INTERNATIONAL TELECOMMUNICATION UNION

TELECOMMUNICATION DEVELOPMENT BUREAU

Document INF/008-E
14 December 2007
Original: Russian

6TH WORLD TELECOMMUNICATION/ICT INDICATORS MEETING, GENEVA, 13-15 DECEMBER 2007

FOR INFORMATION

SOURCE: Moscow Technical University of Communications and Informatics, Russian Federation

TITLE: Improvement of the system of indicators for measuring the information society

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Improvement of the system of indicators for measuring the information society

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Background (1)

- Charter of global information society (Okinawa, 2002): information society (IS), just as the information economy, is understood as society global, and therefore the discussion can deal with the participation or the nonparticipation separate of the countries in its life and use or not use by them its advantages, but not about the construction of the isolated information society in the separately undertaken country.

Background (2)

- 2007 –ITU indicators “Measuring the Information Society. ICT Opportunity Index and World Telecommunication/ICT Indicators”, which contain ITU opinion about possible solution for measuring the level of IS maturity in either country

Background (3)

- National and regional programs of IS development. For example, the Program of IS development in Russia (2003, ICT part is prepared by MTUCI), its renewal is the Strategy for IS development in Russia, enacted by Security Council of the country in 2007.

Objectives (1)

1. Create the system of the indexes not only for evaluation of the IS development in individual country or region, but also to evaluate the speed of the moving the country or region in this direction i.e. introduce the dynamic characteristics to the general system of the estimation.

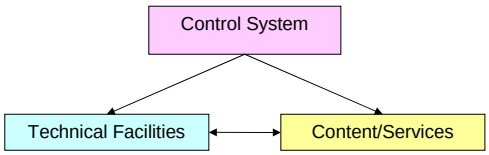
Objectives (2)

2. Take into account not only technical aspects (achieved level of the technical equipping), but also the use of resources (filling by the content, proposed and used services), and adequacy of control system (from regulatory laws to information safety).

Components of the IS development

IS objectively presents itself as an ensemble of three components:

- technical facilities of communications,
- service and content, delivered by means of these facilities,
- control system, which includes legislative regulation, agreements between providers of the equipment and content, and mechanisms of the supplying with the information safety.



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Indicators of the IS development

General indicator of IS development can be represented by the vector

$$I = \left(I_{tech-st}, I_{tech-dyn}, I_{serv-st}, I_{serv-dyn}, I_{cont-st}, I_{cont-dyn} \right) \quad (1)$$

where following designations are accepted:

$I_{tech-st}$	– indicator of the current technical ICT equipping,
$I_{tech-dyn}$	– indicator of the dynamics of ICT equipping change and development,
$I_{serv-st}$	– indicator of the current content and realized ICT services,
$I_{serv-dyn}$	– indicator of the dynamics of content and services change and development,
$I_{cont-st}$	– indicator of the current state of all control system components ,
$I_{cont-dyn}$	– indicator of the dynamics of control system change and development .

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Static and dynamic indicators (1)

Set of the possible values of vector *I* constitutes the space **I**, which, as it follows from formula (1), can be represented as

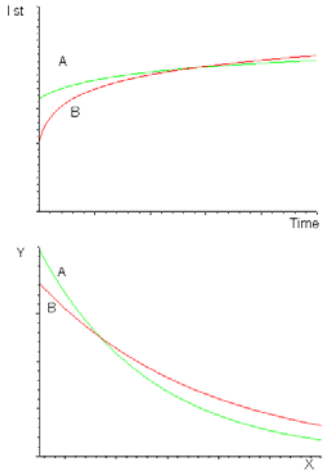
$$\mathrm{I} = \mathrm{I}_{tech-st} \otimes \mathrm{I}_{tech-dyn} \otimes \mathrm{I}_{serv-st} \otimes \mathrm{I}_{serv-dyn} \otimes \mathrm{I}_{cont-st} \otimes \mathrm{I}_{cont-dyn} \quad (2)$$

where separate factors are in accord with subspaces of corresponding indicators variation.

Static and dynamic indicators (2)

Both indicators of current state (static indicators with –*st* in indexes) and indicators which reflect a change of state in time (dynamic indicators with –*dyn* in indexes) are necessary for estimation of the efforts of single country or region for the involvement into Information Society.

Two countries are shown in the figures, where $X = X(t)$ - current state of static indicator and $Y = Y(t) = X(t) - X(t-1)$ is a value of increment (dynamics).



Static and dynamic indicators (3)

Indicators, which describe the current state of IS development, form subspace

$$I_{st} = I_{tech-st} \otimes I_{serv-st} \otimes I_{cont-st} \quad ,$$

and indicators, which describe dynamic processes, form subspace

$$I_{dyn} = I_{tech-dyn} \otimes I_{serv-dyn} \otimes I_{cont-dyn} \quad .$$

In is obvious that $I = I_{st} \otimes I_{dyn}$ accurate to the permutation of factors.

