

MINISTRY OF SCIENCE AND HIGHER EDUCATION
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FEDERAL STATE AUTONOMOUS EDUCATIONAL INSTITUTION OF HIGHER EDUCATION
"NORTH CAUCASUS FEDERAL UNIVERSITY"

METHODOLOGICAL INSTRUCTIONS

for completing laboratory work on the subject "Data Visualization / Data
visualization»
for master's students in the field 09.04.03 "Applied Informatics" focus (profile) "Management
knowledge"

Stavropol
2026

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INTRODUCTION

In the Microsoft BI solution, users can use the following tools to analyze data in the warehouse and analytic cubes:

- SQL Server Reporting Services for display regulated reporting (programmers can create reports in Visual Studio, and office users can use ReportBuilder);
- Office Visio for creating custom diagrams and linking to them data schemas from the warehouse, analytical cubes and arbitrary sources;
- Microsoft Excel for office users to create custom reports in spreadsheets;
- Data Mining Add-ins for Office to Discover Patterns in large volumes of data organization and creation of new knowledge based on these patterns (data mining);
- PowerPivot for Excel for independent connection of new ones data sources and creation of new calculation indicators by office users;
- SharePoint for outputting reports from tools to the portal Microsoft BI;
- SharePoint PerformancePoint Services for displaying data on interactive diagrams and using a decomposition tree, as well as for displaying key performance indicator systems (such reports are developed in SharePoint Dashboards Designer).

With the introduction of PowerPivot and PowerView, Microsoft Excel 2013 has become a world-class business intelligence (BI) tool that can store, process, and visualize vast amounts of data. In the following, we will show how PowerPivot and PowerView work with the internal mechanisms of Excel 2013. In addition, we will touch on the topic of APIs for automating PowerPivot tasks.

PowerPivot is an add-in that enables end users to collect, store, model, and analyze large volumes of data in Excel. PowerView provides intuitive visual representations of data in PowerPivot models and SQL Server Analysis Services (SSAS) tabular mode databases.

In Excel 2013, PowerPivot and PowerView are no longer separate add-ins that you must download and install. They are now included with the product out of the box. PowerPivot in Excel 2013 is very similar in functionality to the PowerPivot add-in for Excel 2010. Likewise, the Excel 2013 version of PowerView is similar in functionality to PowerView for Microsoft SharePoint 2013 and SharePoint 2010 through SQL Server 2012 SP1.

To connect these settings, you must select the following sequence:

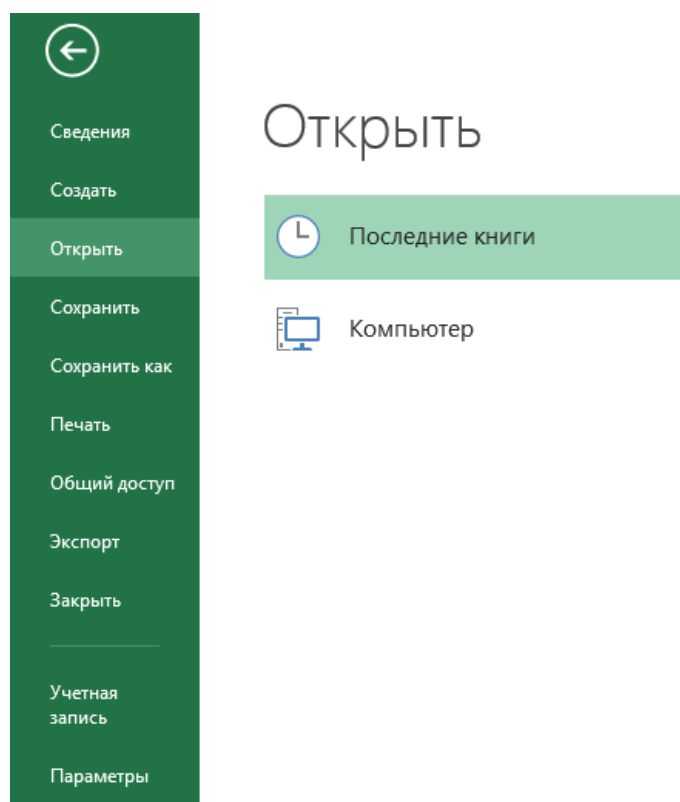


Figure 1 – Deploying the PowerView add-in

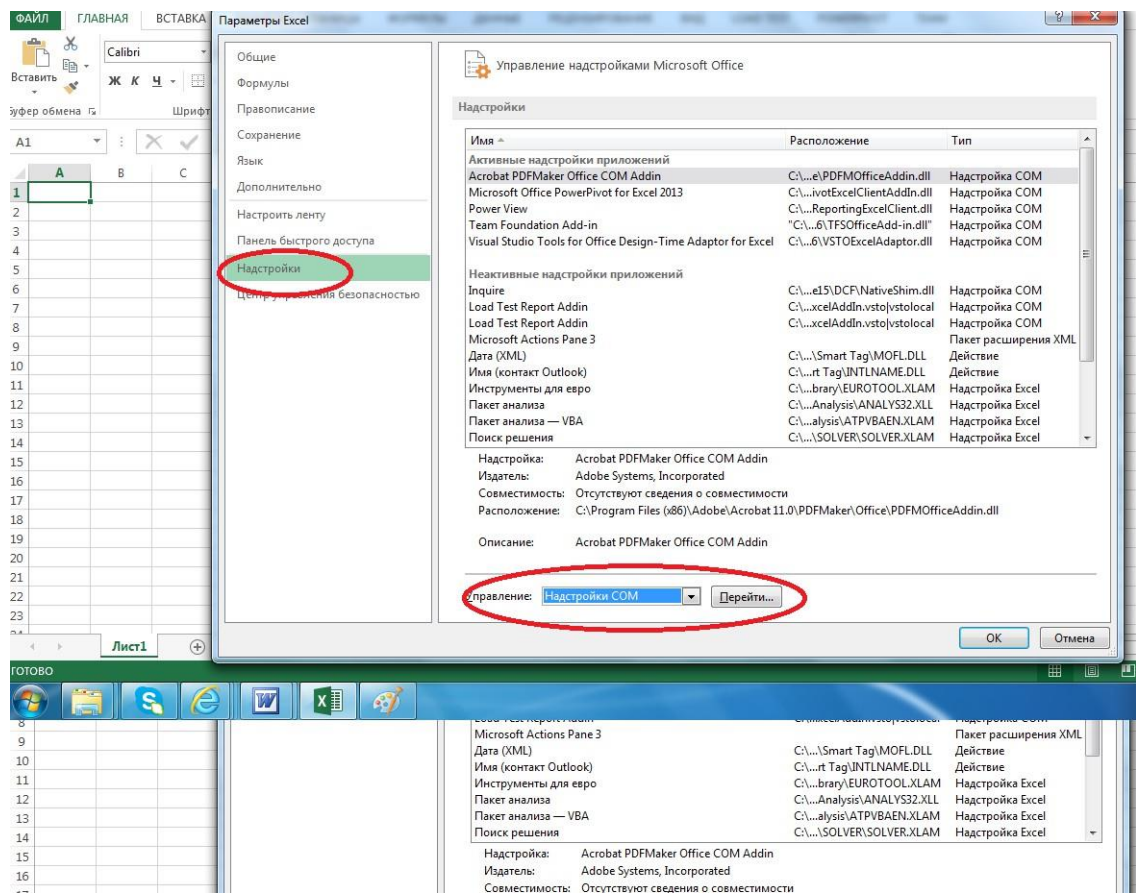


Figure 2 – Deploying the PowerView add-in

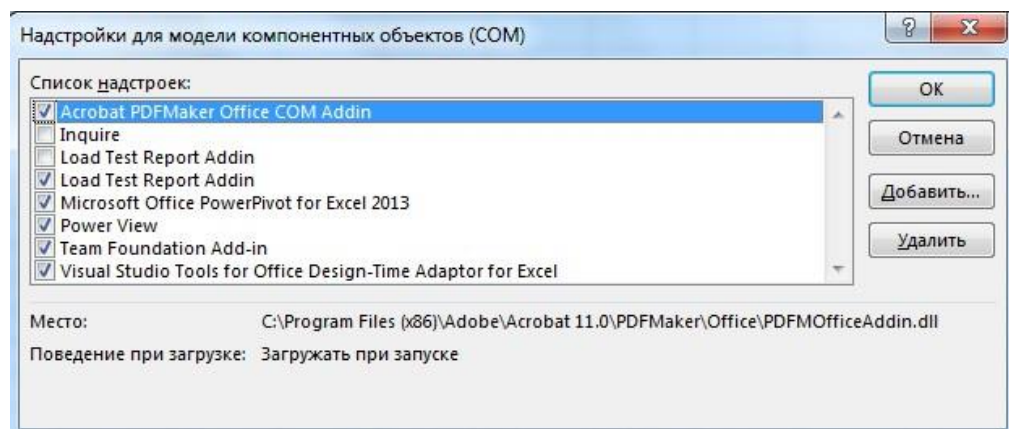


Figure 3 – Deploying the PowerView add-in

LAB WORK #1. Basic methods of working with PowerView.

Subject -Basic methods of working withPowerView. The purpose of the work ismaster the methods of working withPowerView. The competencies being formed or their parts -OK-3; OK-5 Theoretical part.Two versionsPowerView

Power View reports in SharePoint Server are RDLX files. In Excel, Power View sheets are part of an Excel workbook (XLSX file). You cannot open a Power View RDLX file in Excel or an Excel XLSX file with Power View sheets in Power View in SharePoint. You also cannot copy charts or other visualizations from an RDLX file to an Excel workbook.

You can save Excel XLSX files with PowerView sheets to SharePointServer or locally in Office 365 and open them in SharePoint.

Both versions of PowerView require Silverlight installed on your computer.

TIP: When using the Power BI preview for Office 365, you can now view PowerView sheets in Excel in your browser without installing Silverlight.

Getting Started with Any Version

- Enabling PowerView in Excel 2013
- PowerView in SharePointServer environment: creation, saving and

printing reports

- Ready to submit data

Report always ready to present data: information in it

can be viewed and displayed at any time because it uses real data. You don't need to use the PowerView preview of the report to see what it looks like.

Data Sources for PowerViewPower View in SharePoint supports reading mode and full-screen mode, which hides the ribbon and other design tools to make room for visualizations. The report retains all the interactivity, with filtering and highlighting capabilities.

In Excel 2013, you can use data directly from Excel as the source data for Power View in Excel and SharePoint. As you add tables and create relationships between tables, Excel creates a data model behind the scenes. The data model is a collection of tables and their relationships that represent the real-world relationships between business functions and processes, such as Products, Inventory, and Sales. You can modify this data model in PowerPivot in Excel to create a more sophisticated version for Power View reports.

You can also create PowerView reports based on: 1. a tabular model that runs on SQL Server 2012 Analysis Services (SSAS);

2. multidimensional model on SSAS server (if you are creating reports PowerView in SharePointServer).

Tabular, dimensional, and data models serve as a bridge between the complex organization of underlying data sources and the individual presentation of data. The semantic layer of the data model ensures that all elements of PowerView work seamlessly.

Create charts and other visualizations

Power View lets you quickly create a variety of visualizations, from tables and matrices to pie, bar, and bubble charts, as well as sets of multiple smaller charts. Start with a table, as you can easily transform it into other visualizations to determine how best to present your data. To create a table, click a table or field in the field list, or drag a field from the field list into the view. Power View displays a table in the view that shows the actual data, with column headings automatically added.

To transform a table into other visualizations, click a visualization type on the Design tab. Only the charts and visualizations that best suit the data in the table are available in Power View. For example, if Power View doesn't find any aggregated numeric values, the charts are unavailable.

Filtering and highlighting data

Power View provides several ways to filter data. Using the metadata of the underlying data model, Power View identifies relationships between different tables and fields in a workbook or report. Based on these relationships, you can use a single visualization to filter and highlight all visualizations on a sheet or pane. You can also display the filter pane and define filters for a specific visualization or all visualizations on a sheet or view. In Power View in SharePoint, you can leave the filter pane visible or hide it before switching to reading mode or full-screen mode.

Slices

Slicers in Excel allow you to compare and evaluate data from different perspectives. Slicers in Power View work similarly. If a view has multiple slicers, selecting an item from one slicer filters the other slicers in the view.

Sorting

In Power View, you can sort tables, matrices, bar charts, column charts, and sets of multiple small charts. In tables and matrices, you sort columns, in charts, you sort categories or numeric values, and in sets of multiple small charts, you sort multiple fields or numeric values. In each case, you can sort in ascending or descending order by attribute values (such as ProductName) or numeric values (such as TotalSales).

Reports with multiple views in PowerView in SharePoint A single PowerView in SharePoint report can have multiple views. All views in a PowerView in SharePoint report are based on

on the same table model. Each view contains its own visualizations, as well as filters that apply only to it.

NOTE: In Excel, each Power View sheet is a separate sheet. A single Excel workbook can contain any number of Power View sheets, and Power View sheets can be based on different models.

Performance

To improve performance, Power View retrieves only the data it needs to visualize. So, even if a table or view is based on an underlying data model containing millions of rows, at any given time Power View fetches data from the underlying table only for the rows that are visible in the table. As you scroll horizontally through the table, the scroll bar will bounce back, allowing you to scroll down as Power View fetches new rows.

Sharing PowerView Reports Sharing PowerView in Excel

You can save Excel workbooks to a SharePoint 2014 site using Excel Services in SharePoint or ExcelWebApps, either locally or in the cloud.

Other users can view and work with Power View sheets in workbooks saved there.

You can hide individual sheets in an Excel workbook, so you can hide all the sheets in a workbook and leave only the Power View sheets visible.

Sharing PowerView Reports in SharePoint When you create Power

View reports in SharePoint, they are saved to the SharePoint Server 2010 or 2014 server, where other users can view and work with them.

Users can also edit them and (subject to permissions set on the server) save their changes.

You can also export an interactive version of a PowerView report to PowerPoint in SharePoint. Each view from the PowerView becomes a separate PowerPoint slide. Interacting with PowerView reports exported to PowerPoint is the same as working with views in Reading Mode and Full Screen Mode in PowerView: you can work with the visualizations and filters that the report creator added to each view, but you can't create new visualizations and filters.

Comparison of PowerView, Report Builder, and Report Designer

PowerView does not replace existing ReportingServices reporting tools.

Report Designer is a sophisticated design environment that helps developers and IT professionals add reporting functionality to their applications. In Report Designer, you can create operational reports, shared data sources, and shared datasets, and design controls for the report viewer.

With Report Builder, IT professionals and power users can create rich, actionable reports, reusable report parts, and shared data sets.

Report Builder and Report Designer create RDL reports, while Power View creates RDLX reports. You cannot open RDL reports in Power View (and vice versa).

NOTE. Reports in the Report Definition Language can be open on report servers in ReportingServices native mode or SharePoint mode.

RDLX PowerView reports can only be opened on report servers in SharePoint mode.

Report Designer and Report Builder, like Power View, are included in ReportingServices for SQL Server 2012 SP1.

Customizing PowerView Report Properties with PowerPivot

In PowerPivot, you can customize a number of properties to enhance your reporting experience in PowerView.

1. Select standard units
2. Set the default title, image and ID for each table in the model
3. Determine how duplicate values will be handled in PowerView reports
4. Hide tables, fields, and measures from PowerView report creators
5. Set the standard fields for the table that will be added to the report at the same time when clicking on a table in PowerView

Equipment and materials

To perform the laboratory work, it is recommended to use a personal computer with the following characteristics: 32-bit (x86) or 64-bit (x64) processor with a clock frequency of 1 GHz or higher, RAM - 1 GB or higher, free disk space - at least 1 GB, DirectX 9 graphics device. Software: operating system WINDOWS 7 and higher, PowerView.

Safety instructions

Safety precautions when performing laboratory work are the same Withas those generally accepted for users of personal computers.

Do not repair the personal computer, install or remove software on your own; in case of a personal computer malfunction, inform the laboratory service personnel (operator, administrator); observe safety regulations when working with electrical equipment; do not touch electrical outlets with metal objects; the user's work area of the personal computer must be kept clean; it is not allowed to eat or drink near the personal computer.

Exercise: Customize PowerView report properties using PowerPivot.

1. Select standard units
2. Set the default title, image and ID for each table
in the model
3. Determine how duplicate values will be handled
in PowerView reports
4. Hide tables, fields, and measures from PowerView report creators
5. Set the standard fields for the table that will be
be added to the report at the same time when you click on a table in PowerView.

Contents of the report and its format

- a brief outline of the theoretical basis; a
- description of the main stages of the work.

Test questions:

1. Create charts and other visualizations Filtering and highlighting
2. data
3. Slices Sorting
4. Reports with multiple views in PowerView in
- 5.

SharePoint

A list of literature recommended for use on this topic

1. Matyushkin, I.V. Modeling and visualization by means of
MATLAB physics of nanostructures / I.V. Matyushkin. - M.: RIC "Technosfera", 2011. - 188 p. - (The
World of Programming). - ISBN 978-5-94836-286-1; Ditto [Electronic resource]. -
URL: <http://biblioclub.ru/index.php?page=book&id=135405>

LAB WORK 2 Main tasks of PowerView development.

Subject -Main development tasksPowerView.

The purpose of the work ismaster development methodsPowerView.

Formable competencies or parts thereof -UK-3; UK-5 Theoretical part.

It's easy to launch the Power View add-in in Microsoft Excel 2013. In Excel, on the Insert tab, select Power View.

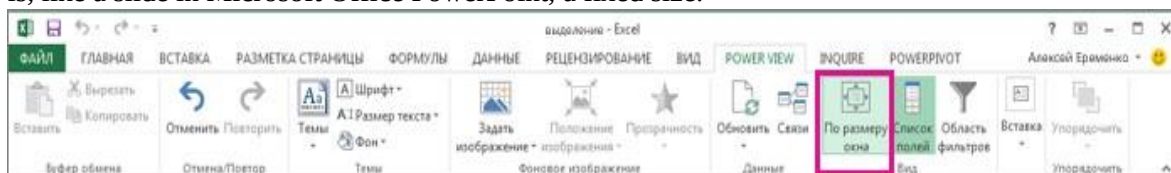
PowerView in SharePoint.

Run Power View from a Data Model in Excel (XLSX), a Shared Data Source (RSDS), or a BISM connection file (BISM) in SharePoint Server 2013.

Models can be in a standard SharePoint Server 2013 document library or in a PowerPivot gallery. The PowerView authoring environment opens with a pane containing the visualizations.

Resize PowerView report to fit window

Unlike other Excel sheets, a PowerView report sheet in Microsoft Excel (or a view in SharePoint) is, like a slide in Microsoft Office PowerPoint, a fixed size.



By default, this sheet takes up the entire window and changes its size as additional panels are opened. For example, if you show the filter area, it will shrink to fit the remaining window. This feature can be disabled.

To prevent the sheet from being resized to fit the window, unclick the button.By window size. Now you can view different parts of the sheet by scrolling.

Why are the chart icons unavailable?

If an item on the ribbon is disabled (grayed out), it means that the action is not available for the item selected in the sheet or view. For example, if a table does not contain measures such as sums or averages, it cannot be converted to a chart, so all chart icons on the tabConstructor will be disabled.

What do the icons in the field list mean?

The panel to the right of the view is called the field list.

The fields section in the top half contains a list of tables and fields in the data model that the PowerView report is based on. These are the fields that are available for inclusion in the report.

The bottom half is the layout area. This displays the field layout options for the visualization selected in the view.

Fields in the fields section

Click a field to add it to the view. If a visualization is selected in the view, the new field is added to it. Otherwise, the new field becomes the start of a new visualization.

You can also drag a field into the view. You can start a new table or add a field to an existing table.

Table names

Expand the table name in the fields section to see the fields in that table.

When you click a table name, Power View adds the table's default fields to the view. Default fields are fields that are defined in the data model on which the report is based.

Fields with row labels

Σ Aggregates are table fields marked with the sigma symbol (Σ). An aggregate is a numeric value that represents the size, quantity, scale, or importance of something. Aggregates are defined in the model that the report is based on. At least one aggregate is required to create a chart visualization.

You can also use a field that is not an aggregate as an aggregate. For example, if you have a field called "Product Name", you can add it to the table and set it to count.



Calculated fields in a table are marked with a calculator icon .



These fields are sometimes called calculated measures. Each calculated field has its own formula created with DAX. You cannot change the aggregate. For example, if it is a sum, you can only use the sum.

Layout section

The elements in the layout section depend largely on the type of visualization selected in the area. For example, if a chart is selected, fields will be displayed in the Value, Axis, and Series areas. You can do the following in the layout area:

Drag fields from the fields area of the field list to the fields area of the layout area. They will be added to the visualization selected in the area.

Remove fields from the layout area. This does not remove them

from the model. Change the aggregate in the layout area. By default, most aggregates are sums. You can change the default aggregate using PowerPivot. You can also change the aggregate on a case-by-case basis by clicking the arrow next to the field name in the Values list and selecting Average, Minimum, Maximum, or Count.

Viewing a PowerView report in SharePoint in Reading Mode and Full Screen Mode

In reading mode, the report takes up the entire browser window. In full-screen mode (as the name suggests), the report takes up the entire screen, similar to a slide show in PowerPoint. This mode is used for presentations made using PowerView.

On the Home tab>Reading Mode or Full Screen Mode.

In both modes, the ribbon and field list are hidden, so there is much more space for visualizations. The filter area retains its state from the design mode (if it was visible in the design mode, it will also be visible in the reading mode and in full-screen mode).

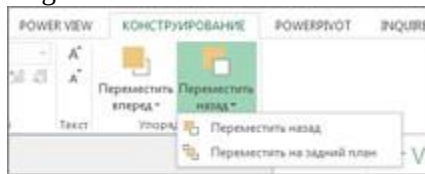
In Reading Mode and Full Screen Mode, you can switch between views in a report using the arrow keys or the view switcher icon in the lower left corner. You can work with report visualizations in the same way as in Design Mode.

However, you cannot modify the report in Reading Mode or Full Screen Mode. For example, you cannot move, delete, or resize visualizations, or copy, delete, or reorder views.

To exit full-screen mode or reading mode and return to the previous mode, press the ESC key.

Overlapping and pasting elements on top of each other

Elements in a view can partially or completely overlap each other. For example, you can insert a small chart on top of a large one. For ease of development, you can move objects to the foreground or to the background.



Select a visualization in the design workspace. On the tab Constructor select an item: Move forward, On Foreground, Move Backward, Send to Back

Advice

If one visualization is on top of the upper right corner of another, it can be difficult to select the filter or expand icon for the visualization that is in the background. To filter it, bring it to the foreground and then bring it back.

If you add a new visualization to an already populated area, Power View places it on top of the existing elements.

Expanding the visual image

There is a button in the upper right corner of each visual image.

expand . Clicking this expands the visualization to fill the entire PowerView window, or the entire screen in Reading or Full Screen mode. This is a temporary mode. The rest of the report still appears at the bottom, and clicking the expand icon again will return the visualization to its original place in the report.

Changing the size of the visual image

Visualizations resize automatically as you add new fields to visualize, or you can resize them manually.

Changing the size of the visual image manually:

1. Choose a visual image.

2. Hover your mouse over one of the change markers

size of the visual image (the marker will appear if you hover the pointer over the middle of one of the gray dotted lines surrounding the visual image). The pointer will change shape to a double-sided arrow .

3. To resize the visualization, drag it double-headed arrow.



NOTE.

Once you manually resize a visualization, it will no longer automatically resize when you add new fields. Instead, scroll bars will appear that you can use to scroll through the contents of the visualization. To return to automatic resizing, double-click one of the resizing handles.

Cancel

One of the benefits of designing in PowerView is that you can undo almost everything you've done. This allows you to experiment freely because you can undo unsuccessful attempts. You can undo multiple steps in the order in which they were performed.



“Unfortunately, it is not possible to display your data because closely related fields are on different axes.”

This message is displayed in PowerView when the same visualization field is used in multiple areas, such as the axis and legend areas.

If you are creating Power View in SharePoint reports (RDLX files) using a SQL Server Analysis Services multidimensional model, this message may appear even for different fields if they are "tightly related" (that is, they share common key fields). This limitation is due to the addition of support for multidimensional models.

Solution 1: Removing the field

Remove a field from all but one area. For example, if you have a histogram with the same field in both the axis and legend areas, remove it from the legend and leave it only in the axis.

Solution 2: Create a duplicate field in the data model

If you have access to the Data Model for the Power View report, create a copy of the field. For example, suppose you have a column chart with the field "Country" in both the axis and legend areas. In the Data Model, create a

calculated column with the formula "[Country]" and name it "Country2". Then in PowerView, drag the Country field to the axis, and Country2 to the legend.

Equipment and materials

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Exercise:

1. Resize PowerView report to fit window
2. What do the icons in the field list mean?
3. Why are the chart icons unavailable?
4. Fields with row labels
5. Layout section
6. Viewing a PowerView report in SharePoint in reading mode and full screen mode
7. Overlapping and inserting elements on top of each other
8. Expanding the visual image of the report
9. Creating a duplicate field in the data model
10. Deleting a field

Contents of the report and its format

- a brief outline of the theoretical basis; a
- description of the main stages of the work.

Test questions:

1. Changing the size of the visual image manually:
2. Changing the size of the visual image
3. Expansion of the visual image
4. Overlapping and inserting elements on top of each other
5. View a PowerView report in SharePoint in reading mode and full screen mode

A list of literature recommended for use on this topic
topic.

1. Matyushkin, I.V. Modeling and visualization by means of MATLAB physics of nanostructures / I.V. Matyushkin. - M.: RIC "Technosfera", 2011. - 188 p. - (The World of Programming). - ISBN 978-5-94836-286-1; Ditto [Electronic resource]. -
URL: <http://biblioclub.ru/index.php?page=book&id=135405>

LAB WORK #3. Diagrams and other elements

presentations in PowerView.

