

Analysis of factors and trends in the DBMS market in Russia

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Abstract. At the present stage of development of information systems, there is a growing need for reliable systems for storing and retrieving information. Each organization uses a significant amount of data in its activities, which makes it necessary to have a reliable DBMS, which will allow organizing the storage of a large amount of information with high speed of search and update. Due to the current political situation in Russia, there is a tendency towards import substitution of software, including DBMS. This situation became the main impetus for the development of domestic software. The development of domestic database management systems is also encouraged by government policy. All this led to an increase of popularity and number of developments of domestic software in general and DBMS in particular.

1 Introduction

Database management systems (DBMS) are one of the key elements of information systems, since data is currently an important strategic resource of an organization [1].

With the help of a DBMS, the database is kept up to date, the integrity of the database is ensured, and effective access to data is ensured for various categories of users.

DBMS solve the problem of storing, reading and changing data, ensuring its correctness, completeness and consistency, and also simplifying the mechanism for working with a huge amount of information. Using data types and additional constraints, you can be sure that the stored data will comply with the established rules, also due to the use of a transaction mechanism [2].

Thus, DBMSs are necessary in modern projects that require constant work with stored data, and the issue of choosing a DBMS is very important for companies with a high degree of information technology integration.

2 Methodology

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2.1 Main functions and types of DBMS

DBMS may have additional functions such as query optimization, accelerated search of stored data, and backup. Many modern DBMSs support restricting access to data based on the user's role. Moreover, with the help of modern relational DBMSs, the user can create complex database queries.

Database management systems allow you not only to create, change, delete various databases, but also to combine existing data according to certain criteria. A DBMS makes it possible to store data (including large amounts of data) in a structured form and in the required format, maintain its integrity and recover after failures. The DBMS also allows you to protect data from hacking using access control, when different groups of users have access to different volumes and segments of data. An important function of the DBMS is also the ability to download and sort data according to specified filters using SQL queries.

Table 1. Comparative analysis of various types of DBMS.

DBMS type	advantages	disadvantages
hierarchical	efficient use of computer memory and high speed of performing basic operations on data	slow access to data segments of lower levels of the hierarchy, clear focus on certain types of requests.
network	high efficiency in terms of memory consumption and operating speed	the rigidity of the database schema, as well as the difficulty for the user to understand and perform information processing
relational	ease of understanding by the user, flexibility of the database scheme in an already created application	high memory costs, relatively low data access speed
object-oriented	simpler code and more efficient organization compared to the relational model	Linking to a specific programming language does not allow linking a specific database to an object created in another language
object-relational	makes it possible to implement special code without rebuilding the entire DBMS and leaves the usual relational data organization	complexity resulting in increased costs

Currently, relational DBMSs are most widespread due to the convenience of the relational model for working with data [3], so in this article we will consider this type.

2.2 Analysis of the DBMS market in Russia

The Russian data storage market suffered a slight decline in 2022, but continues to grow. In 2022, the market was collectively valued at 56 billion rubles. By 2027 it will amount to 170 billion rubles, showing an increase of more than three times. (E. Kvasha. A. Malakhov. V. Tyutrin. Rynok sistem upravleniya i obrabotki dannykh v Rossii: tekushcheye sostoyaniye i perspektivy razvitiya – URL: <https://www.csr.ru/upload/iblock/874/qfbc7smn1fdpzee5ah2jd59qkdv59xw.pdf>)

In 2022, in the Russian DBMS market, the share of costs for contracts concluded by state companies with Russian and foreign DBMS suppliers has changed significantly compared to 2021. In 2021, about 85% of the costs were purchases of foreign products, but in 2022, contracts with Russian DBMS suppliers accounted for about 96% of the amount of government procurements.

In 2021, the leader in terms of the value of contracts concluded with state-owned companies was the foreign company Oracle. The cost of contracts with Oracle was 84% of the cost of all contracts where the purchased DBMS was specified (SUBD (rynok Rossii) – URL: [https://www.tadviser.ru/index.php/Статья:СУБД_\(рынок_России\)](https://www.tadviser.ru/index.php/Статья:СУБД_(рынок_России))). In 2022, due to the political situation, some foreign DBMS providers, such as Oracle and Microsoft, left the market. Therefore, the sales leader in the Russian DBMS market has changed.

Based on the results of 2022, the value of contracts with the Russian company Postgres Professional amounted to 89% of the total amount of contracts. At the same time, the cost of government procurement of DBMS decreased from 5.4 to 2.9 billion rubles (SUBD (rynok Rossii) – URL: [https://www.tadviser.ru/index.php/Статья:СУБД_\(рынок_России\)](https://www.tadviser.ru/index.php/Статья:СУБД_(рынок_России))). The reason for this may be the lower license cost for PostgreSQL products. A PostgreSQL Pro Enterprise license with technical support for a year in 2022 cost approximately 750 thousand rubles per processor core, while a comparable Oracle license cost about 1.5 million rubles (Vysshiiy soft: pochemu gossektor zakupayet rossiyskiye sistemy upravleniya bazami dannykh – URL: <https://postgrespro.ru/blog/media/596996>). Both companies issue permanent licenses without expiration dates and provide technical support services for an additional fee. In addition, some companies may have switched to free DBMSs, which could also explain the 20% decrease in the number of contracts concluded in 2022 compared to 2021 (SUBD (rynok Rossii) – URL: [https://www.tadviser.ru/index.php/Статья:СУБД_\(рынок_России\)](https://www.tadviser.ru/index.php/Статья:СУБД_(рынок_России))).

