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# CREATE DATA CUBE WITH MS EXCEL

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## ABOUT ARTICLE

**Key words:** OLAP, OLAP systems, database, user applications, OLTP, multidimensional data, DBMS, Power Pivot, pivot table, visualization.

**Abstract:** This article provides information about the research done in creating the data cube. Methods for creating a data cube and learning algorithms are also considered.

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## INTRODUCTION

With the rapid development of computer technology and the popularity of electronic devices such as computers and mobile phones, the Internet has joined all aspects of people's lives. People spend a certain part of their lives in social networks, and an unimaginably large amount of human information is also collected in this Internet network. So, who will sort these and who will find the information we need in seconds? Never heard of Big Data before? I'm sure you've heard. In the last 4-5 years, everyone is talking about big data. But do you really know what big data is and how it affects our lives?

The amount of data on planet Earth is growing exponentially for many reasons. Various sources and our daily activities generate a lot of information. With the invention of the Internet, the whole world went online, everything we do leaves a digital footprint. Smart-objects operate online, the rate of data growth increases rapidly. Major sources of big data are social media sites, sensor networks, digital images/videos, cell phones, purchase transaction records, websites, medical records, archives, military surveillance,

e-commerce, sophisticated scientific research, and more. All these data will be around a certain quintillion bytes. In 2020, the size of data was around 40 zettabytes, which is equivalent to seventy-five times every grain of sand on the planet.

So how can humanity manage such large data? One of the OLAP technologies, presentation of data in the form of a multi-dimensional cube, is used to overcome such problems of Big Data.

## RESEARCH METHODOLOGY

The scientific works of scientists, researchers and engineers within the subject, and the educational literature created in this research were systematically studied. Their conclusions and opinions were comparatively analyzed and the data processed.

## ANALYSIS AND RESULTS

OLAP is a real-time big data analysis tool. OLAP systems are based on multidimensional data processing arrays. The elements of OLAP systems are as follows:

1) Database

2) OLAP systems

3) User applications

The real essence of OLAP is that the initial data for data analysis is presented in the form of a multidimensional cube, and it is provided with the ability to optionally manage it and get reports of the necessary data parts. The simplest way to condense the data in the form of a cube is to connect the tables together in the Ms Excel Office program. In this case, we will create an offline cube. For this, the PivotTable program must be connected to Ms Excel on the computer.

To create an offline cube file, we use an offline cube generator to select a subset of data from an OLAP database, and then save that subset. The report does not have to include all fields, it does not have to be entered into a file, and you can select any size and data fields available in the OLAP database. To minimize file size, you can enter only the information you want to display in the report. All elements are also stored for the offline file, which can be entered into the property fields available in the database for those elements.

OLAP databases are designed to handle large amounts of detailed data, so a

server-based database can take up significantly more space than is available on a local hard drive. If you select a large amount of data for an offline data cube, you may run out of disk space. The following approach will help you reduce the offline cube file size. Free up disk space or select another disk Before saving the cube file, delete unnecessary files from the disk or save the file to a network drive. Consider how you can reduce the amount of data included in the file so that the file contains all the information needed for a PivotTable or PivotChart report.

In general, every professional knows what OLAP is today. At least the concepts of "OLAP" and "multidimensional data" are firmly connected in our minds.

The term OLAP is closely related to the term Data Warehouse. "A data warehouse is a collection of domain-specific, time-bound, and immutable data to support the management decision-making process."

Data in the warehouse comes from operational systems (OLTP systems) designed to automate business processes. In addition, the repository can be supplemented with external sources, for example, statistical reports.

Why build data warehouses - after all, they contain redundant data that already "lives" in databases or files of operating systems? The answer can be short: it is impossible or very difficult to directly analyze the data of operating systems. This is due to various reasons, including data fragmentation, storing them in different DBMS (Data Base Management System) formats and in different "corners" of the corporate network. But even if all the data in the enterprise is stored in a central database server (which is very rare), the analyst hardly understands their complex, sometimes confusing structures. The author has a rather sad experience of trying to "feed" hungry analysts with "raw" data of operating systems - it turned out to be "too heavy" for them.

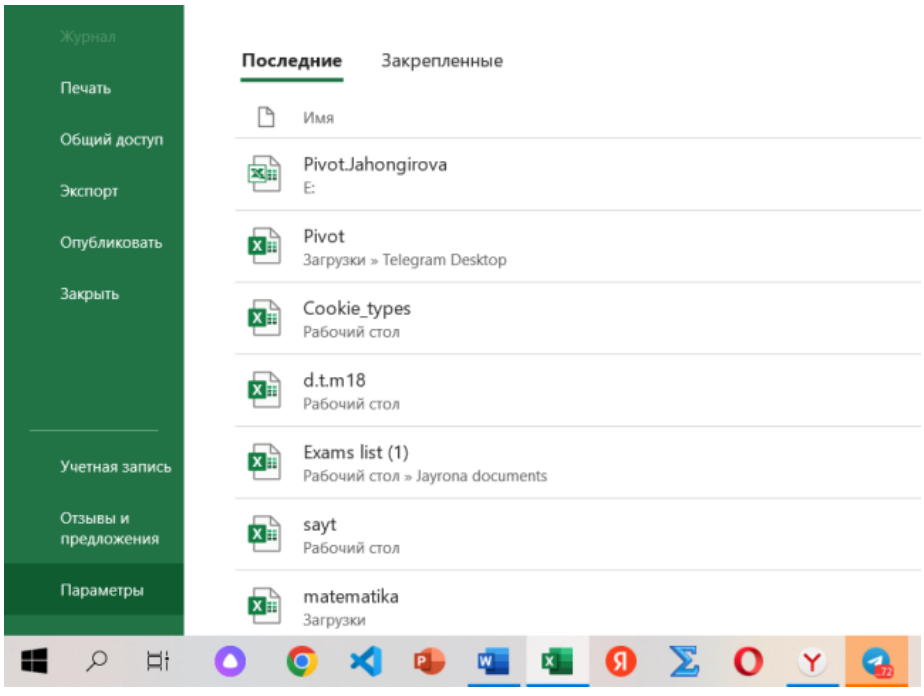



**Figure 1. MS Excel program file menu.**

To connect an offline cube file to an OLAP server database, follow the steps below. We connect the offline cube file to the OLAP server database.

Place the Pivot Table on the computer and activate it by entering the Excel program.

For example, we create a data cube for a chain of stores, for which we need to create several tables with data entered in advance. To connect these prepared tables to each other, we use the Pivot Table menu in Excel. The data entered in each table is marked with a corresponding ID number.

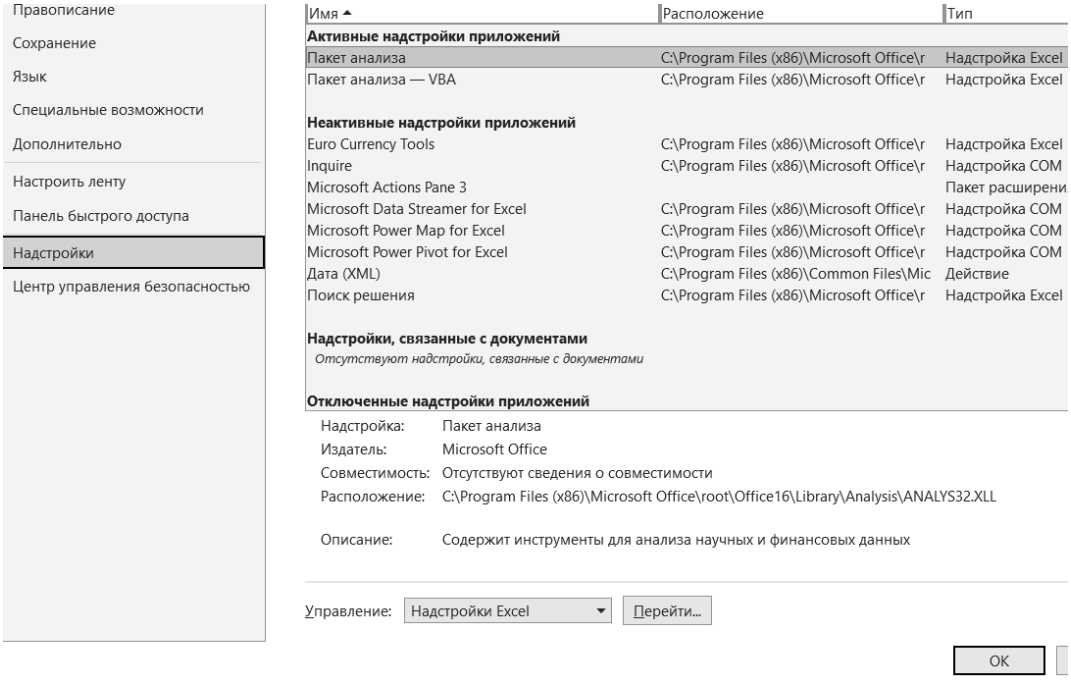



**Figure 2. MS Excel program settings section.**

Entering our main table, select the Power Pivot menu from the menu bar and select the "Manage" command(“Управления”).