Subject -Charts and other presentation elements inPowerView. The purpose of the work ismaster charts and other presentation elements in PowerView.

The competencies being formed or their parts -UK-3; UK-5 Theoretical part.

With Power View in SharePoint 2013 and Excel 2013, you can quickly create a variety of data visualizations, including tables, matrices, bar and bubble charts, histograms, and a variety of chart sets. For each visualization you create, you start with a table on a Power View sheet, which you then easily transform into other visualizations to determine how best to show your data.

- To create a table, click a table or field in the Field List, or drag a field from the Field List into the view. Power View displays a table in the view that shows the actual data with column headings automatically added.
- To transform a table into other views, click a view type on the Design tab. Depending on the data in the table, Power View turns different view types on and off to find the view that best suits the data.

ADVICE.To create a new view, create another table by clicking an empty view, and then select fields in the fields section of the field list.

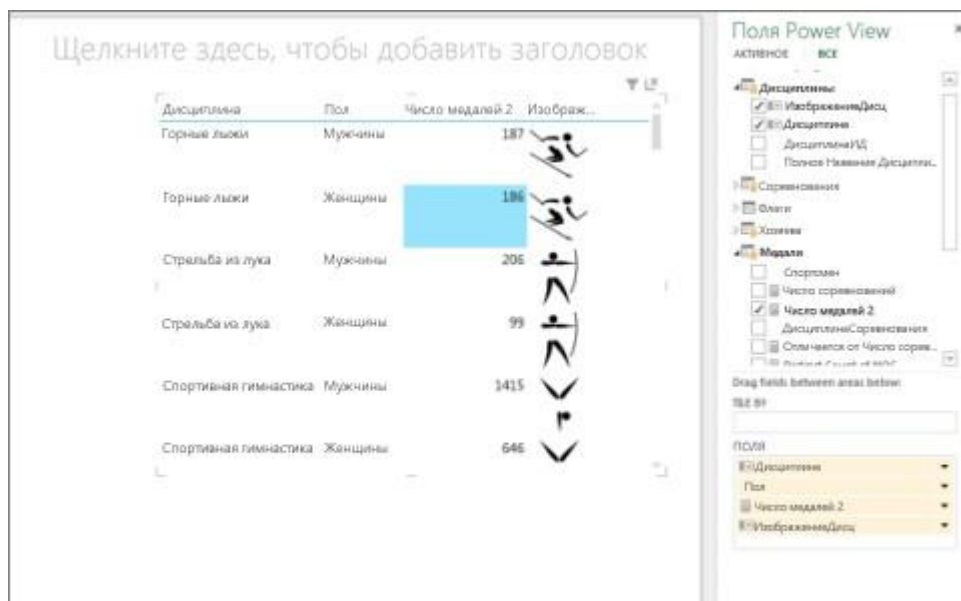
Examples of views available in PowerView



2. Flip function for mosaic elements (croissant selected).
3. Card in container, filtering by current element (croissant).
4. A chart in a container with cards showing the volume of products consumed and served, filtered by croissants, from January to December.
5. Uniform diagrams, filtering by bakery products, sorting by decreasing volume of products served.
6. Histogram showing the volume of products served and consumed, filtered by bakery products.

Creating a table

Creating any visual representation starts with a table. There are many different ways to create a table in Power View.



le charts. Charts can
tions for showing or

hiding labels, legends, and titles.

The charts are interactive: as you select a value in the chart, you can perform the following actions.

- Highlight this value in the diagram.
- Filter all tables, matrices and mosaics by this value

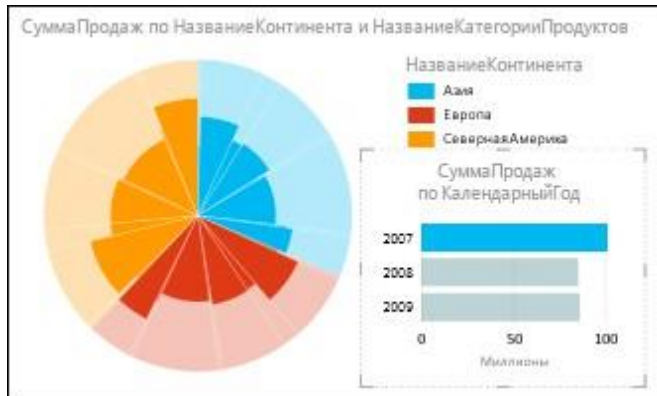
elements in the report.

- Highlight this value in all charts in the report.

Charts are also interactive in presentation mode, such as reading mode and full-screen mode in Power View in SharePoint or in a Power View sheet in an Excel workbook, or when viewed in Office 365.

Pie charts

Pie charts in Power View can be simple or complex. You can create a pie chart that drills down when you double-click a slice, or a pie chart that contains nested slices within a larger colored slice. You can cross-filter a pie chart with another chart. For example, if you select a column in a bar chart, the portion of the pie chart that corresponds to that column is highlighted, and the rest of the pie chart is shaded.



Scatter and bubble charts

Scatter and bubble charts are great for displaying a large amount of related data in a single chart. Scatter charts display one numeric field on the X axis and another on the Y axis, making it easy to see the relationship between the two values for all chart items.

In a bubble chart, the third number field controls the size of the data points. To see changes in data over time, you can add a play axis to a scatter or bubble chart.

Graphs, bar charts and histograms

Line charts, bar charts, and histograms are useful for comparing data points in one or more data series. Line charts, bar charts, and histograms display one field on the X axis and another field on the Y axis, making it easy to see the relationship between the two values for all chart items.

Line chart

In this type of chart, categories are arranged vertically.

axes, and the values are horizontal. Line charts

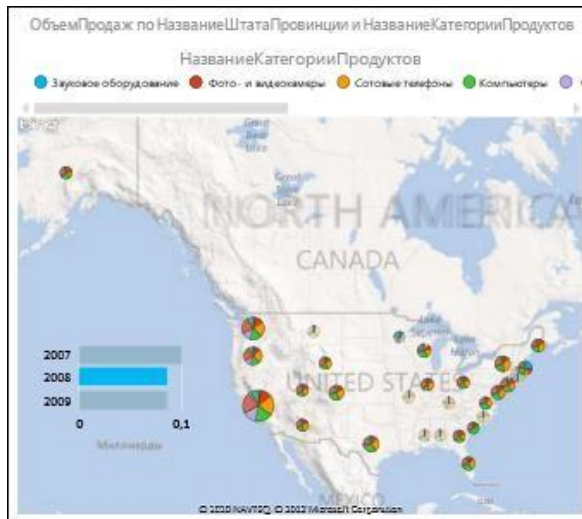
Recommended for use if:

- one or more data series need to be displayed;
- the data contains positive, negative, and zero (0) values; data from
- multiple categories must be compared;
- Axis labels are longer.

In PowerView, you can choose from three line chart subtypes:

stacked, normalized, and clustered.

Histogram



Schedule

Line charts are similar to scatter plots. The difference is that a line chart has only one value axis (the vertical axis), and the horizontal axis shows evenly distributed groups (categories) of data. Line charts distribute category data evenly along the horizontal (category) axis, and plot all the numeric values along the vertical (value) axis.

It is recommended to use charts instead of scatter plots if:

- along the horizontal axis it is necessary to use text labels; these labels may represent evenly spaced values, such as months, quarters, or fiscal years;
- a small number should be used along the horizontal axis numerical labels; if there is a small number of evenly spaced numerical labels representing time intervals, such as years, a graph can be used;
- a time scale must be used along the horizontal axis;

Use a chart when you want to present dates in chronological order at specific intervals or units of measurement, such as the number of days, months, or years, even if the dates on the sheet are not in order or have a different unit of measurement.

Cards

Maps in PowerView use the BingMap tile background, so you can zoom and pan them like any other Bing map. As you add fields and places, dots appear on the map. The larger the value, the larger the dot. When you add multi-value series, pie charts are created on the map, with the size of the chart illustrating the size of the total.

Similar charts: a set of charts with common axes Using similar chart types, you can create a set of charts with common X and Y axes and arrange them side by side, making it easy

Data, ordered V columns or rows of a sheet can be displayed as a histogram. Histograms useful For to represent changes in data over time and to compare different values visually. Histograms typically place categories on the horizontal axis and values on the vertical axis.

In PowerView, you can choose from three histogram subtypes: stacked, normalized, and

compare many different values
called "trellis charts."

at the same time. Single-type charts are sometimes

Matrices

Matrices are similar to tables in that they consist of rows and columns.

However, matrices have the following capabilities that tables do not:

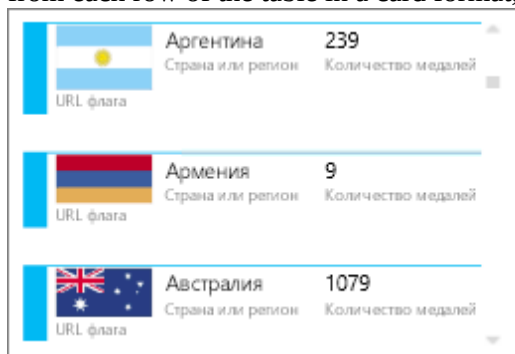
- display data without duplicate values;
- displaying intermediate and final values

for rows and
columns;

- data enlargement and detailing in the presence of
- hierarchy; collapse and expand the view.

Cards

A table can be converted into a series of cards that display the data
from each row of the table in a card format, like a filing cabinet.



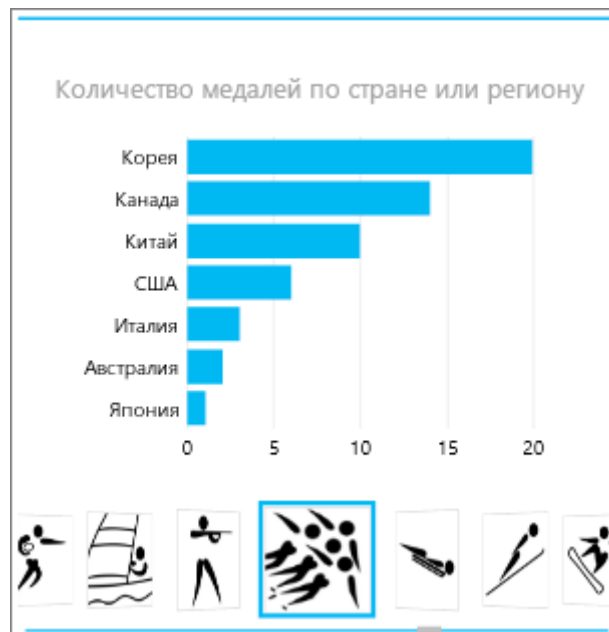
	Аргентина	239
URL флага	Страна или регион	Количество медалей
	Армения	9
URL флага	Страна или регион	Количество медалей
	Австралия	1079
URL флага	Страна или регион	Количество медалей

Mosaic elements

A table or matrix can be converted into tiles to present tabular data interactively. Tiles are containers with a dynamic navigation bar. They act as filters, i.e. they filter the content by the value selected in the tab bar.

You can add multiple visualizations to a tile, filtered by a single value. You can use text or images as tabs.

This image shows the number of medals won by countries in speed skating.



Equipment and materials

To perform the laboratory work, it is recommended to use a personal computer with the following characteristics: 32-bit (x86) or 64-bit (x64) processor with a clock frequency of 1 GHz or higher, RAM - 1 GB or higher, free disk space - at least 1 GB, DirectX 9 graphics device. Software: operating system WINDOWS 7 and higher, PowerView.

Safety instructions

Safety precautions when performing laboratory work are the same

Withas those generally accepted for users of personal computers.

Do not repair the personal computer, install or remove software on your own; in case of a personal computer malfunction, inform the laboratory service personnel (operator, administrator); observe safety regulations when working with electrical equipment; do not touch electrical outlets with metal objects; the user's work area of the personal computer must be kept clean; it is not allowed to eat or drink near the personal computer.

Exercise:

1. Types of charts used in PowerView
2. Pie charts
3. Scatter and bubble charts
4. Graphs, bar charts and histograms
5. Line chart
6. Histogram
7. Maps
8. Matrices
9. Cards
10. Mosaic elements

Contents of the report and its format

- a brief outline of the theoretical basis; a
- description of the main stages of the work.

Test questions:

1. Types of charts used in PowerView
2. Pie charts
3. Scatter and bubble charts
4. Graphs, bar charts and histograms
5. Line chart
6. Histogram
7. Maps
8. Matrices
9. Cards
10. Mosaic elements

A list of literature recommended for use on this topic

topic.

1. Matyushkin, I.V. Modeling and visualization by means of MATLAB physics of nanostructures / I.V. Matyushkin. - M.: RIC "Technosfera", 2011. - 188 p. - (The World of Programming). - ISBN 978-5-94836-286-1; Ditto [Electronic resource]. - URL: <http://biblioclub.ru/index.php?page=book&id=135405>

LAB WORK #4. Filtering in PowerView

Subject -Filtering inPowerView

The purpose of the work ismaster filtering inPowerView. The competencies being formed or their parts -UK-3; UK-5 Theoretical part.

Filters hide all data except the data you need. The Filters area in PowerView has several types of filters: regular filters, cross filters, and slicers.

