

Using the power query system for processing and data mining SAP ERP

*Alexey Tkachenko**, and *Mikhail Chernyshov*

Kaluga State University n.a. K.E.Tsiolkovski, 248023 Kaluga, Russia

Abstract. The article discusses the use of an intelligent Power Query system for processing data from SAP ERP. When used with SAP ERP data, Power Query can greatly simplify the data analysis process, as well as improve the accuracy and reliability of results. The article provides an overview of the main features of Power Query and how they can be used for data processing in conjunction with the SAP ERP system. It highlights the benefits of using Power Query, including speeding up data processing time, improving data accuracy, and the ability to easily exchange and reuse data processing procedures. Using Power Query to process and analyze bank statements via SAP ERP provides many advantages. Power Query's powerful data processing and transformation capabilities enable organizations to analyze their financial data quickly and accurately, making it easier to identify trends, improve decision-making and stimulate business growth. In addition, the integration of Power Query with SAP ERP provides organizations with a centralized representation of financial data in real time, which allows them to make informed decisions and optimize their activities. Using Power Query to analyze bank statements can also help organizations reduce manual data processing and minimize the risk of errors, increasing the accuracy and reliability of financial information. In general, Power Query offers a powerful solution for organizations seeking to optimize financial analysis processes and ensure business success.

1 Introduction

Intelligent systems are computer systems designed to perform tasks that usually require human—level intelligence. These systems are able to solve complex problems, make decisions, and even learn from their own experience. One of the key characteristics of intelligent systems is their ability to adapt flexibly. They are able to continuously improve their productivity by analyzing data and adjusting their algorithms accordingly. This makes them very effective at performing a wide range of tasks, from speech and image recognition to predicting results, and optimizing business processes. Another important aspect of intelligent systems is their ability to process huge amounts of data. This makes them well suited for applications such as data analysis, where they can quickly identify patterns and make predictions based on this information. Intelligent systems are increasingly being used in a wide variety of industries, from healthcare to finance. For example, in healthcare, they are used to improve patient outcomes by analyzing patient data and providing personalized

* Corresponding author: tkachenkoAL@tksu.ru

recommendations. Finance and intelligent systems and technologies have had a significant impact on the work of financial departments in recent years, as they are used to optimize investment strategies and minimize risks. The introduction of advanced technologies, such as Excel Power query systems, has significantly increased the efficiency and accuracy of financial transactions.

Excel Power Query is a data connection tool that allows users to access and manage data from various sources. This is especially useful for finance departments because it allows them to extract, transform and upload data quickly and easily. The tool automates the data retrieval process, which eliminates the need for manual data entry and reduces the risk of errors. One of the key advantages of using Excel Power queries in the work of the finance department is the ability to simplify the data analysis process. By integrating data from multiple sources such as bank statements, invoices and receipts into a single dataset, the finance department can quickly and easily analyze data to make informed decisions. This saves time and reduces the risk of errors in financial statements. Another advantage of the Excel Power query is its ability to automate repetitive tasks. For example, it can be used to schedule automatic data updates, which reduces the time spent on manual data updates and ensures that the finance department will always have access to the latest data. This allows the finance department to focus on more strategic tasks, such as data analysis and informed decision-making. In addition, the Excel Power query improves the accuracy of financial statements by eliminating the need for manual data entry. This reduces the risk of errors and increases the reliability of financial data. The tool also provides robust data security features such as data encryption and password protection to ensure the confidentiality and integrity of sensitive financial data.

SAP ERP (Enterprise Resource Planning) is a software application developed by SAP to manage the main business processes of an organization. It is a comprehensive solution that covers a wide range of business functions, including finance, HR management, procurement, sales and much more. SAP ERP integrates all the data and processes of an organization into a single centralized system, allowing organizations to make informed business decisions, rationalize their activities and optimize business processes. The SAP ERP program provides a number of tools and modules that help organizations manage their activities, including financial accounting, supply chain management, production planning, sales and distribution. With powerful analytical capabilities and real-time reporting, SAP ERP provides organizations with a comprehensive view of their activities, allowing them to make better decisions and stimulate business growth.

2 Research methodology

Power Query provides several useful statistical tools that can help in analyzing data obtained from SAP ERP:

- 1) Summary statistics: including quantity, sum, average, minimum, maximum and standard deviation of data;
- 2) Filtering: deleting unnecessary data according to certain criteria;
- 3) Grouping: Creating subsets of data based on one or more columns;
- 4) Merging: Combining data from multiple sources into one dataset;
- 5) Pivot Tables: Summarize and analyze data by converting it to another format;
- 6) Conditional formatting: visual highlighting of data based on certain conditions;
- 7) Data type detection: Automatic detection and conversion of data types (for example, text to date).

These statistics allow you to efficiently and efficiently analyze data in Power Query, which allows you to make more informed business decisions. One example of the implementation of Power Query in the activities of the finance department working with SAP

ERP is the integration of data from several sources (for example, bank statements) into a single financial report.

To demonstrate this example, we will create an analog of statements from 3 different banks (Tables 1-3) generated in the SAP ERP system after the initial download from client banks:

Table 1. Bank Statement.

Date	Loan amount	Debit amount	Bank	Purpose of payment
03.03.23	100		1	Spare parts
03.03.23	2000		1	Spare parts
03.03.23	50000		1	Outsourcing
03.03.23		200	1	Materials
03.03.23		15000	1	Outsourcing

The statements presented in Table 2 and Table 3 are loaded from other banks, which affects the position of the columns of the uploaded tables, which complicates processing.

Below is one of the possible ways of processing bank statements uploaded from SAP ERP using Power Query (Figure 1):

1) Open Microsoft Excel and select the "Data" tab.

Table 2. Bank Statement.

Date	Purpose of payment	Loan amount	Debit amount	Bank
03.03.23	Casting	9900,9	1	2
03.03.23	Casting	10000		2
03.03.23	Insurance	88321,25	3123	2
03.03.23	Transportation services		59590	2
03.03.23	Transportation services		91993	2

Table 3. Bank Statement.

Purpose of payment	Loan amount	Debit amount	Bank	Date
Payment under contract No. 0101	100		3	03.03.23
Payment under contract No. 0101	2000		3	03.03.23
Payment under contract No. 0101	50000		3	03.03.23
Payment under contract No. 0101	55000		3	03.03.23
Payment under contract No. 0101	103030		3	03.03.23

2) Click on "Get data" and select "From file" and then "From Workbook" (Figure 1).

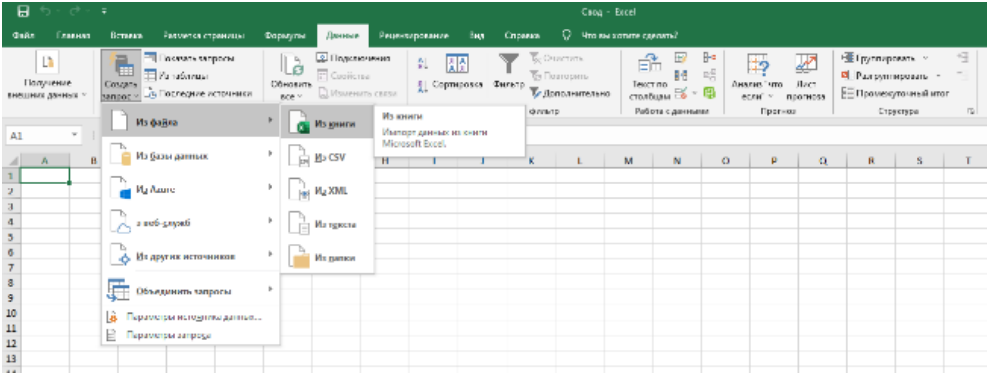


Fig. 1. The Getting data from a workbook.

3) Select the first bank statement and click "Upload" to import data into Power Query (Figure 2).