Static and dynamic indicators (4)

Subspaces for each of three components can be evolved analogously :

$I_{tech} = I_{tech-st} \otimes I_{tech-dyn}$, $I_{serv} = I_{serv-st} \otimes I_{serv-dyn}$ and $I_{cont} = I_{cont-st} \otimes I_{cont-dyn}$. This provides another separation of the involved multidimensional space (2). It is clear that $I = I_{tech} \otimes I_{serv} \otimes I_{cont}$ and we get the possibility of flexible analysis of several components and subspaces.

ITU indicators from this point of view (1)

In the ITU ICT Opportunity Index and WT/ICT Indicators the scientific approach and technique of data processing for determination of $I_{tech-st}$ are presented and author's suggestion concerns two steps of space $\mathrm{I}_{tech-st}$ decomposition. At the first step two subspaces are evolved: $\mathrm{I}_{infodensity}$ describes current state of economy and labor market, and $\mathrm{I}_{info\ use}$ describes the current ICT contribution to the economy.

$$\mathrm{I}_{tech-st} = \mathrm{I}_{infodensity} \otimes \mathrm{I}_{info\ use}$$

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ITU indicators from this point of view (2)

At the second step each of these spaces again is spitted up two subspaces namely:

$$\mathrm{I}_{infodensity} = \mathrm{I}_{networks} \otimes \mathrm{I}_{skills} \quad ,$$

where first factor describes ICT infrastructure and second one – professional skill of population. In the expression

$$\mathrm{I}_{info\ use} = \mathrm{I}_{uptake} \otimes \mathrm{I}_{intensity}$$

first factor describes a level of ICT services consumption and second factor – intensity of channels usage .

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ITU indicators from this point of view (3)

More detailed description of second level indicators consists in the following:

$$I_{networks} = (I_{n1}, I_{n2}, I_{n3}) \ ,$$

where I_{n1} – main telephone lines per 100 inhabitants,

I_{n2} – mobile cellular subscribers per 100 inhabitants,

I_{n3} – international internet bandwidth (kbps per inhabitant).

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ITU indicators from this point of view (4)

For the indicator of population's education the following description is suggested:

$$I_{skills} = (I_{s1}, I_{s2}) \ ,$$

where I_{s1} – adult literacy rates,

I_{s2} – reflects the structure of population's education (primary – secondary – tertiary)

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ITU indicators from this point of view (5)

Description of telecom services consumption reduces to three parameters:

$$I_{uptake} = (I_{u1}, I_{u2}, I_{u3}) \quad ,$$

where I_{u1} – Internet users per 100 inhabitants,

I_{u2} – proportion of households with a TV,

I_{u3} – computers per 100 inhabitants .

ITU indicators from this point of view (6)

Description of the network exchange intensity looks like:

$$I_{intensity} = (I_{i1}, I_{i2}) \quad ,$$

where I_{i1} – total broadband Internet subscribers per 100 inhabitants ,

I_{i2} – international outgoing traffic per capita.

ITU indicators from this point of view (7)

Thus ITU suggests a multidimensional description of ICT indicators as vector of dimension 10. Corresponding space of variation can be formed as the Cartesian product of four subspaces with dimensions 2, 3, 3 and 2 respectively:

$$\mathrm{I}_{tech-st} = \mathrm{I}_{infodensity} \otimes \mathrm{I}_{info\ use} = \left(\mathrm{I}_{networks} \otimes \mathrm{I}_{skills}\right) \otimes \left(\mathrm{I}_{uptake} \otimes \mathrm{I}_{intensity}\right)$$

The dimension of final space is 36.

Comparison of the countries and regions (1)

Let region *A* is formed by *n* countries and for each of them it is found the vector of indicators

$$I_k = \left(I_{tech-st,k}, I_{tech-dyn,k}, I_{serv-st,k}, I_{serv-dyn,k}, I_{cont-st,k}, I_{cont-dyn,k}\right)$$

Procedure of finding the total indicator of the region on each component can be different, let us denote it for component I_α as $\Lambda(\alpha)$, then for whole region we shall get the vector of total indicators

$$I^A = \left(\Lambda(tech-st)_A, \Lambda(tech-dyn)_A, \Lambda(serv-st)_A, \Lambda(serv-dyn)_A, \Lambda(cont-st)_A, \Lambda(cont-dyn)_A\right)$$

Comparison of the countries and regions (2)

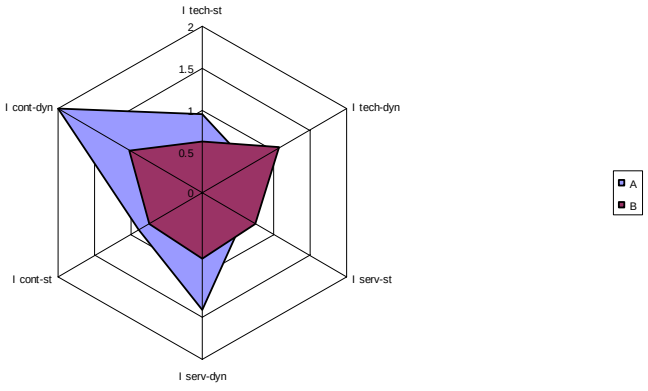
From the indexes of separate regions it is possible to derive the world-wide index

$$I^W = \left(\Lambda(tech-st)_W, \Lambda(tech-dyn)_W, \Lambda(serv-st)_W, \Lambda(serv-dyn)_W, \Lambda(cont-st)_W, \Lambda(cont-dyn)_W\right)$$

and to compare with it the indexes of separate regions and countries.

