SYNERGY BETWEEN COMPUTER SCIENCE AND BUSINESS – BUSINESS INTELLIGENCE SYSTEMS

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K e y   w o r d s: information, data processing, knowledge management and processing, Business Intelligence systems, development of BI systems, data warehouse, OLAP systems – data mining.

A b s t r a c t

E-business requires specific software, especially in the case of large, scattered companies operating under unfavorable market conditions. Such solutions as Business Intelligence systems enable to discover correlations and interdependences between economic data, i.e. to perform multi-dimensional data analyses. Large amounts of data acquired and collected every day provide the basis for making optimum strategic decisions.

SYNERGIA INFORMATYKI Z BIZNESEM – SYSTEMY BUSINESS INTELLIGENCE

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S ł o w a   k l u c z o w e: informacja, przetwarzanie danych, zarządzanie i przetwarzanie wiedzy, Systemy Business Intelligence, tworzenie systemów BI, hurtownie danych, systemy OLAP – eksploracja danych.

S t r e s z c z e n i e

Wspomaganie biznesu, szczególnie w przypadku dużych, rozproszonych firm działających na trudnym rynku, wymaga specyficznego rodzaju oprogramowania. Dzięki takim

rozwiązaniom jak systemy Business Intelligence możliwe jest odkrycie związków między danymi gospodarczymi, czyli wielowymiarowa analiza danych. Gromadzone codziennie tysiące danych stają się podstawą optymalnych decyzji strategicznych.

Introduction

Under conditions of e-economy, the competitive power of companies is more and more often related not only to the production and distribution of goods and services, but also to information processing and interpretation. Information becomes a "currency" of new economy, and data – raw materials indispensable for achieving a success. Computer science, providing modern information technologies and tools, is able to support all spheres of economic activity (SALA, TAŃSKA 2003).

The amount of business data gathered at companies is growing by as much as 100% per year. It follows that one of the main priorities is to refer to data acquired by companies in the decision-making process. In addition, fiercer and fiercer competition and rapidly changing market conditions require better and better data quality, and a faster and faster rate of their transformation into useful information. Thus, a question arises: how to transform data into valuable business information, i.e. information that can contribute to making the right strategic decisions. The answer to this question is difficult due to a great variety of data storage methods.

One of the solutions may be primary data integration. The process of data integration at a company must be preceded by making an inventory of all source documents characterizing and describing particular economic operations. This enormous amount of data is stored using various media and carriers (Fig. 1).

Fig. 1. Data diversity
Source: KUROWSKI (2003)

Core and essence of Business Intelligence systems

The term "Business Intelligence" (BI) was coined by analysts from the Gartner Group in the 1980s, to describe a new, developing class of information systems. These systems are based on the acquisition, processing and presentation of data coming from different sources. However, in some publications Business Intelligence is still perceived as espionage or industrial intelligence, which is misuse and oversimplification of the term. In fact BI systems are supposed to support and improve business decision making by using available data resources. The development of these systems was a natural consequence of increasing competition between companies, and the need to respond immediately to the changing requirements of users, as well as to monitor closely the activities of economic organizations.

In contrast to traditional management systems, Business Intelligence has a much wider scope of operation, and offers the possibility to analyze unstructured data (e.g. press articles, Internet publications, memos, etc.). The majority of BI users are interested in gaining access to reports and making complex queries, rather than in the navigation and transformation of structured data stored in data warehouses, or unstructured data derived from these systems.

The BI systems available on the market differ in the level of their "intelligence", i.e. effectiveness of analytical tools. BI is expected not only to provide tools for data analysis, but also to prepare and perform this analysis. The simplest types of analysis originate from basic econometric and statistical methods, such as correlation analysis or linear regression.

The main advantage of the systems of this class is their high descriptive value, which means that they enable to generate a clear and comprehensible picture of relationships between particular aspects of business. According to Howard Dresner, a business specialist in the area of Business Intelligence, there is no need to invest large amounts of money into data warehouses for ERP (Enterprise Resource Planning), CRM (Client Relationship Management) or BI. Instead, it is necessary to understand the organization we work for. It is necessary to understand and order the processes taking place in this organization. It is also necessary to make a concerted effort with business users to ensure adequate data quality, since the data stored at warehouses must be valuable and reliable. And finally, it is necessary to present a united front with business, so as to justify financially the investment in BI systems (WARNO 2003).

