BUSINESS INTELLIGENCE AS A PART OF THE INFORMATION SYSTEMS ARCHITECTURE

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Summary. The article proves the expediency of using BI technology, which is based on the ability to manage large amounts of unstructured data for strategic business opportunities in any industry or field of activity, improving the quality of data processing and improving the visibility of data presentation of information. The advantages of using BI include reduced costs for information management, saving employees’ time by processing information more efficiently; the ability to analyse large amounts of data and, as a result, the ability to reduce the number of employees required to process information. The overall goal of Business Intelligence is to enable businesses to make informed decisions based on complete analytics, increase the speed of processing large amounts of data, improve the quality of the resulting information and its visualisation, introduce mechanisms for data analysis and forecasting models.

Keywords: Business Intelligence, information system, corporative solution, data analysis, data visualization.

An information system (IS) is an interconnected set of tools, methods and personnel used to store, process and deliver information to achieve a set goal. It is an information repository with procedures for entering, retrieving, placing and releasing information. The development and implementation of information systems are aimed at improving the efficiency of information, labour, money and material resources management by optimising and automating the process of interaction between the actors in the data domain. As a result, the information system provides timely, reliable and complete information for management decision-making. At the same time, the internal operation of data processing, generation of resulting information in a clear and simple form, transfer to the end user can be improved through the use of Business Intelligence tools. At the same time, the internal data processing operation, the action of generating the resulting information in a clear and simple form, the transferring it to the end user can be improved through the use of Business Intelligence tools.

Business Intelligence (BI) is a set of processes, tools and technologies that help businesses make important decisions based on data analysis [1]. BI technologies
handle large amounts of unstructured data for strategic business opportunities. The rationale for using BI as part of a corporate information system is as follows:

1. BI information systems can be used in any industry or field of activity, both at the level of the company as a whole and for divisions or individual products [2].

2. Implementation of an effective mechanism for managing large amounts of data. With the number of data to be processed in modern companies running into the terabytes, BI provides the means to process and increase the speed of processing large amounts of data, leaving room for the scaling that the enterprise may face in the future.

3. Improving the quality of data processing. The quality of information is characterised by its reliability, completeness and timeliness, and data, that does not have these characteristics, is of no practical value. In general, the quality of operational and strategic decisions, and thus the competitiveness of the enterprise, depends on the correctness of data processing. BI modules involve the implementation of various filters, building a system of qualitative indicators of business processes to build multi-criteria queries from users.

4. Increase the visibility of data presentation. The main distinguishing characteristic of BI is the availability of visualisation tools for the resulting information. Depending on the requirements of a particular data domain, BI provides dashboards, charts, graphs for end users, increasing the ease of perception and analysis of the presented information.

The generalised architecture of an information system into which a BI module is built can be represented as shown in Fig. 1, where the mandatory components are:

- data storage. The data storage for an IS and BI can be used as cloud data repositories, relational and non-relational databases, file storages or spreadsheets;
- components of the user interface through which data input and output operations are performed, and queries are generated to data stored in the data warehouse;
- BI tools for visualising the resulting information;
- components that implement the business logic of the IS.

![Fig. 1. Information system architecture with BI](image)
When designing the architecture of an IS with BI it is necessary to take into account that BI can be implemented as:

1. A component for standardised reporting that allows you to build detailed reports using template solutions and query criteria for users.
2. A component that implements multidimensional data analysis, generating the resulting information based on complex expressions – multicriteria queries.
3. The component that implements forecasting mechanisms for the development of business processes allows you to model the development of events at the enterprise based on the analysis of the current state.

Depending on the initial conditions, the type of BI component and the ultimate goal of its application, there are different ways to implement it, such as:

- self-written solution. If the company has IT specialists who are professionally prepared to develop the BI components, it may decide to design, implement and test the BI components on its own. In this case, the quality of the final software product will directly depend on the level of professional skills of the specialists involved in this development;

- use of existing software applications and solutions. In this case, there are three key factors: price, quality and integration time. Usually, the price and integration time are too high for the average manufacturer and also require significant staff time. The main disadvantage, in this case, is that existing tools offer unified, standardised ways to solve problems and require customisation of these solutions to the specific conditions of the data domain. If providers of existing BI software applications offer customisation and integration services, this can be an additional cost. Implementing and configuring the software in-house can be time-consuming and difficult;

- cloud solutions. Implementation of cloud solutions primarily requires a corporate decision to move enterprise data to the cloud with an understanding of all the benefits, disadvantages and risks of storing data in the cloud.

If a decision is made to implement the BI component of the corporate information system independently, the development process will depend on whether the BI component is designed for an existing information system or whether the BI component is created alongside the development of the corporate information system. This will determine the proper choice of tools, technologies, programming languages, and integrated environments for the BI component’s software implementation.

In any case, the BI component development life cycle will include the stages of requirements and data domain analysis, solution design, software implementation, testing, implementation (integration with existing software), use and maintenance. This is how it is necessary to implement the BI functionality, which is the realisation of methods [3]:

1. Data storage. The data in the storage should be structured in a special way for more efficient analysis and query processing (unlike ordinary databases, where information is organised in such a way as to optimise the processing time of current transactions).
2. Data integration. To create and maintain data warehouses, ETL tools are used – instruments that provide data extraction, data transformation, in other words,
converting it to the required format, and data loading into the warehouse or another database.

3. Data analysis. To generate various data slices and multi-criteria queries. Online analytical processing tools (OLAP) can be used for comprehensive data analysis [4].

4. Data presentation. Various graphical tools are used to present data, such as reports, graphs and charts. A common way to visualise data is to use dashboards, where the results are displayed in the form of indicators and scales that allow you to monitor the current values of selected indicators, compare them with the minimum/maximum acceptable values and thus identify potential threats to the business.

The advantages of using BI as part of corporate IS include the following:
- BI information systems reduce the effort required to manage information by eliminating unnecessary data extraction processes and existing duplication of information;
- BI information systems save personnel time by making information processing more efficient;
- The ability to analyse large amounts of data reduces the number of employees required to process information.

Conclusions. The overall goal of BI is to enable businesses to make well-rounded decisions based on complete analytics. A company that has implemented BI will have complete, accurate and organised data. Integration of BI into corporate information systems allows for improvement in the efficiency of information systems using BI methods and tools, especially in terms of increasing the speed of processing large amounts of data, improving the quality of the resulting information and its visualisation, and introducing mechanisms for data mining and forecasting. BI as a component of a corporate information system helps to solve the following tasks: collecting data from various sources, structuring and storing them in a single system; analysing large amounts of data to form and confirm hypotheses or develop business decisions based on analytics; modelling possible solutions to assess their impact on the bottom line and forecasting further development based on available data.

References: