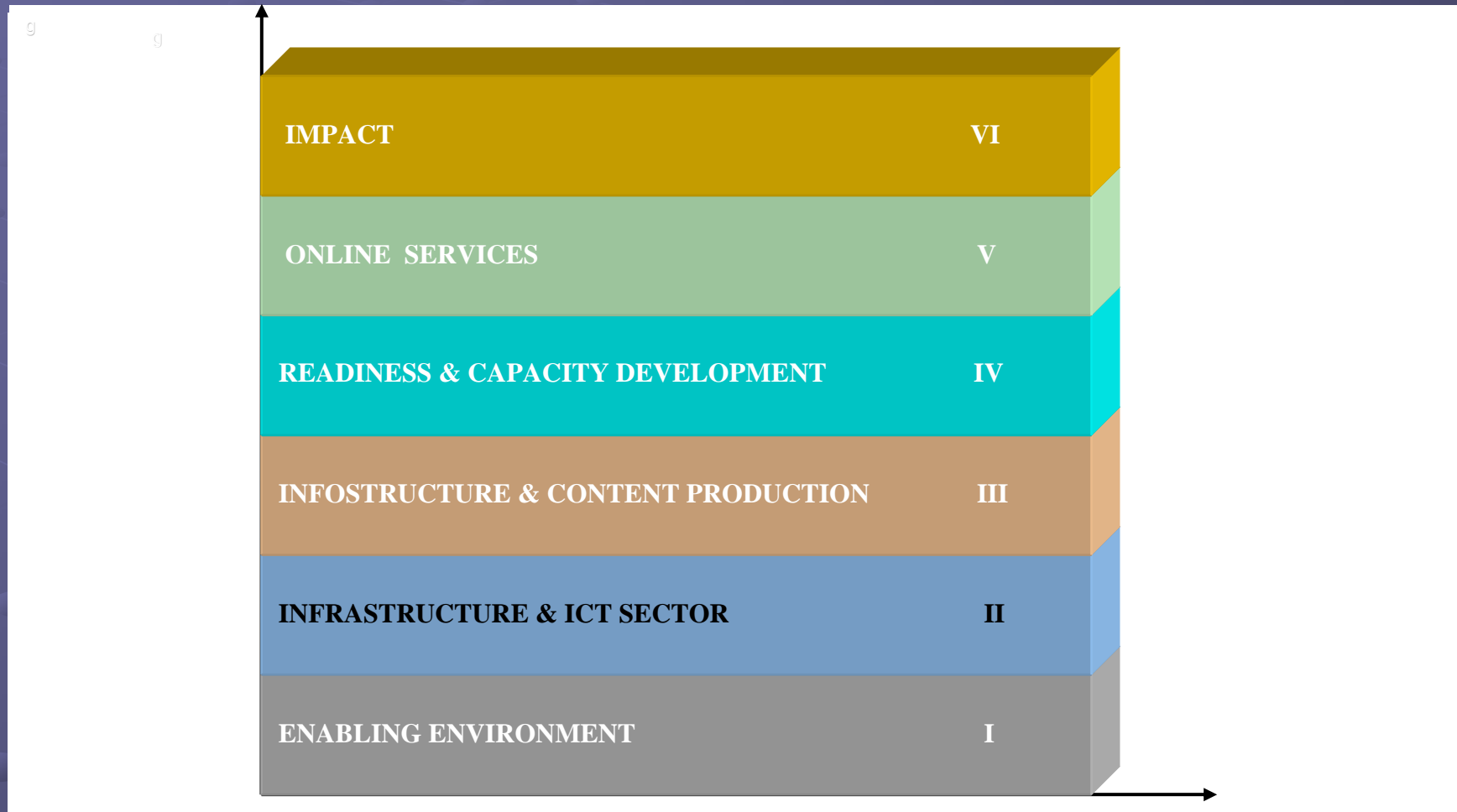
Remarks

- Reports deal with various Types of Impacts:
 - Direct Economic Impact: ICT investments, income, jobs creation
 - Indirect Economic Impact on Growth
 - Increase of Benefits, Reduction of Costs
 - Improvement of Online Service
 - Improvement of Governance
 - Telework, Society transformation
 - Sectorial changes: education, Research, Environment, Music
 - Etc.
- No real System of measurement
- Different Focus
- Many Propositions Have not yet Been Tested
- Often Difficult to Isolate Direct Impact of ICT
- Still a Research Area

