

Toward a Unified International Assessment Method for the Information and Communication Technology

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Keywords: Millennium Development Goals (MDG); Information and Communication Technology (ICT); International Telecommunication Union (ITU); Digital Access Index (DAI); Worldbank; Knowledge Assessment Method (KAM); United Nations (UN); UN Development Program (UNDP); UNDP Human Development Index (HDI); UN Department of Economic and Social Affairs (UN-DESA); E-Government Readiness Index (EGRI); Knowledge Society.

Abstract. The Information and Communication Technology (ICT) represents an important pillar for the knowledge society. For the assessment of the ICT state in a country, various indicators and indices have been devised. Among these indicators, the most widely acknowledged are: the International Telecommunication Union (ITU) Digital Access Index (DAI) devised in response to the Millennium Development Goals (MDG); the ICT assessment indicators associated with the Worldbank's Knowledge Assessment Method (KAM); and the United Nations (UN) E-Government Readiness Index (EGRI) devised by the UN Department of Economic and Social Affairs (DESA). These different indicators and indices initiate the need for a unified and comprehensive framework for the assessment of ICT development that contributes to the assessment of the knowledge society. This paper is concerned with the development of this framework. The paper considers the indicators and indices of DAI; ICT of KAM and the EGRI; and attempts to provide an integrated framework that accommodates all of them, in a well organized manner structured in layers according to five domains.

Introduction

The state of the Information and Communication Technology (ICT) infrastructure and use of a country is becoming of increasing importance for its knowledge management and potential future development. The assessment of this state for the different countries of the world is widely considered as an essential part of the assessment of their state of development. There are different international methods for the assessment of the ICT state, and the most important of them include the following:

- The Digital Access Index (DAI) introduced by the International Telecommunication Union in response to the Millennium Development Goals (MDG) [ITU 2003].
- The ICT indicators of the Knowledge Assessment Method (KAM) developed by the Worldbank [KAM Worldbank Website].
- The E-Government Readiness Index (EGRI) devised by the United Nations (UN) Department of Economic and Social Affairs (DESA) [UN 2008].

Among these methods, there are various similarities and differences in assessing the ICT state in various countries. This leads to the obvious question of why the ICT state is not assessed by a unified international method that help providing one referenced assessment, avoiding duplications and saving efforts.

Responding to the above question, this paper addresses the ICT assessment methods mentioned above, and uses them for devising a framework for a future unified ICT assessment method. This framework can be used by international organizations, concerned with ICT and the knowledge society, as a base for the development of the target unified assessment method. It is hoped that the work would receive the necessary attention that enables it to contribute to solving the problem posed by the above question.

The Digital Access Index (DAI)

The Digital Access Index (DAI) is a composite index consisting "five main dimensions", and these are listed and identified in the following:

- “Infrastructure”, it has two indicators associated with telephone mainlines and mobile subscribers relative to the population.
- “Affordability”, it is concerned with the cost of the Internet use, and therefore represents the “environment” of encouragement or discouragement to use the Internet.
- “Knowledge”, it has two indicators associated with literacy and school enrolment relative to the population, this is also related to the environment of using ICT, as educated people need ICT services more than others.
- “Quality”, this is related to the “infrastructure” and concerned with the Internet bandwidth and broadband users relative to the population.
- “Usage”, this is also related with the infrastructure and concerned with the Internet users relative to the population.

Table 1 list the indices and identifies their indicators.

Dimensions	Indicators
Infrastructure	Telephones: mainlines
	Telephones: mobile phones
Affordability	Internet tariff
Knowledge	Adult literacy
	School enrolment
Quality	Internet bandwidth
	Broadband users
Usage	Internet users

Table 1: The dimensions of the Digital Access Index (DAI) of the International Telecommunications Union (ITU) [ITU, 2003].

ICT in the Knowledge Assessment Method (KAM)

The Knowledge Assessment Method (KAM) has the following two main parts: assessment of the economic performance; and assessment of the knowledge economy through the Knowledge Economy Index (KEI). In turn, KEI is associated with the assessment of three main components: innovation system; education and human resources; and ICT. Table 2 (a) gives further details of the KAM showing the number of indicators associated with each part and component. It should be noted that each part and component has a total number of indicators, and these indicators have essential ones. KAM has “83” total indicators, “14” of them are considered to be essential..