Creating a Filter Using the Filter Pane

Power View includes a Filters area for basic and advanced filters for the entire area and for individual views. Like slicers, filters in the Filters area are saved with reports and apply only to a single sheet or view, not the entire workbook or report. Unlike slicers, they reside in their own area, not in the spreadsheet or view, and therefore do not take up space in the report.

Displaying the filter area

Hover over the visualization and click the icon *Show filters* in the upper right corner. Then drag the fields from the fields area list of fields in the filters section.

A filter area appears, showing the fields and visualization measures.

ADVICE. You cannot create filters for slices or mosaic visualizations.

In Excel, on the PowerView tab > Filter Pane.

In PowerView in SharePoint on the tab Home > Filter area. In the filters area:

To set filters for an entire sheet or view, select View.

To set filters for a specific visualization, select Chart (or Table, or another visualization type).

Drag fields from the field list to the filter area. You can also click the arrow next to a field in the field list, then select Add to Filter.

NOTES

When the Filter Pane is displayed in Design view, the report author and report users can view and work with filters in the Filter Pane while viewing an Excel workbook in the browser in Excel Services or while viewing a Power View report in SharePoint in Reading mode or Full Screen mode.

If a filter is specified in the filter area, it will continue to filter the report even after the filter area is closed.

Filtering by image field is not possible.

To hide the filter pane, click in an empty area of the canvas and click the Filter Pane button.

The difference between view filters and visualizations

Filters on an entire sheet or view are very different from filters on individual visualizations.

View or Sheet Level Filters are applied on the very at a detailed level of data and filtered according to the values in each cell.

Visualization filters are applied at the statistical level processing.

For example, filtering a bar chart for products that sold more than \$1,000 means that products for which the sum (or other statistical function) of each line in the chart is greater than \$1,000.

View filters

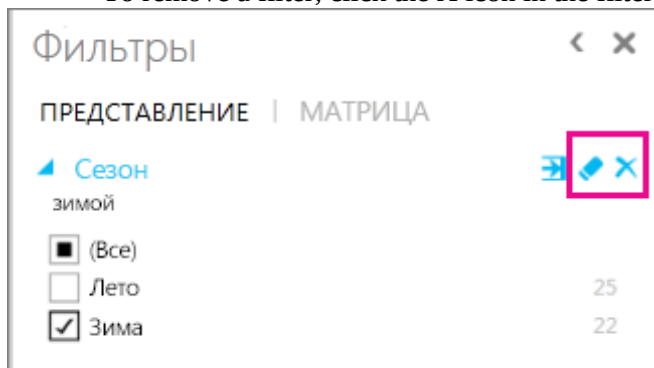
View-level filters apply to the entire Power View sheet. If the Excel file contains other Power View sheets, filters added here will not affect them. The filter applies to all visualizations in the view. If a visualization contains data that the filter applies to, it will be filtered accordingly. Otherwise, it will remain unchanged.

In the filters area, select the item Performance.

You can drag other fields from the field list into the filter area, including fields that are not included in this view.

You can also click the arrow next to a field in the Fields area of the Field List, and then choose Add to View Filter.

To remove a filter, click the X icon in the filters area. To clear a filter, click the eraser icon.



Visualization filters

Visualization-level filters can be set for tables, matrices, cards, and charts, but not for slicers or card containers. However, you can set filters for tables, matrices, and charts that are in a card container.

To view filters for a single visualization, hover over its upper-right corner and click the filter icon. This will open the Filters pane, already populated with the filters in the visualization.

If the filter pane is expanded, after you select a visualization, its type will appear in a gray header in the filter pane. For example, if you select a chart, the header will appear in the filter paneDiagram. Click this heading to view filters for the chart.

You can drag other fields from the field list into the filters area, including fields that are not included in this visualization or any other in the view.

You can also click the arrow next to a field in the Fields area of the Field List, and then chooseAdd to filter [visualization].

You can remove filters that you've added to a visualization, but you can't remove filters for fields that are part of the visualization. You can clear these filters to make them no longer effective.

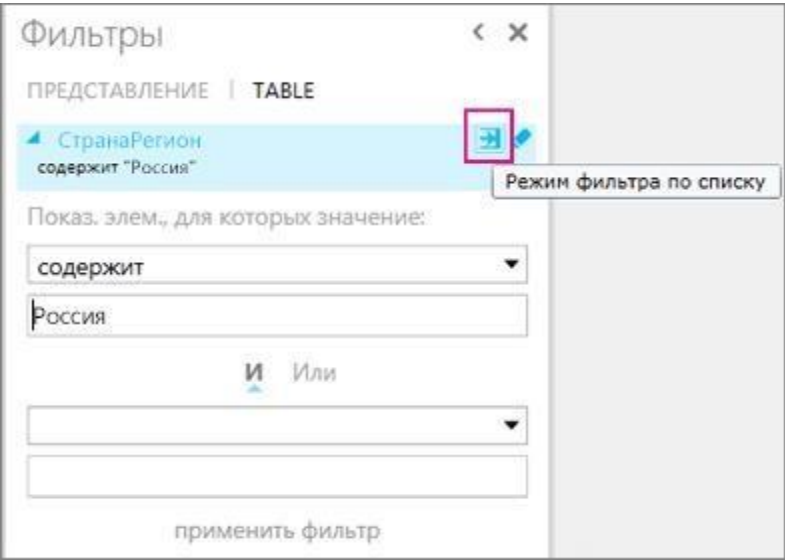
If you add a filter for a field in a visualization and then remove that field from the visualization, the filter will remain in effect for the visualization.

To remove a filter, open the filters area for the visualization and remove the filter from the area.

Basic and advanced filters

To switch between basic and advanced filters, click the icon Advanced Filter Mode, the first one to the right of the field name in the filters area.

Advanced filter



These are other filter parameters.

	BASIC FILTER	ADVANCED FILTER
Text fields	Flags, similar autofilters V Microsoft Excel	Free-form fields where you need to enter values that the field contains, does not contain, and so on.
<u>Numerical fields</u>	Slider from the least to the greatest meanings in the field.	Free-form fields where you need to enter values that are smaller than the field, larger than the field, and so on.
Date fields	Date sliders or flags	Free-form fields where you need to enter relevant values, field, Not corresponding to the field and so on.

ADVICE. The numbers after each flag value show how much

records contain this value. If the field contains more than 500 values, a message will appear stating that not all elements are shown.

Search in filters

If you are filtering on a field with a long list of values, use the search function to find a specific value.

Under the field name in the filters area, enter the text to search for and click the magnifying glass icon.

ADVICE. If the field does not contain a large number of values, field search is not displayed. You can search for a value in a filter at the visualization level or at the view level specified for a text field to determine whether to enable filtering. Portions of the field values that match the search text are highlighted in the search results list. The search is case-insensitive: Apple and apple will return the same results. Depending on the filter, the search is limited to a visualization, sheet, or view, but does not search the entire workbook or report.

Wildcard characters are also supported: the question mark (?) and the asterisk (*). The question mark matches any single character, and the asterisk (*) matches any sequence of characters. If you want to find a question mark or asterisk in the text, you should enter a tilde (~) before the character you are looking for in the find_text function.

For example, if you enter in the list of countries r?n in the field search, then the search will return two countries: Fwoundtion and Iwound. If you enter in the search field r*n, ten countries will be included in the search results, including Germanand, Irlandiya and Armen and I.

NOTE. If wildcards are used in the search, then the results list will not highlight parts of the text that match the query.

Filter operation in a saved PowerView file

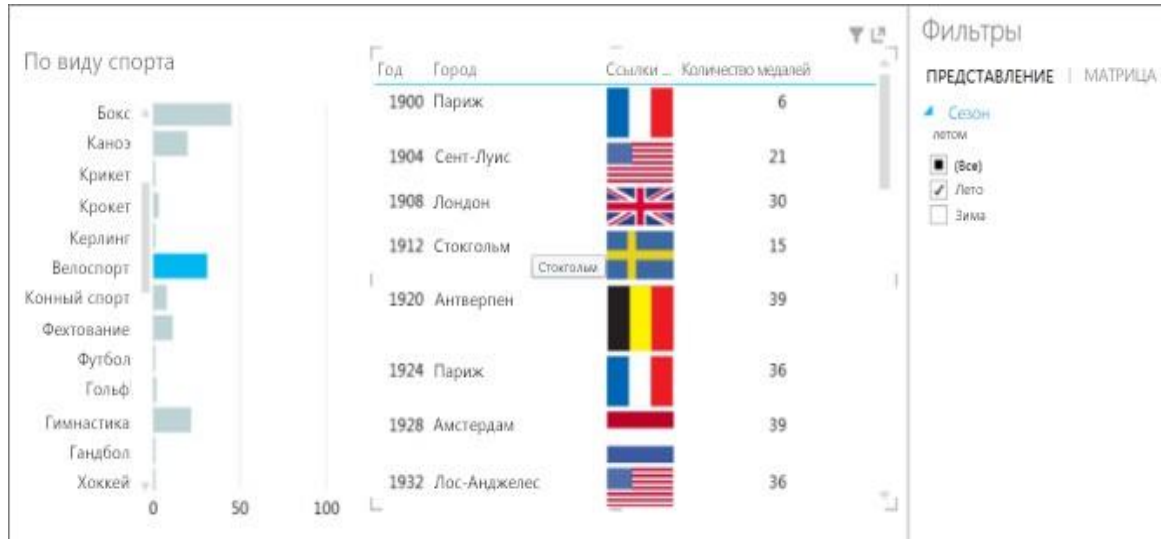
Each of the methods for filtering data in a report works differently when you save the report or workbook.

If you set a filter or slicer when you create a sheet or Power View in Excel or SharePoint, the state of the slicer or filter is saved with the file.

Changes made in the browser in Excel Services for an Excel workbook or in Reading mode or Full Screen mode for a Power View report in SharePoint are not saved, so changes made when filtering in these modes are also not saved.

Cross filters

Because of the relationships described in the underlying model, charts can act as filters. When you select values directly on a chart, other data areas in the view are automatically filtered. For example, if you select a single column in a bar chart, the values in the matrix in the report view are automatically filtered.



Line chart filter matrix

To select multiple values, CTRL-click them. To clear a filter, click inside the filter but don't click a value.

Cross filtering also works with charts that have multiple series. Clicking one bar segment in a stacked bar chart filters by that value. Clicking an item in the legend filters all segments of that series.

The crossfilter selections are retained across sheets or views, but are not saved with the workbook or report. If you save the workbook or report and later open it, each chart will be in its original state.

Equipment and materials

To perform the laboratory work, it is recommended to use a personal computer with the following characteristics: 32-bit (x86) or 64-bit (x64) processor with a clock frequency of 1 GHz or higher, RAM - 1 GB or higher, free disk space - at least 1 GB, DirectX 9 graphics device. Software: operating system WINDOWS 7 and higher, PowerView.

Safety instructions

Safety precautions when performing laboratory work are the same as those generally accepted for users of personal computers. Do not repair your personal computer, install or remove software on your own; in case of malfunction

inform the laboratory service personnel (operator, administrator) about this; observe safety regulations when working with electrical equipment; do not touch electrical outlets with metal objects; the user's work area of the personal computer must be kept clean; it is not allowed to eat or drink near the personal computer.

Exercise:

1. Difference between view filters and visualizations
2. Visualization filters
3. View filters
4. Basic and advanced filters
5. Search in filters
6. Filter operation in a saved PowerView file
7. Cross filters
8. Line chart filtering matrix Contents of the report and its format
 - a brief outline of the theoretical basis; a
 - description of the main stages of the work.

Test questions:

1. Cross filters
2. Line chart filtering matrix
3. Filter operation in a saved PowerView file
4. Search in filters
5. Advanced filter
6. Visualization filters

A list of literature recommended for use on this topic

topic.

1. Matyushkin, I.V. Modeling and visualization by means of MATLAB physics of nanostructures / I.V. Matyushkin. - M.: RIC "Technosfera", 2011. - 188 p. - (The World of Programming). - ISBN 978-5-94836-286-1; Ditto [Electronic resource]. - URL: <http://biblioclub.ru/index.php?page=book&id=135405>

LAB WORK #5. Selecting data in PowerView

Subject -Selecting data inPowerView

The purpose of the work is master data extraction in PowerView. The competencies being formed or their parts - UK-3; UK-5 Theoretical part.

Highlighting allows you to examine a subset of data without losing the ability to view the entire data set. The selected data is highlighted, while the rest is shaded. Simply highlighting a data point reveals its relationships (or lack thereof) to the rest of the data.

Based on the metadata in the underlying data model, Power View uses relationships between different tables and fields in the model to make items on the sheet stand out from each other.

Data highlighting is not saved with the report. If you save the workbook and then reopen it, you will not see the highlights you applied earlier.

Adding a selection

On a Power View sheet with a chart and at least one other chart or map, select one or more slices or bars in the chart.

To select multiple values, CTRL-click them. To clear the selection, click inside the original visualization but do not click a value.

