

# **Information society in transition countries – information and communication technologies statistics: initial steps in official statistics (in Azerbaijan experience)**

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## **1. Introduction**

In XXI century the improvement of the socio-economic development based on creation of and transition to information society, formulation of the e-government system and development of the intellectual potential is one of the main priorities of the world countries. The importance of ICT has become leading factor for current and future perspectives and makes main provisions of the programs of national activity and e-strategy of the governments. The ICT's role in the "Millennium Development Goals (MDG)" was highly evaluated and formed the base for the "Golden Book" (WSIS Golden Book, Geneva 2003 – Tunis 2005) prepared in the framework of the world summits (WSIS, Geneva 2003 – Tunis 2005) on information society conducted in Geneva and Tunis with participation of more than 170 countries. The ICT became a main measurement indicator and issue of human development and globalization.

## **2. ICT processes and official statistics**

In comparison with developed countries the penetration of ICT is newly distributed in the countries in transition, the flow of IT equipments and growth in its application is now observed with high speed. During last 5 years, the volume of IT equipments exported to Azerbaijan, which also is a country of transition, is increased for 2.4 times, value added created in the ICT sector - for 2.6 times, investment directed to fixed assets in ICT sector - for 3.4 times, number of mobile cellular subscribers - for 3.5 times, the number of fixed telephone lines - for 1.3 times. For the purpose of provision of development of the ICT "The National Strategy on the Information and Communication Technologies in the Behalf of the Development of Azerbaijan Republic (2003-2012)", "State program on the development of communication and information technologies in the Republic of Azerbaijan for 2005-2008 (Electron Azerbaijan)" has been confirmed. The interest and demand on IT is increasing day by day. However, in the publications of international organizations the information related with IT statistics is

insufficient. As a result, increase rate of ICT significantly exceeds the official statistics and the statistical measurement of ICT is not adequate with its development, i.e. in spite of the fact that carrying out of ICT policy requires well organized statistics, the suggestion of the statistics is not so significant with respect to users requirement in the framework of the ICT processes. Such case could be explained as non-fulfillment of the fundamental principles of the official statistics. Base on aphorism of the professor Robert M. Solow, Nobel Prize laureate (you can see computers everywhere, but not in the productivity statistics) on “paradox of computer”, it will not be difficult to imagine the situation of the statistics. All abovementioned is a stand point for discussion among scientists and practical users.

Existing situation of ICT statistics has been discussed among national statistical authorities and international organizations for many times. For example, within the last year issues related with the current situation of ICT statistics and its development have been raised 6 times in the official statistical authorities of Azerbaijan Republic and various decisions of more than 20 articles have been adopted. 36th session of UN Statistical Commission has been mainly dedicated to this issue. Thus, worries on ICT statistics have been expressed in the reports by the Partnership on Measuring ICT for Development "Information and Communication Technologies (ICT) Statistics" prepared on the base of inquiries from 52 African countries, 53 Asian-Pacific countries, 24 Central Asia and CEE countries, 36 Latin America and Caribbean countries, 13 Western Asia countries. Also, it is shown that, 85 countries have positive answer on the inquiries sent to 179 countries in the material of ICT Business Statistics “Status of Information Society statistics in National Statistics Offices” prepared by UNCTAD for world summits on information society (WSIS, Geneva 2003 – Tunis 2005). Only 44 of countries responded the inquiries have mentioned that they collect main data in this area. Low position of ICT statistics has been analyzed in regions where the transition countries have concentrated in the report of “Status of Information Society statistics in National Statistics Offices Central Asia and Central and Eastern European Countries” of UNCTAD. Analysis of reports, observations and researches enables us to say that, the current situation of information society statistics of official statistics in many countries of the world, especially in transition countries is not satisfactory.

### **3. Core ICT indicators, approaches for measurement**

Among CIS countries the complete measurement of the ICT statistics is firstly started in official statistics of Azerbaijan. The international practice, especially the practice of the

European countries was studied, “Core indicator system on information society statistics” was prepared, methodological plans of questionnaires and statistical observations were worked out. The statistical survey was carried out in 5.0 thousand households (0.3%) covering 14.1 thousand individuals (family members) at the age of more than 15 years old by all regions of the country. 20.2 thousand legal persons engaged in all branches of the economy, excluding agriculture and trade enterprises having less than 5 employees, were involved in statistical observation. The data on ICT sector and import and export of ICT goods is processed. In the result of that the information corresponding international standards and meeting the requirements of the government, international organizations and other users was received concerning with IT statistics. Obtaining of the certain basic theoretical and practical knowledge by national statistical bodies is a positive case for measurement of IT statistics in future.

