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RELATIONSHIP BETWEEN USER BEHAVIOR AND THE BI SYSTEMS EFFECTIVENESS

The organizational and functional aspects of the business analytics system are worked out. It is suggested to use a subjective-oriented methodical approach to forecasting the effectiveness of BI systems implementation.

Keywords: *business intelligence, enterprise, efficiency, user impact, information systems.*

Numerous scientific works of scientists and specialists, devoted to the prospectus of business analysis of enterprises, show the high level of its relevance and the urgency of resolving. The presence of ecological, technical, organizational, ergonomic, and other functions of the enterprises involves in-depth investigations of various factors influence on the levels of costs, profits and the observation of scientifically based methodological approaches to their management. The simplification of the business analysis system has to increase not only the level of the effectiveness of these processes, but also the activity of the enterprise as a whole.

The main objective of the introduction of biosynthesis analytics systems is to increase the speed of data exchange, the speed of tasks execution, cost cutting and functional processes automation to reduce casual and systematic errors of operators. Persons responsible for decision making are increasingly involved in analytical systems to achieve their goals. Effective use of their potential is a very interesting task because of the organizational restructuring complexity and high cost of adjustment and staff training. In addition, the potential and effectiveness of business intelligence systems depends on the successful implementation of an adequate information system at the enterprise. The urgent question is the choice of the main factors of influence on the efficiency of implementation of business analytics systems and determination of ways to increase the speed of data processing with the growth of information space.

The competitive environment of the modern market requires companies to be guided in their business by the data of business intelligence applications for a stable position in the industry [1]. Since information is of the highest value, the most realistic way for enterprises to outpace competitors is to effectively use company data to provide predictive solutions [2, p. 42], simulation of situations proposed to be made on the basis of business intelligence [3, 4]. Business intelligence software (BI) allows companies to effectively identify and evaluate structural patterns [5], anticipate trends in the industry, and offers operational transparency. Functionality of business analytics, ultimately allows managers to translate information reports into useful actions in relation to key operations [6]. Technologies are valuable, regardless of the size of the company, contribute to the development of strategy and increase the exchange of information through software platforms. This is particularly beneficial for large companies where BI acts as a central portal for multichannel and system data specifically for quick, in-depth analysis and more efficient solutions [7]. When selecting a business intelligence system, you should pay attention to web accessibility, real-time reports, flexible export formats, and financial analysis tools. Other peculiarities that should be taken into account before purchasing a business intelligence system include scalability in the event of an enterprise increase, data availability limitation, forecasting functionality [8, p. 44; 9] and visualization tools such as graphics or graphics capabilities.

The analysis of professional literature has shown that the scientists determined, formulated and substantiated the theoretical and methodological principles of business analytical systems. At the same time, the transition to new information technologies leads to the backwardness, opposition and rejection of staff at the initial stage of their development, and in the future, the adaptation of incentive methods and approaches used by entrepreneurs in the management of enterprise costs.

Given the evolution of economic science, the transition from traditional to integrated management and the expediency of incorporating various factors affecting business analytics, there is a need for further development and improvement of scientific and methodological foundations and tools for measuring and improving the effectiveness of user behavior.

The main purpose of this work is to develop the theoretical and methodological foundations for managing the effectiveness of business analytics information systems in close connection with the behavior of the user, which allows taking into account the factors of the state of enterprises.

The Business Intelligence (BI) system is a technology that provides significant value for business by increasing the efficiency of making managerial decisions [2]. In an uncertain and highly competitive busi-

ness environment, the importance of strategic information systems, such as these, is easy to identify. High rates of implementation and investment in software and BI services suggest that these systems are the main provider of decision support on the market today. Most business investments are verified using one form or another. The feature of BI is that traditional valuation methods face the difficulties in identifying software, intangible benefits from the introduction of business intelligence systems; In addition, BIs enable the company to collect, accumulate, store, analyze large amounts of data and helps organize and transform data for decision-making. It also helps the organization to recognize barely visible trends and models that allow you to plan marketing events in advance, adjust tactics and improve the results [10, p. 74-76].

The main characteristics and reports of BI systems are:

- objectives – process optimization, analysis of key performance indicators, forecasting of internal and external data, focus on internal and external data;
- levels – strategic / higher levels;
- user involvement – in exceptional cases at strategic levels of management;
- data management – data warehousing / OLAP / intelligent data analysis;
- typical operations – analysis;
- the number of records – transactions is large;
- cube data orientation;
- detail level – aggregated;
- data age – historic / modern / forecast.