Components and Sub-Components			Indicators		
			Total	Essential	
Economic performance: <i>Includes the Human Development Index (HDI)</i>			9	2	
Knowledge Economy Index: KEI	Economic incentives and institution regime		12	1	
	Economic regime		7	2	
	Governance		7	2	
	Knowledge Index: KI	Innovation system		24	3
		Education & human resources	Education	14	3
Gender			5	0	
Information and Communication Technology (ICT)		12	3		
(Total)			83	14	

Table 2 (a): The components of the Knowledge Assessment Method (KAM) of the Worldbank [KAM, Accessed 2009]

There are “12” ICT indicators in KAM, “3” of them are considered essential. The essential ones are mainly concerned with the “infrastructure”; they include:

- Telephone lines including: mainlines and mobile phones relative to the population.
- Internet users relative to the population.

- Personal computers relative to the population.

The other KAM ICT indicators also include telephone lines. They also consider further details associated with the Internet, as given below:

- Internet infrastructure including: Internet bandwidth, business use and e-government.
- Internet environment that is the Internet tariff.

The other indicators also consider the ICT expenditure relative to the Gross Domestic Product (GDP), and this is of course associated with the ICT environment in the country concerned. In addition, television sets relative to households and newspapers relative to the population are taken into account. Table 2 (b) lists both KAM essential and other ICT indicators.

Essential Indicators	Other Indicators
Telephones: mainlines and mobile phones	Telephones: mainlines
	Telephones: mobile phones
Internet users	Internet bandwidth
	Business Internet use
	e-Government services
	Internet tariff
Personal computers: individual computers	ICT expenditure
	Televisions
	Daily newspapers

Table 2 (b): The ICT indicators of the Knowledge Assessment Method (KAM) of the Worldbank [KAM, Accessed 2009]

It is noticeable that KAM ICT indicators assess ICT infrastructure in more details relative to DAI indicators, but they do not consider “knowledge” like DAI. However, knowledge in KAM is considered in its other components. The “economic performance” part of KAM includes the United Nations Development Program (UNDP) Human Development Index (HDI). This index considers the following indicators that affect the ICT environment:

- “Knowledge” indicators and these are similar to those of DAI.
- “Health” in terms of life expectancy.
- “Standard of living” in terms of GDP.

The HDI indicators are listed in Table 2 (c); which indicates that they are also used in other KAM components.

Components	Indicators	Comments
Knowledge	Adult literacy	Available in the “Education” indicators of KAM
	School enrolment	
Health	Life expectancy at birth	
Standard of Living	GDP per capita	Available in the “Economic performance” of KAM

Table 2 (c): The components of the Human Development Index (HDI) of the United Nations Development Program (UNDP) [HDI, Accessed 2009].

E-Government Readiness Index (EGRI)

The E-Government Readiness Index (EGRI) is a combination of the following four indices:

- The Telecommunication Infrastructure Index (TII).
- The Web Measure Index (WMI).
- The Human Capital Index (HCI).
- The E-Participation Index (EPI).

The TII has indicators associated with the infrastructure similar to those of DAI and KAM-ICT. The indicators of HCI correspond to the “knowledge” indicators of the DAI, and to the “knowledge” indicators of the HDI. Both the WMI and the EPI are specific to EGRI and are associated with e-government services and use. Of course both the “ICT infrastructure” and “the knowledge of people” constitute the base that enables e-government services.

The WMI addresses the question of “how the country concerned deliver on line services to its citizens”. It considers the following:

- The availability of: “health, education, social welfare, labor and finance services”.
- The web development stage, that is whether it is: “emerging, enhanced, interactive, transactional, or connected”.

The EPI addresses the question of “how the country concerned establishes government transparency”. It considers the following:

- The availability of participatory services and facilities.
- The participation dimensions, including: “e-information, e-consultation, and e-decision making”.

Further details of EGRI indices are given in Table 3.

Indices	Indicators		
Telecommunication infrastructure index	Telephones: mainlines		
	Telephones: mobile phones		
	Personal computers		
	Internet users		
	Broadband users		
Web measure index	Target	How individual countries deliver online services to their citizens	
	Assessment method	Absence or presence (binary value) of specific facilities or services on the national portal and the Ministries of: Health, Education, Social Welfare, Labor & Finance.	
		The same set of questions is used for all ministries.	
	Web development stages considered	Emerging	Static information
		Enhanced	With links to archived information
		Interactive	With downloadable forms and limited interaction
		Transactional	Interactive transactional services
Connected		Integrated (whole government) interactive services	
Human capital index	Adult Literacy		
	School enrolment		
e-Participation index (2008 study)	Target	How individual countries establish government transparency	
	Assessment method	“21” citizen’s informative and participatory services and facilities were assessed	
		Scale of assessment: 0-to-4.	
	Assessment dimensions	e-Information	Availability of government information
		e-Consultation	Citizens can initiate debates and give feedbacks
e-Decision-Making		Involving citizens in the decision-making process	

Table 3: e-Government readiness assessment according to the Department of Economic and Social Affairs (DESA) of the United Nations (UN) [UN 2008].

