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Software and Information Support for Business Analysis in Enterprise Management

Abstract. Introduction. *In the last decade, particular interest has been related to the development of business analysis as a direction for developing a system of views on information and analytical support for flexible governance: methodology for collecting, streamlining, transforming, monitoring, analyzing and using information in shaping the modern knowledge economy. Business Analysis integrates modern business intelligence systems and techniques for generating, forecasting, valuing and monitoring key metrics and dashboards using modern visualization techniques. Business Intelligence systems are a variety of tools and technologies for automating company-wide analysis and processing of data, including data warehouses, data marts, OLAP systems, knowledge discovery tools, end-user tools designed to fulfill information requests, build different purpose and structure of reports*

Purpose. *The use of Business Intelligence tools in modern business has become a vital necessity, but, in fact, modern information systems are solving the traditional problems of improving accounting (both financial and management) – the task of improving its efficiency and analytics. But, of course, they are solved on a new technical base, with immensely technological capabilities to collect, transmit, process, store huge amounts of information and provide the necessary information to decision-makers in a convenient way. The main thing here is that there are similar tasks for management needs. In this regard, it is useful to recall the functional structure of management, because in the management system, the technological stage of decision making is implemented by three functions – information, control and analytical. The information and control functions provide the conditions for the implementation of the analytical function. It is logical that due to this business analysis should inevitably play the role of a task manager for accounting, information and control systems created on the BI-platforms.*

Conclusions. *BI in its modern sense is focused on meeting the information needs of management within the formed or projected business model. Not the business itself, but the specific form of its implementation (commercial firm, market contracting systems, consolidated group of enterprises, network structure, franchising, outsourcing, etc.).*

Results. *The main task of business analysis, as a type of professional activity, is to identify the problems of business and identify the need for changes in such forms and their content, to determine the goals and directions of such changes. In this case, the information systems themselves, built on the results of the business analysis, become important tools for the implementation of analytical functions of modern management. If the results of the analysis reveal the need for changes in business processes or the entire business model, then the information system of the company needs re-engineering.*

Keywords: *business analysis; information; decision making process; information technology; Business Intelligence.*

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Програмно-інформаційне забезпечення бізнес-аналізу в управлінні підприємством

Анотація. У статті розглянуто сутність та зміст технологій, що застосовуються на основі платформ Business Intelligence (BI). Акцентовано увагу на ролі BI-систем у вирішенні традиційних завдань фінансового та управлінського обліку шляхом підвищення рівня оперативності та аналітичності. Виявлено, що практичне використання BI в практиці контролінгу діяльності підприємств дозволяє своєчасно виявляти події (Event Detection), що мають критичне значення для безперервності та результативності бізнесу або його бізнес-процесів; проводити моніторинг бізнес-активності (Business Activity Monitoring) в режимі реального часу, що необхідно для поліпшення швидкості і ефективності бізнес-процесів реалізовувати обробку складних подій (Complex Event Processing) для виявлення закономірностей між діями менеджерів і станом і результативністю різних процесів з подальшим формуванням бази даних і проведенням інтелектуального аналізу (Data Mining), заснованого на закономірностях або відхилення здійснювати комп'ютерні симуляції (Simulation) з метою аналізу порівняльної ефективності альтернативних рішень в режимі потрібного часу Обґрунтовано необхідність застосування інформаційних технологій бізнес-аналізу в контролінгу діяльності підприємства. Визначено та охарактеризовано процес формування інформації в цілях прийняття управлінських рішень в системі BI. Наведено етапи реалізація процесу формування рішення на основі BI-платформ. Окреслено рівні управління інформацією, що є підґрунтям для прийняття ефективних управлінських рішень.

Ключові слова: бізнес-аналіз; інформація; процес прийняття управлінських рішень; інформаційні технології; Business Intelligence.

Statement of the problem. No traditional accounting system, however versatile it is, is able to meet all the business information needs. In this case, the information component becomes the most important element of management, so the ability of enterprises to promptly manage all the data needed to make analytically sound decisions, makes them a clear competitive advantage.

