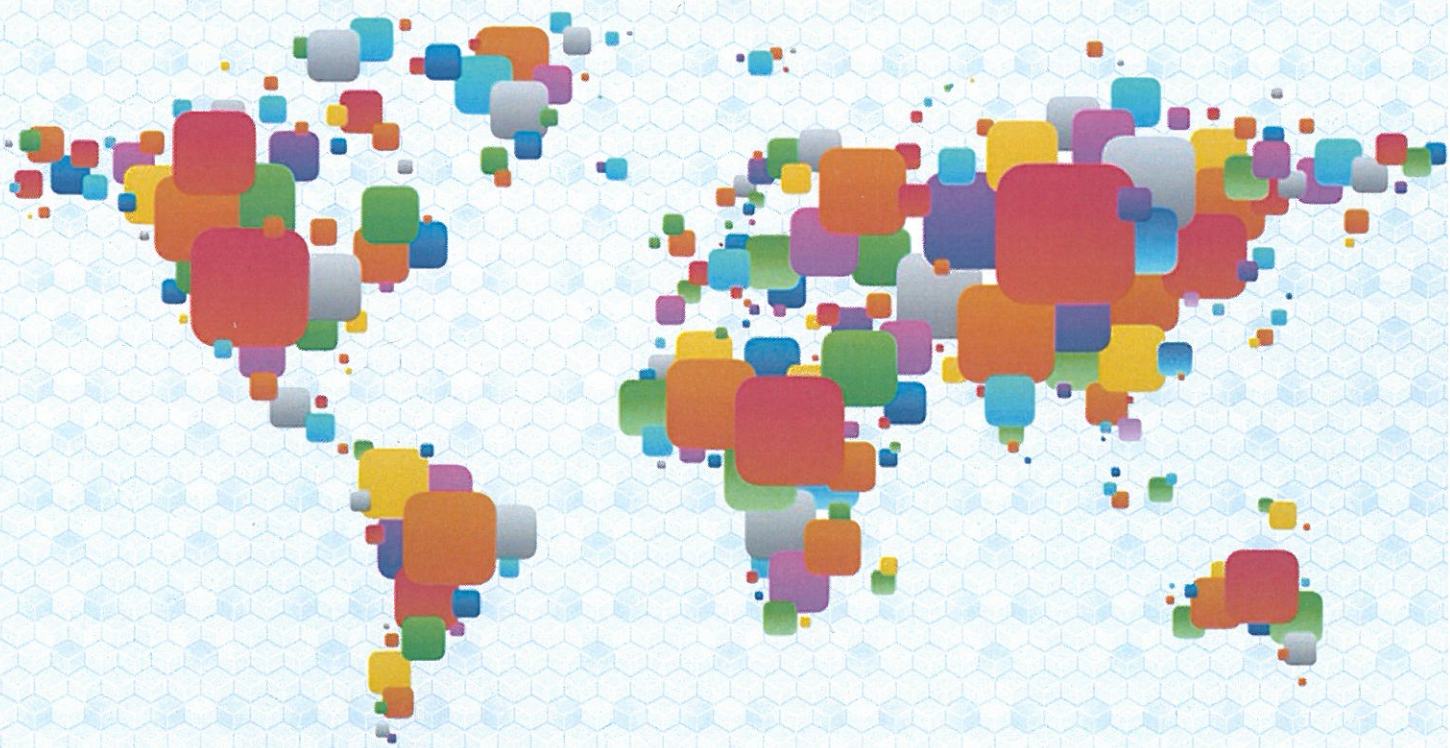
3rd International Scientific-Practical Conference

Innovative Information Technologies

Part III



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The materials of The Third International Scientific – Practical Conference is presented below. The Conference reflects the modern state of innovation in education, science, industry and social-economic sphere, from the standpoint of introducing new information technologies.

Digest of Conference materials is presented in 3 parts. It is interesting for a wide range of researchers, teachers, graduate students and professionals in the field of innovation and information technologies.

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In this paper, we studied a practical implementation of the security methods of counteraction to local attacks. The point to be emphasized is that usage of these methods neither increases costs nor complicates the use of computer, it also doesn't seriously affect system performance on modern computers. Moreover, all implementations are open-source and permitted to copy and to modify. We are sure they effectively protect the computer from the most competent malefactors.

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NEW INFORMATION TECHNOLOGY IN DATA PROCESSING OF POPULATION CENSUS RESULTS

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The new technology used for data processing of population census results is described. The system was recently launched by Rosstat for 2002 and 2010 censuses. It gives the user an opportunity of on-line tabulation any demographic table from micro data with no need to download the data themselves and to set up any software. The examples of the results absent in the official census tabulation obtained by means of this system are given.

Keywords: population census, micro data, data processing, demographic tables, on-line access

Nowadays, the need for statistical information about the population increases in educational and scientific institutions, as well as among governmental bodies and business structures. Despite a significant increase in the amount of statistical data available in the public domain of Federal State Statistics Service (Rosstat), this information is often insufficient for analysis and projection of socio-demographic situation of the country and its regions.