In general, in the public sector there is a tendency towards import substitution of software, including due to the current political situation. The total volume of government purchases of Russian software (software) in 2022 increased by 70%, and purchases of foreign software decreased by more than 25% (TsKIT: v 2022 godu goszakupki rossiyskogo PO vyrosli na 70% – URL: <https://arppsoft.ru/news/arpp/13635/>). At the same time, the costs of purchasing software by government agencies increased by 9.45% (Na rynke SUBD proizoshla smena lidera prodazh – URL: <https://www.novostiitkandala.ru/news/detail.php?ID=1685858>). This is largely due to a decrease in competition after foreign companies left the market.

The percentage of DBMS use out of the total number of organizations using digital technologies by industry and type of activity (Federalnaya sluzhba gosudarstvennoy statistiki – URL: <https://rosstat.gov.ru/statistics/science>) is presented in the picture (Fig. 1)

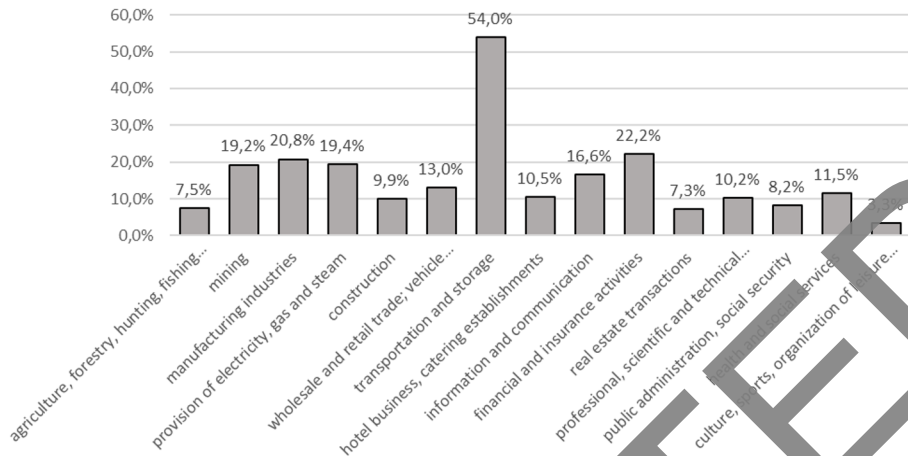


Fig. 1. Percentage of organizations using DBMS.

The company Postgres Professional, used the open-source PostgreSQL project as a basis of their DBMS Postgres Pro. The company also contributes to the development of PostgreSQL and took second place in the world ranking of PostgreSQL 15 developers (Postgres Professional zanyala vtoroye mesto v mirovom reytinge razrabotchikov PostgreSQL – URL: <https://postgrespro.ru/blog/news/5970048>). At the end of 2022, due to active import substitution of DBMS, the company's revenue increased 3.3 times compared to 2021 and amounted to 4.39 billion rubles (Postgres professionalnyy (PPG. Postgres Professional) – URL: [https://www.tadviser.ru/index.php/Компания_Постгрес_профессиональный_\(ППГ%2C_Postgres_Professional\)](https://www.tadviser.ru/index.php/Компания_Постгрес_профессиональный_(ППГ%2C_Postgres_Professional))).

Using a large open source project will greatly reduce the time and money spent on developing a Russian DBMS [4]. One of the advantages of using PostgreSQL for this purpose is the enormous popularity of this DBMS in the world [5]. In addition, PostgreSQL is distributed under the BSD license, which allows to embed the program into your own products without providing access to the source code [6]. Many other popular open-source database management systems, such as MySQL and MariaDB, are distributed under the GPL license, which requires developers who use code of programs distributed under this license to also provide the source code for their products. The GPL license makes it very difficult to commercially use open-source software, so using PostgreSQL as the basis for creating a commercial database is quite natural.

PostgreSQL, MariaDB and MySQL are currently some of the most famous open-source DBMSs. PostgreSQL and MariaDB have shown steady growth in popularity over the past 11 years (Figure 2). The MySQL DBMS, already widely known in 2013, although it did not show an increase in popularity, was able to maintain a stable rating over the past 10 years, compared to the commercial DBMS Oracle and Microsoft SQL Server, whose popularity has noticeably decreased (DB-Engines Ranking - Trend Popularity – URL: https://db-engines.com/en/ranking_trend).