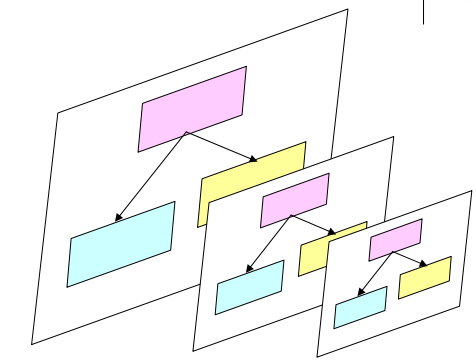
Comparison of the countries and regions (3)

Comparison of the countries or regions A and B can be graphically presented in the form of the petal diagram



Application of existing IS opportunities

The three-dimensional picture, in which one layer is formed by the ***used*** technical possibilities, services and regulator mechanisms, the second layer – by the ***realized*** components, the third layer – by the ***necessities*** (maximum at the given moment) in technical facility, their content and forms of the control, can represents the posture pertaining to time.



Conclusions (1)

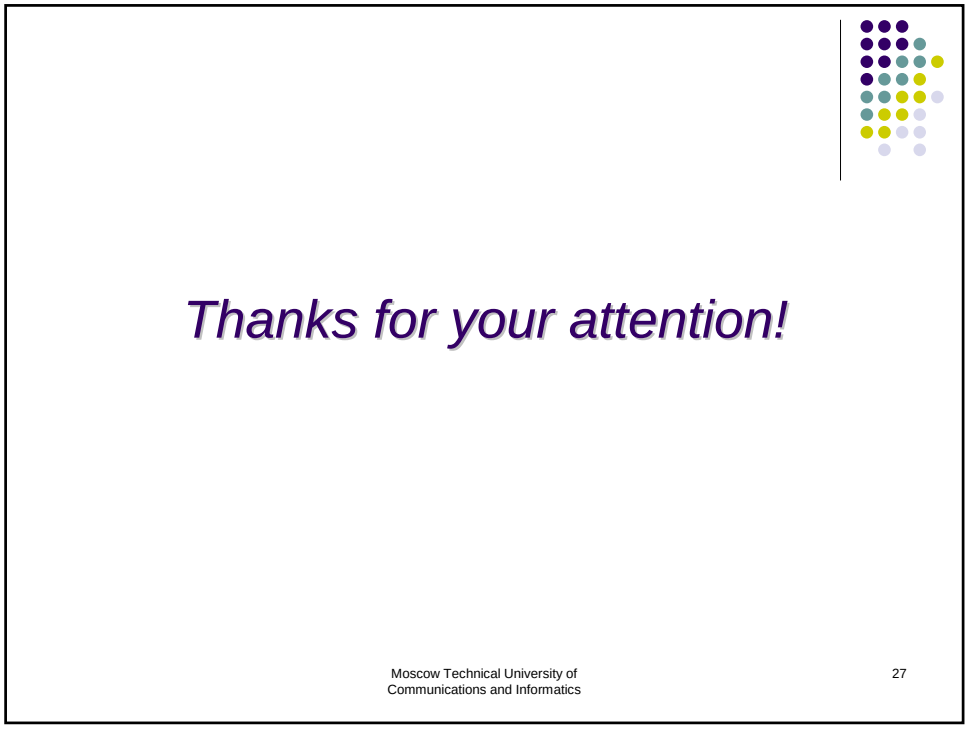
1. The system of indicators proposed by ITU is the first step on the road to constructing the universal system of indicators for measuring the information society development of countries and regions and their motion toward it. It the final system not only technical characteristics must be taken into account.
2. The six-component model is submitted for consideration, allowing estimating the current state and the dynamics of change for technical parameters of telecommunications, and social and legislative constituents.

Conclusions (2)

3. The proposed model makes it possible to carry out analysis with any degree of detailing or generalization. It possesses the adaptability and can easily be adjusted.
4. Analysis in the form of petal diagram is easily performed, for example, by the extended means (Excel etc.), it is obvious and can be carried out with any degree of detailed elaboration both for an estimation of the separate country (region) and for their comparison among themselves and with the average reached parameters.

Conclusions (3)

5. Additional research of the concrete parameters entering into representation of the multivariate indicator is necessary to perform. The particular problem is to analyze the sufficiency or redundancy of such component.
6. For system of indicators (both absolute and relative) unification of the mathematical apparatus of their calculation and updating is necessary. Probably, expediently there would be an introduction of the integrative indicators reflecting long-term data in the form of one parameter. But this question requires additional study.


Thanks for your attention!
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