Applying of Electronic GeoStatistical Resources in Teaching of Economic Statistics

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The growing importance of spatial-time data analysis and statistical modeling of processes in various areas of the economy makes it necessary to adapting the content of economic statistics courses. Professional statisticians is necessary to know a new methodology for the collection of geostatistical data processing and analysis , understanding the results of inter-territorial comparisons and their interpretation , prediction skills of the economic situation in the spatial aspect .
In order to meet the needs of students of all areas the Department of Statistics of the Plekhanov Russian University of Economic developed an electronic geostatistical system of operational analysis and forecasting of socio-economic development of the regions of Russia and a number of EU countries. This system accumulates statistical data from various official sources, automatically calculates parameters and visualizes all statistical information in the spatiotemporal layers. Using the system, statisticians-students study the sources of the geostatistical information, advanced open data technology, methodology of calculation and methods of the visualization of spatially-distributed statistics. The system allows to interactively customize the calculations of inter-territorial statistical comparisons at different levels of aggregation of economic systems. Students of other economic areas can use the system for applied research of the spatial factor of development of the certain sectors of the economy. Applications of this approach in the teaching of economic statistics has allowed to raise the interest of students to study the statistics, while to statisticians-students it has allowed to gain the skills to work with modern information technologies in the field of statistics.

Keywords: Economic statistics, Statistical education, Geostatistics, Information Systems.

1. Introduction

Plekhanov Russian University of Economics is the country's leading economic university with over 108 years of history, highly developed in research and innovations. The University provides its students and postgraduate students with the quality education in the field of economy, commodity, technology, law and other fields.

The Situation Centre for Socio-Economic Development is the scientific and educational Centre of Plekhanov Russian University of Economics, created in 2012.

The main objectives of our activity are to realize fundamental and applied research and development in the field of social and economic development of the Russian Federation regions, to support the educational and research activities of the structural divisions of the University.

Economists around the world are mostly working with numbers. Many good economists are able to see behind the numbers the movements of trains, but only the coolest economists can briefly convert these columns of numbers into the vector of the whole territory or state development. All of them use computational analysis tools, but much depends on the personal qualities as well.

We can teach students the art of strategy. Therefore, we have translated the digital information too easy to read format and give students a significant amount of training in this visual medium. This is actually a minister simulator, giving the opportunity to see the situation from a height and learn to manage it. It is like a strategies family computer game, but instead of elephants – a real Russian land, cities and enterprises, and of course, there is a powerful group of experts and professors by your side.

Situation Centre is located on the Plekhanov University campus and represents a team of remarkable macroeconomics specialists armed with a class of 16 wide touchscreen workstations and a giant wall monitor. We have organized free access to all our resources via the university information grid featuring tablets and smartphones support.

Methodological possibilities of the Centre are not limited to passive submission of information to the university cloud. Every new day our team runs a variety of events, from business consulting to school quizzes.

2. BI system capabilities

Situation Centre provides to students and officers of the University the opportunity to quickly analyze huge/large information massive of local, regional and world scale.

For the work, we use our own Business Intelligence system.

The concept of Business Intelligence includes, as stated in (Wikipedia.org, 2017), a set of theories, methods, architectures and technologies, by means of which a great volume of primary data, most often historical data, is synthesized into information of interest such as key performance indexes for a company management. This information is presented in the form of reports, charts or tables. Quality is the most important aspect when we talk about a correct implementation of any Business Intelligence solution. This must be presented in all of the four moments of the implementation: source data standardization, data processing, data warehouse implementation and reporting. Regarding data warehousing, it has been noticed in time a change from relational to multidimensional. This change was necessary for the creation of dimensions as close to the user perspective as possible. Moreover, a multidimensional analysis offers a database much easier to consult and interrogate at a synthetic level with less keys and administrative tables then in relational theory (B.-A. Ionescu&S. Podaru, 2014).

Even if it occurred in 1958 (D.-A. Berta , 2012), Business Intelligence begins to become known since 1989, when Howard Dresner defines it: "an umbrella concept that describes a set of concepts and methods to improve business decisions by assist systems use decisions based on facts " (D.J.,Power , 2007). In our vision, Business Intelligence is a complex of economic applications used for data analyzing from various sources in order to transform them into information that will substantiate the decisions taken by researchers, professors and students (D. Airinei & D.-A. Berta ,2012).

Along the time, attempting to keep up with technology, Business Intelligence passed through several phases, becoming from operational BI real-time BI (D. Sandu, 2008), adding socialization modules (D.-A. Berta, 2011), and expanding its functionality to be used by mobile phones, turning to Mobile BI (D. Airinei & D. Homocianu, 2010) and now by adding new semantic technologies becomes Semantic Business Intelligence (D.Airinei & D.-A. Berta ,2012).