In our opinion, in national statistical offices the ICT statistics starts with the development of indicators system enabling to compare ICT statistics in national and international level and to characterize the existing situation. These indicators normally should cover the followings: core indicators on ICT infrastructure and access (Basic and extended core A1-A12), core indicators on access to, and use of, ICT by households and individuals (Basic and extended core HH1-HH13), core indicators on use of ICT by businesses (Basic and extended core B1-B12), core indicators on the ICT sector and trade in ICT goods (Basic core ICT1-ICT4). There is a need for more 41 indicators of which 32 is basic core, 9 is extended core and derivative indicators generally for international comparison.

**Table 1**

**Core ICT indicators, optimal approach methods  
and type of survey for transitional countries**

<b>Basic core</b>		<b>Survey unit and method</b>	<b>Observation approach</b>
<b>Core indicators on ICT infrastructure and access</b>			
A1	Fixed telephone lines per 100 inhabitants	Enterprises by NACE code 6420, census	Institutional approach
A2	Mobile cellular subscribers per 100 inhabitants		
A3	Computers per 100 inhabitants	By households, sample survey	Households
A4	Internet subscribers per 100 inhabitants		
A5	Broadband Internet subscribers per 100 inhabitants		

A6	International Internet bandwidth per 100 inhabitant		
A7	Percentage of population covered by mobile telephony	Enterprises by NACE code 6420, census	Enterprises – institutional approach
A8	Internet access tariff (20 hours per month) as a percentage of per capita income		
A9	Mobile cellular tariffs (100 minutes of use per month), as a percentage of per capita income		
<b>Core indicators on access to, and use of, ICT by households and individuals</b>			
HH-1	Proportion of households with a radio	By households and individuals, sample survey	Households, individuals age more than 15
HH-2	Proportion of households with a TV		
HH-3	Proportion of households with a fixed line telephone		
HH-4	Proportion of households with a mobile telephone		
HH-5	Proportion of households with a computer		
HH-6	Proportion of individuals who used a computer		
HH-7	Proportion of households with Internet access at home		
HH-8	Proportion of individuals with access to the Internet from any location		
HH-9	Location of individual use of the Internet from all locations		
HH-10	Internet activities undertaken by individuals		
<b>Core indicators on use of ICT by businesses</b>			
B1	Proportion of businesses using computers	Enterprises by NACE all or selected sections, census or survey	Functional approach for business, Census for J section by NACE
B2	Proportion of employees using computers		
B3	Proportion of businesses using the Internet		
B4	Proportion of employees using the internet		
B5	Proportion of businesses with a Web presence		
B6	Proportion of businesses with an intranet		
B7	Proportion of businesses receiving orders over Internet		

B8	Proportion of businesses placing orders over Internet		
<b>Core indicators on the ICT sector and trade in ICT goods</b>			
ICT1	Proportion of total business sector workforce involved in ICT sector	Census or survey By NACE code	Enterprises – institutional approach
ICT-2	Value added in the ICT sector (as a percentage of total business sector value added)	3000; 3130;3210; 3220; 3230;3312; 3313;5151;5152; 6420; 7123;72	
ICT-3	ICT goods imports as percentage of total imports	Administrative recourses	Functional approach
ICT-4	ICT goods exports as percentage of total exports	Customs statistics by HS	

More than three fourths of core ICT indicators require functional approach and observation units are households and enterprises. Other indicators covers ICT enterprises and observation units are these objects. Information on ICT sector is obtained for SNA-93 in institutional approach.

#### **4. Organizing effective observation methods for ICT statistics**

Core ICT indicators can be grouped by observation units in the following way:

- By households;
- By individuals;
- By enterprises;
- By ICT sector;
- By foreign trade of ICT goods.

a) Indicators on households and individuals make 1/3 part of the main IT indicators and joint observation is more effective. To take into account the below mentioned factors could be more significant for countries in transition for MSO:

- Information on households and individuals is obtained based on the same sample observation. Information on households is obtained based on interviewing of the household head and information on individuals - on interviewing of household members - individuals. For obtaining the information on individuals the head of the household also is participated as respondent.

