Business Intelligence Systems

BUSINESS DISCOVERY – A NEW DIMENSION OF BUSINESS INTELLIGENCE

Justyna Stasieńko

Abstract. *This article deals with the issue of Business Intelligence (BI), especially its next generation - Business Discovery(BD). This tool can help to fill the gap between traditional solutions we get from BI and standalone office productivity applications. Its users are able to forget new paths and make new discoveries. Here we want to present BD as being thoroughly complementary to traditional ERP, CRM, BI, and data warehousing systems. BD brings a whole new level of analysis, insight and value to the information stored within these systems. What is more, its users are not burdened with interfaces which are difficult to use and configure.*

Keywords: *Business Intelligence, Business Discovery, information, analysis, Qlickview*

ACM Classification Keywords: *K.6 Management of Computing and Information Systems - K.6.0 General* Economics

"Computers are useless. They can only give you answers."

Pablo Picasso

Introduction

Currently, one can notice a sea-change approach to the role and importance of information. So far, information has often been treated as a by-product or, at best, co-implemented business processes. Now the information is one of the most important organising resources. The information is a factor that increases the knowledge about the reality surrounding a man, or specific intangible asset, which, with economic progress and development of means and forms of social communication, is becoming more and more important, transforming the face of many traditionally organised economies of the world.

The importance of information in the modern world should be analysed in various aspects. One can even attempt to say that in a sense, the information is the engine of progress in every area of human life. Following an increasing pace, technological development to a great extent depends on the speed and the quality of information. Thus, the access to information should be easy, and the way it is used should present its values.

In order to achieve business benefits the strategic decisions are taken. These decisions result from the study of gathered information. For hundreds of years experience had been mainly a source of information. They were mainly mathematics and mathematical models, then the statistical models, econometric, and now the Internet.

A growing number of data, a flow of information, fast communication via the Internet and new market challenges mean that data analysis, broadening knowledge and skilful decision-making in an increasingly complex market are essential to survive and run business. Solutions in an enterprise operate at many levels and play various roles supporting the administration or management, yet they have their own limitations. Especially in the

processing of a large number of diverse data and in the use of information in many fields. In order to meet the demands BI solutions have been created .

Business Intelligence is now the most important and inevitable point of contact between sciences and business. Business Intelligence tools enable an easy access to information, its analysis and sharing across the organisation and its business environment. They give the possibility to integrate data from different sources and their comprehensive analysis in terms of business needs. BI gives a preview of all business organisations. Their goal is to support effective business management and business planning by providing the right information. They support the work of managers in managing key areas of business. Most generally, one can present it as a process of transforming data into information and the information into knowledge that can be used to enhance the competitiveness of enterprises. Among these tools there are both management systems of information resources, reporting and analysis tools, and also solutions enabling to boost managing performance.

Information in the organisation is generated and processed mostly in the transactional software, such as ERP, CRM. These systems have evolved over the years. The first stage of its development was automating tasks and processes, reporting and logging. This has contributed to an increase in the information registration. The second phase was the emphasis on resource planning and the efficiency of business processes. For better reporting and data analysis data warehouses have been introduce– an aggregation of transactional information and multi-dimensional analytical models. Due to the need of a larger amount of information for analysis and its presentation in a friendly manner, tools in the field of decision support proved to be necessary. The solution which came out to meet the problems of modern organisations are Business Intelligence Systems (BI). Traditional BI technology use data warehousing, analytic tools (OLAP and Data Mining), and presentation techniques. They enable to optimise operations, to increase efficiency, to reduce the risk of taking wrong decisions, as well as to reduce costs and to maximise profits.

Analytical tools

Analytical tools existing on the market support a decision maker by providing him/her with the necessary knowledge - in the form of reports based on historical and current data - to make decisions. They allow the standard and advanced reports using statistical analysis, forecasting, relationship between the data search, research trends [Nycz, 2008].

The basic analytical tools include query generation tool and reporting (Query & Report - Q & R), spreadsheets, OLAP mining and data visualisation tools [Dudycz, 2004].

