

# Modern informational technologies for data analysis: from business analytics to data visualization

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## Abstract

Modern informational technologies encompasses a variety of tools, applications and methodologies that enable to collect data from internal systems and external sources, prepare it for sharing, analysis, develop and run queries against the data, create reports, dashboards and data visualizations.

One of such innovation system in financial landscape is Business intelligence. Its opportunities are in combining a broad set of data analysis applications, including analysis and querying, enterprise reporting of different statistic information, online and real-time analytical processing. Modern technologies also includes data visualization software and powerful environment to build interactive and visually appealing analytics to display the most important information needed to achieve one or more statistic objectives or to consolidate and arrange on a single screen the whole information on main factors of monetary policy, which can be monitored at a glance.

Using such technologies enable to make ad hoc analysis of just published data and to refine statistics implications for monetary policies needs and users requirements as well.

Keywords: Business intelligence; BusinessObjects; statistical data; Dashboards; Ad hoc analyzing; visualization.

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## Introduction

In the modern financial landscape it is necessary to conform to the high quality standards of the provided information and to use up-to-date technologies. Modern informational technologies encompasses a variety of tools, applications and methodologies that enable to collect data from internal systems and external sources, prepare it for sharing, analysis, develop and run queries against the data, create reports, dashboards and data visualizations.

One of such innovation system in financial landscape is Business intelligence (BI) - a technology-driven process for analyzing statistical data and presenting actionable information to help statisticians, economists, business managers and other end users make more informed business decisions or answer their own questions.

## Business intelligence in financial landscape

Business intelligence (BI) is a technology-driven process for analyzing data and presenting actionable information to help end users make more informed business decisions. BI encompasses a variety of tools, applications and methodologies that enable to collect data from internal systems and external sources, prepare it for analysis, develop and run queries against the data, and create reports, dashboards and data visualizations to make the analytical results available to end users and operational workers.

BI data can include historical information, as well as new data gathered from source systems as it is generated, enabling BI analysis to support both strategic and tactical decision-making processes. Initially, BI tools were primarily used by data analysts and other IT professionals who ran analyses and produced reports with query results for business users. Increasingly, however, business executives, economists, analytics and workers are using BI software themselves, thanks partly to the development of self-service BI and data discovery tools.

Business intelligence combines a broad set of data analysis applications, including ad hoc analysis and querying, enterprise reporting, online analytical processing, mobile BI, real-time BI, operational BI, cloud and software as a service BI, open source BI, collaborative BI and location intelligence. BI technology also includes data visualization software for designing charts and other infographics, as well as tools for building BI dashboards and performance scorecards that display visualized data on business metrics and key performance indicators in an easy-to-grasp way.

BI programs can also incorporate forms of advanced analytics, such as data mining, predictive analytics, text mining, statistical analysis and big data analytics. In many cases though, advanced analytics projects are conducted and managed by separate teams of data scientists, statisticians, predictive modelers and other skilled analytics professionals.

## Business Intelligence in Statistics Department

Statistics Department of Central Bank of Russian Federation uses SAP BusinessObjects Business Intelligence for several years and could achieve considerable results in the analysis and data presentation. SAP BusinessObjects BI is a platform used by SAP systems to provide the Department with a flexible route to sharing information that available for the entire Central Bank and end users. Using SAP BI, Department enables to share the information in a real time at every level – from the director of the Department to analysts, from higher executives to lower level employees, it enables better decision making in the Department.

Business intelligence is important for all spheres of statistics to offer a panoramic view of data, which can be easily accessed by anybody with valid and appropriate credentials within and outside the Bank. SAP BO can be easily customized, so that our Department may tailor it according to our needs and information can be accessed much faster.

### Importance of SAP BusinessObjects BI

Here is an overview of the various facts of SAP BusinessObjects BI, and why it is important for Statistics Department.

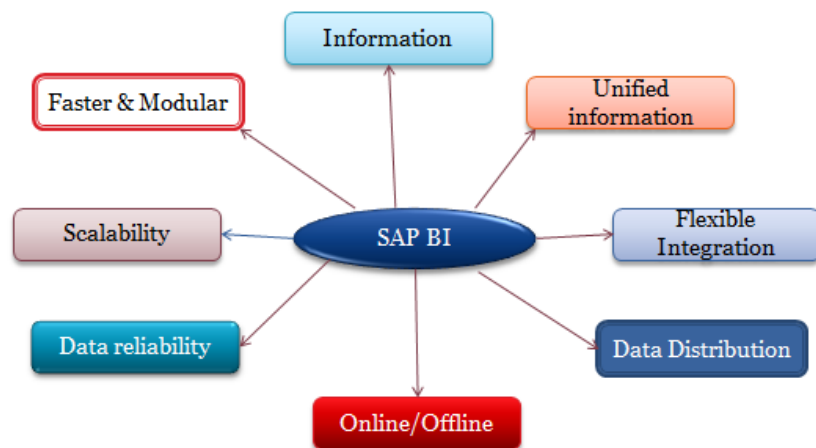


Fig.1

#### Information at fingertips.

SAP BusinessObjects BI provides the entire data to the user of statistic information in a simplified form, so that it can be easily understood. Searching for critical information and gaining a valuable insight is much easier this way. And this is done using common business terms, rather using than any complex semantic knowledge.

#### A unified information system

With SAP BusinessObjects BI, Department doesn't need to maintain several different infrastructures to collect all statistics information. All information necessary for compiling statistics in one system.

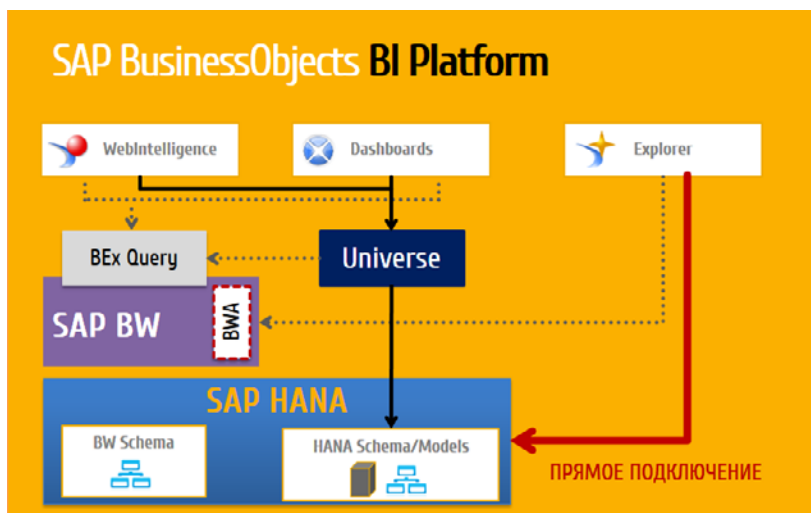


Fig.2

### **It allows for flexible integration and inter operability**

Using SAP BusinessObjects BI the Statistics Department can integrate multiple business applications and modules and make it available to users in an easy and unified way. Users can gather data from any particular department individually in combination with other SAP modules, so a vast amount of business and statistics data can be transferred using SAP BusinessObjects BI.

### **Large Scale Data Distribution**

With SAP BusinessObjects BI, the Department can distribute data with hundreds of thousands of people. The publishing and scheduling functionality of BusinessObjects allows to distribute vast volumes of personalized BI content to a number of employees and end users efficiently. One can share information from BI through e-mail and other platforms, while maintaining security. Exploring this BI functionality is now under way.

### **Offers a new insight into the data**

Using SAP BusinessObjects BI, the Statistics Department gains a valuable new insight into data across various business modules. And BusinessObjects combines all the views to provide the better information.

### **Less work for the IT employees**

Since SAP BusinessObjects BI makes everything available to all the employees in the Department to do their tasks, so there will be less demand on their Information Technology departments to do basic tasks, as this is easily taken care of by Business intelligence.

### **Presents information in a personalized and easy to read format**

SAP BusinessObjects BI does the processing of all queries and presents the result to readers in an easy format, which is personalized and customized according to their requirements. Information is available in Microsoft Office documents and Adobe PDF documents.

### **It always works, whether one is online or offline**

Whether users are online or off-line, SAP BusinessObjects BI is always available through browsers, applications, desktops widgets. So everyone can connected to the Statistics Department's server with the best SAP database solutions.

### **It is always reliable**

SAP BusinessObjects Business intelligence is highly reliable because data can be gathered safely and securely and integrated with the MS office environment.

### **Easy and painless scalability**

SAP BusinessObjects Business Intelligence is easily scalable because of its service oriented architecture. We can increase or decrease the quantity of the processed indicators and our modules and programs will still be functional.

### **Faster, Modular Development**

It can be used not in one or two departments, but also in the whole Central Bank to make the uniform centralized platform of business analyzing.

So, using SAP BusinessObjects Business intelligence (BI) in Statistics Department of Central Bank of the Russian Federation allowing users to access, navigate, analyze, format, and share information across a corporate and business environment and to make simplify data manipulation.

## **Modules of SAP BI, using in Statistics Department**

- **Crystal Reports** -- Enables to design and generate reports.
- **Dashboards** -- Allows to create interactive dashboards that contain charts and graphs for visualizing data.
- **Web Intelligence** -- Provides a self-service environment for creating ad hoc queries and analysis of data both online and offline.
- **Explorer** -- Allows to search information through BI data sources. Users do not have to create queries to search the data and results are shown with a chart that indicates the best information match.

## **Ad-hoc analyzing**

Statistics Department also uses Web Intelligence is an ad-hoc query and reporting environment. Fundamentally, it is an environment that provides self-service access to data. Web Intelligence contains reporting, querying, and information analysis in one integrated product, helping end users turn business insights into effective decisions. With just a few clicks of the mouse, users of statistics can quickly access and format information as well as easily analyze it to understand underlying trends and root causes.

It contains a highly-interactive data interface that allows the report users a great deal of flexibility to view data from different perspectives. Although many report users may only need to build their reports from scratch, it is often necessary for the users to adjust reports to answer current business questions. Our users can easily edit queries and reports to reflect their latest information needs.

This is the example of the standard report of Weighted Average Interest Rates on Deposits of Individuals and Nonfinancial Organizations, which is published on the official cite of the Central Bank of the Russian Federation. The report keeps the structure at the subsequent updatings, the user needs only to hand over the new date.

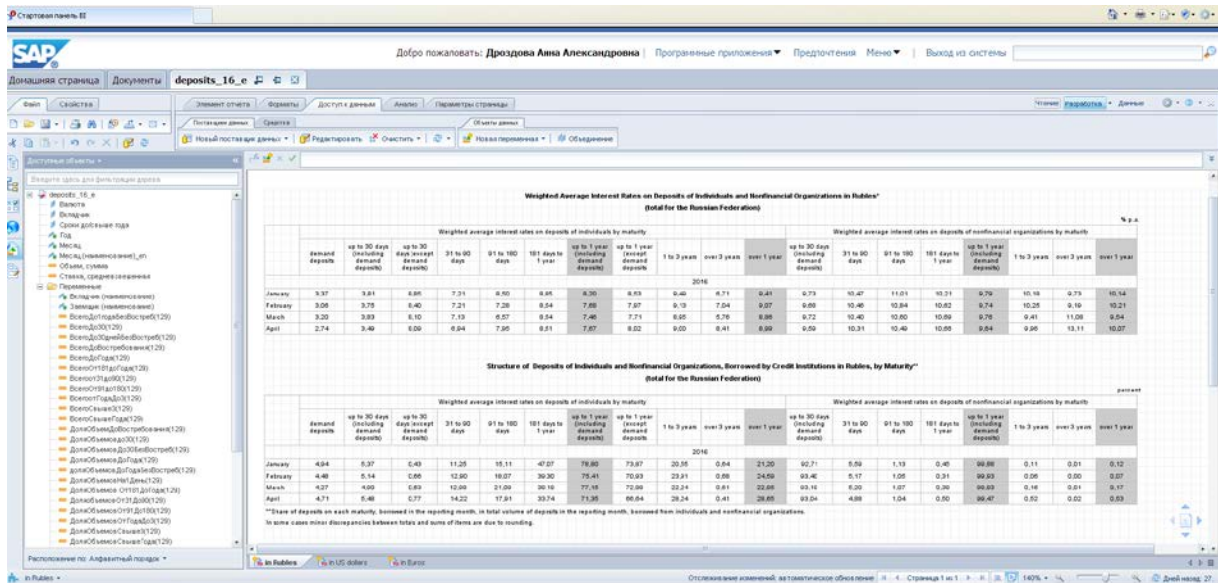


Fig.3

The following options can be taken advantage by user of Web Intelligence in Statistics Department:

- View, edit, remove report, section, or block filters;
- Format and re-size cells, tables, and charts;
- Set breaks and sorts;
- Insert calculations;
- Add rows and columns to tables;
- Create and duplicate tables and charts;
- Turn a grid into a chart or a chart into a grid;
- Create formulas and variables;
- Edit cell formulas in place;
- Recombine report objects within tables and charts.

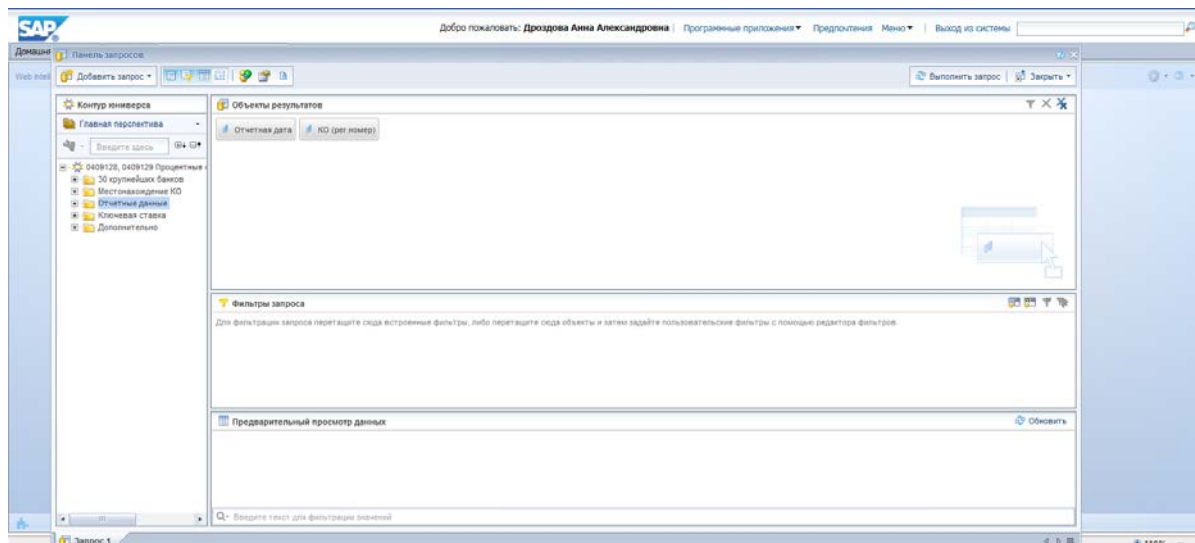


Fig.4

Therefore, all these provide users of our statistics information with self-service and interactivity to have:

- Ability to generate answers to business questions;
- Thorough business and data analysis;
- An environment that utilizes business terminology;
- Intuitive drag & drop interface for document creation;
- Powerful, online and offline ad hoc query and reporting;
- Integrated and trusted analysis for all users;
- A tool built upon a complete, trusted, and agile platform;
- Enable BI standardization via shared administration and security;
- Deliver query, reporting, and analysis globally via a single deployment;
- Extend the reach of interactivity and analysis beyond the enterprise;
- The opportunity to export the created reports in MS Office or PDF format.

### **Powerful, Online and Offline Ad Hoc Queries and Reporting**

SAP BusinessObjects provides an intuitive interface that allows business analysts and non-technical information consumers to ask spontaneous and iterative business questions of their data using everyday business terms.

For example, the usual users can easily:

- compare indicators of the market of housing crediting for last and current year;
- look at dynamics of change of the key rate;
- allocate areas with the maximum shares of arrears on the issued credits;
- count annual rates of a gain on any indicators;
- construct the chart in one clique of a mouse;
- and so on.

On the picture given below it is enough to users to choose indicators which they want to analyze, and they will automatically be added to the chart. All this makes the statistical analysis more evident, available and clear for ordinary users.

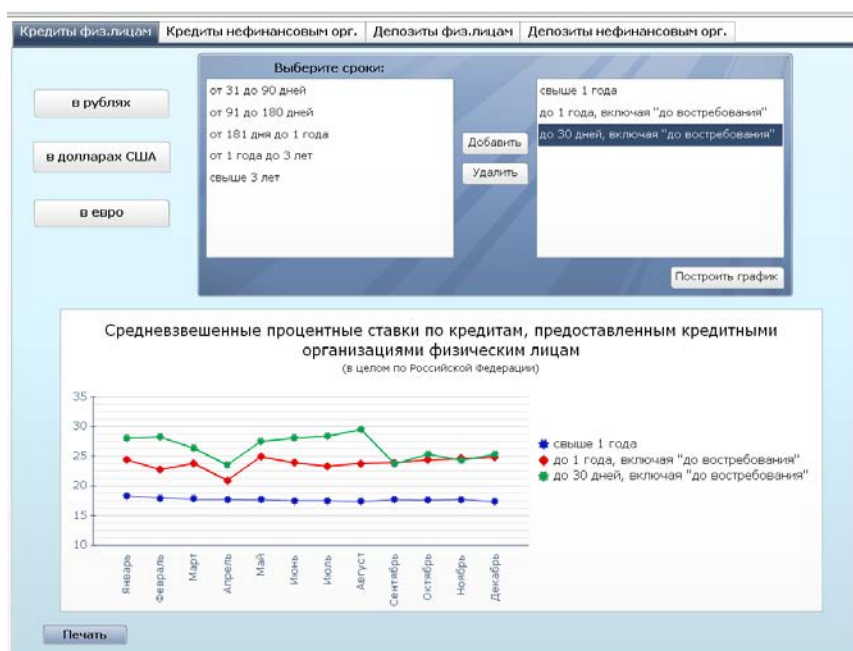


Fig.5

### Integrated and Reliable Analysis for All Users

Using SAP BusinessObjects, Statistics Department delivers a unique, single Web environment to access and interact with information in online and offline mode. The interactive analysis framework ensures that a full range of users can access and analyze secure information, thereby reducing the number of tools.

Department uses SAP BusinessObjects Web Intelligence to complete these main tasks:

- Access and analyze information in a single interface;
- Easily personalize, explore, and discuss information;
- Interact with information via the interactive analysis framework.

Translation engine is also used to provide access to the statistical information and analytical report in multiple languages.

### SAP BusinessObjects Dashboards

Except Web Intelligence, Statistics Department of Central Bank of the Russian Federation uses SAP BusinessObjects Dashboards – a visual display of the most important information needed to achieve one or more objectives; consolidated and arranged on a single screen so the information can be monitored at a glance.



## Key Features of using Dashboards in Statistics Department

- Interactive visual modeling - sliders, gauges, filters, numerical input tools and other visual components allow users to quickly and easily evaluate multiple what-if scenarios.
- Ease of use - intuitive interface, including pre-built components, skins, maps, charts, straightforward export features - make it easy for non-technical users to develop.
- Platform independence - custom graphics and interactivity allow users of statistics information to develop and present financial models, analytical reports and business summaries for the Web, intranets, and portals. Interactive visual can run on any PC, Mac, handheld or any other device supports Flash technology.
- Ease of Excel at design-time and an available set of pre-built dashboard templates and skins.
- XML/Web-services connectivity.
- Off-line analysis.

It has to be realized that almost every tool which is being used for supporting data spread across the statistics information is simultaneously somehow connected with business intelligence solutions. Whilst business intelligence might be – as a whole – boiled down to supporting the process of transforming data into information and, then, information into knowledge usable for the Department, in point of fact almost all tasks connected with data belong to BI branch.

During using Dashboards in the Statistics Department following results were received:

- Identify negative trends. Users can observe changes of certain indicators eventually, allocate negative trends, analyze change of indicators in a section of types of economic activity or subjects of Federation.
- Improve the efficiency of newly-made indicators. The efficiency of analyzing is the common goal for all business intelligence solutions, every tool treat the question in a different way. Dashboards, for instance, support decision making with better information.
- Measure statistics indicators. It's never easy to measure the real performance or efficiency of statistics indicators. Even if something looks good from the outside, in point of fact it might be many times worse, but the external symptoms still aren't visible. Deep analysis let economists to receive more fuller and comprehensive picture of the happening changes or deviations.
- Improve performed analysis thanks to visualization abilities. Pure data often is not enough. What is not visible in spreadsheets of values, might come out thanks to graphic visualization of analysis. Modern dashboards support therefore visual presenting of analysis statistics indicators.

Thanks to using Dashboards in Statistics Department, we could achieve considerable results.

- The first and the most important of all dashboards' features is a good cooperation with data originated from diverse and numerous sources. We need to remember that data across departments of the Central Bank are kept in diverse systems, therefore there occurs a need for having a tool able to read all of them. Our dashboards intercept and store data from multiple sources.
- All more or less complicated calculations have been automated and users don't need to care anymore about how to perform calculations as they're prepared automatically. The only thing left is to decide which data we want to consider and in relation to which.
- Seeing what's happening in the country as a whole can give a whole picture of the enterprise. It's easy as it requires only a few clicks - it is also a feature of the newest generation of dashboards.

- Full and clarify picture for analyzing statistical data and presenting actionable information to help statisticians, economists, business managers and other end users make more informed business decisions or answer their own questions.
- Dashboards allow users to focus on what's actually important for them as well as they can immediately dives into more detailed data, if needed.

In most cases, dashboards are being used for monitoring and analyzing statistics indicators. In this case the executives can see the generalities first, and then drill through to more detailed reports.

It is possible due to increased data aggregation and graphic design - this makes dashboards clear and more transparent, and - therefore - easier to use.

For example, became possible to analyze dynamics of volumes of the Mortgage Loans Extended by Credit Institutions to Individuals-Residents. If before data were presented in the form of the huge table, now they are presented in the form of the evident schedules allowing to carry out the analysis on the chosen federal areas and regions of Russia. It is enough to user only to press on date or on the Federal district.

You can see it in the following pictures.

Before using Dashboard:

	Number of extended loans, units	Volume of extended loans, millions of rubles	Debt on extended loans, millions of rubles		Weighted average maturity, months		Weighted average interest rate, %		Memo: rights of claim under mortgage loans, acquired by credit institutions, millions of rubles
			total	of which overdue debt	on loans extended since the beginning of the year	on loans extended over the month	on loans extended since the beginning of the year	on loans extended over the month	
2006									
01.01	X	30 918	22 223	6	174.6	X	14.9	X	X
01.04	X	13 254	29 739	15	176.9	X	14.3	X	X
01.07	X	46 517	51 594	14	175.6	X	14.1	X	X
01.10	X	97 753	86 252	15	179.1	X	13.9	X	X
2007									
01.01	X	179 612	144 806	22	182.2	X	13.7	X	X
01.04	X	61 940	187 263	32	188.7	X	13.4	X	X
01.07	X	153 263	250 681	92	195.6	X	13.0	X	X
01.10	X	280 875	340 464	160	196.3	X	12.7	X	X

Fig.6

After using Dashboard:



Fig.7

There are several examples of Dashboards of information on actual statistical data on the placed means of the credit organizations.