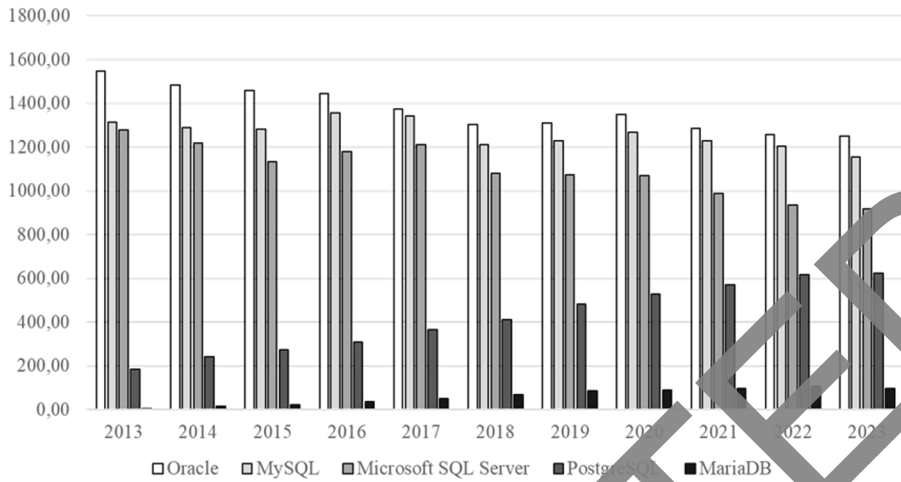


Fig. 2. Average annual popularity level of DBMS.

The international resource DB-Engines named the open source PostgreSQL system the main DBMS of 2023. The popularity of the system in 2023 increased by 34 points, which is higher than the growth rate of any other of the more than 417 systems studied.

According to Google Trends analytics for 2023, the popularity of PostgreSQL in Russia in 2023 was 65% higher than Oracle, 76% higher than MySQL and 95% higher than MS SQL Server (PostgreSQL vozglavila mirovoj reyting rosta populyarnosti SUBD i stala absolyutnym liderom sredi populyarnykh SUBD v Rossii – URL: https://www.cnews.ru/news/line/2024-01-09_postgresql_vozglavila_mirovoj).

3 Factors influencing the DBMS market in Russia

Until 2022, the vast majority of organizations in Russia used Western DBMSs and related products.

In 2022-2023, many customers, having lost the opportunity to purchase and update Western software, took a wait-and-see approach, supporting installed products on their own or with the help of outsourced domestic IT companies.

However, the political situation, showing that Western vendors will not return to the Russian market in the coming years, leads to an awareness of the need for import substitution by an increasing number of domestic organizations. This situation is aggravated by the inability to ensure the operation and development of Western systems left without support for a long time.

The development of domestic software in general and DBMS in particular is also facilitated by government policy that encourages public sector organizations and state corporations to switch to Russian software.

It should also be noted that the stability of the Russian economy under sanctions allows customers to allocate significant funds to IT budgets. This is especially true for the corporate sector.

The above factors will contribute to the widespread replacement in a relatively short time of most of the Western software installed by customers since the beginning of the 2010s. Therefore, the income growth of leading Russian developers may remain at a very high level for several years.

But market development will not stop with import substitution of Western software. One of these factors in the growth of the domestic DBMS market, as well as the software

market in general, is already government policy in the field of data, including the national project to create a data economy, as well as the inclusion of technologies for storing and analyzing big data in the concept of technological development of the Russian Federation to 2030. In addition, the growing quality of Russian products under sanctions will make it possible to more actively enter foreign markets.

4 Suggestions and conclusions

Using an open-source DBMS is beneficial for small companies and startups due to lower costs, since in this case there are no licensing costs [7].

However, using free DBMSs in large projects is associated with risks. For the stable operation of the project, technical support is needed, which can quickly solve problems that arise when using the DBMS. In the absence of active technical support, resolving the problem may take too much time, which in turn will lead to financial or reputational losses for the company. After discovering an error or vulnerability in the DBMS, the company will most likely be forced to restrict access to the program or its functionality. If the solution to the problem is delayed, then users may doubt the reliability of the service and switch to a competitor's product. Moreover, there is a risk of losing potential customers. Therefore, the company must fix the error as soon as possible and convince customers of the reliability of its product.

The events of 2022 have had a significant impact on the software market in the Russian Federation. Due to the need for import substitution, the demand for Russian software has sharply increased, which has given impetus to the further development of the IT industry in Russia, both quantitatively and qualitatively.

The Russian market for management and data processing systems (DBMS) in 2025 will reach the volume that was considered potential before the departure of foreign companies from Russia (Yu. Litvinenko. Podrazrabotchikov podveli bazu – URL: <https://www.kommersant.ru/doc/6225198>). By this year, critical information infrastructure organizations must stop using foreign software.

The Russian DBMS market is a striking example of successful import substitution in the field of information technology. Analysis of the DBMS market also reveals increased interest in open-source software. In general, we can say that the experience of developing domestic developments in the field of database management systems can be used in the future in other areas of the Russian information technology industry.

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