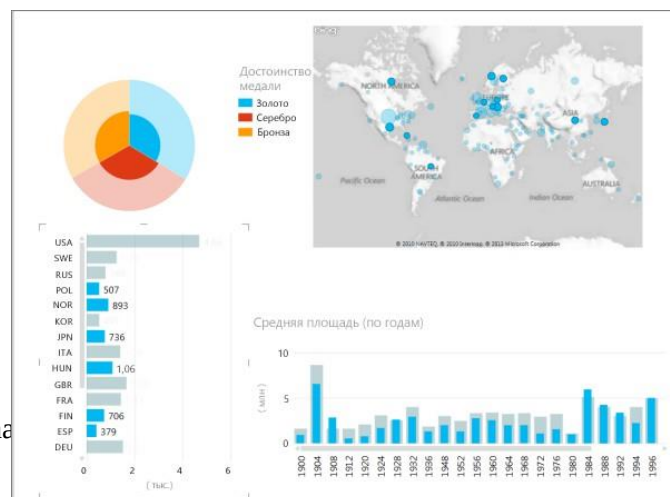
For example, selecting a bar on a chart (cross-filter) highlights other related charts and maps on that sheet.

In this sheet, when you select multiple values on a bar chart, the histogram, pie chart, and map are highlighted.

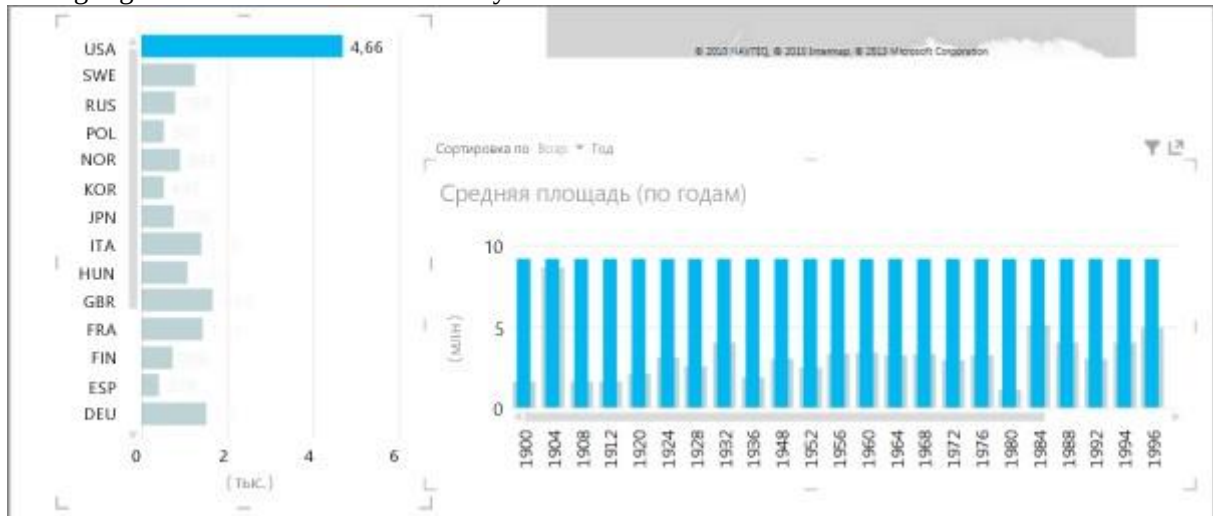
If the highlighting does not apply to all bars or slices in the chart, the previous values are dimmed so you can see the whole picture, not just the highlighted values.

Even columns with zero selection are displayed, allowing you to identify cases where a selected element from the source visualization has no representation in the destination visualization.

Highlighting cha



For visualizations with averages, the highlighted value may be larger than the average. This histogram shows the average area of the participating countries or regions. The United States is larger than the average, so when you select the United States, the highlighted bar becomes narrower so you can see the shaded bar for the total value.



Equipment and materials

To perform the laboratory work, it is recommended to use a personal computer with the following characteristics: 32-bit (x86) or 64-bit (x64) processor with a clock frequency of 1 GHz or higher, RAM - 1 GB or higher, free disk space - at least 1 GB, DirectX 9 graphics device. Software: operating system WINDOWS 7 and higher, PowerView.

Safety instructions

Safety precautions when performing laboratory work are the same

Withas those generally accepted for users of personal computers.

Do not repair the personal computer, install or remove software on your own; in case of a personal computer malfunction, inform the laboratory service personnel (operator, administrator); observe safety regulations when working with electrical equipment; do not touch electrical outlets with metal objects; the user's work area of the personal computer must be kept clean; it is not allowed to eat or drink near the personal computer.

Exercise:

1. Adding a selection
2. Highlighting charts with mean aggregates Contents of the report and its format
 - a brief outline of the theoretical basis; a
 - description of the main stages of the work.

Test questions:

1. Highlighting charts with mean aggregates
2. Adding a selection

A list of literature recommended for use on this topic
topic.

1. Matyushkin, I.V. Modeling and visualization by means of MATLAB physics of nanostructures / I.V. Matyushkin. - M.: RIC "Technosfera", 2011. - 188 p. - (The World of Programming). - ISBN 978-5-94836-286-1; Ditto [Electronic resource]. -
URL: <http://biblioclub.ru/index.php?page=book&id=135405>

LAB WORK #6. Slices in PowerView Topic -Sections inPowerView

The purpose of the work is master the cuts in PowerView. The

competencies being formed or their parts -UK-3; UK-5 Theoretical part.

A slicer is a type of filter. Place a slicer on a sheet to simultaneously filter data from all visualizations it contains. When you select an item in a slicer, all visualizations with related content are filtered by it. Power View slicers work similarly to PowerPivot slicers in Excel.



You can add multiple slicers to a report to combine their filters. The slicers will act as filters for each other.

7. Create a single-column table based on any field that is an attribute and does not contain numeric values, such as "Name" or "Category".

You can use images as slices for

data.

ADVICE.

6. Select the `tabConstructor>Cut`.

9. The table will be transformed into a slice.

10. Select a value on the slice to filter the content

on a sheet or in a presentation.

ADVICE. To select multiple values, hold down the key

CTRL while pressing them.

11. To clear a cut filter, hover over it and

select itemRemove filterin the upper right corner of the cut.

ADVICE. To select all values except a certain set,

Reset the filter using the button in the upper right corner, then hold down the CTRL key and click on a specific value to deselect it. All values will be displayed except for the ones that were deselected.

NOTE.

In this figure, the discipline slice on the left filters out the figure data so that only it is shown in the matrix and histogram on the right.



The slice on the left is a filter for the values in the matrix and in the diagram on the right. Slice filtration is different from other types of filtration. Slices do the following:

- filters data in charts but does not highlight it; saved in a workbook or report. If the workbook is saved, closed, and then open it again, the same values will be selected in the slice;
- can use image fields. In fact, PowerView

Uses the row ID field of the image in the data model as a filter in the slicer. If the data model is in Excel, you may need to configure the table behavior properties for PowerView reports.

Equipment and materials

To perform the laboratory work, it is recommended to use a personal computer with the following characteristics: 32-bit (x86) or 64-bit (x64) processor with a clock frequency of 1 GHz or higher, RAM - 1 GB or higher, free disk space - at least 1 GB, DirectX 9 graphics device. Software: operating system WINDOWS 7 and higher, PowerView.

Safety instructions

Safety precautions when performing laboratory work are the same Withas those generally accepted for users of personal computers.

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Exercise:

1. The concept of a cut
2. Methodology for using a slice in PowerView
3. Difference between shear filtration and other types filtration

Contents of the report and its format

- a brief outline of the theoretical basis; a
- description of the main stages of the work.

Test questions:

1. The concept of a cut
2. Methodology for using a slice in PowerView
3. Difference between shear filtration and other types filtration

A list of literature recommended for use on this topic

topic.

1. Matyushkin, I.V. Modeling and visualization by means of MATLAB physics of nanostructures / I.V. Matyushkin. - M.: RIC "Technosfera", 2011. - 188 p. - (The World of Programming). - ISBN 978-5-94836-286-1; Ditto [Electronic resource]. - URL: <http://biblioclub.ru/index.php?page=book&id=135405>

LAB WORK #7. Hierarchies and sorting in PowerView.

Subject -Hierarchies and sorting inPowerView.

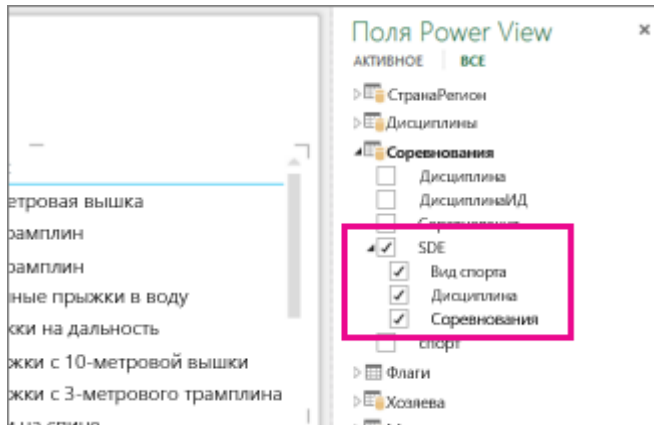
The purpose of the work ismaster hierarchy and sorting in PowerView. The competencies being formed or their parts -UK-3; UK-5 Theoretical part.

If your data model has a hierarchy, you can use it in PowerView.

You can also create a hierarchy in PowerView from scratch.

The advantage of having a hierarchy in the Data Model is that it can be used in every Power View table or report that is based on that model. You can only create a hierarchy in the Data Model in Excel by opening the PowerPivot window.

This data model already has a hierarchy called "VDS" consisting of the fields "Sport" > "Discipline" > "Events". The hierarchy can be added to a PowerView report with one click.



Adding an existing hierarchy to a PowerView

If your data model does not have a hierarchy, you can create one in Power View. Adding multiple fields to the rows or columns area of a matrix creates a hierarchy for that matrix. Adding multiple fields to the axis area of a chart creates a hierarchy for that chart. Hierarchies allow you to drill down or drill down on a chart or matrix.

The fields in a hierarchy can be placed in any order. It does not have to be a natural hierarchy like Category > Subcategory > Product. It can be a hierarchy like Category > Year > Continent.



Creating a hierarchy in PowerView

SQL Server Analysis Services tabular models can also contain hierarchies that are used in Power View tables and reports.

Sorting in PowerView

In Power View, you can sort data in tables, matrices, bar charts, and column charts. You can sort individual charts in sets of multiple charts.

You can sort numeric fields, such as Sales Amount, and non-numeric fields, such as Name.

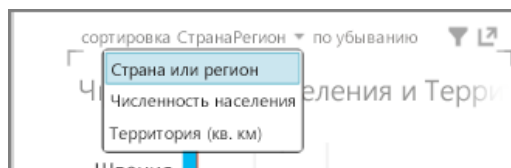
Sorting Charts in PowerView

In Power View, you can organize data in a chart with a single click.

You can sort chart categories by category value (in the Axis box) or by numeric value (in the Values box).

1. Hover your mouse over the top border of the chart. text will appear in the upper left corner: sort by, then the field name, and then age or departed.
2. Click a field name to sort by a different field.

meaning.



3. Click on the text 'age or departed' to change direction sorting. The chart is sorted by default in descending order of the Country/Region category value.

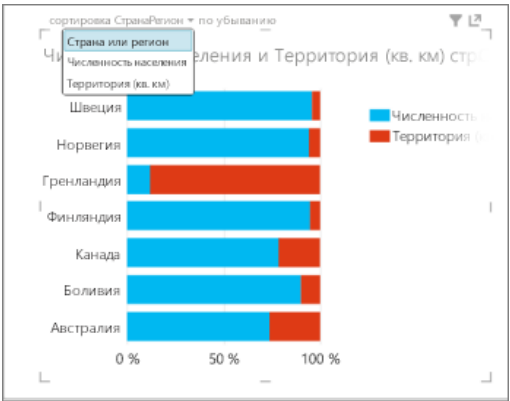


Chart sorted in ascending order by Land area value.

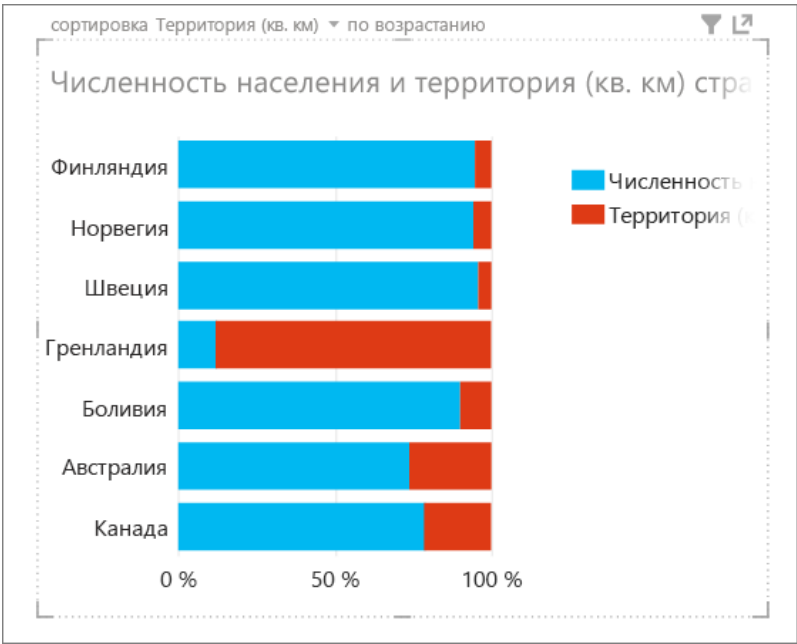


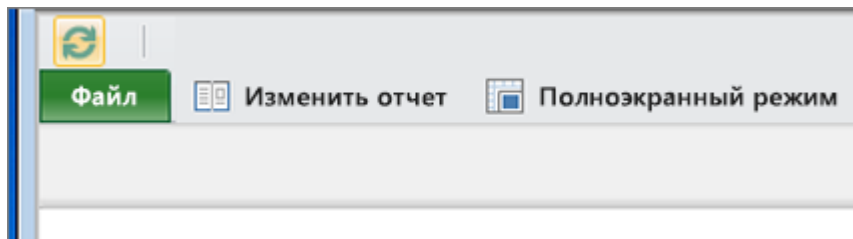
DIAGRAM TYPE	SUPPORTED SORTING	SUPPORTED SORTING LITTLE CHARTS
Column	Eat	Eat
Linear	Eat	Eat
Schedule	Absent	Eat
Point bubble or	Absent	Eat
Histogram or bar chart with accumulation	Eat	Eat
Standardized bar chart or diagram	Eat	Eat

Point bubble with playback axis	or diagram	Absent	Absent
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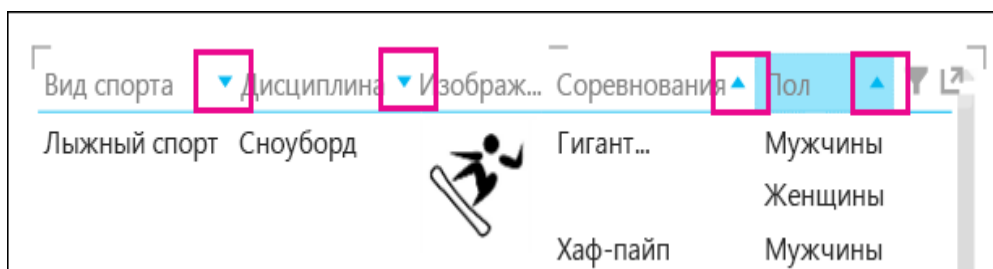
Sorting tables and matrices in PowerView

In Power View, you can sort a table or matrix to display data in the order you want. You can instantly reorder data by sorting any column in a table or matrix (except columns containing images).

NOTE. If you sort data in PowerView in SharePoint, you need to use the edit mode. In the table or matrix you want to sort, click the "Edit Report" button in the upper left corner of the report area.



1. In a table or matrix, click the heading of the column that must be sorted. After that, an up or down arrow will appear next to the header, indicating the sort order of the field: ascending or descending.



2. Click the arrow button to change the order sorting. You can sort text, numbers, dates, and times. You cannot sort columns with images.

3. Matrix sorted in descending order by sport, by in descending order by discipline and ascending order by competition.

Вид спорта	Дисциплина	Соревнования	Пол	Число медалей
Бадминтон	Бадминтон	одиночка	Мужчины	16
			Женщины	16
		двойки	Мужчины	44
			Женщины	44
Баскетбол	Баскетбол	баскетбол	Мужчины	617
			Женщины	323
Бобслей	Бобслей	двойки	Мужчины	100
			Женщины	12
		четверки	Мужчины	217
		пятик	Мужчины	15
Скейтон	индивидуальный...		Мужчины	12
			Женщины	6

4. Note that next to the column headings "Gender" and "Number of Medals" do not have arrows. The "Gender" column uses the default sort order, alphabetically. "Number of Medals" is a value field and is not sorted in this view.
5. In matrices it is possible to sort the entire matrix one by one numeric column, or sort by one non-numeric column at each grouping level. Suppose you have a matrix grouped by the Sport column, with the Discipline, Event, and Years columns. You can sort by Years only, or by one or more of the other three fields (Sport, Discipline, Event), according to their order in the matrix.

The matrix below is sorted by number of years. When sorting by number of years of competition, the matrix is sorted from the sport that has been competing for the longest number of years to the sport that has been competing for the fewest years. Within each sport, disciplines are also sorted from the longest to the fewest years. Disciplines with equal numbers of years are sorted alphabetically.

Matrix sorted by descending number of years

Вид спорта	Дисциплина	Изображ.	Соревнование	Пол	Число лет
Каратэ	Каратэ		Каратэ	Мужчины	8
	Каратэ		Каратэ	Женщины	8
Самый спорт	Самый спорт		до 90 кг	Мужчины	12
	Самый спорт		до 90 кг	Мужчины	12
	Самый спорт		до 90 кг	Женщины	12
Биатлон	Биатлон		12,5 км, масс-старт	Женщины	1
			15 км, масс-старт	Мужчины	1
			2x7,5 км, эстафета	Женщины	1
			4x6 км, эстафета	Женщины	1
			патрульная гонка	Мужчины	1
			10 км, преследование	Женщины	2
			12,5 км, преследование	Мужчины	2
			15 км	Женщины	8
			7,5 км	Женщины	8
			10 км	Мужчины	8
Бобслей	Скейтинг		20 км	Мужчины	11
			20 км	Мужчины	13
			индивидуальн.	Женщины	2
			индивидуальн.	Мужчины	4
Бобслей	Бобслей		пятиборье	Мужчины	1
			пятиборье	Мужчины	1

This matrix is sorted by discipline.

Matrix sorted in descending order by the second category - discipline

Добавить название

Вид спорта	Дисциплина *	Название	Пол	Соревнование	Число лет
Беготон	Беготон		Мужчины	10 км	8
				12.5 км, преследование	2
				15 км, масс-старт	3
				20 км	18
				4x7.5 км эстафета	11
			Женщины	патрульная точка	1
				10 км, преследование	2
				12.5 км, масс-старт	3
				15 км	5
				2x7.5 км эстафета	3
Бобслей	Скелетон		Мужчины	индивидуальный скор.	4
				индивидуальный скор.	2
			Мужчины	парники	1
				парники	18
			Женщины	двойки	17
				двойки	2
			Женщины	Керлинг	3
				Керлинг	3
			Женщины	Керлинг	3
				Керлинг	3

Equipment and materials

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Safety instructions

Safety precautions when performing laboratory work are the same

Withas those generally accepted for users of personal computers.

Do not repair the personal computer, install or remove software on your own; in case of a personal computer malfunction, inform the laboratory service personnel (operator, administrator); observe safety regulations when working with electrical equipment; do not touch electrical outlets with metal objects; the user's work area of the personal computer must be kept clean; it is not allowed to eat or drink near the personal computer.

Exercise:

1. Loading and displaying PowerPivot data
2. How Calculations Work in PowerPivot
3. Introduction to DAX, measures
4. Complex calculations with calculate
5. Working with multiple tables
6. Linked and disconnected tables
7. FILTER vs CALCULATE Contents of the report and its format
 - a brief outline of the theoretical basis; a
 - description of the main stages of the work.

Test questions:

1. Loading and displaying PowerPivot data
2. How Calculations Work in PowerPivot

3. Introduction to DAX, measures
4. Complex calculations with calculate
5. Working with multiple tables
6. Linked and disconnected tables
7. FILTER vs CALCULATE

A list of literature recommended for use on this topic

topic.

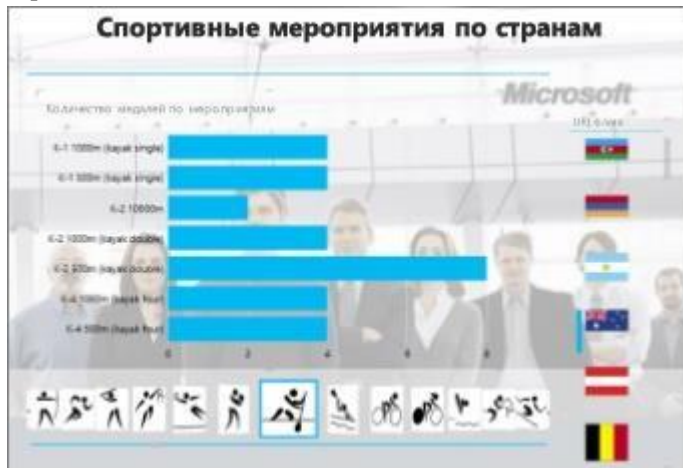
1. Matyushkin, I.V. Modeling and visualization by means of MATLAB physics of nanostructures / I.V. Matyushkin. - M.: RIC "Technosfera", 2011. - 188 p. - (The World of Programming). - ISBN 978-5-94836-286-1; Ditto [Electronic resource]. -
URL: <http://biblioclub.ru/index.php?page=book&id=135405>

LAB WORK #8. Images in PowerView Topic -Images in PowerView

The purpose of the work is master the use of images in PowerView. The competencies being formed or their parts -UK-3; UK-5 Theoretical part.

Images look very attractive in PowerView sheets in Excel or SharePoint. Here's what you can do:

- Add static images as background or underlay, or as design elements (for example, a company logo).
- Add images linked to data contained in report.



Adding Static Images to PowerView

Pictures and background images can be used for decoration or as marking elements. These elements are not repeated across all sheets and views of a workbook or report, so you can use one image or several, as desired.

Adding a background image

1. If you are working in Excel, go to the Power View sheet (tabInsert>Power View).

2. On the tabPower View in the sectionBackground image clickSet image.

You can choose position images: By size surfaces, Near or In the center.

3. Set the transparency value. The higher the percentage, the more transparent (and less visible) image.

Adding an image

4. On a blank PowerView sheet, on the PowerView tab, click the Insert button and select the Picture item.

5. Select the image and click Open.

6. Once the image appears on the sheet, you can:

- Move it: Click on the image, then hover over it



mouse to the edge to make a pointing hand cursor appear.

- Resize it: Click on the image, then hover

Move the cursor over the resize handles in the middle and at the edges until a double-headed arrow cursor appears. 

Using Data-Linked Images in PowerView Images are linked to data in the data model and are part of it. For example, you can use photos of your company's products or employees.

Insert images into PowerView to make your report more attractive and informative.

- As tabs in a container with mosaic elements. In cards.
-
- As values in a slice.

Tab images in a container with tiled elements



disciplines - in this case is mosaic container.

dynamic navigation bar. Tiles act as filters: they are selected in the tab strip. Images make great tile tabs.

7. On a worksheet or in PowerView, create a visual the image you want to see in the mosaic.

8. Drag the image field into the windowMosaic.

PowerView creates a mosaic with images in the tab strip. You can do many different things with the mosaic elements.

Images in the card

	Аргентина	239
URL флага	Страна или регион	Количество медалей
	Армения	9
URL флага	Страна или регион	Количество медалей
	Австралия	1079
URL флага	Страна или регион	Количество медалей

These cards show flags and medals from different countries. 9. On the PowerView sheet, add the required fields to the card.

10. On the tabConstructorselectTable, and then -Card. In

PowerView, the fields are arranged in the same order as in the window.Fields, but with two exceptions:

- The field is displayed as a header by default. The image appears larger and more prominent by default.
-

noticeable.

Image as a value in a slice



the left-hand slice. The slice filters out all

pty canvas.

that contains your

es.

14. Select the tabConstructor>Cut.

TIP: If the functionCutis inactive, check the number of fields in the table. A slice can be created from a table with only one field.

15. Now, by switching images in the slice, you can filter sheet of values associated with this image.

Setting Properties in PowerPivot for Use in PowerView Assigning a Default Image in PowerPivot

If your data is stored in Excel, you can set a default image in PowerPivot. Default images added to a card are larger and more prominently positioned on the sheet. Default images (or image links) should only be used once per table (each row contains a unique image).

16. On the tabPowerPivotin Excel select the itemControl data model.
17. If the PowerPivot tab is not visible, enable PowerPivot.
18. On the tabAdditionallypress the buttonBehavior tables.
19. AskRow ID, for example a column with
unique identifier. Values in the row identifier column must be unique.

20. Set the valueDefault imagefor the title column with
image.

Controlling sort order

Another benefit of setting a default image is that you can control how images are sorted. By default, images in slices and tiles are sorted by image file name, but if you set a default image, sorting is done by the row ID column. If you set another column as a default label, images are sorted according to the values in that column.

If your data is stored in Excel and the image table contains rows with duplicate values, you can still set the sort order to another field.

21. On the PowerPivot tab, select Manage Model.
data.
22. If the PowerPivot tab is not visible, enable PowerPivot.
23. Click on the column containing the images or their URLs.
addresses.
24. On the Home tab, select Sort by Column.
25. The column with the image can be selected in the Sort field.
26. In the Sort by field, select the name of the column by which to sort.
need to sort images.
27. Click OK.

Data-Linked Image Sources

You can add images from several sources to your PowerView report:

- from the site;

- from the data model;
- from the SharePoint site.