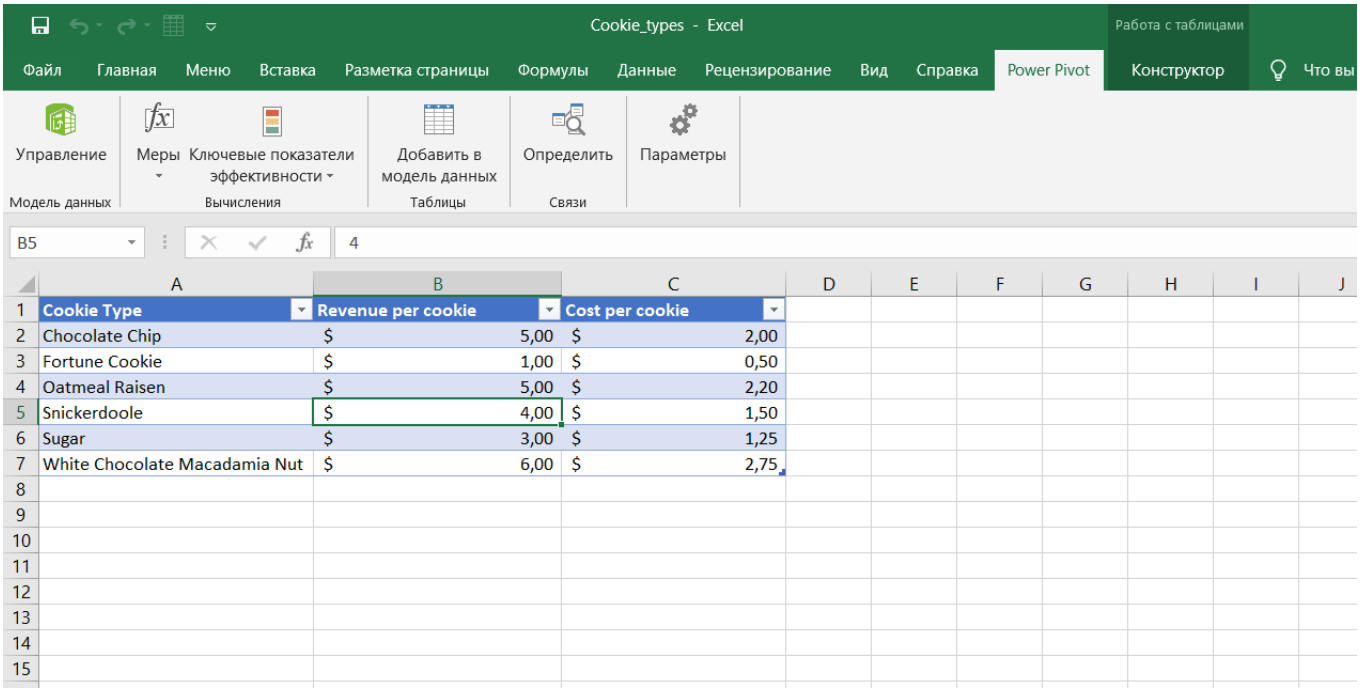



**Figure 3. Power Pivot application menu.**

As a result, the following window will appear, and from this window we will select the command “Из других источников”, that is, "from other sources".

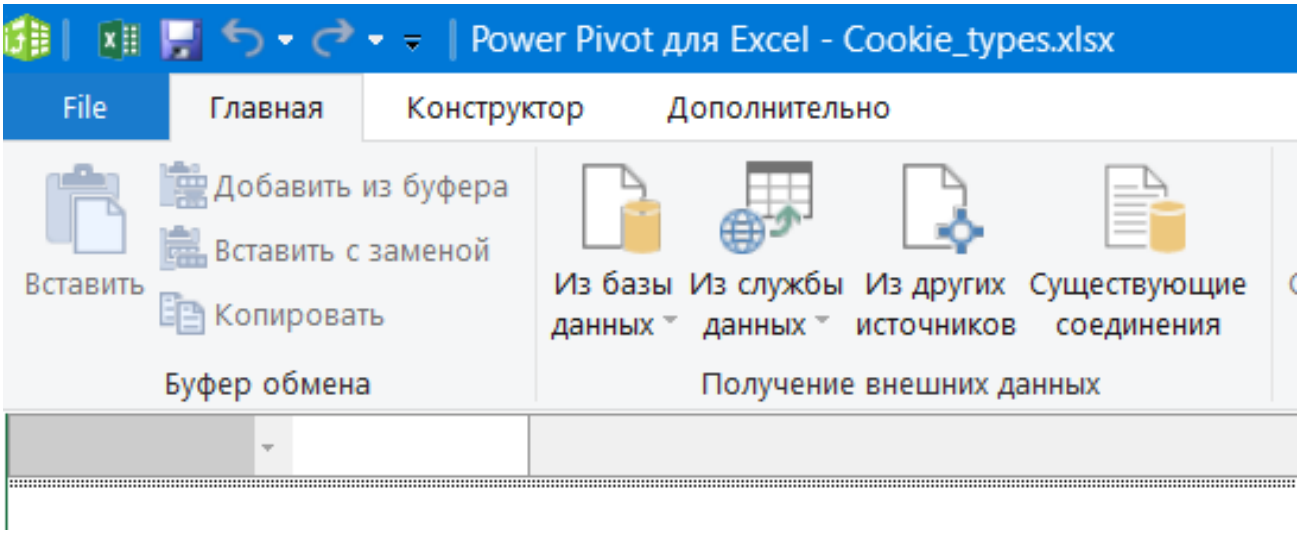



**Figure 4. Connect an external data source in Power Pivot.**

The resulting window contains various commands, from which we select the item to import data from an Excel file and click the “Далее” command.