Business Intelligence system, as a concept, in different fields of production is treated differently, so most scientists consider it to be meaningless. Understanding where the importance of information technology lies, and how to measure this value remains an important issue for executives and scholars. Twenty years ago, most IT investments were made to the benefit of the organization at the operational level (for example, ERP systems of different generations). Large volumes of data are processed at high speeds. The equipment becomes extensible and compatible with other systems. The popularity of business data processing systems has been growing rapidly since the beginning of 2000, with a sharp increase in the number of computers used in commercial applications. These changes are justified – systems can handle a lot of tasks much faster than the latest technology, and businesses can save on labor [11, p. 297-300].

Research shows that organizations that use analytics outperform competitors. Organizations with a high "analytical coefficient" (ie, in essence, the level of use of analysts) work on average three times better. According to Gartner, by 2016, the market for BI systems and analytical platforms remained one of the fastest growing segments of the world software market. The average annual growth rate of this market was 7% between 2011 and 2016. In 2016, the market reached \$ 17.1 billion [12].

It should be noted that the number of large vendors in the global market for BI systems and analytical platforms has almost doubled over the past three years [12]. Now, the mega-vendors are confronted with many specialized developers who defend their place "under the sun" and through more active innovation, they move their own platforms very intensively (Fig. 1).

Analysts believe that a number of factors will contribute to further growth of the outsourcing BI market. The high cost of the system, the setting and the limited number of skilled workers are one of these factors. This also contributes to the difficulty of trying to determine the benefits that the organization's information technology provides. Difficulties in identifying the benefits of information systems can be explained by the emergence of a performance paradox. Classical financial techniques such as Net Present Value (NPV) and Cost and Benefit Analysis (CBA) are not entirely suitable for effective IT evaluation. In [13, p. 118-120] describes the phenomenon when many managers feel that they have to invest in IT for reasons of competition, but economically they often fail to justify it. It seems that there is an increasing awareness that if evaluation methods still need to be developed, additional measures should be considered. For example, perceive the value, the usefulness of IT to support decision-making and increase customer satisfaction. Risks also need to be taken into account: during deployment of business intelligence systems, one of the key issues is system configuration, quality and timeliness of data and obsolete technologies. Design risks (configurations) stem from an incorrect determination of the true business needs of a system design. The quality of the data depends on the integrity of the technique or the pre-cleaning / filtering of data. The aging of technology means the impossibility of vendors to predict the invention of new processing technologies, the transmission of data prior to the release of the product. Thus, taking into account the high cost of system set-up and the enormous amount of strategic information transmitted to other business entities, it is necessary to develop precise criteria for the implementation and maintenance of business intelligence systems. We believe that such criteria should be:

- decisions made on the basis of business processes. BI systems can not be considered only as a repository or data set. On the contrary, the system introduction leads to the conceptualization of new models of data, processes, content indicators. In addition, when reorganizing, there are additional benefits of doing business.

- this function usually refers to the response time that the system provides to users. In most cases, the response should range from a few seconds to a maximum of 30 seconds for routine queries. The response time depends on the complexity of the database and the specified queries.

- flexibility determines whether the BI solution can continuously adapt to changing business conditions after system installation. BI systems should adapt to changes to any type of business processes and positions as personnel, services and processes, as well as new mandates, laws and rules that require the selection of different types of data. The system should be expanded to accommodate increasing amounts of data and changes in the organizational structure. It should allow you to increase content without slowing down productivity.

- there are two main types of integration: data integration and system integration. Data integration gives you access to data from different types of systems. The BI system will be especially effective if it can overcome the problem of information fragmentation, which will allow managers to measure the quality of business processes that include information from within and outside the organization. System integration refers to two things: BI's ability to expand software with new capabilities and modules, and the ability of the system to coexist with other corporate solutions.

- a user-friendly system interface should be designed to allow managers who do not have the skills to use query language and advanced technology to quickly, easily and understandably navigate data and identify trends. BI developers should be allowed to create a user interface that combines information for users with different degrees of technical knowledge.



Fig. 1. Magic Quadrant for Business Analytics Services [12]

In a situation where all the above criteria are implemented, one can speak of the quality and efficiency of the system, one of the main characteristics of which is the quality of service, which is defined as the degree of discrepancy between expectations of user service and perception of services received.

The quality of service or attraction of users is a cornerstone of efficiency. Despite the fact that many researchers also point out this fact, with the practical application of the user engagement strategy, users are often ignored. That results in poor performance and low work efficiency. In [14] it is noted that the shortage of user involvement is a constant catalyst for unsuccessful restructuring of the organizational structure of the enterprise and the introduction of business intelligence systems. And since the practice of outsourcing is widespread, this problem becomes global.