Process of BI system development

Contemporary economic organizations have at their disposal huge amounts of data coming from information systems existing within the organization (internal sources) or outside it (external sources). The amount of new

data, acquired on a regular basis, is growing rapidly, so it is necessary to manage them effectively.

The creation and introduction of BI systems are continuous operations, because both the company itself and its environment (the market, contracting parties, competitors) are constantly changing. The process of BI system building can be divided into the following stages:

– gaining knowledge from the Internet and source documents recorded in various transaction systems at a given organization, and then imported to data warehouses,
– building a data model adapted to the specificity of a given organization and its information system design,
– establishing criteria for selecting methods and techniques of data warehouse implementation,
– selecting tools to support the process of multi-criteria data analysis,
– creating application software.

Creating Business Intelligence systems enables to attain certain business goals and increase competitive capacity. In order to implement a BI system, and in this way achieve a success, it is necessary to fulfil the following condition: to get both business users and IT (Information Technology) employees involved in this process. This is obvious, but not easy.

We can wonder whether business users are ready to decide:

– which information is relevant,
– which source of this information is reliable,
– who should receive this information and when he should receive it,
– how to store information in order to make the right business decisions.

It seems that most business users do not know how to use data possessed by the company in the decision-making process, and how to handle these data. It follows that business users must realize that they need to continue their education in this area, or turn to experts for help.

Technologies used in BI systems

Modern systems, including BI systems, make use of numerous technologies, among other data warehouses[1], OLAP (on-line analytical processing) systems, and techniques of data mining[2] – Figure 2.

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[1] Data warehouses were created to provide access to archival data on products for analyses and forecasting. Passing from the product-centered to the customer-centered model of organization functioning requires a detailed, real-time analysis of customer behaviors (POE, KLAUER, BROBST 2000). New generations of BI analytical tools enable automation of customer service, marketing, supporting sales specialists or service centers (GROCHOWSKI 2003)

[2] Data Mining is a process of extracting knowledge from databases - it helps to select and order huge amounts of data, which are then transformed into information. In practice it means that data mining provides a set of analytical techniques and tools whose application ensures full use of data and allows to understand users' behaviors (GŁOWIŃSKI 2000)
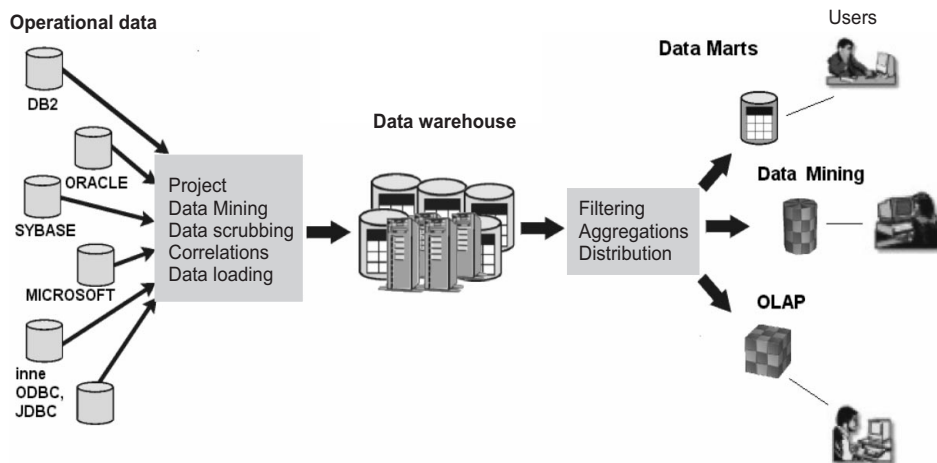
Fig. 2. Data processing in BI systems
Source: Kurowski (2003)

A data warehouse is a set of transaction data, transformed for the purposes of performing analyses. The essence of the concept of such a warehouse consists in combining data coming from many sources in one base, used by analytical applications in the process of supporting business decisions. Some of these data can be transferred to the so called data marts. The process of transforming and transferring information to warehouses is referred to as data mining.