The Proposed ICT Assessment Framework

It can be seen from the above ICT assessment methods and indices that the main ICT assessment domains, for a country, are the following:

- The ICT “infrastructure”.
- The ICT based “online services”.
- The ICT “users”.
- The ICT related “environment”.

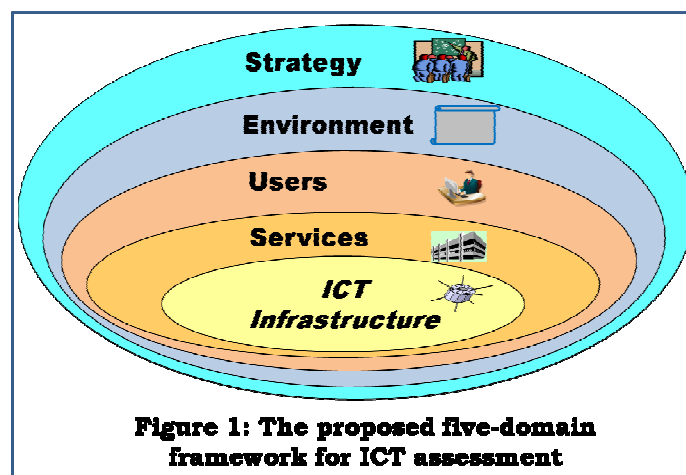
In addition, the country “strategic direction” toward the “knowledge society” is also an important factor in the ICT development state of the country.

In the ICT “infrastructure” domain, different assessment indicators are considered by the various methods considered above; and these include: telephone lines, personal computer, internet access and bandwidth, broadband

facilities and so on. In the ICT based “online services” domain, the organizations delivering such services are involved, and they include: government organizations; education and research institutions; media organizations; business companies; and others. Within this domain comes the web services with their e-participation dimensions which activate the role of knowledge in the society and promote its efficiency and effectiveness.

The ICT “users” domain would be concerned with their knowledge, health and standard of living as in the HDI. Other indicators may include awareness and attitude, as the education level may not be enough to drive people to use the available ICT and online services. In the ICT related “environment” domain comes the ICT services tariff and the ICT investment or expenditure, and the security and privacy of the services. In this respect comes the issue of the existence of a national strategy or policy toward ICT in the country. Such a strategy would be associated with all other domains, and with enhancing the role of ICT in the national knowledge promotion and management, and consequently in development.

Figure 1 provides a hierarchical layered framework that accommodates the above identified domains. Further details of the framework can be developed through an international committee that work toward unifying how ICT should be assessed considering the various domains discussed here. It should also be noted that relating the ICT infrastructure indicators and the online services indicators to the population as a whole do not provide fair assessment, due to the different demographic characteristics of the different countries. A potential solution to this problem would not relate the infrastructure components and services to whole population, but to those who should be using it [Alfantookh 2008].



Conclusions and Future Directions

The work presented in this paper is useful in two main ways. On the one hand, it highlights international methods used for assessing ICT in different countries. The chosen methods are key methods, as they are both: recent and of widespread use. They include: the ITU-DAI, the Worldbank ICT indicators of KAM, and the UN DESA EGAI. The work illustrates how these methods view the various dimensions of the ICT assessment, and how they agree and differ about it. On the other hand, the work uses the methods considered to develop a new comprehensive framework for ICT assessment that incorporates all the issues of the various methods in an organized multi-layer structured manner consisting of five main domains: ICT infrastructure; online services; users; work environment; in addition to strategic directions.

It is hoped that the proposed framework would receive the necessary attention by the international organizations concerned. These organizations can establish a technical committee for discussing the framework and developing it further, with the necessary details, toward becoming the unified international ICT assessment method. As suggested by the framework, the assessment can be structured according to the suggested domains. With such unified structured assessment method, duplications and different classifications can be avoided for the benefit of one comprehensive acceptable view.

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