Among the implemented projects, it is possible to single out monthly monitoring of the most important indexes of the Russian Federation regions, a robust analysis of labor resources based on the primary data of a monthly population survey, identifying hotbeds of social tension based on employment and demographic data [(stat.university , 2017).

However, the core of the Situation Centre is universal. The information-analytical system of the Situation Centre is an easy-to-use platform for interactive reporting, data analysis and report distribution.

The information-analytical system of the Situation Centre can accumulate data from any source – there are public data, databases, for example, SPSS, and even unstructured Excel table pools.

After automated data collection, the system allows you to present information with a large set of visualization tools, including:

• Interactive tables with extensive conditional formatting functionality;
• A whole range of diverse diagrams, graphs, instruments;
• Multilayer vector and raster maps (Fig. 1).

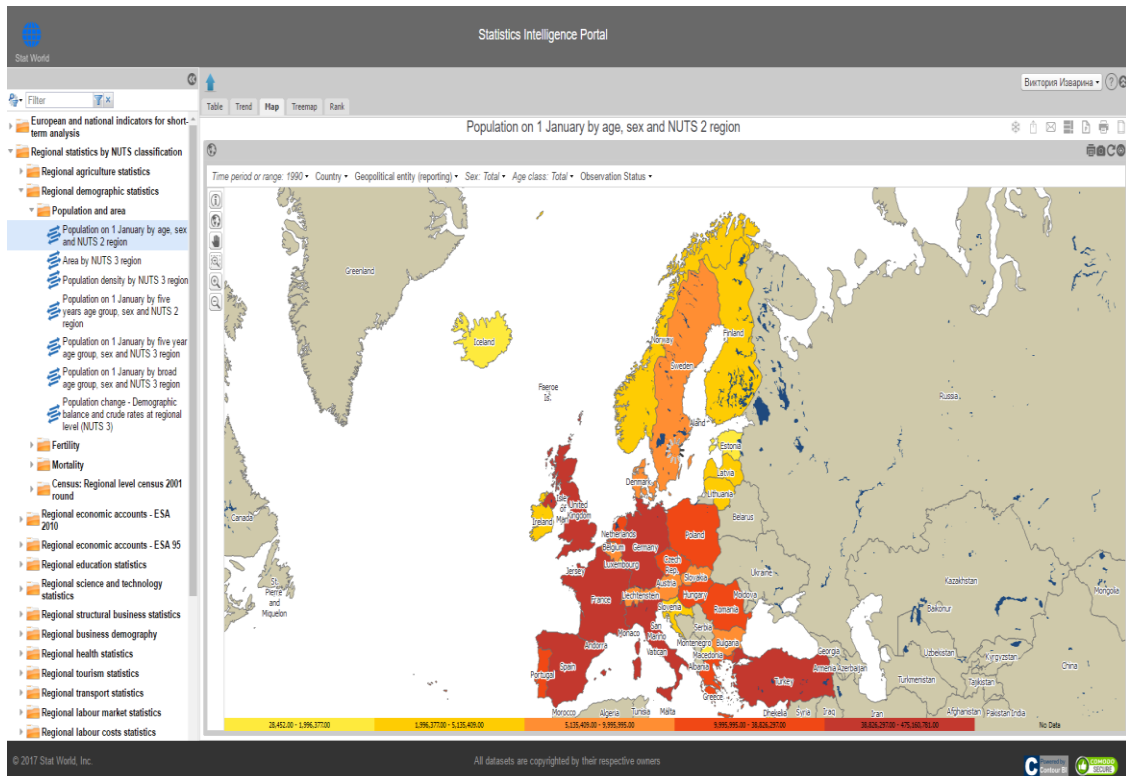When updating the data, the user does not need to reconfigure the visualization.

Fig. 1. Visualization "Multilayer vector and raster maps" on the example of Eurostat data (web-based solution)

System has a simple and friendly spreadsheet-like user interface. When working with reports, users can independently and in real-time obtain dozens of visualization variations with sub-second response times, they build interactive reports with zero programming and publish them in a local network and web. Thus, there are two options of interaction with the system – "thick" client (report designer, is installed on PC) and web-based solution (viewing and express analysis on the Internet).

Users also can print and save reports in various formats: Microcube, MS Excel, MS Word, HTML.

The information-analytical system of the Situation Centre also creates reports based on large amounts of data - millions of records - and does it very quickly. In order to ensure maximum performance optimization, system supports three OLAP technologies:

- ROLAP – building reports from relational databases. Query the database and receive reports in real-time;
- MOLAP – instant opening of pre-built reports;
- HOLAP – immediate opening of pre-built reports with the ability to update them from a relational database.

There is Linked reports' technology. It allows for the quick setup of a workplace for specialists, gathering together connected reports that get information from the different informational systems within an organization. A report built from CRM data can immediately be integrated with a report containing data from ERP, and from there receive a report based on data entered in an Excel spreadsheet.