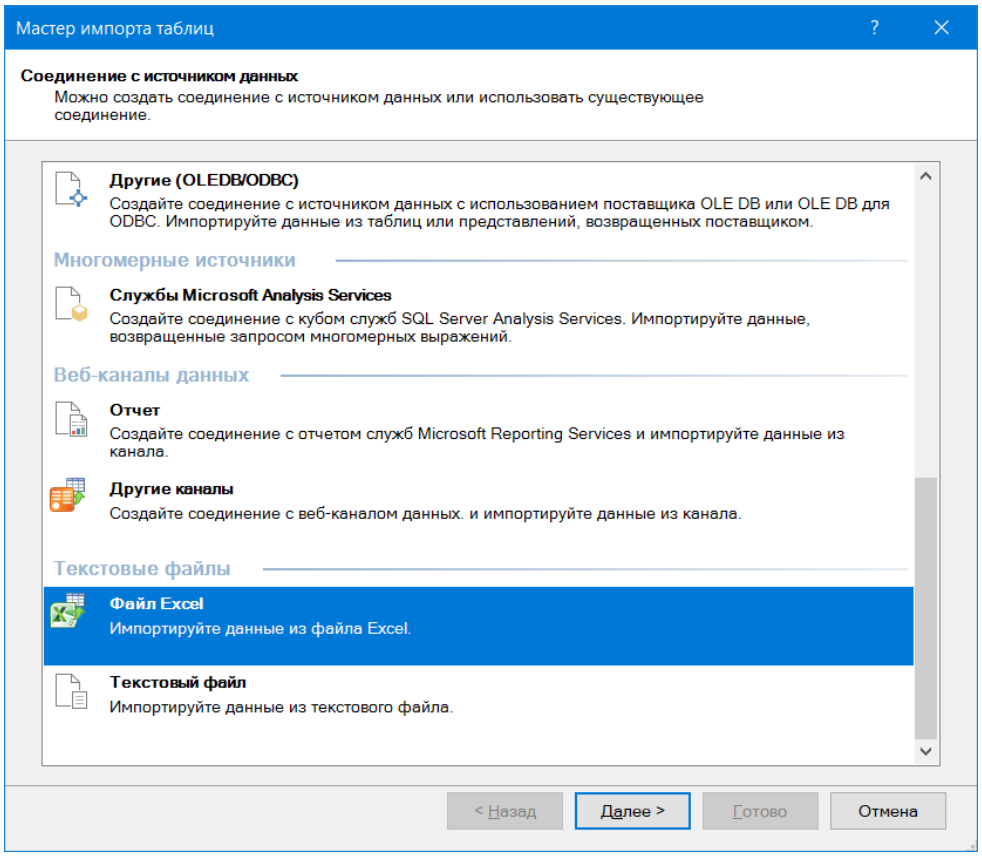



**Figure 5. Choose a form to import external data into Power Pivot.**

From the resulting window, press the “View”( “Обзор”) button, select the Excel file that we need to connect and perform the actions in the sequence specified below.

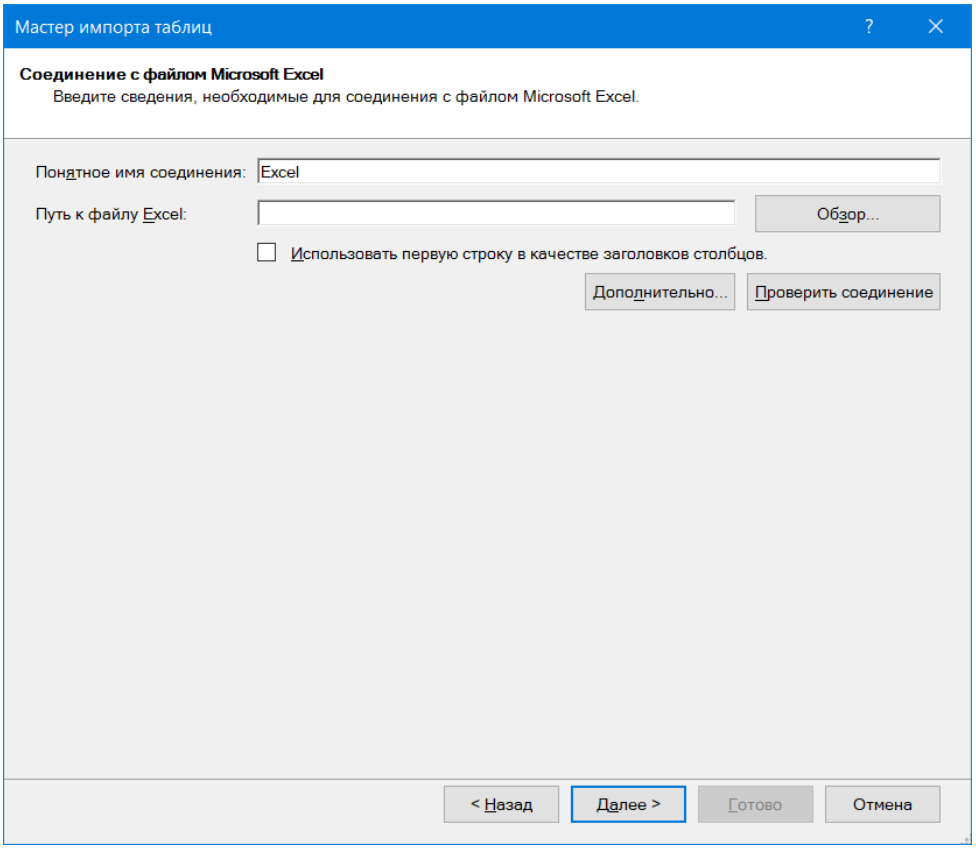



**Figure 6. Upload the .xls file from the computer memory.**

After clicking the “OK” button in the next created window, our work is completed, that is, the second table is connected. The same cycle is performed to connect the third table. By performing the same steps, we can connect the Orders and Customers table to the Products table, which is the main table.

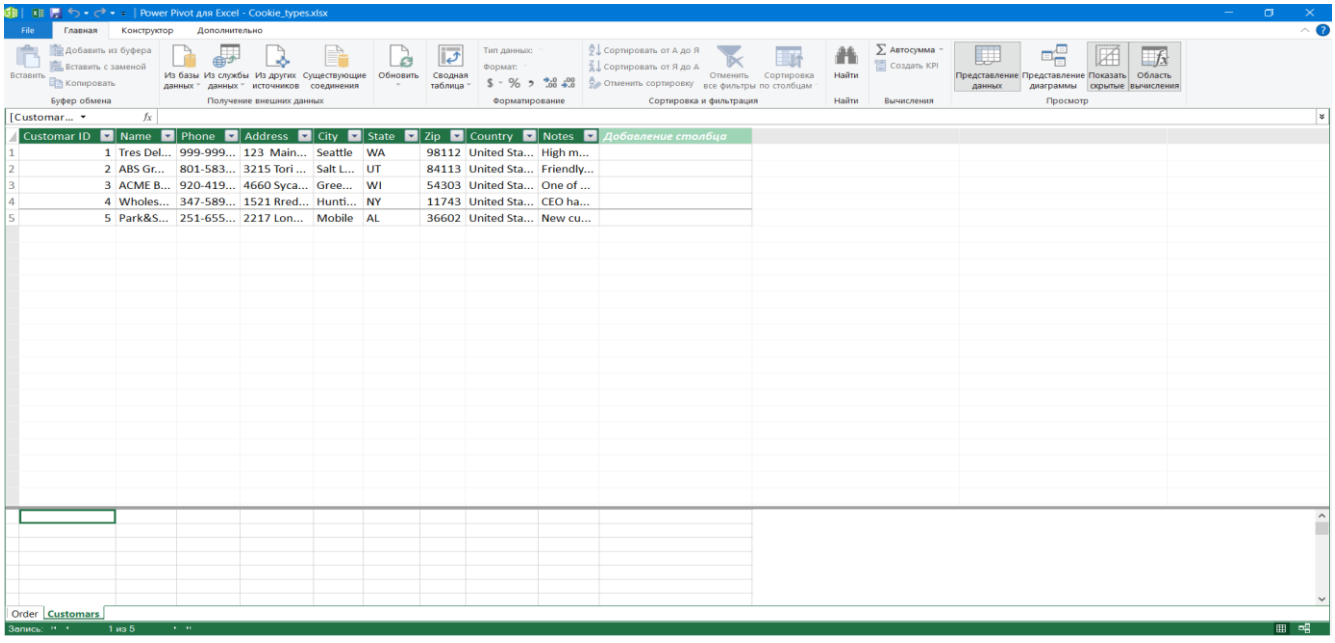


**Figure 7. View of an external file uploaded to Power Pivot.**

After connecting all the tables through the Power Pivot menu, enter the main Products table and select the “Manage”(“Управления”) command from the Power Pivot menu. From the new window that appears, select the “Представление диаграммы” command. Then we will have the following window. We connect the data ID in each column accordingly.