Today, the manager needs tools that provide secure access to internal and external data sources with advanced capabilities for comparisons, groupings and consolidation, factor analysis, disclosure, and distribution of prepared analytical documents, both inside and outside the organization. Therefore, the tendency of recent years has become the integration of software products and the transition from specialized analytical solutions to multi-purpose BI platforms.

In Ukraine, as well as abroad, in the last decade of particular interest is related to the development of business analysis as a direction of development of the system of views on information and analytical support of flexible management: methodology for collecting, organizing, transforming, monitoring, analyzing and using information in the formation of modern knowledge economy. Business Analysis integrates modern business intelligence systems and techniques for generating, forecasting, valuing and monitoring key metrics and dashboards using modern visualization techniques. Business Intelligence systems are a variety of tools and technologies for automating company-wide analysis and processing of data, including data warehouses, data marts, OLAP systems, knowledge discovery tools, end-user tools designed to fulfill information requests, build different purpose and structure of reports.

Analysis of recent researches and publications. The study of the theoretical foundations, methodology and practical principles of organizing business analysis by means of information systems and technologies in domestic literature is not given due attention due to the lack of dissemination of business analysis concepts as a field of research. At the same time, this issue is considered in the works of foreign scientists, including: T. Davenport,

H.-G. Quimper, V. Mehan, S. Unger, R. Kimball, L. Reeves, M. Ross, G. Laursen, K. Paul, and others.

Formulation of aims of the article. The purpose of the article is to study the conceptual foundations of the organization of business information software in business management, to build a mechanism for generating the information necessary for making management decisions, based on BI-platforms.

Exposition of basic material of research. The use of Business Intelligence tools in modern business has become a vital necessity, but, in fact, modern information systems are solving the traditional problems of improving accounting (both financial and management) – the task of improving its efficiency and analytics. But, of course, they are solved on a new technical base, with immensely technological capabilities to collect, transmit, process, store huge amounts of information and provide the necessary information to decision-makers in a convenient way. The main thing here is that there are similar tasks for management needs. In this regard, it is useful to recall the functional structure of management, because in the management system, the technological stage of decision making is implemented by three functions - information, control and analytical. The information and control functions provide the conditions for the implementation of the analytical function. It is logical that due to this business analysis should inevitably play the role of a task manager for accounting, information and control systems created on the BI-platforms.

The use of BI class information systems ensures the achievement of the main task of controlling – the organization of information-analytical management of prospect-oriented management.

Currently, software solutions of three global IT players – SAP, ORACLE and IBM – and a number of domestic products, developed by national companies, are presented in the BI-class systems market.

Practical use of BI in the practice of controlling the activity of enterprises allows:

- identify events (Event Detection) in a timely manner that are critical to the continuity and performance of a business or its business processes;
- conduct business activity monitoring in real time, which is necessary to improve the speed and efficiency of business processes;
- implement Complex Event Processing to identify patterns between managers' actions and status and the performance of various processes, with subsequent database formation and data mining or deviation based data mining (Data Mining);
- perform computer simulations to analyze the comparative effectiveness of alternative solutions in the right time.

Strategic management accounting has become the main provider of information in modern management. It focuses on information related to external to the firm factors, as well as financial and intra-firm sources on the

progress of business operations and the state of business processes. As a result, the factual analysis of deviations is transformed into the analysis of opportunities and risks, and the analysis of dynamics – into the analysis of strategic gaps.

In the context of the aforementioned Business Intelligence, it is advisable to define it as a method of supporting managerial decision-making using IT systems based on monitoring and forecasting the state of information about the conditions and results of the company's activity. That is, BI is the unity of technical support for the formation of useful information from the market and business data, and knowledge - from the information [7]. In turn, knowledge can form the basis of a business process model and procedures related to making and implementing management decisions based on forecasting and estimating the expected consequences of their implementation (Fig. 1).