Query and reporting tools are the most basic tools for data analysis, in particular, gathered in the data warehouses. There are two types of reporting: the standard and so called 'ad hoc'. Frequently they answer the questions "what happened?", "What level of sales was as in the previous year?" etc. In the second half of the 1990s, it was noted that the data stored in databases, transactional systems used in companies caused a lot of trouble to analysts who carried out the assessment of a business enterprise. This problem was solved by introducing analytical techniques implemented, inter alia, in spreadsheets [Dudycz, 2004], which enable to create models that generate periodic reports automatically [Sierocki, 2007]. Spreadsheet offers flexibility when it comes to the definition of the conditions of analysis and ease of use. The difficulty arises when the basis for analysis are large volumes of data or high complexity of the model. In order to achieve the desired analytical flexibility a wide enough diagram of processing must be built, often based on large amounts of macro-commands and sheets. This solution cause difficulties of managing the data, and at the same time it is prone to user's errors. Sheets have a limited working capacity for the data, which almost eliminates their usefulness for the analysis of large portions of data, reaching hundreds of thousands of transactions.

Facing new challenges, a concept of multidimensional databases and OLAP technology emerged, which allowed for a dynamic and multidimensional analysis of business data.

OLAP architecture is encountered in data warehouses and tools for analysis such as query languages, data mining, artificial intelligence, as well as report generators. Through proper presentation, visualization and aggregation, it enables to display and view data from different points of view allowing its user to examine them quickly. In addition, it is characterized by the possibility of an interactive reporting without knowledge of programming languages and to obtain answers to complex and often non-standard queries in a current mode. Therefore, OLAP tools are often used to perform analysis of sales trends, financial analysis (data warehouse), or to pre-screen the data set by the analyst in the initial phase of statistical analysis [Sierocki, 2007].

Data visualization tools are designed to increase transparency and legibility of presented information. Most of the analytical tools offer simple dependence images between the data.

Existing tools of data acquisition and processing of analytical reports, such as generators or spreadsheets were not able to fully meet the needs of managers who have to make a relatively fast growing in-depth analysis.

Facing these challenges, a concept of multidimensional databases and OLAP technology was introduced, HOLAP, MOLAP and ROLAP, which allow for a dynamic and multidimensional analysis of business data. Architecture of the OLAP (MOLAP, DOLAP, ROLAP, HOLAP) may be encountered in data warehousing and data analysis tools such as generators, reports, query languages, data mining, artificial intelligence. It enables to display and view the data from different points of view allowing its user to examine them quickly through an appropriate method of presentation, visualization and aggregation.

OLAP systems are characterized by the possibility of:

- perform multidimensional analysis according to complex search criteria,
- interactive reporting without knowledge of programming languages,
- obtaining answers to complex and often non-standard (so called 'ad hoc') queries in a current mode.

Therefore, OLAP tools are often used to perform analysis of sales trends, financial analysis (data warehouse), or to pre-screen the data set by the analyst in the initial phase of statistical analysis.

In order to deepen the analysis and discovery of repetitive behaviours in large data sets through data mining, matching various models and relationships between data analysis, special methods are used for data mining. Data mining is a methodology that refers to a technique derived from mathematical statistics and machine learning algorithms. Information extracted by using these tools can be used in areas such organisations as the support of decision making, forecasting, financial analysis and risk analysis, optimisation.

A frequently used data mining tool is a universal, integrated system for statistical data analysis - STATISTICA. This software not only contains statistical and graphical procedures for general use, but also powerful tools for analysis and visualisation of data, as well as specialised analytical techniques (e.g. social studies, biomedical, or technical) [Dudycz, 2004].

Other tools to cope with the analysis of the large amounts of data processed into information, and then into knowledge are BI systems.

BI systems should improve the management of knowledge in an organisation at the three levels presented in Table 1

Table 1. 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.

The new generation of Business Intelligence systems

Business Intelligence turns out to be the new quality in the management conception. BI systems are used in order to create and improve the relationship with a customer, yet at the same time to boost management effectiveness. Unfortunately, traditional BI software seems to have failed, as far as delivering on this vision is concerned, as a result of its complexities, time lags, and expensive professional services requirements.