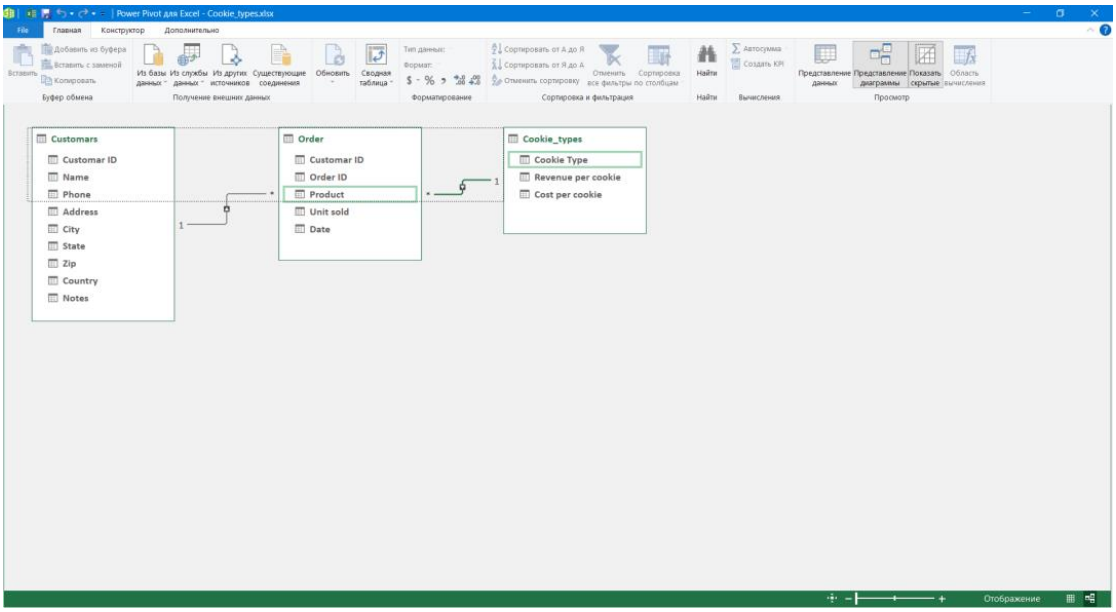
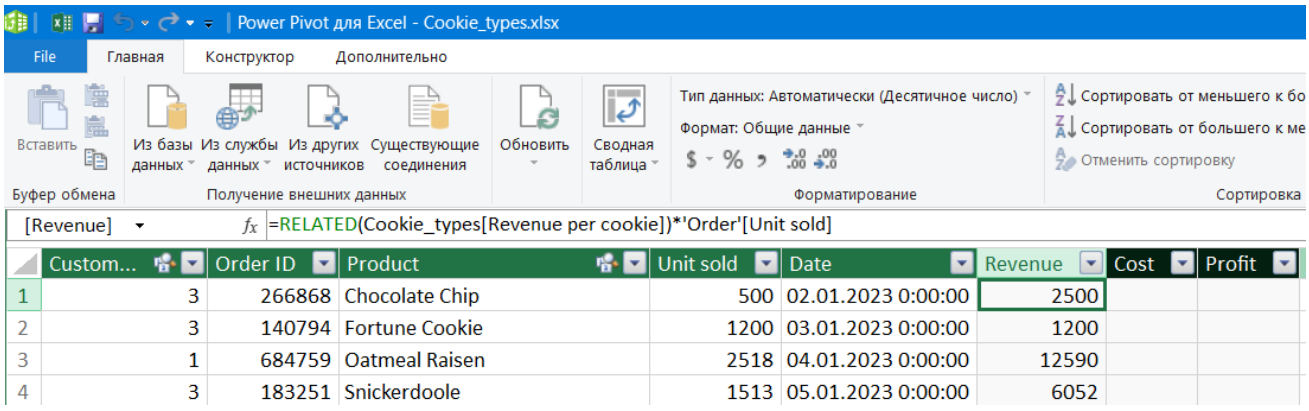



**Figure 8. Connecting external files uploaded to Power Pivot.**

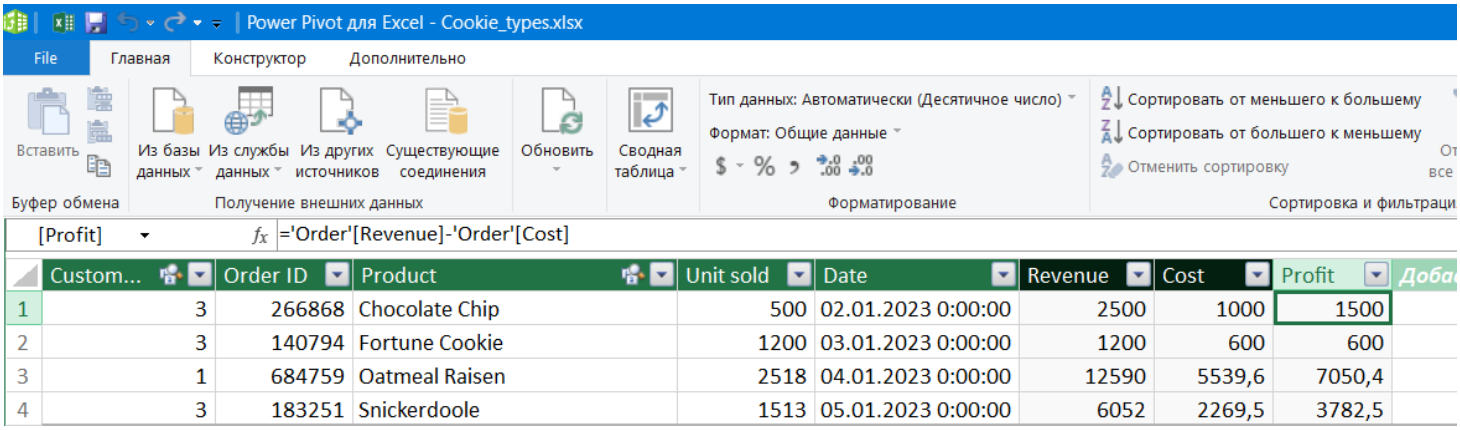
After performing these actions, additional columns will be added to the "Order" order table. Now we need to enter a special mathematical formula in the "Revenue" column. This formula shows how much profit is received from each product.