- Using of the results of other surveys on households or data of the last population census is very optimal for calculation of the sample numbers and estimation of the general population. If using of these version is not possible the sample population could be defined depends on financial resources and possibilities.
- Observation units are defined according to dispersions and homogeneity that calculated based on volume of incomes or expenditures, size of households and strata grouping by place of residence.
- It is effective to compile the list of households based on the list of households participated in other surveys. It could increase the respondent's burden and decrease data quality.
- In spite of the fact that the participation of the individuals in the process of survey was also considered, the observation units of the sample are households, sample units are individuals. The final sample units should be the individuals.
- The survey conduction is possible by face to face, telephone or mail. If there were no responses, its estimate via conventional calculation is not effective way and it is advisable to avoid such cases. So, income of households is differed, homogeneity is less and definition of ICT based on feature is considered as very hard processes.
- As in some European countries, in transition countries for the obtaining of the information in transition countries on individuals the participation of persons at age of 16 years old and over is considered as well. It should be considered that teenagers under 16 years old don't use internet commonly, and purposes of use is not serious.
- Before starting the sample observation firstly the project should be prepared—organization and management of observation, statistical methods, statistical aspects of covering of data processing and descriptive statistics should be defined. Successful realization of sample observation, minimizing of errors in results depends on this stage.
- Sequence of main activities or plan of observation consists of compilation of sample plan, preparation of instructions on survey questionnaires and its filling in, organization and management of sample observation, data collection, analysis, input into computer and processing, publication and distribution.
- Questionnaire is formed based on requirements of users and bodies realizing implementation of ICT policy. The questionnaire should be simple, indicators needed additional calculation and questions related events that rarely happened in the country should not be included in the questionnaire. It is advisable to entrust the compilation data which requires additional time to statisticians or interviewers. On preparation of questionnaires the model of questionnaires of EU Statistics Bureau could be used.

- Processing of data covers evaluation of information by sample and general population based on collected data, preparation of information according to output tables. It is better to form the indicators based on methodological instructions, compilation of output tables according to indicators system. On calculation and evaluation of main indicators the explanations should be understood correctly.
  - After working out of data and receiving of output tables the statistical and economical analysis should be conducted. Statistical and economical analysis of results of sample survey gives possibility to describe data quality and situation by field. Deductive statistical analysis is an estimate of general population based on sample results.
  - In the results of sample data variation indicators and statistical errors are calculated. Sample percentage for next surveys is defined based on level of sample errors and volume of deviation. Making of decisions related to next surveys, compilation of strata, decreasing or increasing of sample volume on regions should be based on statistical analysis of sample results.
  - If the observation and its results are conducted for the first time the wide discussions should be conducted among state bodies engaged with carrying out of ICT policy and opinions of specialists of other related organizations have a great importance. This is important for avoidance of distribution of incorrect information.
- b) ICT indicators on enterprises have a great importance and are under attention of international organizations, government, researchers. For studying of observation units the functional approach method is effective. The factors that are important on statistical observation are following:
- Organization and conducting of observation is realized on the basis of statistical register or business register. Separation of observation units such as enterprise; the institutional unit; the enterprise group; the kind-of-activity unit; the unit of homogeneous production; the local unit; the local kind-of-activity unit; the local unit of homogeneous production could positively impact on results.
  - Studying of available situation of ICT in e-business or enterprises, conducting of statistical observations in all economic sectors and covering of units by all economic activity types (complete or sample) is a positive factor. Such observations give possibility to study and compare the availability of ICT in all branches of social economic life, as well as making of corresponding decisions.
  - Observation of non-financial enterprises related with e-commerce could be studied based on complete or sample statistical observation. Observation includes enterprises functioning by NACE, sections D, F, G, I, K, groups 55.1, 55.2, 92.1, 92. At the same

time enterprises acted by NACE, section E, 55.3-55.5, 92.3-92.7 and 93.0 could also added. Sample observations in non-financial enterprises by NACE, section A, B, C, H is sufficient.

- Taking into account that in transition countries the number of trade enterprises with less than 5 employees is prevalent (section G), it's involvement in sample observation or it's generally non-observation depends on financial and labor resources of NSO.
- Taking into account wide use of IT by financial enterprises (section J) and its less number, their completely involvement in the survey is purposeful.
- In transition countries the information on education and health enterprises that are included in non-financial sector and refer to section M and N could be obtained from Ministries of Education and Health. However, obtaining of information on regions and areas it is purposeful to use local units.
- For the conduct of sample observation the number of employees engaged in enterprises or other variables could be used as base as grouping feature. Number of selections by strata is realized based on optimal allocation (for example Neyman allocation).
- Availability of statistical legislation and local statistical bodies in the transition countries gives possibility to present state reports by mail or directly presentation.
- After receiving of information the conducting of statistical descriptive analysis has a great importance. Results of current survey serve for making of decisions related with the next surveys and receiving of good results.