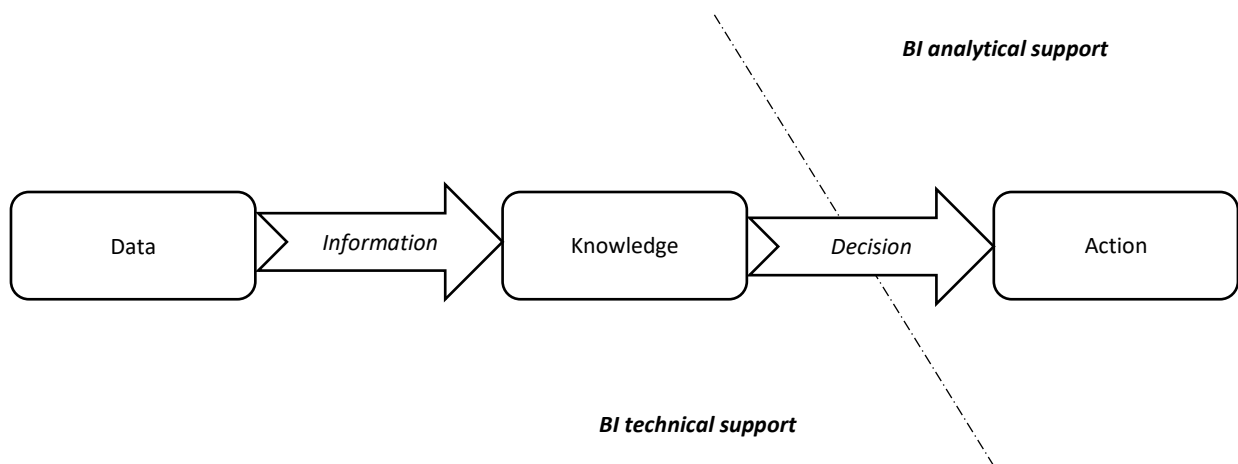


Figure 1 – The process of information formation for management decision making in BI system

Source: by the authors

The process of making a typical BI decision consists of five basic elements (Fig. 2).

The first module is the data collection procedure, which collects information from various sources and performs validation, cleaning, unification and aggregation of the selected data.

The data management module is a central element that stores and structures data. The Data Structuring module creates a Data Warehouse, which is spam-free integrated information from many (external and internal) systems and subsequently used in data marts (Data Mart) or by end-users of analytical information.

The module of application of results of analysis represents specific final results of business-analytical process, with appropriately documented (orders, orders, meetings) and used as ready information samples for end users of information or intermediate databases for further processing. An important module tool is to consider the

query and reporting tools required by end users to create documents (their own reports).

The metadata management module is responsible for generating information about available data, defined modes of access to it, processes for transforming data into knowledge, registering it and providing it to end users.

The storage management module is responsible for creating the BI infrastructure. Its implementation may be based, for example, on the Information Bus (TIB) technology designed to shape the conditions and technical means of distributing real information. In essence, the module provides for the creation of a universal conductor («axis») to which various components and applications can be attached.

The architecture of a business-specific business intelligence system is often a structure created on the basis of «layers (tiers)» (functional-hierarchical levels) that have specific functions and a certain type of interface.