As an example of work with the big data, it makes sense to consider the project, created on the basis of Eurostat open source data.

Thousands of indexes presented on the Eurostat website are automatically downloaded and converted with the help of the OLAP operations in the convenient form for analysis. For each index, all types of visualization are automatically generated (Fig. 1). In online mode, the user can independently go deeper into the data to the regional level of the selected country; change the time series. If necessary, it

is possible in the interactive mode to quickly add to the table an additional detalization of the index (for example, gender, age of the population, Fig. 2).

In the report designer, the range of tools for analysis is much higher - the analyst can create additional calculated facts: as elementary (percentage of the total, deviations from different periods, etc.), and more complex (data verification, kurtosis coefficient calculation etc.).
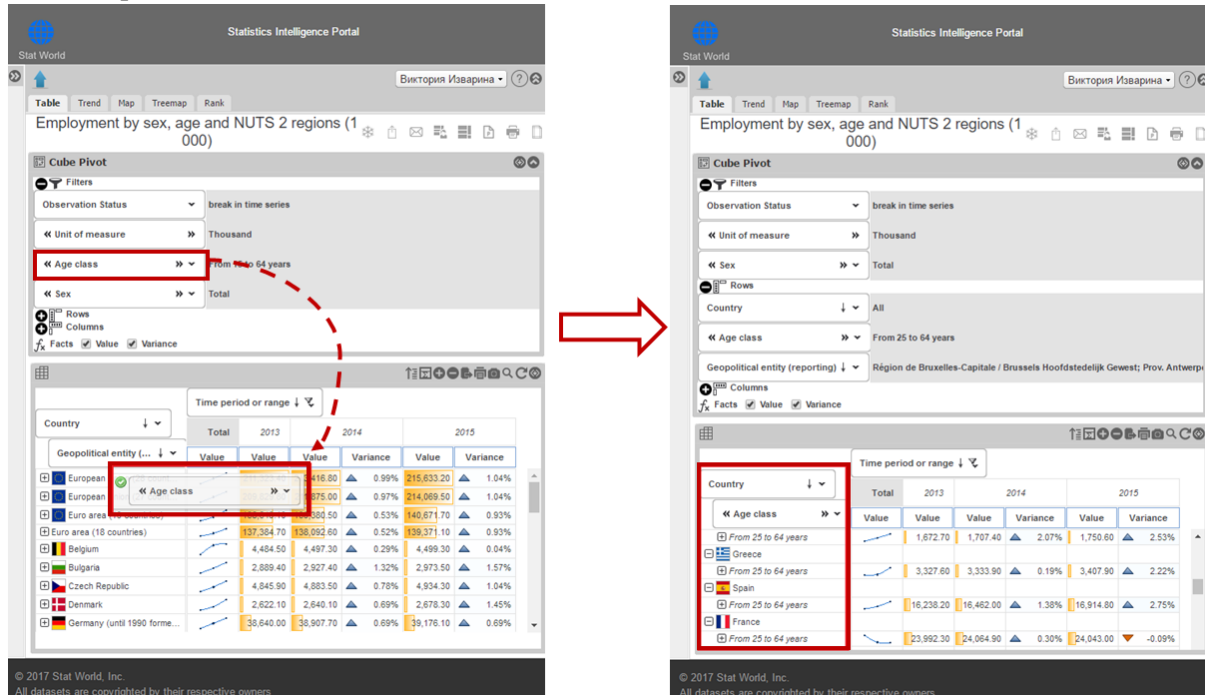

Fig. 5. Example of interactive table setting in web-based solution

A user also can work with the reports either locally without access to Internet using projects stored on a server.

In the University, analysts and lecturers use information-analytical system of the Situation Centre as a "thick" client for the advanced data analysis. Students view reports in the web using only their browsers.

Today we are working with students and lecturers according to the following plan (Fig.3):

1. Those who are interested can be trained to manage the Situation Centre system. Then we install the software on the personal computers of the trained. Then students and lecturers work locally - they create local projects for their own needs.

2. The management team of the Situation Centre appoints moderators of the directions of social and economic development of the regions, for example, the financial sector, industry, labor market, etc. Moderators are lecturers or researchers of the relevant subject area. They assess the level of projects created by users locally and are responsible for placing these projects on the closed portal of Plekhanov Russian University of Economics. Thus, if a student has created a project that, in the expert's opinion, will be useful to other students, graduate students and staff of the University in the scientific and educational process, the moderator places this project on the portal of the Situation Centre of Plekhanov Russian University of Economics.

3. The reports' pool for a particular subject area can be placed in the public access so that all Internet users can view it by going to the Situation Centre web page.

This approach helps:

First, to create a centralized statistical database on various socio-economic spheres, which will allow students, graduate students and staff of the University to receive up-to-date information timely, to minimize the time costs for data searching in the Internet.