OLAP systems are used for quick and efficient analysis of business data coming from various areas of the company activity. The distinguishing feature of OLAP technology is its multidimensional character. It uses a set of elements classifying the data analyzed (e.g. product and time). These tools are applied, among other, for making financial analyses (e.g. sale analyses), production planning, reporting, forecasting, etc. The application of special functions allows to reveal and calculate e.g. business trends which are not visible directly in databases. OLAP servers are designed for the processing of multidimensional queries, realization of analytical functions and providing the user with results in the form of comprehensible information, including graphical representation. The user can ask questions intuitively, and use network software.

Data Mining is a process of extracting knowledge from databases – information resources of a company or corporation. The basic data mining technologies include:
– segmentation, i.e. extracting significant business information from data sets,
– detecting links and sequential patterns,
– classification consisting in finding common features of objects (e.g. within the confines of such groups as products or customers),

– predicting such values as e.g. sale volume, demand for certain goods, or customer behaviors, combined with probability estimation.

An efficient BI system must be characterized by both tool practicality and specific application elements with built-in business functionality. Business Intelligence is also an environment with its own unique architecture (Fig. 3).
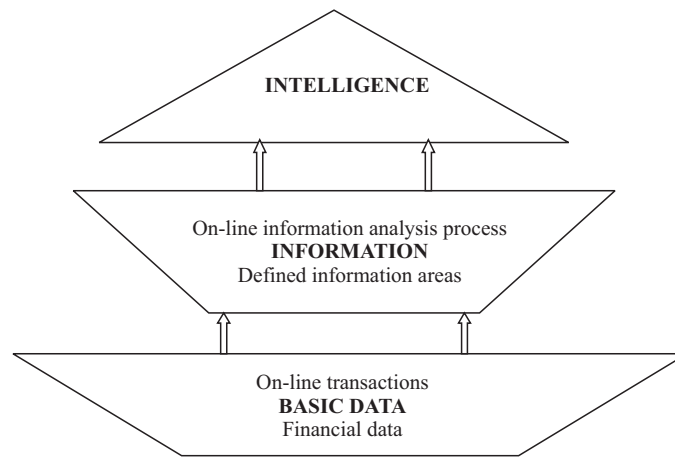

Fig 3. Architecture of the Business Intelligence system
Source: Own study based on (STANOCH 2001)

Therefore, Business Intelligence systems fill the information gap, especially as regards strategic and financial analysis, analysis of customer expectations and requirements, as well as company and market analysis.

Summary and Conclusions

In the nearest future the competitive power of a given economic organization will certainly depend on two factors: access to relevant, reliable information within the shortest possible time, and high selectivity in the process of data creation and utilization. A few companies only treat information as a first-class product; in most cases information is obtained as a side-effect of some other processes. Computer science is slowly becoming a partner for business. The information strategy should result from the business strategy, and the requirements concerning new systems – from the concept of process reorganization.

Therefore, BI is a separate class of systems rather than an overlay for transaction systems. BI is a synonym of flexible information available ad hoc, cross-sectional information obtained from various sources, and advan-

ced distribution mechanisms. In other words, Business Intelligence systems are user-directed processes of data mining, analysis of trends and relationship between data. They provide the user with an iterative process of access to data and analysis.

Reliable information and acquired knowledge enable to reduce the risk connected with business decision making. Knowledge is much more useful while making decisions than facts that can be found in the standard databases. Business Intelligence systems may facilitate access to this kind of knowledge. However, it should be noted that BI systems cannot solve all problems related to the functioning of companies. They contribute to systematizing and collecting information related to the situation of a company. Their advancement is directly proportional to the significance of processed data stored in these systems. Knowledge is the ability to take effective actions, and investment in knowledge always brings the highest rate of return.

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