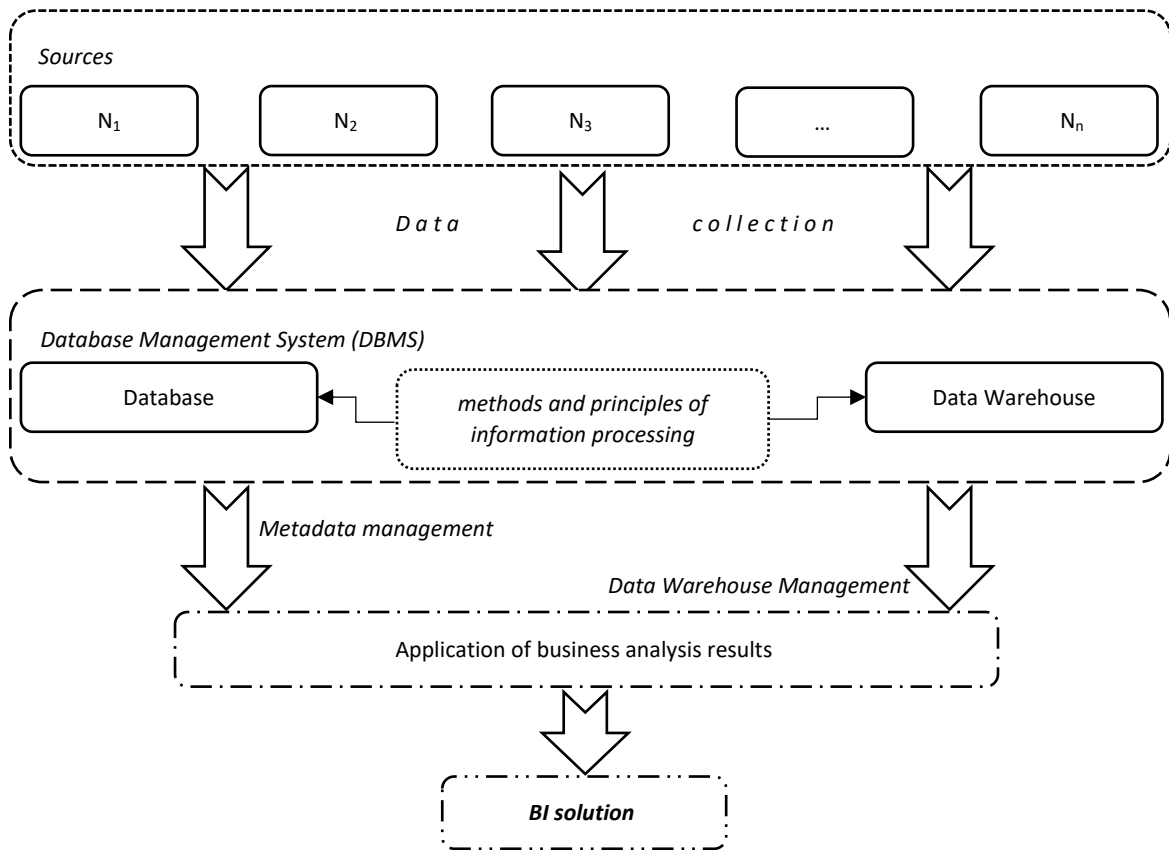


Figure 2 – Implementation of the process of BI-solution formation

Source: by the authors

The proposed model architecture provides for the representation of a central data warehouse (Data Warehouse) as a central mechanism. That is, Data Warehouse is the central subsystem of the system, and the storage and processing subsystems, oriented towards solving specific analytical problems (Data Mart), are so-called functional axes.

Here is a brief description of the individual levels.

First, the data sources. Relevant data can come from within the enterprise itself (inside information) and from external systems (information about the state of the external economic environment). For example, market research companies, specialized alliances and organizations, and partner companies can serve as sources of external data. In the pre-selection phase, the input data is fed through the interfaces to the central data warehouse.

Second, data collection and layout (data integration). This tier performs syntactic and semantic harmonization of data from different sources of information. At the same time, automatic detection of syntax errors, as well as incompatibility of formats, their correction, and bringing data to a single format is performed. Syntax differences, such as different encoding of the same file attributes, different names for the same value attributes, or identical names for different value attributes are unified or differentiated according to domain-specific ordering rules.

Semantic defects, such as lack of data values, unknown presentation format, or semantic errors in operational raw data, are recognized and logged using object-specific validity criteria. However, errors in operational data are often detected manually at the level of prior quality control. Further on this «tier» is the semantic unification of the collected data according to production-economic, subject-specific and time requirements [6, p. 24].

Third, the central data warehouse is the «information core». This central data bank stores the received data in an integrated, unified form for long historical periods of time and provides the stored data for further processing and use at subsequent stages of operation. Particularly important for this data bank is the storage of data for a long time (non-volatile), structuring them according to subject (subject-oriented) and historical correction when more reliable information (time-variant) appears [6].

The structure of the data is modeled without reference to the direction of its use, ie regardless of the specific requirements of the report format. It focuses on relevant data about business objects and their relationships. It also allows the storage of business objects and their relationships. To provide flexibility and necessary expansion, the data structure must be modeled close to the normal distribution with the necessary redundancy [8, p. 53].

The next tier is the Data Marts storage and processing subsystem. At this level, the ordering, systematization and

pre-processing of data are performed on the basis of specific requirements, depending on the scope or subject specialization. It also often performs additional aggregation of basic data (ie, data with a lower degree of aggregation) and the creation of new data elements from combinations of previously existing data elements based on them. The storage and processing subsystem stores previously selected and aggregated data in a form that is consistent with the intended purpose, understandable to the end user.