Forrester Research's definition of BI is "a set of methodologies, processes, architectures, and technologies that transform the raw data into the meaningful and useful information used to enable more effective strategic, tactical, and operational insights and decision-making." This definition of BI covers the whole data-to-insight process (including data preparation). It all appears to be time-consuming, especially to plan and implement - from collecting requirements, to building a data warehouse, to populating a metadata layer. Traditional BI software users have problems to learn and use it, and, in consequence, adoption is limited. Moreover, distribution of information and analytic tools is tightly controlled.

Traditional BI systems are high cost and IT driven. They are chosen, installed, and maintained by IT organisations and in most cases not by the business people themselves who will use them later on. Owing to the complexity of the system, not many people (in an organisation) feel skilled enough to form business insights. When business analysts and IT professionals want to be sure that they deliver the right analysis, the back-and-forth questions and answers with their business constituents make it really difficult for them. Traditional BI usually constitutes more or less centralised, pre-packaged reports or predetermined queries which users can run to get updated numbers. It often happens that the information we get is mostly static. Therefore, users having a question which is outside the standard configuration need to log a ticket with IT and expect their assistance (sometimes weeks or even months). The drawback of BI is the fact that it is centralised, possessed by IT, difficult to change or modify, and slow to deliver results. What is more, it is also expensive and highly complex.

In addition, if one wants to deploy a traditional BI solution, it can take him/her up to a year and a half. By and large,it seems to be due to requirements gathering and data modelling and integration efforts. This is definitely not what the business needs as an organisation can live and die within this time. Furthermore, traditional BI requires lots of services and support in order to keep its various components working smoothly.

BI in the company combines finance, manufacturing, warehousing, logistics, purchasing, sales, HR, planning and strategy - in short, all aspects of a company. Therefore, BI uses a common repository of information - Data Warehouse. All facts come from individual branch systems through ETL processes converted into information and

stored in the DSA - Data Staging Area data warehouse. From this information the system uses the second part of the Business Intelligence which converts this information into knowledge and provides the user through the presentation layer. Thanks to the class Business Intelligence supports managers effectively, and enables, inter alia, building a What-If analysis, budgets and controlling systems.

Traditional BI turns out to be excessively bloated and rigid. Further evolution of these systems will lead to the revival of petrified BI. During this evolution Business Discovery (BD) has emerged. Trying to answer why BI platform displaces BD, one would indicate the four trends that have caused the evolution of the BI software market. The first one is the ability to search the Internet and to obtain a rapid response. The second trend is the community network (social networking) that enables to communicate, to share information and to develop robust, professional and personal networks (with no requirement of technology background). Other trends are the development of mobile and task-specific applications. In conclusion, BD are much faster, open and straightforward at the same time, mobile and addressed for everyone.

Business Discovery platforms (offering new solutions), as opposed to its ancestor, can have a total cost of ownership that is half that of other BI solutions. Business Discovery is a whole new way of doing things for Business Intelligence.

Concept of Business Discovery

If we decide to store data in-memory, it means we no longer have to deal with a database located somewhere else, and we receive no queries and no retrieval. Thanks to it, there is no delay in returning results, whatsoever.

Business Discovery (BD) is a complement to traditional BI, ERP, CRM, and data storage systems. It also introduces
a new level of analysis, knowledge and value of information that fall within these systems. Additionally, it became a response to the unmet needs of users as it is a new way of doing BI. It is a bottoms-up approach that puts the user in control, fulfilling the promise of BI. The main aim of BD is to help users to solve specific business problems in a timely way to get answers to the most critical questions and also to share knowledge and analysis among individuals, groups, and even organisations.

Most essentially, users are capable of gaining insights that address their individual needs at every level of the organisation. It seems that they are not limited to particular paths they must follow, or questions they are obliged to formulate in advance. The key issue is the fact that they can ask about what they need.

Business Discovery gives an opportunity of a whole new level of analysis, insight, and value to existing data stores with user interfaces that are clean, simple, and straightforward. It is complementary to traditional BI software and other enterprise applications. BD is enriched with new opportunities for BI. The most vital one would include an application interface (insight for everyone), the time to provide results of the analysis, mobility of applications, remixability and reassembly, and finally social and collaborative environment.

Importantly, everyone can create an insight by means of Business Discovery. It's the equivalent of open source computing or peer creation. This is definitely intelligence creation — rather than just information consumption. First of all, Business Discovery is not a large collection of centrally-controlled, pre-packaged, and tightly-distributed data. Secondly, rather, it provides data access and analysis to individuals and groups, and allows them to get what they ask for faster and more accurately than ever before.