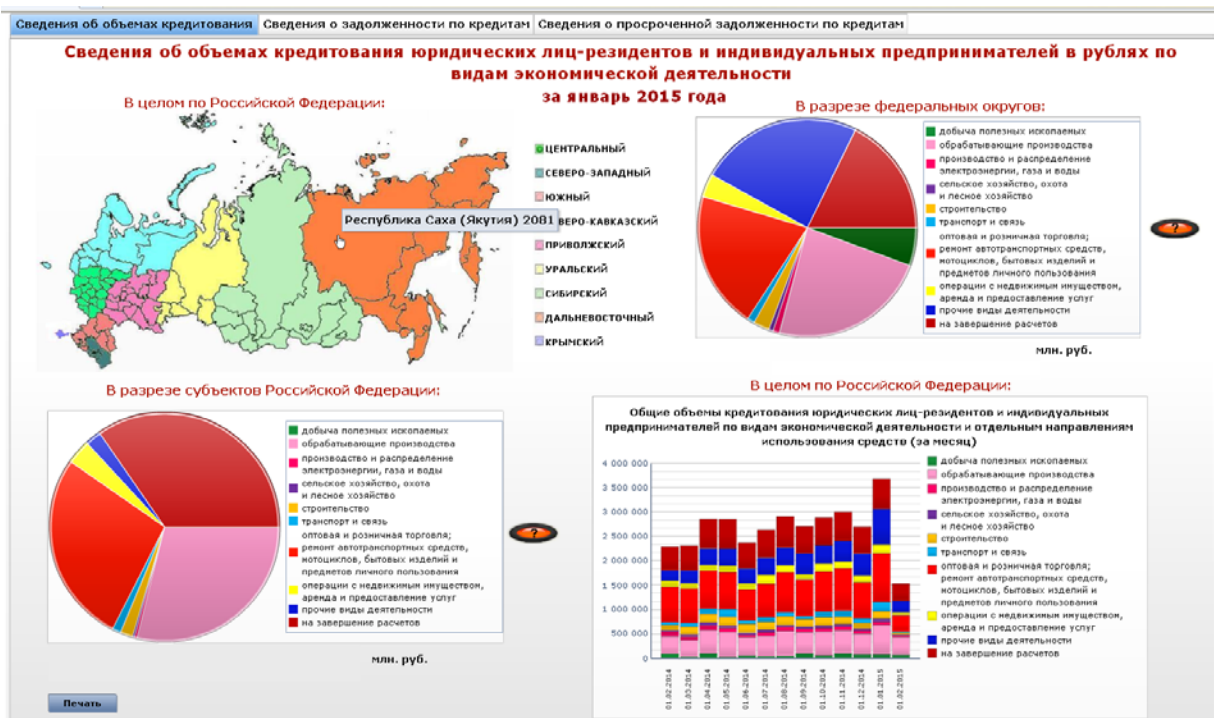


Fig.8

Using these Dashboards you can obtain evident information on:

1. volumes of the granted loans,

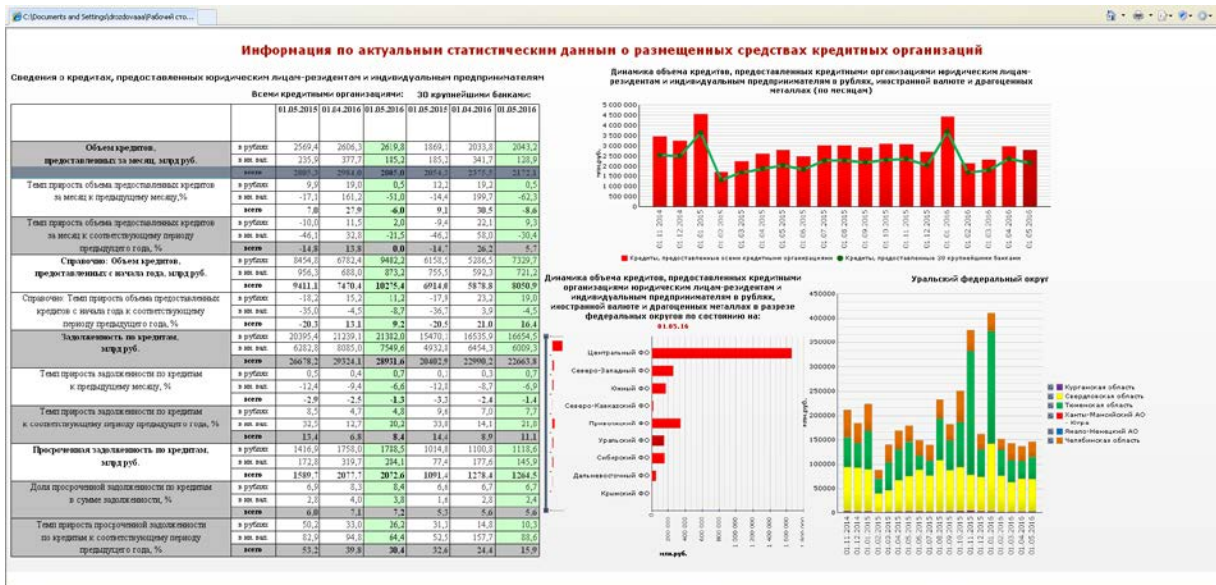


Fig.9

2. debt and overdue debt on the credits,

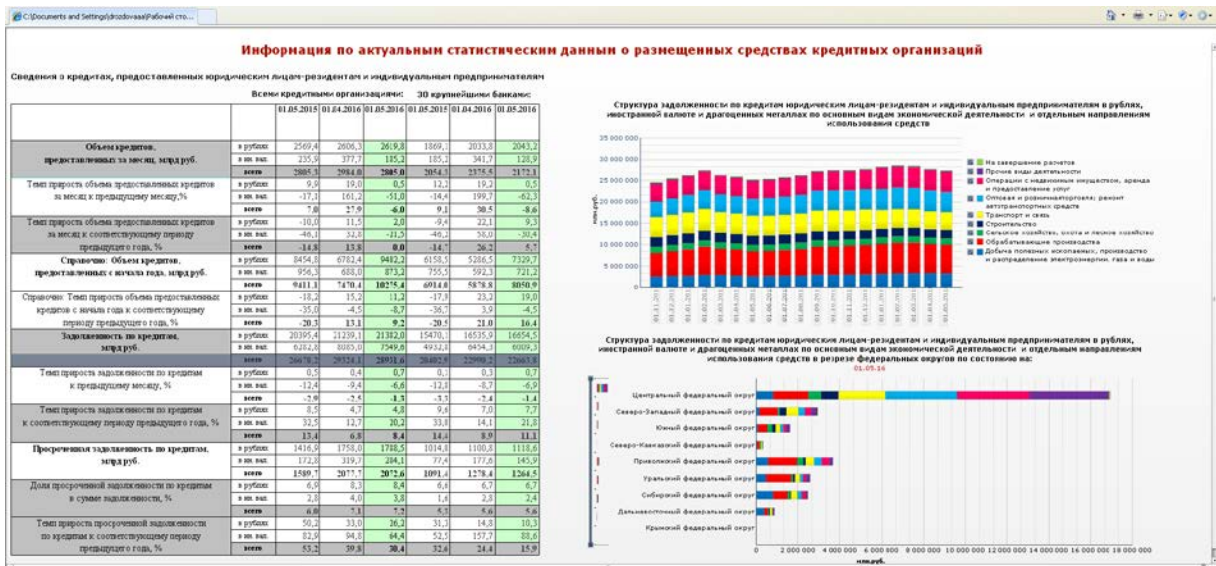


Fig.10

3. rates of a gain of volumes, debts and overdue debts,

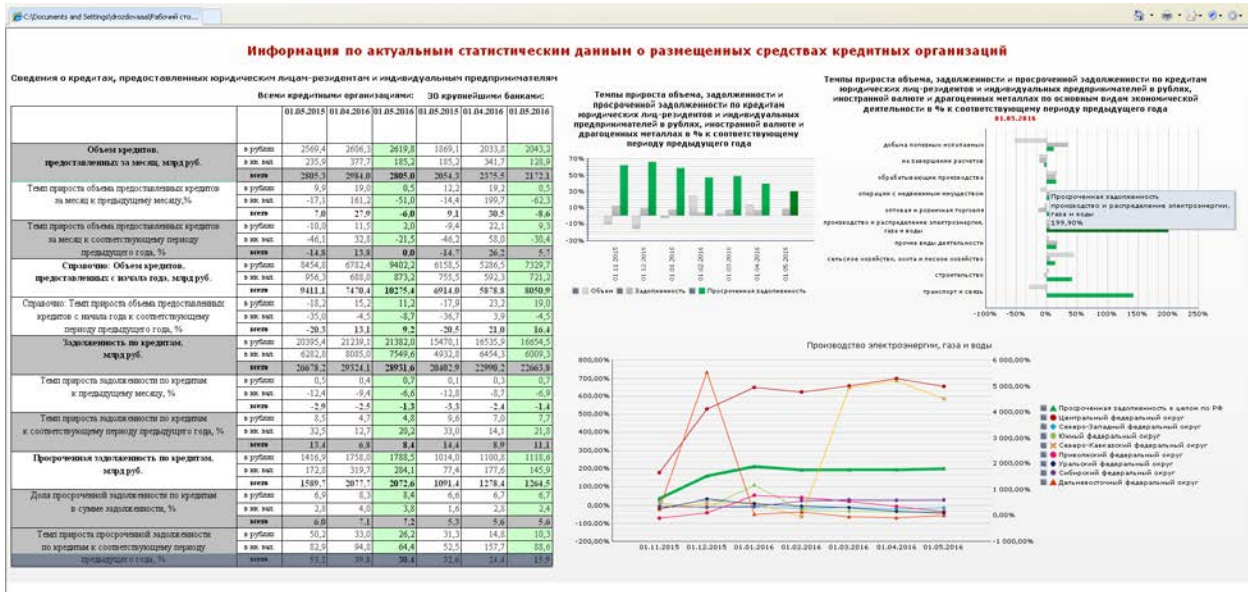


Fig.11

4. share of the overdue debt in the total amount of the debt.

