

BI – SUPPORTING THE PROCESSES OF THE ORGANIZATION'S KNOWLEDGE MANAGEMENT

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Abstract. *The main goal of BI systems is to provide the access for the users to crucial information connected with the tools they use every day. It allows to take more relevant decisions, share knowledge with other people, cooperate within the whole organization and increase the company's gainings. The offered functionality includes either the scalable technology's platforms designed for workers in all management tiers.*

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ACM Classification Keywords: *K.6 Management of computing and information systems - K.6.0 General economics*

Introduction

The increase of the importance of information, which has become one of the most significant company resources, resulted in the growth of information systems' role in economy. These are especially Management Information Systems whose aim is to increase the competition through the use of IT in business strategy. The basic aim of Management Information Systems is to deliver as quickly as possible the information which is complex, reliable and appropriate as far as the form and the content are concerned and gives the answer for the current problem. The derivative aim is to enhance the management process in a given economic system in all management tiers.

The organizations are forced to process a vast amount of data because more and more data coming from the company's activity gives detailed information about consumers, new sales channels or extending the assortment. It turns out that using a worksheet for informing about business strategic decisions is not sufficient any more.

IT market offers many systems which constitute supporting tools for decision making processes. These are for example Support Decisions Systems, Executive Support Systems, Integrated systems – mainly ERP systems ect. Nowadays, they cannot always cope with all users' requirements. The excess of information, its arrangement,

inappropriate interpretation leading to mistakes have become the reason of creating Business Intelligence Systems (BI). BI systems are the generation of Management Information Systems (MIS) categorized according to the criteria of decision support level [Niedzielska, 2003]. The place of BI is presented by Fig.1. The role of BI is to support the processes of organization's knowledge management.

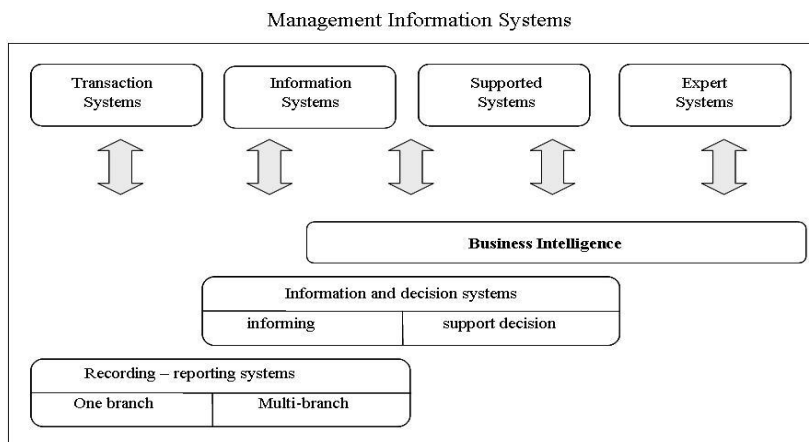


Fig.1. Management Information Systems.

Source: Niedzielska E.: Informatyka ekonomiczna. Wydawnictwo Akademii Ekonomicznej, Wrocław 2003, s.55.

BI systems

BI systems support decision making process and provide the access to up-to-date and reliable information. They help to find the answer for questions connected with the efficiency of the company's activity, explain the reason of the current situation and make plans for the future. They retrieve the data from many sources, usually in databases and then they analyse and process it. As a result BI is supposed to create the material which will constitute the base for drawing conclusions and rationalizing the process of making decisions.

In comparison with traditional systems, BI systems provide the quicker access, gathering and reliable information exploration. That is why, they use the advanced methods of data analysis such as mining, aggregation, crossing, casting and any other types of abstraction

levels of processes mapping in order to monitor the changing economic realities. They adjust the company to the current changes as quickly and precisely as possible and as a result make it more competitive. They analyse trends and relationships as well as their variation, consolidation and dissemination of information in the organization. They share data, models and computational formulas with other applications. They create typical reports and forms of presentation. They make it possible to make analyses ad hoc, predefine the set of questions and the access to the data and reports via the Internet portals. They contribute to the cost reduction of preparing reports and analyses. They are able to identify the chances and the risk, to show tendencies and consolidate the intuitive exploration of the main acts for the processes being realized. BI systems use the knowledge gathered in company's informative resources as well as the knowledge and experience of participants of the given process in order to understand the current processes' dynamics better. They can also combine the organization's strategy with operational activities, monitor the completion state of plans and prognoses and determine the costs of doing business. In comparison with any other systems they pass on the precise and up-to-date information to the users and define the economic processes in applications and automate them [Mańkowska, 2012].