BD enables instant analysis. The user receives the results at the bedside, where it lasted weeks with the traditional BI. It has a direct access to all necessary data. Technology can ask any questions to which answers are kept on-line.

At all levels in an organisation business decision makers need data at their fingertips, wherever they are. They want to work how and where they like - whether that be in the warehouse, on the customer site, or on the trade show floor. Tablets and other large-form-factor mobile devices promise to make business data ubiquitous. Unlike traditional BI solutions, Business Discovery platforms provide an intuitive interface and an application infrastructure that is tailor-made to exploit the opportunity of a truly mobile, well-informed workforce.

BD supports mobile applications. This allows the provision of data while using mobile devices such as iPhone, Android.

Business Discovery platforms empower anyone to quickly develop and deploy simple, focused, and intuitive applications that can be easily reused. These applications are easy to modify, mash up, and share, allowing innovation to flourish at the edges of the organisation and spread inward. The new opportunity is leveraging a model that lets any user quickly develop and deploy task-specific, purpose-built BI applications. BD platform enables its users to quickly create and implement among others their own applications. These applications are able to quickly solve specific problems.

Nobody can predict what questions business users will have when they start exploring data — not even the users themselves. Traditional BI solutions require IT or power users to get involved whenever new questions arise. In contrast, Business Discovery platforms make it easy for business users to remix and reassemble data in new views and create new visualisations for deeper understanding. With BD, users generate insights like never before.

BD makes it easy to "remix" and reassemble data to the new views (previews) and a fast way to create visualisations.

BD is a social and collaborative environment. It enables its users to share and collaborate on insight and analysis. They can share insights within Business Discovery apps or through the integration with collaboration platforms. Business Discovery is about creating a community of users who engage in wiki-like decision-making to drive knowledge that can cascade across an organisation.

QlikView BI in-memory

QlikView is a modern and innovative approach to Business Intelligence. What adds value to the existing QlikView BI applications include: making the process of assembling, associating, and preparing data for analysis simple and straightforward, allowing users to interact with data in the way they think-associatively. A great advantage of QlikView is that data is collected in memory, which improves analysis and convenience to use.

QlikView was built with a simple architectural premise. All data should be held in memory, and all calculations should be performed when requested and not prior. The goal was to deliver the powerful analytic and reporting solutions in a quarter of the time, at half the cost and with twice the value of competing OLAP cube based product.

QlikView is the world’s first associative, in-memory BI platform. It manages associations among data sets at the engine level, not the application level, by storing individual tables in its in-memory associative engine. Every data in the analytic dataset is associated with every other data point in the dataset.

Associative cheese means finding answers to questions, but also the questions that have not yet been started. What is meant by a simple application is creating questions that do not require knowledge of creating queries in SQL. This associative experience gives decision makers a better overview of their business.

Visualisation is of dual significance. Firstly, it refers to the visual display of summarised forms of information. Secondly, the ability to see those displays change as the selected date is changed. QlikView offers various ways

of data presentation: graphs, charts, tables and others. It also enables its users to create different types of measures that enhance the analysis process. It provides flexible, intuitive and powerful data visualizations.

Using the QlikView application is pleasant and not too complicated (Fig.1)