Attracting users can be viewed from two sides. Participation of a contemplative user, and when he remains an outsider in the design and implementation of software; checks the specifications and performs some functions while operating the system. This kind of participation is characterized by a user log, which allows you to chronologically track operations and their frequency of execution. Sometimes, users conduct an expert review of the system, give recommendations for the removal of unimportant modules and overall optimization, with all the actions to change the code made by the involved professionals. Rarely, users act only as a transient psychological type of personality. They are personally involved in the development of the system or its individual parts. In this case, the level of satisfaction of workers increases; their expectations about the system's capabilities are adequate; they are ready for risk situations; Negotiating and resolving design conflicts is faster; fewer workers resist change.

Users of the second type will be considered as experts. Experts give their estimates of the likelihood of certain degrees of damage, on the basis of which it would be possible to find the average values of expert assessments, and accompany their assessments with the data on the probability of different values of volume or percentages of losses. The expert estimation method is based on the fact that the unknown characteristic of the investigated phenomenon is treated as a random variable, and the individual assessment of each expert regarding the truth and significance of a particular event is a reflection of its distribution law [15, p. 37]. In order to apply the method of expert assessments in the decision-making process on choosing the duration of the operation of the enterprise, the question of the experts selection is considered, their interviews are conducted and the obtained results are processed. The qualitative composition of the experts is based on the analysis of the breadth of the problem, the probability of the estimates, the characteristics of the experts and the costs of the resources. Characteristics of the experts group are determined on the basis of their individual characteristics: competence, creativity, conformism, attitude to examination, constructivist thinking, collectivism, self-criticism. There is a problem of matching the characteristics and choosing experts, taking into account contradictions regarding their qualities.

The problem of harmonization of characteristics and the choice of experts, taking into account the contradictions concerning their qualities, is solved according to the formula:

$$D_i = \frac{N_i}{N}, i = \overline{1, I},$$

where I – number of experts;

N_i – the number of cases in which the i -th expert gave an assessment whose admissibility was confirmed on practice;

N – total number of cases of participation of the i -th expert in solving the problem.

The contribution of each expert to the probability of the whole group ratings can also be calculated from this formula.

The consistency of expert opinions is estimated by calculating the quantitative measure, which characterizes the degree of individual thoughts convergence. The analysis of the coherence degree values allows us to develop a correct judgment about the general level of knowledge regarding the state of the market segment in which the enterprise proceeds, on the financial and material resources of the enterprise, and to identify the grouping of expert opinions due to sharp opinions, concepts, the nature of professional activity, etc.

Conclusions and suggestions. The organizational and functional aspects of the business analytics system have been worked out. It is possible to consider BI as an object system that consists of components (elements) that are interrelated in space and system-process, which is composed from certain functions (operations) that are interrelated in time.

The conceptual-categorical apparatus of business analytics has been further developed. It is suggested to use a subjective-oriented methodical approach to forecasting the effectiveness of BI systems implementation.

It is noted that the user, as well as the consistency of expert users opinions, are important for the stable information systems operation, and therefore the development and improvement of the theoretical and methodical apparatus is a prime and necessary condition for their effective functioning.

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ВЗАЄМОЗВ'ЯЗОК МІЖ ПОВЕДІНКОЮ КОРИСТУВАЧІВ ТА ЕФЕКТИВНІСТЮ СИСТЕМ БІЗНЕС-АНАЛІТИКИ

Опрацьовано організаційний та функціональний аспекти системи бізнес-аналітики. Запропоновано використовувати суб'єктивно-орієнтований методичний підхід до прогнозування ефективності впровадження систем Бі.

Ключові слова: бізнес-аналітика, підприємство, ефективність, вплив користувача, інформаційні системи.

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The main purpose of this work is to develop the theoretical and methodological foundations for managing the effectiveness of business analytics information systems in close connection with the behavior of the user, which allows taking into account the factors of the state of enterprises.

The Business Intelligence (BI) system is a technology that provides significant value for business by increasing the efficiency of making managerial decisions. Therefore main characteristics and reports of BI systems were defined.

We believe that a number of factors will contribute to further growth of the outsourcing BI market as it was defined. The high cost of the system, the setting and the limited number of skilled workers are one of these factors. This also contributes to the difficulty of trying to determine the benefits that the organization's information technology provides. Difficulties in identifying the benefits of information systems can be explained by the emergence of a performance paradox. Risks also need to be taken into account. Thus it is necessary to develop precise criteria for the implementation and maintenance of business intelligence systems that is a subject of further development.

It was stated that the quality of service or attraction of users is a cornerstone of efficiency. Therefore, different ways of involving the user were concerned.

It is noted that the user, as well as the consistency of expert users opinions, are important for the stable information systems operation, and therefore the development and improvement of the theoretical and methodical apparatus is a prime and necessary condition for their effective functioning.

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