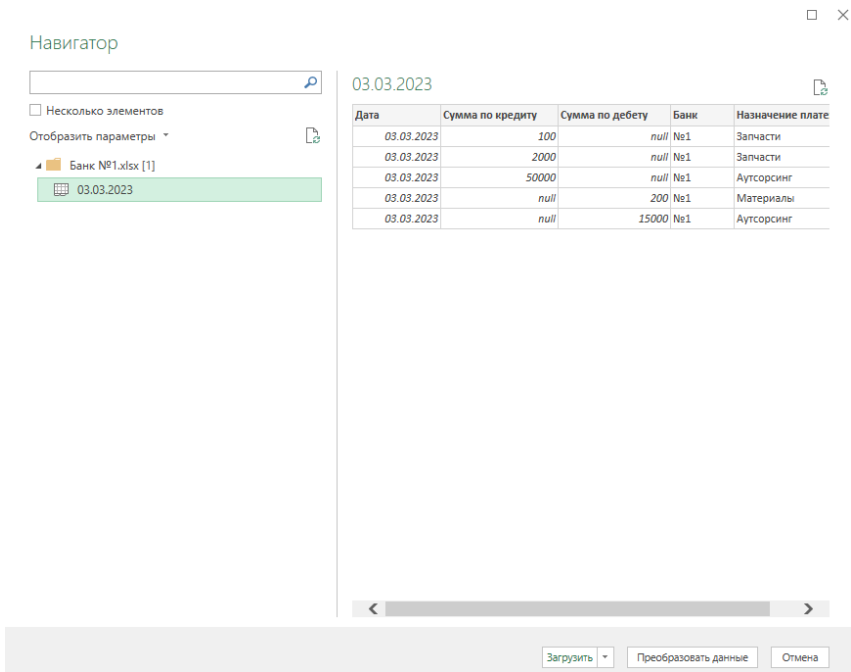


Fig. 2. Getting data from a workbook.

4) Go to the tab "View", "Advanced editor". Convert the request into a function using the command (filename)=> in order to, by analogy, request data from other bank statements located in the same folder (Figures 3, 4).

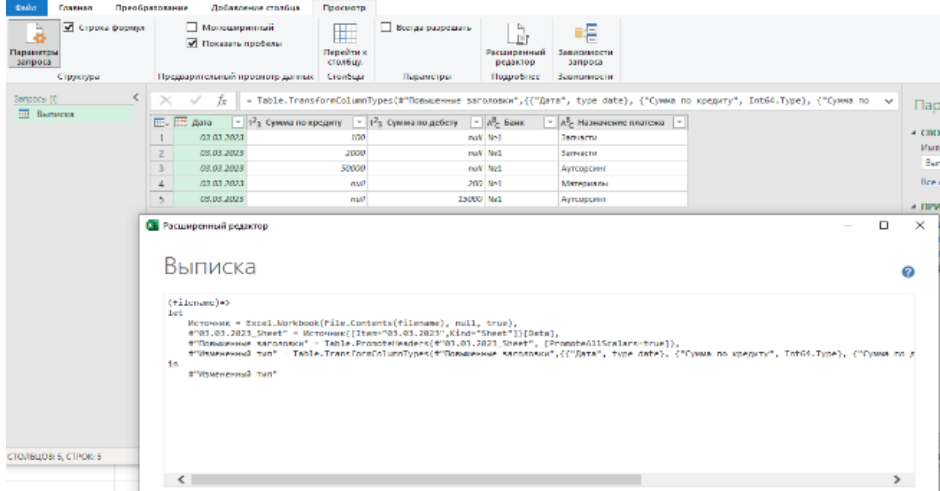


Fig. 3. Converting a request into a function.

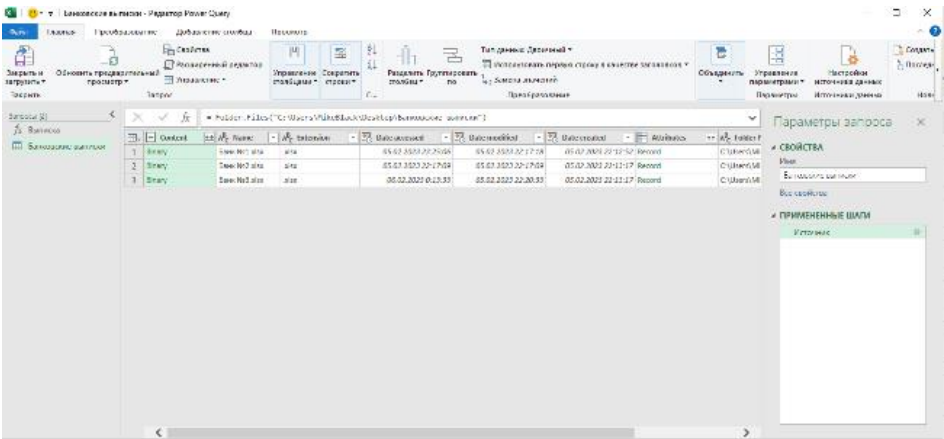


Fig. 4. Combining queries.

- 6) Add a custom column, prescribe the function written on the first statement, and apply it to all files in the folder (Figure 5).
- 7) Expand the custom column. We use Power Query data transformation functions such as "Row Filter", "Column Deletion" and "Value Replacement" to clean and transform data as needed. Finally, click "Close and Upload" to upload the processed data to an Excel sheet for further analysis and reporting (Figure 6).

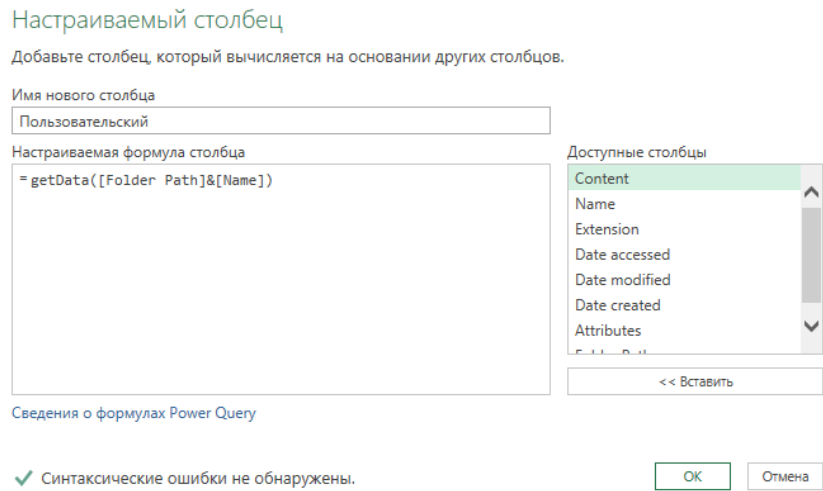


Fig. 5. Applying a function to a shared folder.



Fig. 6. Uploading summary information.

It can be seen that 16 lines were loaded, no errors occurred. The statements were combined on one sheet, while the number of statements after the written query function can

be freely increased. Columns that have the same name, but were in different order were also brought to the same format. Next, you can apply filters on the necessary columns, or use the request function for a new sheet to sort the information. If the data in the folder changes, you need to go to the "Data" tab and perform the "Update all" function.

This development allows you to get rid of manual processing of statements from SAP ERP, transferring them to Excel for further analytics, as well as to make this process faster and eliminating human errors. In the example, a small amount of data was used, but when it comes to processing a large amount of Big Data, it is immediately clear how relevant this topic is for an enterprise where it was done manually.

4 Results of the study

This is a basic example, and the exact steps may vary depending on the specific requirements and complexity of the data. In addition, in some cases, advanced features may be required, such as combining data from multiple sources and creating custom calculations.

Here are some additional features that can be obtained through the integration of Power Query with SAP ERP:

- 1) Updating and automating data: Power Query can automate the process of updating data from SAP ERP, ensuring constant relevance and accuracy of data.
- 2) Data Pooling and Consolidation: Power Query can be used to combine and consolidate data from multiple sources, including SAP ERP, into a single centralized dataset for analysis.
- 3) Advanced Analytics: Power Query provides a number of advanced analytics capabilities, such as data modeling, data visualization, and predictive analytics, which can be used to gain a deeper understanding of data from SAP ERP.
- 4) Custom Calculations: Power Query allows users to create custom calculations and formulas to get meaningful conclusions from SAP ERP data.
- 5) Data sharing and collaboration: Power Query allows organizations to easily exchange data from SAP ERP and collaborate with them, improving data exchange and collaboration within the organization.
- 6) Error Detection and Correction: Advanced error detection and correction features in Power Query help organizations minimize the risk of errors and improve the accuracy of data from SAP ERP.
- 7) Performance Optimization: Power Query provides tools to optimize the performance of data processing and analysis operations, allowing organizations to easily process large amounts of data from SAP ERP.