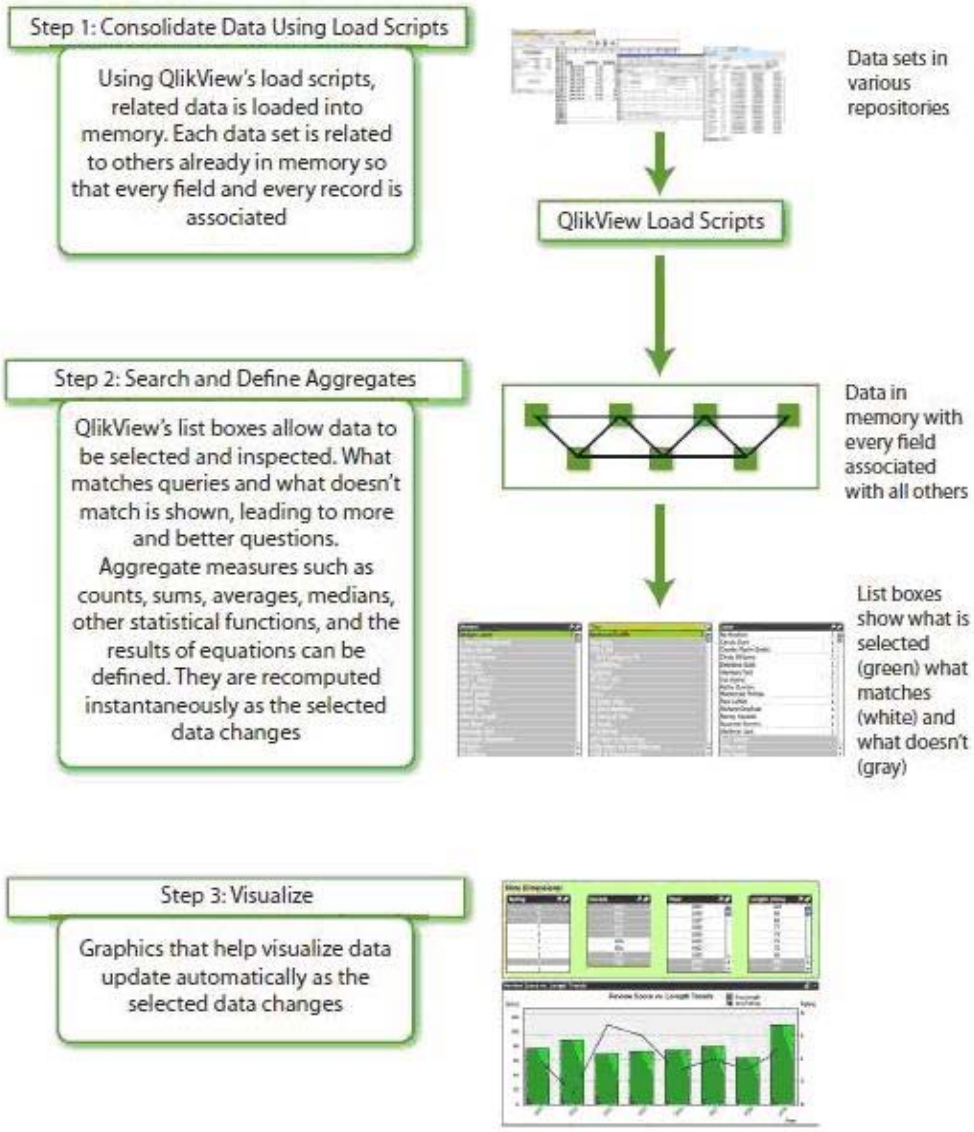

Fig. 1. A Step-by-Step Tour Through QlikView. Source: [The Art of Business Discovery p.8]

QlikView stores data in memory instead of retrieving it from databases and OLAP cubes, it cannot only display what is included in your search, but also what is excluded as well. This is certainly a real departure from traditional BI (i.e. for the first time, unknowns become known).

Compared to other analytical tools or BI based on the OLAP 'cube', an application of QlikView present the analysed data to the user in a faster and simpler way. QlikView gives a chance to impose criteria onto the data. In a straightforward and quick way, QlikView gives the opportunity to return to the previous data or to add further ones upon existing criteria. Due to its simplicity and ease to use, a user-friendly and attractive QlikView interface is a modern and highly efficient application. It has also, not available for other solutions, the time of submission of new studies, computing power and flexibility. Software flexibility leads to the lack of restrictions on the number

of dimensions and measures, and its power – to virtually immediate response to inquiries from the system, even with databases of up to five hundred million records. It also provides the possibility of an immediate transition to a single transaction.

QlikView enables to view data from different perspectives (Fig. 2). Indeed, some analysis can also be done, for example in a spreadsheet, but QlikView provides instant viewing of data by analysing different criteria.