BI systems may include the activity of the whole organization and make the detailed reports and analyses (Table 1).

The organizations start to notice the importance of budgeting and planning processes which are the following elements in converting the reporting and analytical systems into real BI systems. The process of reporting and analysing is important for each organization regardless of its size. The decisive factor which lead to the use of BI systems is not only the size of the organization but rather the number and variety of processes within its activity. In the organization with the expanded structure the time needed for gathering and processing the information is too long and that is why BI system is indispensable here. The implementation of BI system should be taken into consideration when the company's activity is complex. It is also helpful when there is no connection between the generated information and reports and the given strategy or the necessity of carrying plans and prognoses when the data concerning the future is incomplete. Another thing is a vast amount of databases and the tools from various contractors, lack of cohesion and unequivocal cause-an-effect-relationship between particular reports, lack of a quick and easy access to the processed information by managers as well as lack of satisfactory data concerning the analysed data.

Table 1. BI systems processes in particular activity areas of the organization

Area	Activity
Finances	<ul style="list-style-type: none"> - the current analysis of financial result - monitoring the condition of cash flow evaluation of financial ratio
Sale	<ul style="list-style-type: none"> - analysis of sales effect - prognosis of sales trends - analyses of products and profits profitability (analysis of the most and the least profitable products or the most and the least efficient workers) - marketing analyses sales verification
Logistics and buying	<ul style="list-style-type: none"> - estimation of stockhouse state - improvement of stockhouse economy - analysis of logistics processes - analysis of the efficiency of supply - contractors and collaborators' analysis
Production	<ul style="list-style-type: none"> - analysis of production costs - analysis of the use of production supply - analysis of production quality
Marketing	<ul style="list-style-type: none"> - analysis of market trends - providing the knowledge and experience gained while planning and introducing new products in the market - evaluation of the possibility of exerting an influence on the market (for example means on the advertisement) - evaluation of economic situation and development perspective
Human Resources	<ul style="list-style-type: none"> - analysis of work and register of workers' absence
CRM	<ul style="list-style-type: none"> - improving the relationship with clients - evaluation of some clients' profitability looking for key clients

Source: Own elaboration.

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The aim of implementing BI system on an advanced level is to support the process of making management decisions. The typical problems:

- to discover the reasons of the current business situation "what caused that something else happened?";
- identification process – "Which category should a particular case be numbered with?";
- prediction of further development of a given situation – "What may happen?"
- simulation of possible effects of making any management decisions;
- suggesting optimal options of the management decisions.

BI systems are supposed to enhance the organization's knowledge management in 3 levels presented in Table 2.

Initially the BI systems were restricted for supporting decisions in strategic and tactical area – while creating and developing products, while managing the finances as well as managing the process' efficiency. Currently, the properly implemented BI tools make it possible to deliver the information in any management level starting from the strategic one, through the tactical and daily management of the organization. The functionality of Business Intelligence solutions is not only restricted to a simple reporting but it can also support the management and realization of planning process, budgetary financing, reporting and the control of the achieved results. As far as the monitoring and formation of the companies' activity are concerned, they gain new possibilities while moving from time-consuming data collection and preparing the data and balance sheets to analysis of information which is currently made accessible through the advanced BI tools. BI applications of new generation are supposed to make accessible the information crucial to make decision on any operational level. BI tools play an important role in supporting the workers who are in direct touch with a customer.

Table 2. Tasks of Business Intelligence Systems

Management level	BI tasks
Operating	Analysis carried out ad hoc, information on current operations, finances, sales, collaboration with suppliers, customers, clients, etc.
Tactical	Fundamentals of decision making in marketing, sales, finance, capital management. Optimising future actions and modification of financial factors, technology in the implementation of strategic objectives.
Strategic	Precise setting of goals and tracking their implementation, to perform various comparative statements, conducting simulation development, forecasting future performance under certain assumptions.