As a way of solving this problem, statistical agencies of many countries organize public access to micro-databases. Since the most detailed information is collected during the population census, in most cases, access is given to these data. One of the largest international projects on population data at the individual level is IPUMS (Integrated Public Use Microdata Series, [1]).

In 2012, Rosstat granted to Internet users full and free access to micro-data of the 2002 All-Russian population census, containing information on private households. Software package SuperSTAR, developed by the Australian company Space-Time Research, was used for that purpose. The choice of this particular software is based on the fact that it is designed specifically for the purpose of granting access to large volume of anonymized micro-data at

high speed. This software is used by national statistical services of many countries for providing web-based access to the data of censuses and surveys, and is being improved by the developer on a regular basis according to the needs of users. Thus, SuperSTAR enables the user:

– to design an arbitrary table layout using any indicators covered by the 2002 and 2010 All-Russian population censuses;

– to form a table with aggregate data of the 2002 and 2010 censuses according to the terms characterizing the population on the base of the layout specified;

– to form queries with intersection of features of various objects (e.g., households and dwellings, or persons and households. While constructing a query, such as "households in which there are persons aged 15 years and older by the type of dwelling occupied", a conjunction of features relating to dwelling, person and household takes place, is an option not supported by most database management tools);

– to visualize the data in the form of tables and graphs;

– to export the tables generated in formats of MS Excel, xml or csv, and diagrams - in png or pdf formats.

In order to create an arbitrary table with the results of the 2002 and 2010 censuses, users need to know in details their program and methodology, which can be found on the official website of Rosstat [2]. In addition, different metadata describing the selected parameter are available to the user during the table design. Otherwise, the risk of receiving incorrect information may be high. For example, data on educational attainment for the whole population, instead of those aged 10 years or older, will have an irregular structure because the educational attainment of persons under 10 was not specified.

Generation of tables with the census results takes place promptly within a few minutes, due to the special format of data storage developed by Space-Time Research Company.

While providing online access to the census micro-data, Rosstat is obliged to maintain the confidentiality of personal data in accordance with the following federal laws:

– Federal Law of 27 July 2006 N 152-FZ “On Personal Data”: “confidentiality of personal data – the requirement, which must be observed by the operator or other party who has received access to personal data, not to allow their distribution without the consent of the subject of personal data or other lawful grounds”;

– Federal Law of 25 January 2002 N 8-FZ “On the National Census”: “Information on population stated in population census forms shall be considered confidential and shall not be divulged (disseminated). Said information shall be used for generating federal information resources”;

– Federal Law of 29 November 2007 N 282-FZ “On Official Statistical Accounting System and State Statistics in the Russian Federation”: “Primary statistical data contained in the forms of federal statistical observation is restricted information, except the information, access to which should not be limited in compliance with federal laws. Subjects of official statistical accounting should provide confidentiality of restricted information. Primary statistical data making restricted information should not be disclosed or disseminated and shall be used only to form official statistical information”.

Despite the fact that the primary information in the database is impersonal and inaccessible to users, it is possible to identify individual respondents due to unique features, typical for the surveyed group of individuals. Among such features are: date of birth or ethnicity untypical for the residents of this village, etc. First of all, the risk of disclosure of personal data is high for the residents of settlements with small population.

To protect personal data, Rosstat uses a distortion algorithm, which introduces minor distortion in the values of a table, making impossible the disclosure of confidential information. This ensures the representativeness of the data and users are not limited to access to the census

results by aggregation of the values of the indicators or territorial units. The tables that are slightly distorted in order to hide confidential data contain such a warning.

Table 1. Sample table formed without personal data protection algorithms (conventional data)

City	Total population	Age (years)								
		0 - 9	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 and over	Not specified
Bronnitsy	191	6	12	67	38	48	10	6	4	-
Dzerzhinsky	81	4	10	18	22	10	13	-	1	3
Dolgoprudny	796	23	47	256	260	141	31	6	6	26
Dubna	71	3	10	9	6	17	9	5	7	5
Zheleznodorozhny	86	4	12	16	13	16	8	4	3	10
Zhukovsky	3712	35	105	985	1053	884	304	105	162	79
Ivanteyevka	242	5	6	91	91	29	6	2	-	12
Klimovsk	93	7	2	15	37	23	2	4	2	1
Kolomna	115	10	6	35	32	12	8	6	-	6
Krasnoarmeysk	19	-	1	8	6	4	-	-	-	-

Table 2. Sample table formed using personal data protection algorithms (conventional data)

City	Total population	Age (years)								
		0 - 9	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 and over	Not specified
Bronnitsy	188	4	12	67	36	47	9	9	4	-
Dzerzhinsky	81	5	9	15	20	10	14	-	-	-
Dolgoprudny	797	21	47	260	257	139	33	5	7	30
Dubna	71	3	10	8	7	15	11	7	5	3
Zheleznodorozhny	84	9	13	15	15	13	6	5	4	10
Zhukovsky	3713	36	108	988	1052	886	300	104	160	81
Ivanteyevka	242	4	4	91	90	27	3	-	-	8
Klimovsk	92	9	6	13	38	22	3	3	-	-
Kolomna	112	11	9	32	37	13	9	7	-	7
Krasnoarmeysk	20	-	3	8	5	6	-	-	-	-

Any network user has access to the micro-database of the 2002 and 2010 censuses with opportunity to build arbitrary query that contain aggregate data, using web-site of Rosstat [3]. Registration is not required.