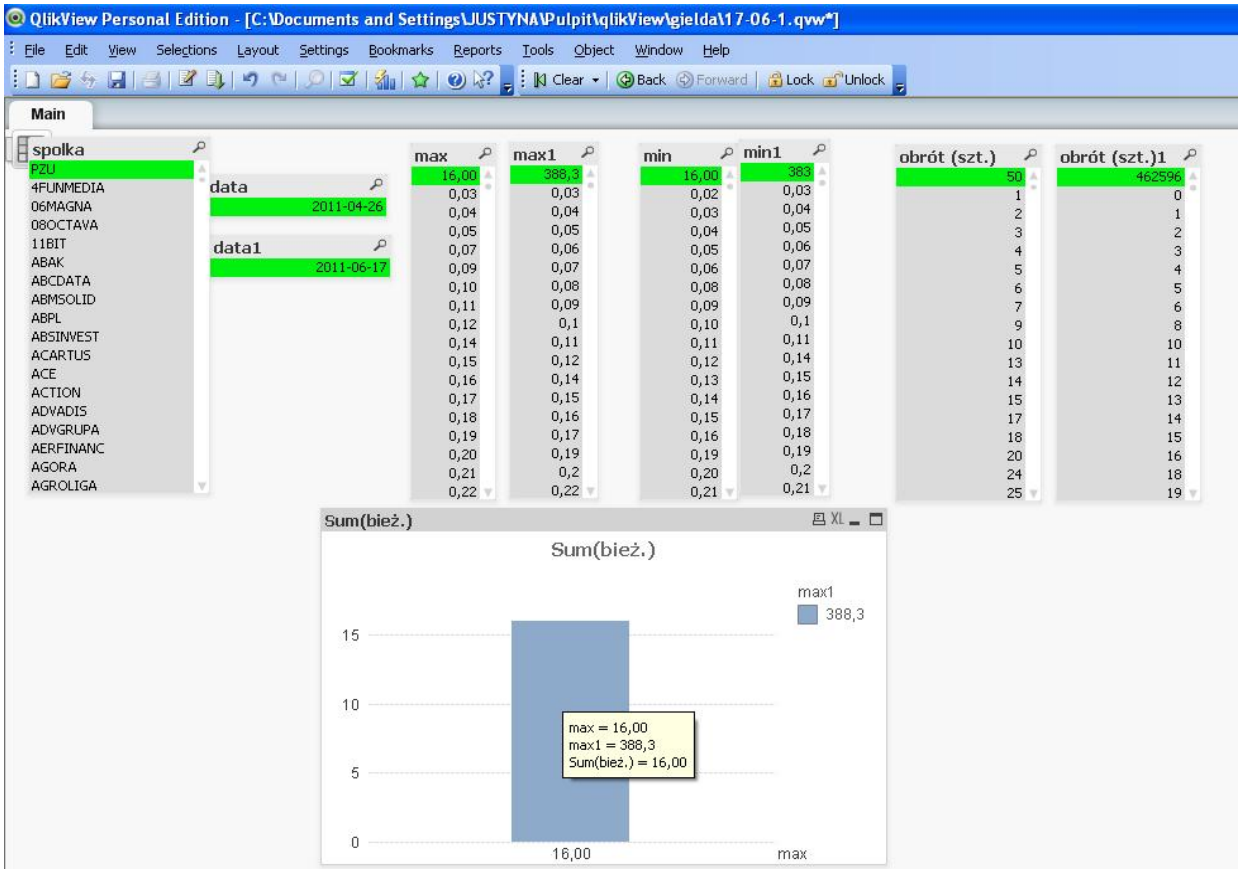

Fig. 2. Comparison of speed, start and end of a listed company PZU session held on 26.04.2011 and 17.06.2011
Source: Own elaboration

It is not necessary to switch from a previous analysis (Fig. 2), all one needs to do is to simply click or select the appropriate criteria and get a completely different analysis (Fig. 3) that no longer applies to the company, PZU, but only to the same level of stock prices such as 0.19 PLN during the trading session on 17.06.2011. This is a great help because another analysis from the beginning is not required. While working on some data one can analyse them in many ways without switching between windows, sheets, etc.

QlikView software enables to transfer analysis results, which remain still just as functional, onto hardware. The application allows printing of the results in the form of reports, exporting them to MS Excel or saving as PDF. It is practically capable of integrating all data formats - from standard relational data into text reports, the data from Excel and XML streams. QlikView is quickly and easily deployed and integrated with existing enterprise systems.