Source: Own elaboration [Stasieńko, 2011].

BI system implemented in the operational level provides so called management information. It may occur in a form of charts, reports, tabular specifications etc. This information is created as a result of operations conducted on the data (exploration and aggregation). The management information is applicable in statistical methods, operational research and econometric models. It is typically used for costs monitoring and financial liquidity, analysis of net profit margin, analysis of manufacturing productivity and monitoring the condition of storage etc. BI systems have the advantage over classical reporting systems in which the analyses structure is "flat". The information is examined from only one point of view. BI systems are multi-dimensional structures. This feature allows to analyse at the same time the information from many points of view that can be changed dynamically. BI systems use also the methods of artificial intelligence. We can distinguish for example grouping through the analysis of the clusters, decision trees – sequential pattern analysis, classical pattern analysis – NN classifier and the classifiers based on decision-making within neural networks, inference system's [M. Flasiński, 2011]. BI systems can exist independently and take data from transactional systems (SCM and CRM) or they can constitute a part of them (a module).

BI in-memory

The growing number of the analysed data, the greater users' requirements and incapability of traditional BI platforms contributed to the change of attitude towards BI systems. There was a turning point in BI technology as well as in business users' awareness and preferences. There is a growing need for computing power. As a result there are innovative tools using in-memory bases called also Business Discovery. They are widely used as the most important analytical tools. The new technology makes it possible for BI users to use the flexibility, simplicity and service independence (self-service software conception), quickness and accuracy of analyses as well as the access to information in a form of attractive visualizations. QuickTech company with its QlikView is a leader in this market. The application is elaborated on the pioneering analytical platform based on associative in-memory conception being developed from 1993. QlikView application is also available in Poland.

Apart from technological aspects, another thing enhancing the current changes is the business user's awareness. The above mentioned trend reflects the social changes connected with perceiving the software and application tools. Nowadays, IT consumers are accustomed to the quickness and service simplicity. IT tools in which various processes last longer are difficult to be accepted by the users. The users appreciate modern BI in-memory technologies where uploading and processing the data in operational memory, even if it is dispersed or gathered in different standards allows to make interactive real-time analyses and to receive the answers in split seconds. It is reflected in gradual transmission of BI tools from specialists to the business users.

Most Business Intelligence solutions based on OLAP technology usually limit the analyses to several dimensions and as a result it forces the users to determine the questions they would ask in the future in the first phase of implementation. The traditional OLAP always downloads the data because it is impossible to perform an operation on the basis of others. The implementation and work in QlikView are different. The analyses are not restricted by any number of dimensions and the changes can be made ad hoc very quickly. Such features of QlikView make it possible to use agile methods of projects management. The applications may be created evolutionally and the users are able to start using the effects of their activity and they can also take part in the process of their implementation. Another advantage is the possibility of adding new data to the application at any moment and from any source including for example text files, XML or Excel Worksheets. Such possibilities allow to modify the existing applications or creating new ones able to make any analyses in unusual situations. The analyses results are presented in form of

clear carts and balance sheets. Graphics can be arranged and changed from the point of view of various groups of workers and that is why the use of QlikView gives a lot of satisfaction. The managers monitor and control sales processes all the time so that they can detect even the smallest deviation and react as quickly as possible. QlikView is a complete business intelligence solution that consists of a data source integration module, analytic engine and user interface. QlikView is based on a patented architecture called Associative Query Logic (AQL) and is completely different from other OLAP tools.

Through AQL, QlikView eliminates the need for data cubes and data warehousing, replacing the cube structure with a patented data structure called a Data Cloud [Morejjon, 2012]. The Data Cloud does not contain any pre-aggregated data but instead builds non-redundant tables and keeps them in memory at all times. Queries are then created on the fly and are run against the Data Cloud's in-memory data store.