| | Custom... | Order ID | Product | Unit sold | Date | Revenue | Cost | Profit |
|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 266868 | Chocolate Chip | 500 | 02.01.2023 0:00:00 | 2500 | | |
| 2 | 3 | 140794 | Fortune Cookie | 1200 | 03.01.2023 0:00:00 | 1200 | | |
| 3 | 1 | 684759 | Oatmeal Raisen | 2518 | 04.01.2023 0:00:00 | 12590 | | |
| 4 | 3 | 183251 | Snickerdoole | 1513 | 05.01.2023 0:00:00 | 6052 | | |

**Figure 9. Add a new field to the uploaded file.**

In the same way, we enter a special mathematical function formula in the "Cost" and "Profit" columns and it will automatically calculate for us. At the bottom of the table, we will enter a formula that calculates the total profit and the total number of buyers.




| | Custom... | Order ID | Product | Unit sold | Date | Revenue | Cost | Profit |
|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 266868 | Chocolate Chip | 500 | 02.01.2023 0:00:00 | 2500 | 1000 | 1500 |
| 2 | 3 | 140794 | Fortune Cookie | 1200 | 03.01.2023 0:00:00 | 1200 | 600 | 600 |
| 3 | 1 | 684759 | Oatmeal Raisen | 2518 | 04.01.2023 0:00:00 | 12590 | 5539,6 | 7050,4 |
| 4 | 3 | 183251 | Snickerdoole | 1513 | 05.01.2023 0:00:00 | 6052 | 2269,5 | 3782,5 |

**Figure 10. Add a new field to the uploaded file.**

After performing these actions, our tables will be connected to each other in the form of a cube, and we can use these tables at once, displaying all the information in one window. To do this, select the Pivot table("Сводная таблитца") command in the Power Pivot menu and enter the table data given there in the fields on the left side of the window.

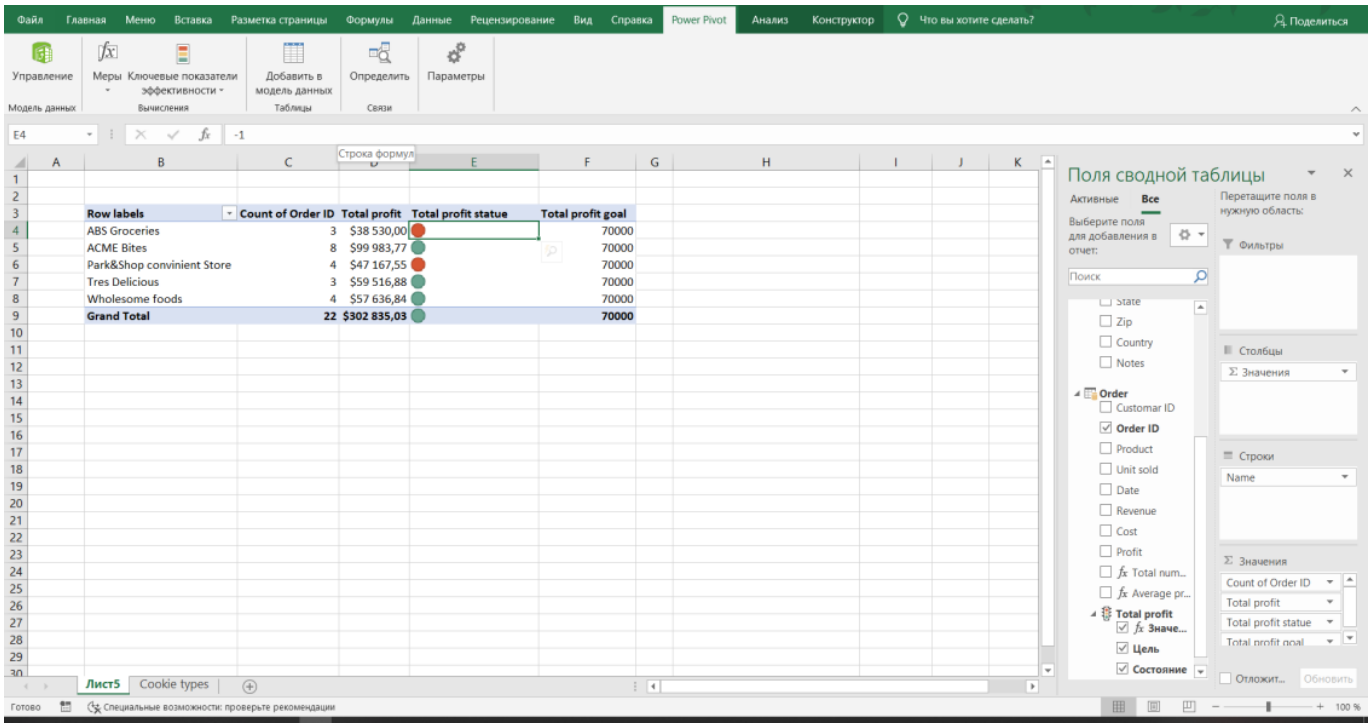



**Figure 11. Representation of a data cube loaded with a pivot table.**

As a result, the above table is created. As you can see, in this field we can see all the elements of the excel files that we originally created, and we can also highlight them by a certain limit and their status by colors depending on the indicators in the field. We can also represent these data in a graphical form, which is called data visualization in science. For example, in chart view:

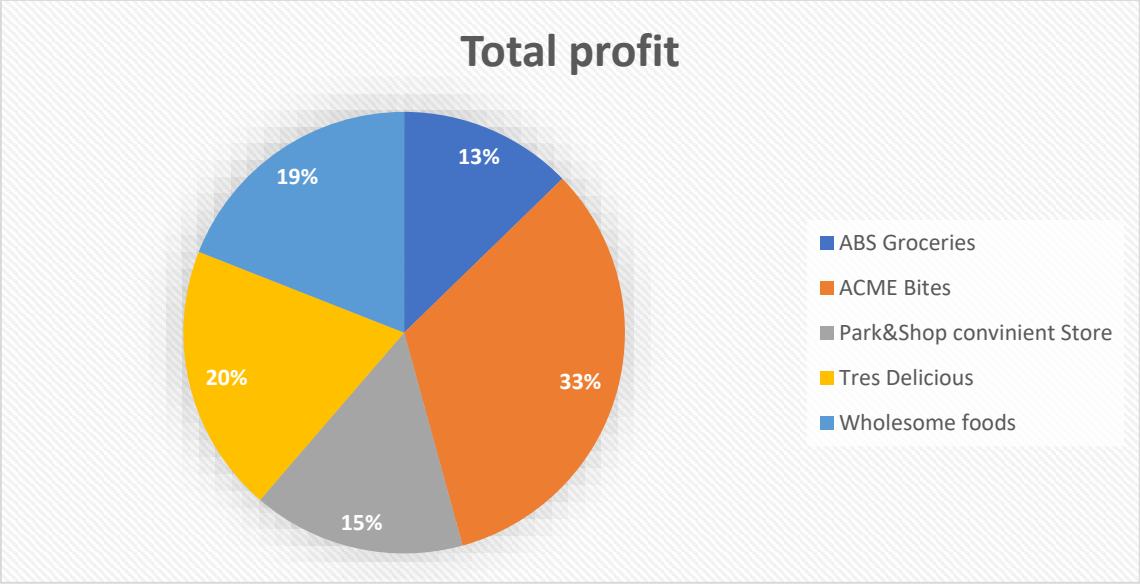
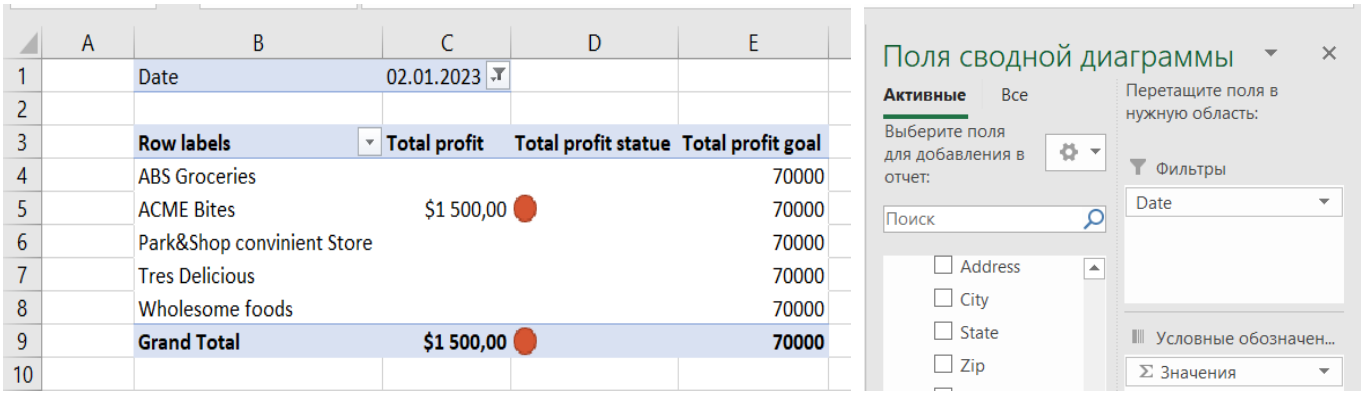



**Figure 12. Visual representation of the created data cube.**

In this case, we haven't applied any filters yet. If we want to sort it by "Date", we need to put this same field in the part called “Филтры”. As a result, by selecting one of the dates, we can see the process performed on this date:



| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | | Date | 02.01.2023 | | |
| 2 | | | | | |
| 3 | | **Row labels** | **Total profit** | **Total profit statue** | **Total profit goal** |
| 4 | | ABS Groceries | | | 70000 |
| 5 | | ACME Bites | $1 500,00 | | 70000 |
| 6 | | Park&Shop convinient Store | | | 70000 |
| 7 | | Tres Delicious | | | 70000 |
| 8 | | Wholesome foods | | | 70000 |
| 9 | | **Grand Total** | **$1 500,00** | | **70000** |
| 10 | | | | | |



**Figure 13. Add a field to a filter area in a pivot table.**

## CONCLUSION

In short, this function of Ms Excel is very convenient for creating OLAP cubes by combining several files and allows them to be graphically represented. Usually, this technology is very useful for working with big data in scientific research or large commercial companies, and it is also advantageous because it can represent a number of data sets in one place.

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