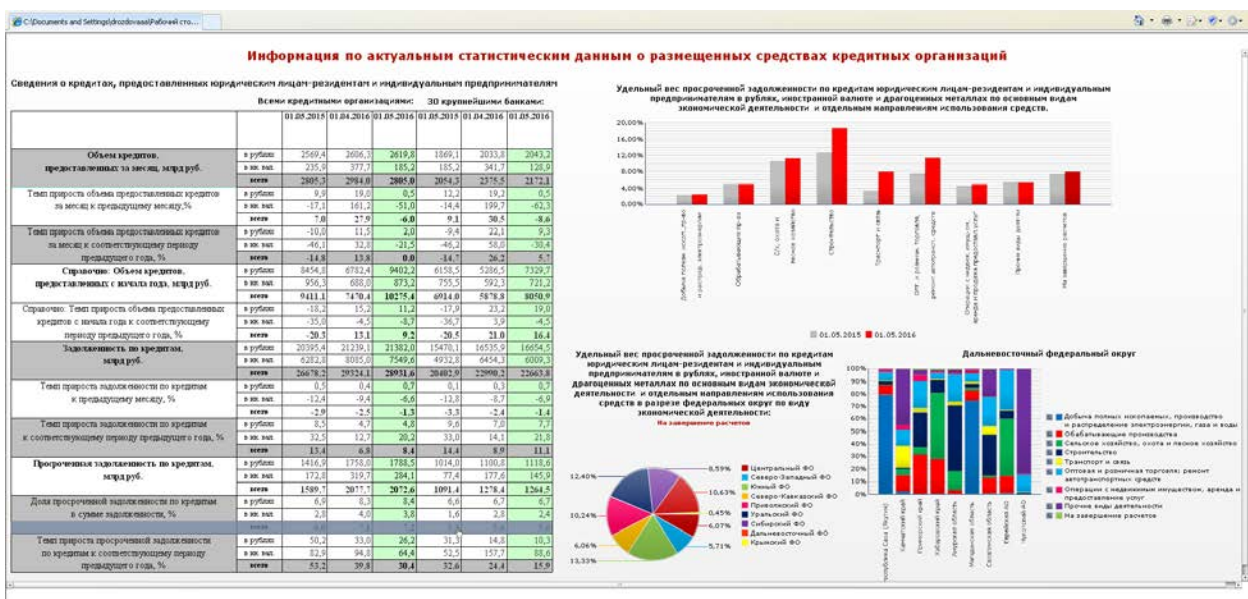


Fig.12

As we work our way from the big picture to the nuts and bolts of our dashboard design, we want to outline common features that can make our dashboard more useful. Depending on the form that user've chosen, the dashboard can be much more than simply charts on a page.

- Interactive elements highlight key information;
- User configuration let users customize their view of the data;
- Advanced visualizations make complex data easy to understand and navigate.

## Features of analyzing with Dashboards

- Drill down: Ability to go from a summary metric or view to additional detail that provides more context and/or breakout of the information.
- Filters: Allow users to define the scope of the data in the dashboard to reflect their needs. Filters can either be global (refining scope for the entire dashboard) or local (refining scope for a specific chart or metric or view).
- Comparison: Ability to see two or more subsets of the data side-by-side. A line chart, for example, may let the user view two geographic regions as separate lines.
- Alerts: Highlight information based on pre-defined criteria. The alert may be activated when a metric goes outside of a particular threshold.
- Export / print: Give users the ability to pull information out of a dashboard. Export to formats that let users do more with the data like Excel and CSV rather than PDF.
- Advanced visualizations: If it is useful to show more complex data in the dashboard, a variety of advanced visualizations can help make it digestible. A few visualization types to consider include geographic map, treemap, network diagram, tag cloud, scatterplots and bubble charts.

Besides, advantages of using Dashboards can be illustrated in the comparative table.

	Paper One-pager	Paper Presentation	Excel	Online app	E-mail / text message	Large screen
Timeliness	-	-	+	+	+	+
Aesthetic	+	+		+	-	+
Mobility	+				+	-
Connectivity	-	-		+	+	+
Data detail	-	+	+	+	-	
Data density	+	+			-	
Interactivity	-	-		+	-	-
Collaboration					+	-

Fig.13

## Conclusions

The opportunities of Business intelligence are in combining a broad set of data analysis applications, including analysis and querying, enterprise reporting of different statistic information, online and real-time analytical processing. Modern technologies also includes data visualization software and powerful environment to build interactive and visually appealing analytics to display the most important information needed to achieve one or more statistic objectives or to

consolidate and arrange on a single screen the whole information on main factors of monetary policy performance, which can be monitored at a glance.

Using such technologies enable to make ad hoc analysis of just published data and to refine statistics implications for monetary policies needs and users requirements as well.

BI technologies provides a self-service environment for creating ad hoc queries and analysis of data for users, not having knowledge or experience in SQL query building and data base structure.

Using SAP BusinessObjects helps to reduce the expenditure on informatization of Statistics Department activities.

Further developments are aimed at designing Dashboards on all high-demanded statistics areas and using all the functionality of sharing information or data delivery in a personalized way.