There is no need for organization of additional observation for obtaining of information by ICT sector. Value indicators are reflected in the statistics of enterprises according to NSA-93 and the necessary information is collected. ICT sector includes production and service fields that cover storing, transmitting and reading the information and data in the electronic format. It comprises by NACE 1.Manufacture of office machinery (3001); 2.Manufacture of computers and other information processing equipment (3002); 3.Manufacture of insulated wire and cable (3130); 4.Manufacture of electronic valves and tubes and other electronic components (3210); 5.Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy (3220); 6.Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods (3230); 7.Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment (3320); 8.Manufacture of industrial process control equipment (3330); 9.Wholesale of electrical household appliances and radio and television goods (5143); 10.Wholesale of computers, computer peripheral equipment and software (5184); 11.Wholesale of other office machinery and equipment (5185); 12.Telecommunications (6420); 13.Renting of

office machinery and equipment, including computers (7133); 14. Hardware consultancy (7210); 15. Publishing of software (7221); 16. Other software consultancy and supply (7222); 17. Data processing (7230); 18. Database activities (7240); 19. Maintenance and repair of office, accounting and computing machinery (7250); 20. Other computer related activities (7260). Employees of NSO could receive necessary information according to value added created by enterprises acted on IT sector, number of employees engaged in this sector, its wage, investment and other indicators.

ICT goods are intended to fulfill the function of information processing and communication by electronic means, including transmission and display, or use electronic processing to detect, measure and/or record physical phenomena, or control a physical process. It has to be taken into consideration that, the production of ICT goods is specified in activity of D section of NACE (ISIC) and PRODCOM, import and export by HS.

In international level, according to the general reference of the UN, WTO and other international organizations 179 various types of products have been included into the ICT goods in general. 18 telecommunication equipments, 10 computer and computer equipments, 44 electronic components, 45 audio and video devices and 62 other ICT goods have been included here.

## **5. Results, vagueness and definition of perspectives in the field of IT statistics for countries in transition**

Development perspectives of studying of ICT in international statistics should be identified. Employees of official statistics need the opinions of policy makers, international organizations, scientists, researchers and other users. Taking into account links of ICT with reforms and standards the problems and perspective for countries in transition could be grouped as follows:

- Conducting of ICT statistics and its quality depends on international and national classifications and register. For example, produced IT productions could be defined by PRODCOM, NACE, HS. On absence of international classifications and analogical national classifications in ICT statistics its complex statistics is not possible.
- On approaching from Azerbaijan practice prism for transition countries the main problems are related with e-state, e-education, e-health open branches. In spite of the fact that the enterprises operating in these branches are involved in statistical observation, obtaining of the specific answers by means of same observations is very difficult. Obtaining of information by these fields requires conducting of additional statistical

observations. It is interesting that there are no e-state, e-education, e-health indicators in “Core ICT indicators” prepared by ITU, OECD, UNCTAD, UNESCO, UN Information and Communication Technologies Task Force, UNECA, UNECLAC, UNESCAP, UNESCWA and EUROSTAT.

- One of the main problems in ICT statistics is calculation of satellite accounts that give the possibility to calculate the share of ICT sector in GDP. Calculation of value added, evaluation of expenditures that are included in intermediate consumption by enterprises the secondary activity of which refers to IT sector requires new and additional methodology along with enterprises functioning in the IT sector.
- There are some problems related with lack of financial means for conducting of regular observations in transition countries. When conducting of regular observation is not possible by using other indicators it is possible to estimate and forecast information. The complexity of this process, correct selection of mathematical methods makes preparation of detailed methodological indicators as necessary.
- There is great need in statistical specialists on evaluation and measurement of ICT role in social-economic development processes. Training of staff, studying of international practice is one of the main issues, especially training of specialists on application of descriptive statistics, definition of sample framework, sample design, processing and distribution of information.
- Scientists, researchers and official statisticians should be interested in definition of future perspectives of ICT statistics. Continual renovation of indicators systems, studying of international standards and coordination of steps of statisticians should be defined.
- Applying of descriptive statistics, definition of sample frame, sample design, processing and distribution of information in ICT statistics.

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