5 Conclusions

In conclusion, it should be noted that the use of Power Query for processing and analyzing bank statements through SAP ERP provides many advantages. Power Query's powerful data processing and transformation capabilities enable organizations to analyze their financial data quickly and accurately, making it easier to identify trends, improve decision-making and stimulate business growth. In addition, the integration of Power Query with SAP ERP provides organizations with a centralized representation of financial data in real time, which allows them to make informed decisions and optimize their activities. Using Power Query to analyze bank statements can also help organizations reduce manual data processing and minimize the risk of errors, increasing the accuracy and reliability of financial information. In general, Power Query offers a powerful solution for organizations seeking to optimize financial analysis processes and ensure business success.

References

1. D. M. Nazarov, *Informatika i obrazovanie* **2(311)**, 30 (2020)
2. A. Tkachenko, D. Lavrentev, M. Denisenko, V. Kuznetsova, *E3S Web of Conferences* **270**, 01003 (2021)
3. R. Brijder, J. Van Den Bussche, T. Weerwag, F. Geerts **44(4)**, 15 (2019)
4. M. H. Shakirov, *Jelektronnye biblioteki*. **24(4)**, 710 (2021)
5. G. G. Bondarenko, V. V. Andreev, A. A. Stolyarov, I. V. Chukhraev, A. L. Tkachenko, *Fizika i Khimiya Obrabotki Materialov* **4**, 94 (2001)
6. M. V. Aljab'eva, *Vestnik Belgorodskogo universiteta kooperacii, jekonomiki i prava*. **4(77)**, 302 (2019)
7. A. Tkachenko, D. Lavrentev, M. Denisenko, V. Kuznetsova, *SHS Web of Conferences* **141**, 05001 (2022)
8. S. A. Filin, *Dajdzhest-finansy* **26(1)**, 107 (2021)
9. D. G. Stepin, *Jekonomika i predprinimatel'stvo* **6(107)**, 1289 (2019)
10. M. A. Taitslin, *Proceedings of the Steklov Institute of Mathematics* **274(1)**, 273 (2011)
11. G. G. Bondarenko, V. V. Andreev, A. A. Stolyarov, A. L. Tkachenko, *Vacuum*, **67(3)**, 617 (2002)
12. H. C. Liu, *Lecture Notes in Computer Science* **6588**, 195 (2011)
13. D. Y. Choi, *Enhancing the power of Web search engines by means of fuzzy query* **35(1)**, 31 (2003)
14. A. L. Tkachenko, A. V. Mazin, M. M. Tyurina, *Proceedings of SPIE - The International Society for Optical Engineering* **12564** (2023)
15. V. Owei,, *Data & Knowledge Engineering* **36(2)**, 109 (2001)
16. H. Wang, Z. Guan, T. Yang, Y. Xu, *China Communications* **11(6)**, 89 (2014)
17. I. Beloglazov, K. Krylov, *Mathematics* **10**, 2959 (2022)
18. A. I. Beksultanova, A. L. Tkachenko, *Proceedings of SPIE - The International Society for Optical Engineering* **12564**, 1256410 (2023)
19. M. Mainguenaud, *Lecture Notes in Computer Science* **1929**, 511 (2000)
20. A. Shanneb, *International Journal of Education and Management Engineering* **10(5)**, 1 (2020)
21. R. R. Savchuk, *Managing of the Business Processes in Enterprise by Moving to SAP ERP System. IEEE Conference of Russian Young Researchers in Electrical and Electronic Engineering* (2019), pp. 1467-1470