QlikView, thanks to the unique associative in-memory database technology, provides a quick insight into data and as a result makes it easier to take decisions for all business workers. It is all done thanks to one coherent analytical platform and it is quicker and cheaper. This platform was the basis for creating applications which enable making analyses of various types of data which were mentioned in [Stasieńko, 2010]. Developing technology creates new applications to analyse the data on a given subject. Last year there were created new applications connected with sport events like Olympic games and Euro 2012. The QlikView Global Games App captures the spirit of the 2012 Global Games. This application allows to analyse the event's stats, facts, trends, and trivia. It also enables to visualize, analyse, compare, and contrast game data by athletes, sports, countries and more. The data goes back to the very beginning of the modern games. This application contains historical medal winners data from 1896 through 2008 and daily updates of medal winners in 2012. The sports data, GDP, population and world record data are also available in this application for extended analysis. Fig.2. presents the amount of medals won during Olympic games by Polish competitors. Fig.3. shows a list of Polish Olympians of particular sport discipline and medals. The second chart depicts the number of medals won in particular sport disciplines. Fig.4. includes personal information about a given Olympian.

KICK-IT application and Qlik-IT Euro Football 2012 allow football fans to discover interesting facts connected with football. They make it possible to watch (data actualization took place in every 60 minutes) groups eliminations, quarter-finals, semi-finals and finals (Fig.5.), matches results, the best footballers etc. It is possible to check the information about the already played matches (fig.6.): the place, a group composition, shooters, changes and the received cards etc.



Fig.2. Application window, after choosing a particular country – Poland, which shows a number of medals won during Olympic games by Polish athletes
Source: Own elaboration.



Fig.3. A list of Polish Olympians of particular sport discipline and the obtained medals as well as the number of medals won in particular sport disciplines
Source: Own elaboration.

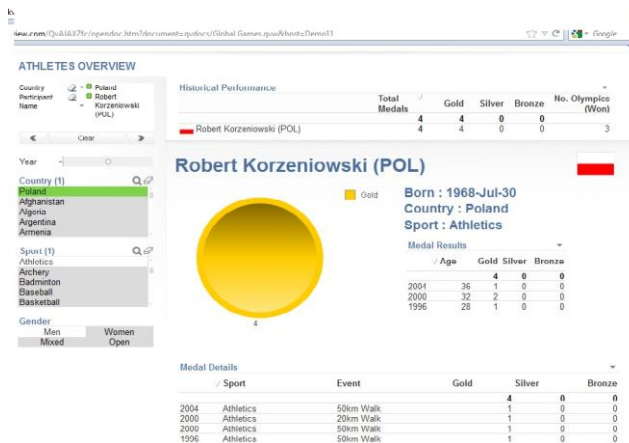


Fig.4. The information concerning the number of medals won during the World Championship by an athletic
Source: Own elaboration.

Group	Team	MP	W	D	L	HR	LR	GF	GA	GD	PTS
Group A	1 Czech Republic	3	2	0	1	1	1	4	5	-1	6
	2 Greece	3	1	1	1	2	2	3	3	0	4
	3 Russia	3	1	1	1	3	3	5	3	2	4
	4 Poland	3	0	2	1	4	4	2	3	-1	2
Group B	1 Germany	3	2	0	0	1	1	5	4	1	6
	2 Portugal	3	2	0	1	2	2	5	4	1	6
	3 Denmark	3	1	0	2	3	3	4	5	-1	3
	4 Netherlands	3	0	3	4	4	4	2	5	-3	0
Group C	1 Spain	3	2	1	0	1	1	6	1	5	7
	2 Italy	3	1	2	0	2	2	4	2	2	5
	3 Croatia	3	1	1	1	3	3	4	3	1	4
	4 Republic of Ireland	3	0	0	3	4	4	1	9	-8	0
Group D	1 England	3	2	1	0	1	1	5	3	2	7
	2 France	3	1	1	2	2	2	3	3	0	4
	3 Ukraine	3	1	0	2	3	3	2	4	-2	3
	4 Sweden	3	1	0	2	4	4	5	5	0	3

Fig.5. Data concerning the matches: winning, lost and drawn ones, score, and costumes worn by a given team.

Source: Own elaboration.