The system for providing access to the population census micro-data at Rosstat web-site is under regular development. One of the examples is a new feature for keeping the combination of characteristics of different persons in a family at tabulation. The direct opportunity of such feature was primarily absent for the 2002 census data. However it appeared for 2010 census after including in the list of characteristics of nuclear family the set of them for a husband and for a wife. After this it became possible to select, for example, the families with specified set

of ethnicities of husband and wife. The following table displays the result of combing several queries to the system, allowing to estimate the number of ethnically mixed families.

Table 3. Mono-ethnic and ethnically mixed marital pairs by ethnicity of husband, selected ethnicities outside corresponding national republics, Russia, 2010.

Ethnicity of husband	Number of families	Percentage of families outside national republic in all families in Russia	Ethnicity of husband and wife coincide	Ethnicity of husband and wife are different	Percentage of ethnically mixed families
Chechens	34139	15.69	28088	6051	17.7
Ingush	7937	13.20	6222	1715	21.6
Mari	38339	48.54	23679	14660	38.2
Tatars	474297	62.20	269669	204628	43.1
Kalmyks	2300	9.39	1228	1072	46.6
Bashkirs	59765	26.78	30827	28938	48.4
Chuvash	95543	45.81	47906	47637	49.9
Udmurts	20502	25.06	8938	11564	56.4
Mordovians	64482	58.79	20750	43732	67.8
Yakuts (Sakha)	773	1.23	209	564	73.0
Komis	3233	11.46	639	2594	80.2

Ethnicities are listed in ascending order of percentage of ethnically mixed pairs.

Let us consider as an example the queries resulted in two values in this table on Kalmyks. The following options were specified:

- Summing up: nuclear family (“family cell”), number of families (check-box), Add to row (button)
- Family cell: Type of family cell: Marital pair without children under 18 (check-box), Marital pair with children under 18 (check-box), Add to column (button)
- Responses of husband: Ethnicity of husband: Kakmyks (check-box), Add to row (button)
- Year of census: 2002 (check-box), Delete from a table (button)
- TEPCOH-ATE: Russian Federation (check-box), Add to row (button)
- Extract data (button)

The result contains two figures: the number of families of Kulmyk husband without children 7155 and with children 17342. The total is 24497.

The second query is the same except the territory:

- TEPCOH-ATE: South federal district: The republic of Kalmykia (check-box), Add to row (button)

The result contains the following figures: number of families of Kulmyk husband in the national republic without children 6491 and with children 15706. Their total is 22197.

Thus the difference between these totals gives us the rest number of families of Kalmyk husband outside the national republic. It is equal to 2300 or about 9.39 per cent of their total in Russia.

One of the most significant features of the system is flexibility at table design. The user has an opportunity to select the object for counting (person, dwelling, household, or family), a year of census (2002 or 2010), the level of territory (Russia, federal district, subject of the Russian Federation – oblast, kray, republic, up to the level of separate villages), as well as to specify the indicators of the object selected (age, sex, place of birth, educational attainment, ethnicity, etc.), the column or row as sides of a table under construction for each descriptor. For students, scholars, as well as the general public it opens quite new and very rich field of population studies. It should be noticed that the total number of objects described in the database exceeds 200 million.

References

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ANALYSIS OF THE METHODS FOR THE ASSESSMENT OF ENTERPRISE INTELLECTUAL CAPITAL

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The concept of intellectual capital and how to assess it are considered. 4 categories for measuring intellectual capital, grouped by K.E. Sveiby, are examined. It was concluded that every enterprises, owing to the specificity, selects individual methods for the assessment of intellectual capital.

Intellectual capital components are heterogeneous. Despite the fact that they are generated by the human intellect, some of them exist in the form of knowledge, inseparable from people possessing them, and others form objective conditions of application of this knowledge to increase enterprise competitiveness.

In scientific literature the concept of "intellectual capital" is used relatively recently. It was introduced in 1990 by Griliches relative to those intangible values, which define the difference between the market cost of the corporation and replacement value of its assets. It was only in 2000 when the intellectual capital was spoken about as a key resource of a modern enterprise. Leif Edvinsson and Michael S. Malone defined the intellectual capital value as a difference between the market cost of the company and the value of its net assets. At the present stage of research in the field of the intellectual capital theory the following scholars are engaged: E. Brooking, V. Geits, Galbraith, M. Castells, A. Toffler, V. Inozemtsev B. Leontyev, L. Miller etc.

L. Edvinsson was the first to define the intellectual capital as the knowledge and information which can be converted into cost. This opinion is shared by B. B. Leontyev, who defined the intellectual capital of the organization as the value of available intellectual resources. These scholars single out the following components of the intellectual capital: human capital and structural capital, which consists of organizational and client capitals. As soon as the intellectual capital was put on a par with other factors of production, there arose the problem of its measurement.

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