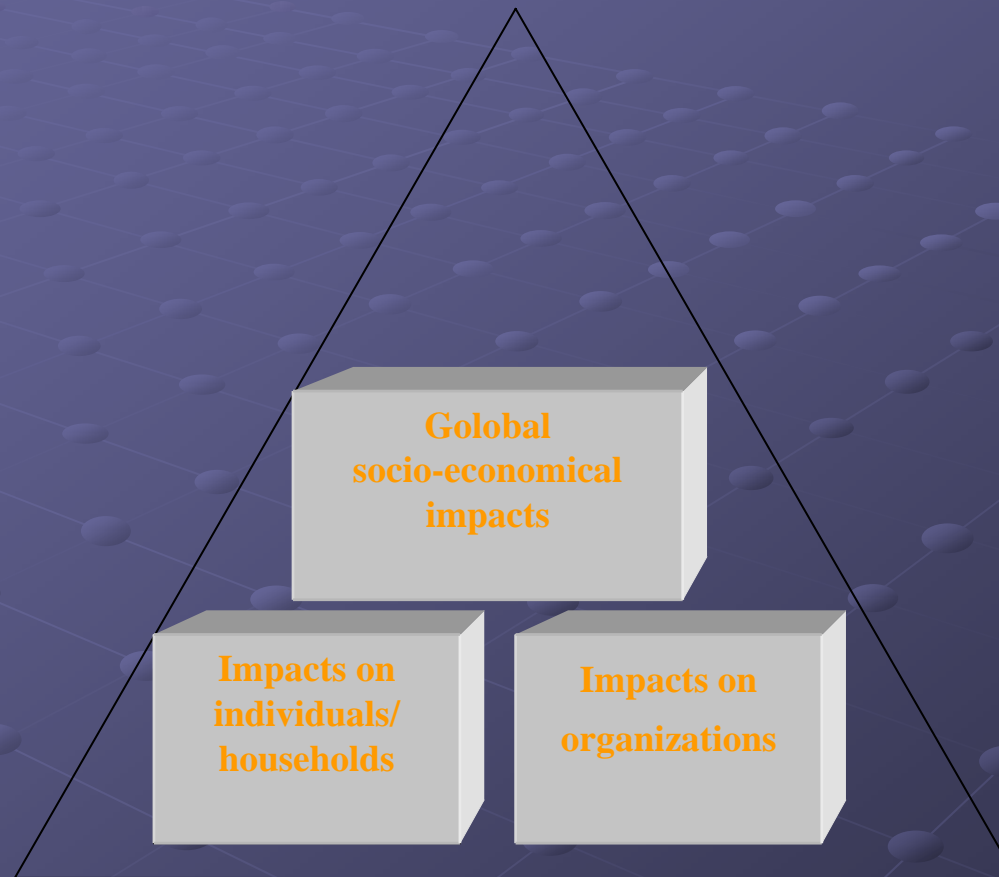
What can be Done?

**Expand Previous Model, Design a Referential Framework,
Find or Create Appropriate Indicators**

Expanded Reference Model



Perspectives of Analysis



Global Socio Economical Perspective

Category/Dominate	Sub-Category/Sub-Dominate
Direct economic impact of the ICT sector	contribution of the ICT sector to the economic growth
	contribution of the sector ICT to Employment
	national and international investments in ICT, Corporate investment in ICT
	exchange of goods and services in ICT
	technological dynamism of the ICT sector
Indirect Economic impact of ICT sector (macroeconomic analysis)	Impact on the global productivity and on the productivity of factors
	effects on Global employment
Social cultural, informational Impact	Social impact
	Cultural impact
	Information and knowledge
	ICT Security (cybercriminality)

Individual/Household Perspective

	Category/Dominate	Sub-Category/Sub-Dominate
	Economic	expenses generated by ICT new business opportunities possible reductions of costs
	Communicational	communication between individuals communities of individuals
	Accessibility and production of information and knowledge	access to information and to knowledge Production/diffusion of information and knowledge
	Interactions with public/private organizations	interactions public administration interactions business
	Working Modes	telework: work from afar (to free itself/themselves of the constraints of time and space), mobility
	Private life	Quality of life possibilities of piracy, access and disclosure of information and data of private nature
	Security of a personal ICT environment	Risk of multiple attacks (virus...) and of failures (losses of data)
	Cultural	Cultural melting (brassage) local languages (for a better understanding in a context of globalization)

Organization Perspective (1)

Common Indicators

Category/Dominate	Sub-Category/Sub-Dominate
Economic (microeconomic analysis)	Investments in ICT
	economic performance (productivity, profitability)
	costs
Strategic	products / services
	Customers / citizens (widening base)
	development at the international level
	Technology
	Quality
	Networking of organizations
	Watch (veille)
	management of resources and knowledge
	ICT Security

Organization Perspective (2)

Common Indicators

Organizational	Strutural changes
	changes in management processes
	Development of the telework
Communicational informational	Internal communication and exchange of information
	communication with stake holders
	exchanges within communities of practice informational
Transactional	operations related to online transaction; (XtoB, XtoC, XtoG)
Governance	Improvmnt of transparency,
	Improvmnt of information
	Improvement of the involvement of stake holders
	Improvement the accountability
	Subsidiarity
	improvmnt of the satisfaction of the citizen/client

Organization Perspective (2)

Specific Indicators

Category/Dominate
E-government
E-business
E-education
E-research
E-health
E-agriculture
E-leisure (entertainment)
E-environment

Proposal of Impact Indicators

Perspective of Analysis/ #	Pertinent Set	Basic Set	Key Set
Global Socio-Economical Perspective	46	21	9
Individual/Household Perspective	32	19	7
Organization Perspective Common Indicators	63	31	14
Organization Perspective Specific Indicators	53	30	13
Total	194	101	43

Summary on Impacts

- Reference Framework for Impact Indicators
- Selection and **Development** of 3 Sets of Indicators
 - Pertinent
 - Basic
 - Key
- Need to Provide an Measurement Guide: Definition and objectives, method of calculation and methodology of measurement & analysis

Done for Key Indicators

- Need to Validate Through Tests and Real Measurement & Analysis
- A new Area That Requires a Lot of Research

Conclusion

- Reference Models for Indicators
- Set of Penetration & Usage Indicators (110)
- Set of Key Impact Indicators (43)
- Measurement User's Guide: Definition and objectives, method of calculation and methodology of measurement & analysis
- Work with **Official Tunisian Institutions (National Statistics Council)** in their endeavours to enrich the national Statistics System
 - A working group has been created for work on this issue
 - A Workshop is scheduled for 5-6 april 2007
- Need to Validate Through Tests and Real Measurement & Analysis:
 - To be sought through INS & IEQ (2007 surveys!!!!)
- More Research Work on:
 - Impact
 - Analysis

MERCI