Team	Player	Number
Poland	Wojciech Szczesny	1
	Robert Lewandowski	9
	Line-up	
	11 Wojciech Szczesny	1
	20 Lukasz Piszczek	13
	13 Marcin Wasilewski	15
	15 Damien Perisic	2
	2 Sebastian Boenisch	16
	16 Jakub Blaszczykowski	7
	7 Eugen Polanski	10
10 Ludovic Obraniak	11	
11 Rafal Murawski	8	
8 Maciej Rybus	9	
9 Robert Lewandowski	22	
22 Piotr Mysliwski	70	
70		
Substitutes		
22 Piotr Mysliwski	70	
70		
Greece	Giorgios Karagounis (Pen. Miss)	
	Giorgios Karagounis	
	Dimitis Salpingidis	
	Jose Holebas	
	Line-up	
	1 Kostas Chalkias	15
	15 Vassilis Totosidis	19
	19 Sokratis Papastathopoulos	8
	8 Arisam Papadopoulos	20
	20 Jose Holebas	2
2 Giannis Maniatis	21	
21 Kostas Katsouranis	10	
10 Giorgios Karagounis	18	
18 Stelios Ntinas	17	
17 Theofanis Gekas	7	
7 Georgios Samaras	5	
5 Vasilios Papadopoulos	14	
14 Dimitis Salpingidis	48	
48		
22 Kostas Fortounis	68	
68		

Fig.6. Detailed information on a particular match

Source: Own elaboration.

QlikView application is implemented in Polish organizations successfully. We can distinguish for example: banks, pharmaceutical company, companies connected with structural branch as: Tuxplex, Saint Gobain Polska, Iglotech, Ever GRUPA, ESBANK Bank Spółdzielczy, EGIS Polska, Casinos Poland, BRE Bank SA, Biuro Podróży ITAKA, Antalis Polska. These companies chose QlikView solutions (BI In-memory) because of its computing Power, flexibility, low requirements as far as the equipment is concerned and its intuition. There are more and more systems on the Polish market which use in-memory technology. One of them is an integrated system Comarch CDN XL. "BI Start" module is used for creating reports and making analyses on the basis of data based on in-memory technology. As opposed to a "full" version of Business Intelligence packet, all the data generated by the reports is stored in computer memory. Among many other aspects, Comarch CDN XL BI Start has wide options of creating and manipulating the reports and

presenting them in more than 40 types of charts. What is more, it is able to manage the qualifications for activating the reports, to operate either domain accounts and SQL logins. It organizes reports in folders and makes it possible to create applications for sending e-mails with reports for particular users on the basis of a schedule (e.g. Every day they receive information about the storage and payment [5].

The market has been dominated so far by the tools based on traditional solutions (Table 3).

Table 3. BI tools in the particular IT companies

Software producer	Product
Oracle	Siebel Business Analytics Applications
	Hyperion System 9 BI+
SAS	Business Intelligence
SAP	BusinessObjects XI
IBM	Cognos 8 BI
Microsoft	Analysis Services
MicroStrategy	Dynamic Enterprise Dashboards
Pentaho	Open BI Suite
Information Builders	WebFOCUS Business Intelligence
TIBCO Spotfire	Enterprise Analytics
Sybase	InfoMaker
KXEN	IOLAP
SPSS	ShowCase

Source: Own elaboration.

Currently, the potentates in IT business (Microsoft, IBM, SAP, Oracle) try to include in-memory solutions in their offers. They usually create hybrid tools which combine classical BI and BI in-memory. On the other hand, BI products offered by these potentates lose their position of solutions treated as analytical platform standards in the organizations. There is going to take place a reshuffle among the main analytical solutions contractors because of such an intensive solutions evolution and the change of standards in work with business applications.

Conclusion

Nowadays, the attitude toward BI changes in many organizations. It is the end of era in which the business was run by intuition. The organizations, which are going to be successful, are the ones able to manage the information and use it in the decision making process.

BI systems give the possibility of increasing the competition on the market and taking proper and quick decisions.

BI systems help also to combine the initiative connected the enterprise's future with the branch of conducted business activity in order to understand and sort out the data in such a way that helps the managers to receive the crucial information in the proper time and as a result increase the enterprise's efficiency.

Business Intelligence systems deserve certainly credit in strategic management of the company. They constitute great tools in decision taking processes. As far as the analyses are concerned they can contain all areas of economic organization. Nevertheless, it is necessary to remember that analytical systems are risky and the success of their implementation is strictly connected with the use of their functionality by the users.

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Major Fields of Scientific Research: Management Information Systems, Business information technology