Table 2 shows the advantages of QlikView applications compared to traditional BI systems.

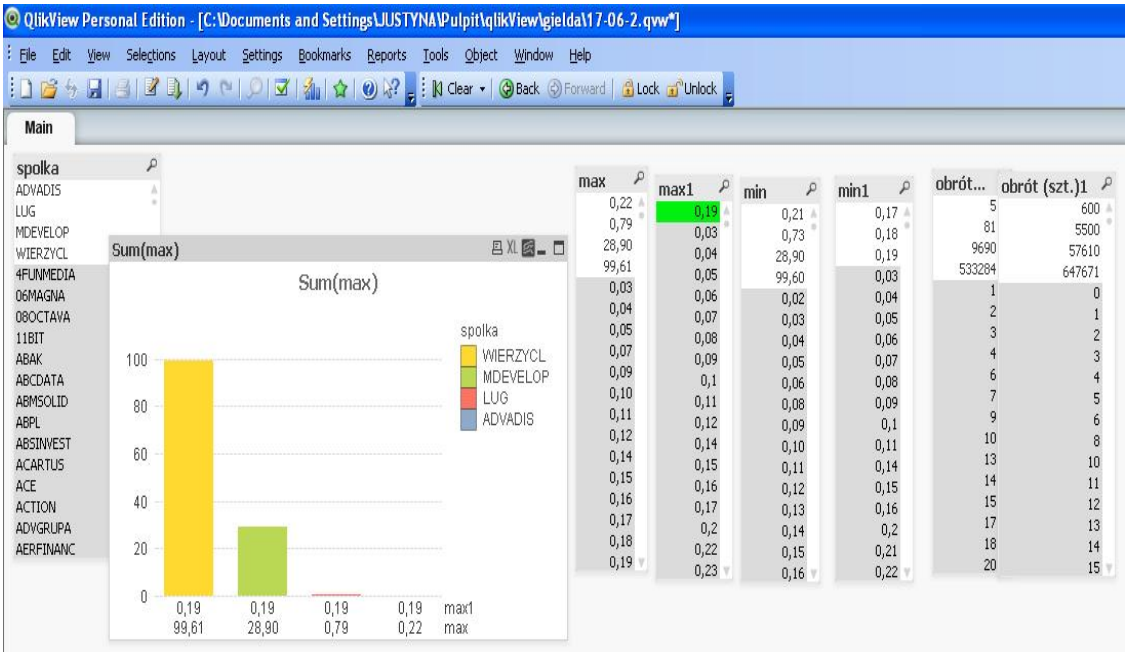

Fig. 3. Maximum price for shares at the 0,19 PLN level on June 17th, 2011. Source: Own elaboration

Table 2. The differences between traditional BI and in-memory BI systems, such as QlikView

Traditional BI	QlikView
Lots of tools: data warehouse and data marts, OLAP, query and reporting tools, data mining	Simple architectural premise - all data should be held in memory
Presentation techniques of analysis (dashboards, scorecards, reports)	Presentation techniques of analysis (charts)
Many users	One user
Longer time of implementation (approximately 18 months)	Short time of implementation (several weeks)
High costs of implementation	Low costs of implementation
Less convenient and flexible for user	Easy to use, flexible
Time-consuming and complex process of information processing	Fast query and on demand calculation engine

Source: Own calculation.

At the end of 2010, there is another version (QlikView 10). A new feature is the ability to deploy the software on any platform: local, cloud computing and mobile devices. The release of the platform in the cloud is via Amazon's Elastic Compute Cloud (EC2). It has also enormous power to allow flexible analytical processing of large data sets while maintaining access to the details. It is not limited by any number of dimensions. Changes in the designed applications can be performed quickly and without possessing advanced knowledge of programming. The application offers new opportunities to present the results of studies using AJAX. New ways to visualise data facilitate the understanding of the data presented. Searching for information through associative search capabilities has been improved as well.

Summarising QlikView in-memory analysis and reporting is simplifying analysis for everyone and has clearly demonstrated its affordability and value to organizations across industries for solving their performance and information challenges.