Images on external site

If the images are on an external site, PowerView accesses them anonymously, so anonymous access must be enabled for such images. Otherwise, even readers with viewing rights may still not be able to see the images.

The process for adding images from an external site is the same for images on a SharePoint site. However, the processes for adding URLs for images from external sites and a SharePoint site are different.

Let's say you have access to a set of images on an external site, and you have a column in an Excel spreadsheet with the names of the images. The most flexible way to manage links to the images is to create a calculated column that contains the name and URL of the image on the external site.

28. Copy the URL of the external site.

29. On the tab **PowerPivot** in Excel select the **itemControl** data model.

If the **PowerPivot** tab is not visible, enable **PowerPivot**. 30. Click in an empty cell in the column **Add Column** and enter

an equal sign (=), a URL in quotation marks (""), and the image column name in square brackets ([]). For example:

= "http://contoso.com/images" & [ImageColumnName]

31. **PowerPivot** will add the URL to each cell in the column and image title.

32. Right-click the column header and select **Rename** column. Enter a suitable title.

33. To check if the formula works, copy one of the values and paste it into your browser's address bar. The image should open.

External images cannot be displayed on PowerView sheets in Office 365. Images must be in a table in the data model.

NOTE.

Images stored in the data model

Storing images in the data model provides the following benefits:

- The book will be complete. Such a book can be opened in offline and the images will be available.
- Images will open in PowerView sheets in Office

365.

Images must be in a column with a binary data type. Images are not visible in PowerPivot; all fields in the column will show "Binary Data".

However, if you add fields to PowerView, the images will be visible.

IMPORTANT: Images in a binary data column are visible in the Field List in PowerView only if the underlying table contains a Row ID column.

NOTE: PowerView does not treat OLE objects as images.

This means that it is not possible to import images into the data model from Access, since images are stored as OLE objects in that application.

Images in SharePoint folder

If you're using Power View in SharePoint (rather than Excel), you can link to an image in a SharePoint folder the same way you would for an external site.

PowerView sheets in Excel can open images from a SharePoint site only if anonymous access is allowed. This is generally not allowed in most SharePoint configurations. So even if you and your workbook readers have permission to view images directly from the SharePoint site, they may not appear in the Power View in Excel.

NOTE.

Equipment and materials

To perform the laboratory work, it is recommended to use a personal computer with the following characteristics: 32-bit (x86) or 64-bit (x64) processor with a clock frequency of 1 GHz or higher, RAM - 1 GB or higher, free disk space - at least 1 GB, DirectX 9 graphics device. Software: operating system WINDOWS 7 and higher, PowerView.

Safety instructions

Safety precautions when performing laboratory work are the same as those generally accepted for users of personal computers.

Do not repair the personal computer, install or remove software on your own; in case of a personal computer malfunction, inform the laboratory service personnel (operator, administrator); observe safety regulations when working with electrical equipment; do not touch electrical outlets with metal objects; the user's work area of the personal computer must be kept clean; it is not allowed to eat or drink near the personal computer.

Exercise:

1. Time Intelligence
 2. Iterators
 3. Patterns:
 4. Budgeting
 5. Shopping cart analysis
 6. Non-standard calendar
 7. Performance
 8. Creating reports in PowerView
- Contents of the report and its format

- a brief outline of the theoretical basis; a
- description of the main stages of the work.

Test questions:

1. Time Intelligence
2. Iterators
3. Patterns:
4. Budgeting
5. Shopping cart analysis
6. Non-standard calendar
7. Performance
8. Creating reports in PowerView

A list of literature recommended for use on this topic

topic.

1. Matyushkin, I.V. Modeling and visualization by means of MATLAB physics of nanostructures / I.V. Matyushkin. - M.: RIC "Technosfera", 2011. - 188 p. - (The World of Programming). - ISBN 978-5-94836-286-1; Ditto [Electronic resource]. - URL: <http://biblioclub.ru/index.php?page=book&id=135405>

LAB WORK #9. Visualizing Geographic Data Using the Power Map Add-in

Subject -Visualizing Geographic Data with the Add-in Power Map.

The purpose of the work is master the visualization of geographic data with using the Power Map add-in.

The competencies being formed or their parts -UK-3; UK-5 Theoretical part.

GeoFlow is a new Excel2013 add-in for 3D data visualization with a world map. With GeoFlow, you can display geographic and temporal data, analyze it, and create visual tours for sharing.

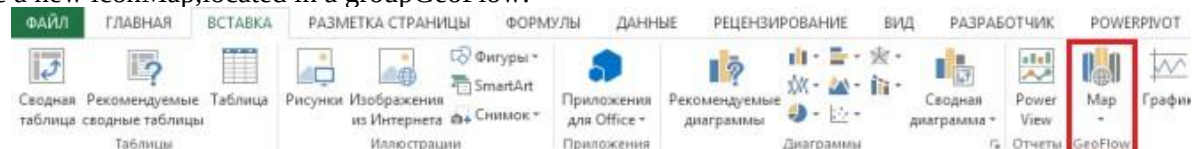
GeoFlow allows you to:

- 1) display millions of rows of data on Bing maps,
- 2) understand the essence by seeing the data in geographic space, and seeing these changes over time,
- 3) present by creating attractive video tours. Please note that since June 2013, Microsoft has replaced the project code name GeoFlow with the official Power Map.

Installing and running GeoFlow

GeoFlow only works with Excel 2013 and above. You need to download installation package from the official Microsoft website and run it. After that, GeoFlow will be installed on the ribbon in the tab Insert,you

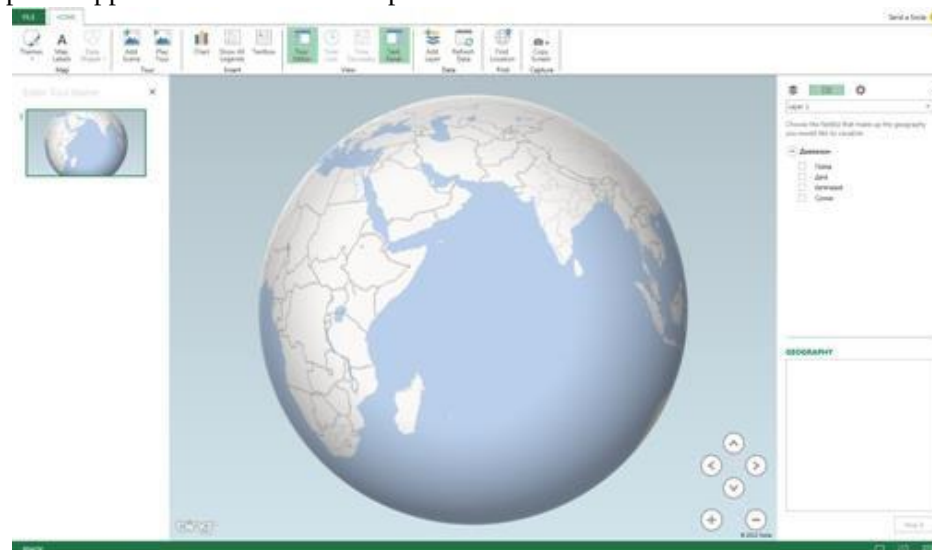
will see a new iconMap,located in a groupGeoFlow.



Download Excel file from example data to display in GeoFlow . This file contains fictitious data on computer sales by Russian cities, broken down by date.

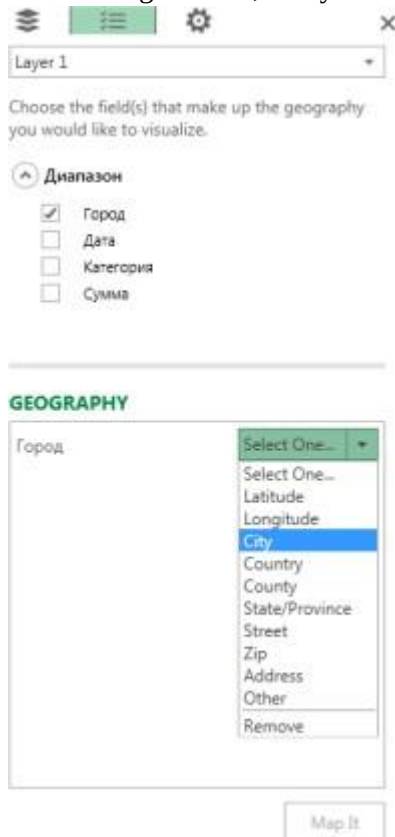
1. Open the data file
2. Click on any cell in the table on the sheetSummary.
3. Go to the tabInsert ->GeoFlow,click on

iconMap.The application window will open.GeoFlow Preview for Excel.



4. First, you need to decide on the geography of the data. To for this we put a tick opposite the fieldCityin the right panel, and here, in the tabGeographyopposite the fieldCitywe chooseCityfrom the drop-down menu. ClickMap It.

It is worth noting that the documentation for the add-on states that GeoFlow only accepts city names written in English. But, oddly enough, it also found cities written in Cyrillic.



In addition to city and street names, you can specify latitude and longitude for a more precise location. Then in the listGeographyshould chooseLatitude and Longitude.

1. Use your mouse to rotate the globe so that Russia became the visible part. If you want to change the viewing angle,

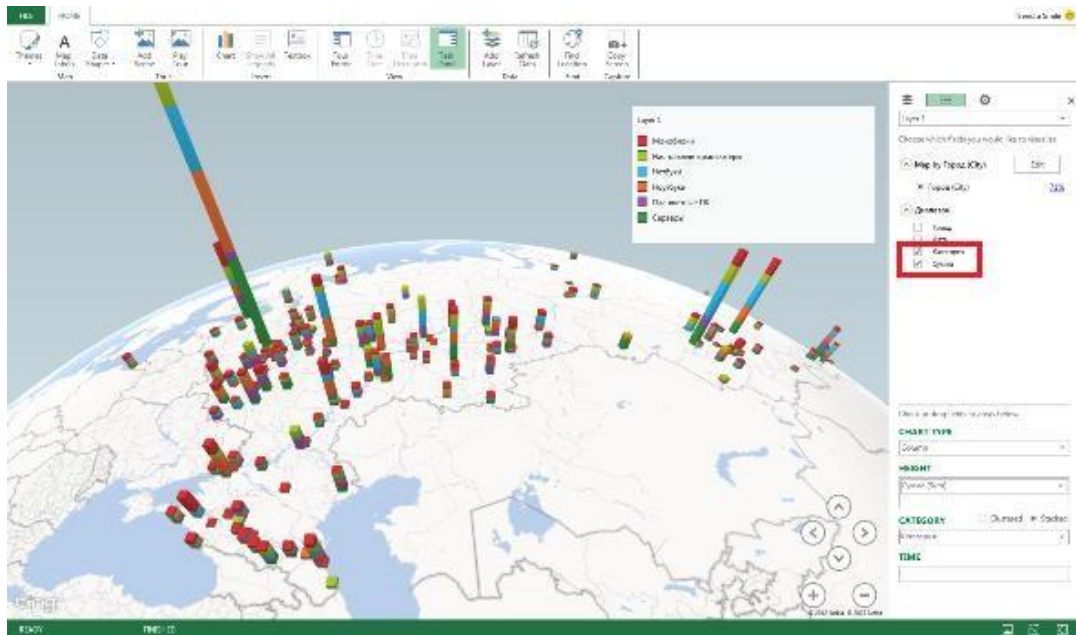


hold down the key **Alt**, while moving the mouse.

2. Next, you need to specify the data that we want to link to the

To map. In the right panel, check the boxes

against **Category** and **Sum**. **GeoFlow** will display sales data for each city, broken down into categories.



3. You can also see how sales have changed since

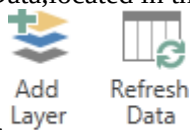
over time. To do this, check the box next to the field **Date**. At the bottom of the screen you will see a timeline. By moving the slider you will see how sales have changed over a given period.



Updating and adding data to GeoFlow

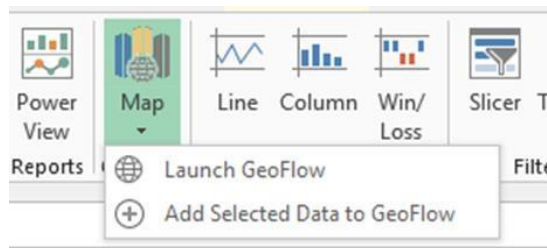
If your details have changed, you can update them using the button

Refresh Data, located in the group **Data**.



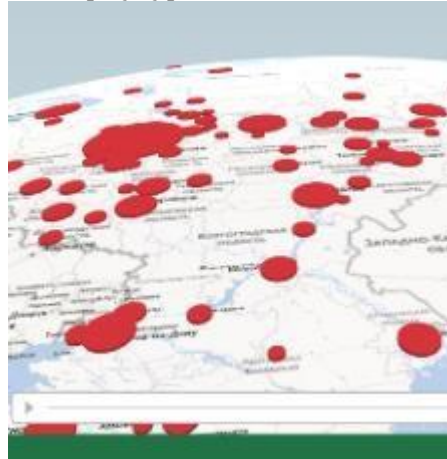
If **Data** has been replenished with new rows, you also need to tell GeoFlow about this.