Data modeling is mostly done by multidimensional modeling and presentation of results using star or snowflake schemes. The procedures envisage measures to speed up the read operations of database information through significant denormalization or use of a multidimensional database. For each specific area of application, this tier contains the necessary data with the desired degree of aggregation.

Finally, the tier is the use of business intelligence. This tier provides end-users with the components through which the final evaluation and presentation of the results of the business analytical process is carried out. In addition, information is distributed at this stage to end users.

Depending on the purpose and functionality, the methods of applying the results of the business analytical process are differentiated into the following categories.

Standard Reporting is a regular, standardized report in the form of lists, tables and charts. These include aspects such as automatic information sharing, information portals and integrated concepts for granting access rights. In addition, ad-hoc Reporting plays an important role. The user initiates the generation of reports required by him based on the nature of the access to the data and the work functions that are provided to him after authorization.

The calculation of analytical indicators and the identification of areas of inefficiency on the basis of benchmarking (benchmarking) is carried out to determine the benchmarks of development. Intra-industry, functional, competitive and strategic benchmarks are used to identify and more selectively study best practices. The study and transfer of best practices allow us to introduce into business enterprises the best practices of other enterprises in those areas where there are bottlenecks that impede the achievement of the target efficiency and effectiveness. Areas of inefficiency are determined by managers based on an analysis of the critical business success factors (not in line with best practices) or a comparative assessment of the conversion rates of the performance indicators into performance (the values of the coefficients for the evaluated process are significantly worse than in the leading companies).

In the context of managing the performance of a management entity, the results of its operations must be linked to the chosen development strategy. In addition to identifying strategic development goals for the facility that provide verification of its status and development indicators, it is necessary to evaluate the performance of

the facilities on a permanent basis by comparing actual (or projected) Key Performance Indicators (KPIs) with those of that are set according to the strategy. If deviations of the actual values of the data from the target levels are detected, their consequences for the strategy implementation are evaluated. With the expected negative consequences, actions are planned and implemented to correct the activity of the company as a whole, its individual strategic business units and business processes.

Various standard software components presented in the IT market make it possible to carry out logical analysis according to the specifics of a specific line of business. It is widely known that financial advisory companies use various information products to analyze risk management or monitor credit card fraud for card companies and insurance companies. In this field, technologies and data mining (Data Mining) are used, which is based on the study of patterns between individual indicators and the detection of atypical deviations. An appropriate example is a chart of regulatory deviations of financial indicators [2-3].

In the case where a manager is dealing with a long-running business, it is advisable not only to present real-time management information, but also to formulate and predict expected levels of development indicators at the right time, using historical analysis data, developed by simulation models of business processes and value chains. That is, forecasts with moving averages become necessary. In order to support the planning and forecasting process in the manager's arsenal, it is necessary to have a component of automated data flow management, which together with the collection and provision of planning data makes it possible to track the individual stages of plan implementation. This component becomes most relevant in the implementation of long-term investment-innovative business development projects, which requires the identification of control points at different stages of the project life cycle, assessing the practical feasibility of continuing the project and the parameters of its adjustment at each stage of control.

In our view, Gap Analysis, which is a process of comparative analysis of target values of process development parameters (managed process chains) and expected, taking into account planned and implemented development activities and programs, may be promising for application. This allows the manager to evaluate the adequacy of efforts in various areas of managed development and their relevance to the economic environment and business goals.

Conclusions. Thus, BI in its modern sense is focused on meeting the information needs of management within the formed or projected business model. Not the business itself, but the specific form of its implementation (commercial firm, market contracting systems, consolidated group of enterprises, network structure, franchising, outsourcing, etc.). At the same time, the main task of business analysis, as a type of professional activity,

is to identify the problems of business and identify the need for changes in such forms and their content, to determine the goals and directions of such changes. In this case, the information systems themselves, built on the results of the business analysis, become important tools

for the implementation of analytical functions of modern management. If the results of the analysis reveal the need for changes in business processes or the entire business model, then the information system of the company needs re-engineering.

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