Conclusion

BI systems have existed / operated in the market for about two hundred years. Transforming data into information and information into knowledge enabled business decisions, allowing users to make effective and informed choices based on data analysis. Technology development in this field has also brought change. It turned out that traditional BI systems are too complicated, delayed and requires professional services, which are costly. Therefore, the direction of change went toward cheaper and faster applications. Thus, there arose the Discovery Business Systems which are a whole new way of doing things for Business Intelligence.

BD bridges the gap between traditional BI solutions and standalone office productivity applications, enabling users to forge new paths and make new discoveries. BD works with what you have and infuses new capabilities into BI: insight for everyone, zero-wait analysis, mobility, an app–like model, remix ability and reassembly, and a social and collaborative experience.

Bibliography

[Dudycz, 2004] Dudycz H. Przetwarzanie analityczne podstawą rozwiązań informatycznych klasy Business Intelligence. Materiały konferencyjne SWO, Katowice, 2004. http://www.swo.ae.katowice.pl/_pdf/138.pdf

[Januszewski, 2008] Januszewski A. Funkcjonalność Informatycznych Systemów Zarządzania, t.2 Systemy Business Intelligence, PWN, Warszawa, 2008.

[Nycz, 2008] Nycz M., Smok B. Busienss Intelligence w zarządzaniu. Materiały konferencyjne SWO, Katowice, 2008. http://www.swo.ae.katowice.pl/_pdf/421.pdf

[Olszak,2005] Olszak C. Wspomaganie decyzji w erze informacji i wiedzy. W: Systemy wspomagania organizacji. Praca zbiorowa pod redakcją H. Sroki i T. Porębskiej-Miąc. AE, Katowice, 2005, s.346-353.

[Sierocki, 2007] Sierocki R.: OLAP to efektywna technologia przetwarzania danych analitycznych. Controlling i Rachunkowość Zarządcza nr 1/2007. http://www.infosynergia.eu/pliki/publikacje%20-%20Robert%20Sierocki%20-20OLAP%20to%20efektywna%20technologia.pdf

[Surma, 2007] Surma J. Wsparcie strategicznych decyzji zarządczych z wykorzystaniem Business Intelligence. Innowacyne Aspekty Strategii Przedsiębiorstwa pod red. Lidii Nowak. Politechnika Częstochowska, Częstochowa, 2007. http://www.surma.edu.pl/wp-content/czestochowa-jerzy-surma-2007.pdf .

[Surma 2009] Surma J.Business Intelligence – Systemy Wspomagania Decyzji Biznesowych, PWN, Warszawa, 2009.

RELATED WHITE PAPERS

The QlikView Product Roadmap, December, 2010

http://www.qlikview.com/us/explore/resources/whitepapers/qlikview-product-roadmap

The Associative Experience: QlikView's Overwhelming Advantage, October, 2010

http://www.qlikview.com/us/explore/resources/whitepapers/the-associative-experience

QlikView Architectural Overview, October, 2010

http://www.qlikview.com/us/explore/resources/whitepapers/qlikview-architectural-overview

http://community.qlikview.com/blogs/theqlikviewblog/archive/2010/09/21/software-should-fit-the-business-not-the-other-way-around.aspx

A QlikView White Paper; *Business Discovery: The Next Generation of BI*; Published January, 2011; http://www.qlikview.com/us/explore/resources/whitepapers/business-discovery-the-next-generation-of-bi

A CITO Research Explainer: *The Art of Business Discovery*; May 2010

http://www.qlikview.com/us/explore/resources/whitepapers/the-art-of-business-discovery [March, 2011]

A QlikView Technology White Paper: *QlikView Architectural Overview* Published October, 2010 http://www.qlikview.com/us/explore/resources/whitepapers/qlikview-architectural-overview [March, 2011]

A White Paper from QlikTech International AB: *QlikView 7. The In Memory Business Intelligence Revolution.* http://www.businessintelligence.bg/files/presentations/Intro_to_QlikView_061206.pdf [February, 2011]

Authors' Information

Justyna Stasieńko – *lecturer, The Institute of Technical Engineering, The Bronisław Markiewicz Higher State School of Technology and Economics, Czarnieckiego Street 16, 37-500 Jarosław, Poland; e-mail: justyna.stasienko@pwste.edu.pl*

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