Secondly, to master the methods of multidimensional data analysis, to gain experience in creating your own analytical solutions.
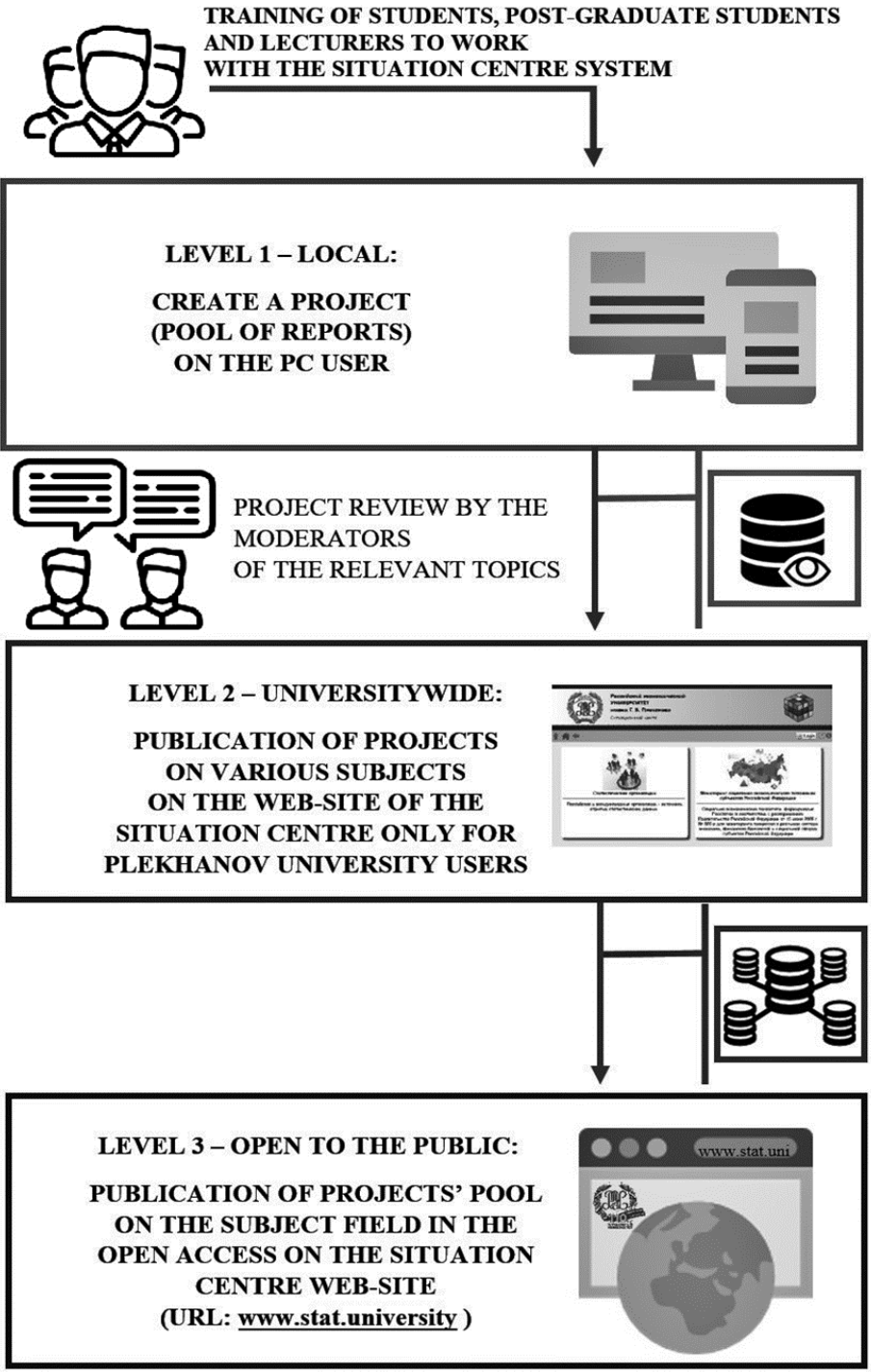

Fig. 3. Interaction pattern of the Situation Centre of Plekhanov Russian University of Economics with students and departments

3. Conclusions

The information-analytical system of the Situation Centre is a Business Intelligence platform and it allows significantly accelerating the creation of new analytical solutions, preserving all the

accumulated experience, and gives new qualities to the research - multidimensionality and interactivity.

System of the Situation Centre can be installed on any laptop or desktop and used to develop personal techniques in data analysis and build interactive tables, graphs and maps for the course work. Lecturers and researchers, using the tool to write scientific papers can significantly improve the level of their research.

Multidimensional data analysis plays a crucial role in any work done with statistical, financial and business data, and for this reason ought to be made accessible to every university student and officer.

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