To do this, select any cell in the table with data. Go to the tab **Insert** to the group **GeoFlow**. Click on the arrow below the button **Map**, in the drop-down menu select **Add Selected Data to GeoFlow**.



Changing the display of data

You can choose from three different data display types: bar, bubble, and thermal.



To change the display type, in the right panel in the lower window, select from the drop-down list Chart Type, one of three graphs.

Check or drag fields to areas below:

CHART TYPE

Column

Column

Bubble

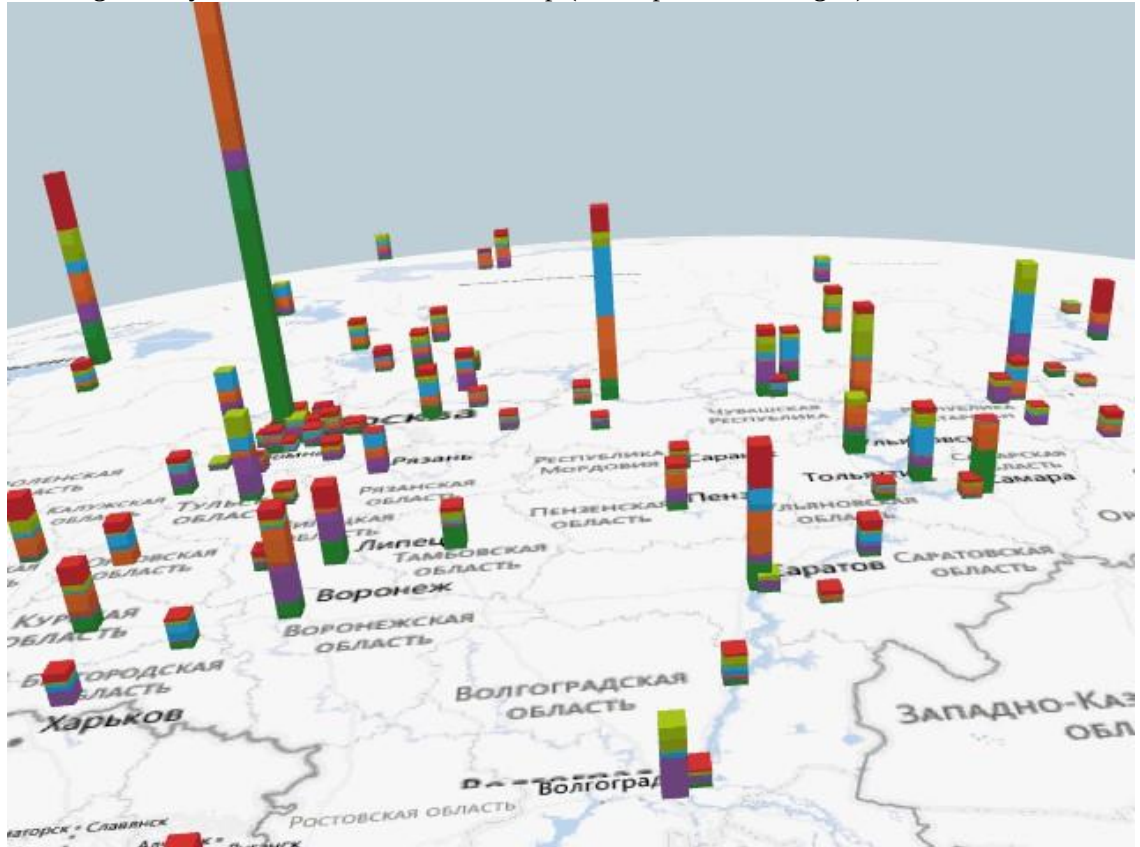
HeatMap

CATEGORY

Visualizing data over time

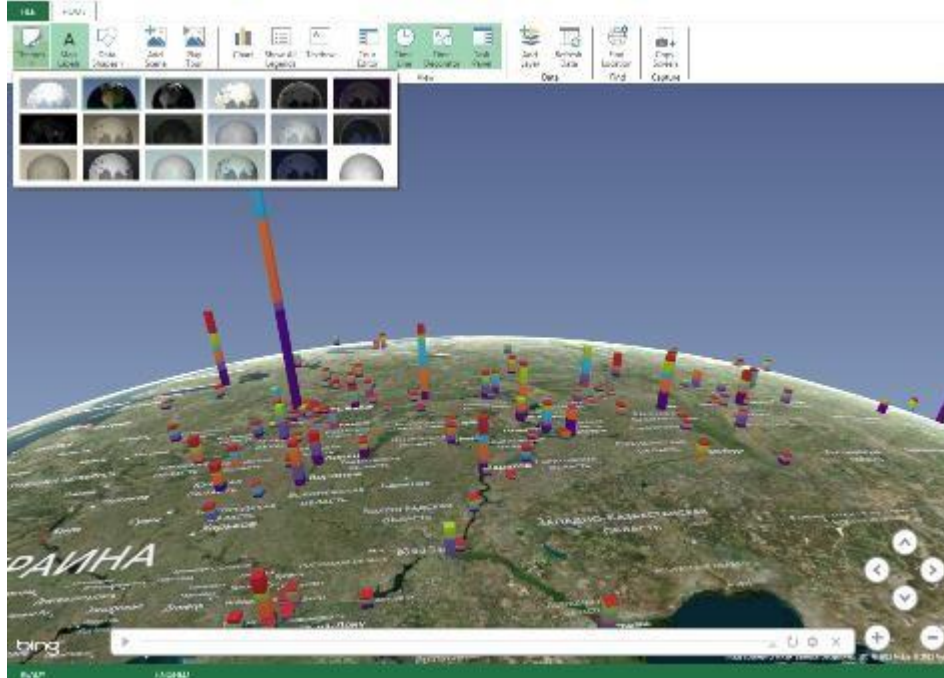
You can see how your data changes over time by clicking the button Play on the timeline,

located at the bottom of the screen. GeoFlow will start displaying data from the very first day for which data exists and gradually accumulate it in a certain step (the step can be changed).



Card styles

GeoFlow offers several map views. Themes are available in the Home in the groupMap.



Some themes contain basic road maps, some contain high-precision satellite images. Depending on your needs, you can choose the most suitable map theme.

Equipment and materials

To perform the laboratory work, it is recommended to use a personal computer with the following characteristics: 32-bit (x86) or 64-bit (x64) processor with a clock frequency of 1 GHz or higher, RAM - 1 GB or higher, free disk space - at least 1 GB, DirectX 9 graphics device. Software: operating system WINDOWS 7 and higher, GeoFlow.

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Exercise:

1. Visualization with GeoFlow
2. Updating and adding data to GeoFlow
3. Changing the data display
4. Visualizing data over time
5. Card styles

Contents of the report and its format

- a brief outline of the theoretical basis; a
- description of the main stages of the work.

Test questions:

1. Visualization with GeoFlow
2. Updating and adding data to GeoFlow
3. Changing the data display
4. Visualizing data over time
5. Card styles

A list of literature recommended for use on this topic.

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RECOMMENDED REFERENCES

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[Electronic resource].
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URL:

MINISTRY OF SCIENCE AND HIGHER EDUCATION
OF THE RUSSIAN FEDERATION
FEDERAL STATE AUTONOMOUS EDUCATIONAL INSTITUTION
OF HIGHER EDUCATION
"NORTH CAUCASUS FEDERAL UNIVERSITY"

METHODOLOGICAL INSTRUCTIONS

on organizing independent work on the subject "Data
Visualization / Data
visualization»
for master's students in the field 09.04.03 "Applied Informatics" focus
(profile) "Management
knowledge"

Stavropol
2022

Introduction

Knowledge management is one of the most popular concepts of modern organizational management, which is closely related to such concepts as "knowledge worker", "knowledge-based economy", "learning organization". The development of this concept began in the 1980s of the 20th century, and continues vigorously to this day. The concept of "knowledge management" itself was introduced in 1986 by Karl Wiig, and at the turn of the 80s and 90s, several developments in the field of knowledge management appeared at once

- the Scandinavian, Japanese and American approaches.

1. General characteristics of independent work of a student studying the discipline Data visualization – forming a set of common competencies of the future master's degree in the field of study 09.04.03

"Applied Informatics".

2. Objectives of mastering the discipline:

- to develop in graduate students an understanding of the principles and skills of preliminary data processing for subsequent visualization;
- to form theoretical and practical foundations for the application of visualization techniques for various types and structures of data;
- to form the theoretical foundations and practical skills of applying visual analysis techniques to detect hidden patterns in data;
- to develop skills in designing and programming data visualization systems.

3. Formed competencies- UK-3; UK-5

4. Schedule for completing independent work

No. p/p	Chapter disciplines	Week semesters	SRS in hours	Forms of the current control academic performance
1	Lab 1. Basic methods of working with PowerView	1.	7	Interviews on course topics
2	Lab 2. Main tasks of PowerView development	2.	7	Interviews on course topics
3	Laboratory work 3. Charts and other presentation elements in PowerView	3.	7	Interviews on course topics
4	Laboratory work 4. Filtering in PowerView	4.	7	Interviews on course topics
5	Lab 5. Highlighting Data in PowerView	5.	7.5	Interviews on course topics
6	Lab 6. Slices in PowerView	6.	8	Interviews on course topics
7	Lab 7. Hierarchies and sorting in PowerView	7.	8	Interviews on course topics
8	Laboratory work 8. Images in PowerView	8.	8	Interviews on course topics
9	Laboratory work 9. Visualize Geographic Data with the Power Map Add-in	9.	8	Interviews on course topics
TOTAL			67.5	

5. Methodological recommendations for studying theoretical material

At the first stage, it is necessary to familiarize yourself with the working program of the discipline, which examines the content of the topics of the lecture course, the relationship of lecture topics with practical classes,

topics and types of independent work. For each type of independent work, specific reporting forms are provided.

Lab 1. Basic methods of working with PowerView Task:

Customize PowerView report properties using PowerPivot.

1. Select standard units
2. Set the default title, image and ID for each table
in the model
3. Determine how duplicate values will be handled
in PowerView reports
4. Hide tables, fields, and measures from PowerView report creators
5. Set the standard fields for the table that will be
be added to the report at the same time when you click on a table in PowerView.

Lab 2. Main tasks of PowerView development

1. Resize PowerView report to fit window
2. What do the icons in the field list mean?
3. Why are the chart icons unavailable?
4. Fields with row labels
5. Layout section
6. Viewing a PowerView report in SharePoint in reading mode and full screen mode
7. Overlapping and inserting elements on top of each other
8. Expanding the visual image of the report
9. Creating a duplicate field in the data model
10. Deleting a field

Lab 3: Charts and Other Presentation Elements in PowerView

1. Types of charts used in PowerView
2. Pie charts
3. Scatter and bubble charts
4. Graphs, bar charts and histograms
5. Line chart
6. Histogram
7. Maps
8. Matrices
9. Cards
10. Mosaic elements

Lab 4. Filtering in PowerView

1. Difference between view filters and visualizations
2. Visualization filters
3. View filters
4. Basic and advanced filters

5. Search in filters
6. Filter operation in a saved PowerView file
7. Cross filters
8. Line chart filtering matrix

Lab 5. Highlighting Data in PowerView

1. Adding a selection
2. Highlighting charts with mean aggregates

Lab 6. Slices in PowerView

1. The concept of a cut
2. Methodology for using a slice in PowerView
3. Difference between shear filtration and other types filtration

Lab 7. Hierarchies and sorting in PowerView

1. Loading and displaying PowerPivot data
2. How Calculations Work in PowerPivot
3. Introduction to DAX, measures
4. Complex calculations with calculate
5. Working with multiple tables
6. Linked and disconnected tables
7. FILTER vs CALCULATE

Lab 8. Images in PowerView

1. Time Intelligence
2. Iterators
3. Patterns:
4. Budgeting
5. Shopping cart analysis
6. Non-standard calendar
7. Performance
8. Creating reports in PowerView

Lab 9: Visualizing Geographic Data with the Power Map Add-in

1. Visualization with GeoFlow
 2. Updating and adding data to GeoFlow
 3. Changing the data display
 4. Visualizing data over time
 5. Card styles
-
6. Methodological instructions for preparing for the test

The credit procedure is not carried out as a separate control event; the assessment of the student's knowledge occurs based on the results of the current control.

7. Methodological materials defining procedures
assessment of knowledge, skills, abilities and (or) experience of activities characterizing the stages of formation of competencies

Current assessment of master's degree students by teachers being carried out conducting practical classes in the discipline, based on the results of an oral survey during practical classes and the completion of independent work assignments.

For independent study, the master's student must prepare answers to interview questions, complete additional assignments on the topic of the lesson, study additional scientific sources, and make a summary of the article (if provided). The student receives the maximum grade if he actively participates in the work, has a command of the material, can express his thoughts logically and clearly, creatively approaches the solution of the main issues of the topic, and demonstrates independent thinking.

The grounds for reducing the assessment are:

- poor knowledge of the topic and basic terminology;
- lack of ability to apply theoretical knowledge to solve problems practical tasks.