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BUSINESS INTELLIGENCE FOR INFORMATION SOCIETY

Introduction

Leveraging information is a key success factor for companies and the whole societies. Business Intelligence (BI) is a broad category covering technologies, applications and processes responsible for the collection, storage, data access and analysis that can help users in making more effective decisions¹. It is considered as a new working culture with information and a specific methodology that would refer to working with information and knowledge, open communication, and knowledge sharing².

The research questions I ask in this study are: (1) what possibilities may offer BI systems for the information society and first of all for different enterprises, (2) what kinds of BI models and applications can be used in the enterprises and what are the implications for them.

The study was based on: (1) a critical analysis of literature, (2) a observation of different BI initiatives undertaken in various enterprises, as well as on (3) semi-structured interviews conducted in polish enterprises in 2012. Some interviews, conducted in 20 polish enterprises, were held with over 80 responders: executives, senior members of staff, and ICT specialists They represented the service sector: telecommunications (T)-4, consulting (C)-4, banking (B)-4, insurance (I)-4, marketing agencies (MA)-4.

¹ B.H. Wixom, H.J. Watson: *The BI-based Organization*. "International Journal of Business Intelligence Research" 2010, Vol. 1, No. 1, pp. 13-28; A. Schick, M. Frolick, T. Ariyachandra: *Competing with BI and Analytics at Monster Worldwide*. Proceedings of the 44th Hawaii International Conference on System Sciences, 2011.

² S. Negash, P. Gray: *Business Intelligence*. In: *Decision Support Systems*. Ed. F. Burstein, C.W. Holsapple. Springer, Berlin 2008, pp. 175-193.

The remainder of my paper is organized as follows. Firstly, the idea of information society has been described. Then, an overview of subject literature on BI has been conducted. Next, a road map for applying different BI models and applications in enterprises is recognized. Finally, the main benefits of BI using have been analyzed.

The paper provides valuable information on the possibilities of BI applying in different enterprises. It makes useful contribution to the literature and theorists understanding of ways in which combinations of BI are used.

1. Background and related works

1.1. Information society

The topic of an information society is the basis of many analyses and discussions. The history of information society development has begun many years ago. It was Friedrich von Hayek, Nobel laureate who in 1937 described information as a good³. F. Machlup, American economist, anticipated appearing the new sectors and branches associated with information technologies, information services and information processing⁴. In science fiction books dated on the sixties of XX century S. Lem presented the vision of society based on information techniques. However, the term of information society (*johoka shakai*) was introduced by Japanese ethnologists Tadao Umesao in 1963. It means the society that development is mainly determined by different ICT using. Large contribution to the development of information society brought D. Bell⁵. He outlined a new kind of society – the post-industrial society. The author argued that the post-industrial society would replace the industrial society and would be information-led and service-oriented. A. Toffler⁶ described the development of information society and compared it to three waves: agrarian, industrial and post-industrial where the basic source is information. Next, P. Drucker⁷ provided an incisive analysis of the major world transformation taking place, from the age of capitalism to the knowledge society, and examined the radical affects it will have on society, politics, and business now

³ F. von Hayek: *Economics and Knowledge*. "Economica" 1937, No. 4 (February), pp. 33-54.

⁴ F. Machlup: *The Production and Distribution of Knowledge in the United States*. Princeton, New Jersey, 1962.

⁵ D. Bell: *The Coming of Post-industrial Society. A Venture in Social Forecasting*. Basic Books, New York 1976.

⁶ A. Toffler: *The Third Wave*. Bantam Books, New York 1980.

⁷ P.F. Drucker: *Post-capitalist Society*. Harper Business, New York 1993.

and in the coming years. Then, M. Castells⁸ analyzed the social and economic changes associated with the technological revolution, described the global economy as a constant flow of information and created a theory of the network society.

Nowadays, many authors confirm that the rapid development of ICT, including the Internet, contribute to radical changes in the functioning of society and economy⁹.

It should be noticed that the topic of information society is also in the center of attention of many countries. They have incorporated the idea of building the information society into their strategic planning. They have noticed new development possibilities as well as an opportunity to become attractive partners on the global and competitive market. In Europe Union, one of the first documents, treated on information society was the report called Bangemann report¹⁰. Also, Poland saw a great opportunity for itself in a transformation of society into the information society. The opportunity to accelerate economic development and to become more competitive partner in the international arena.

An analysis of different concepts of information society has led to the adoption, for the purposes of this article, of the following definition: the information society is a society that has unlimited access to ICTs, information and knowledge, and can use them to achieve different objectives of social, economic, cultural, educational, etc. nature¹¹. The aim of the information society is to gain competitive advantage internationally, through using ICT in a creative and productive way.

1.2. The issue of Business Intelligence

Business Intelligence (BI) is a broad category covering technologies, applications and processes responsible for the collection, storage, data access and anal-

⁸ M. Castells: *The Rise of Network Society. The Information Age: Economy, Society and Culture*. Vol. 3. Blackwell Publisher. Oxford 1996; M. Castells, P. Himanen: *The Information Society and the Welfare State. The Finnish Model*. Oxford University Press, Oxford 2002.

⁹ C.M. Olszak, E. Ziemia: *The Use of ICT for Economic Development in Silesian Region in Poland*. "Interdisciplinary Journal of Information, Knowledge, and Management" 2011, Vol. 6, pp. 197-216; N. Roztocki, H.R. Weistroffer: *Information Technology in Transition Economie*. "Journal of Global Information Technology Management" 2008, Vol. 11(4), pp. 2-9; D. Tapscott: *Grown Up Digital: How the Net Generation is Changing your Word*. McGraw Hill, New York 2009.

¹⁰ "Europe and the global information society Recommendations to the European Council", The European Council, 1993.

¹¹ E. Ziemia, C.M. Olszak: *Building a Regional Structure of an Information Society on the Basis of e-Administration*. "Issues in Information Science and Information Technology". Ed. E.B. Cohen. Informing Science Press 2012, Vol. 9, pp. 277-295.

ysis that can help users in making more effective decisions. BI system can be also defined as an integrated set of tools, technologies and programmed products which are used to collect, integrate, analyze and share data¹². It is composed of a set of the following essential components¹³:

- ETL (Extraction-Transformation-Load) tools responsible for data transfer from operational or transaction systems to data warehouses;
- data warehouses, environment to store, aggregate and analyze data;
- analyzing, reporting and presenting tools, such as: OLAP (tools which allow access and which analyze and model business problems and share information that is stored in data warehouses), data mining (tools for determining patterns, generalizations, regularities and rules in data resources), reporting and *ad hoc* inquiry (tools for creating and utilizing different synthetic reports), drill down reports;
- presentation layers that include customized graphical and multimedia interfaces or dashboards to provide users with information in a comfortable and accessible form.

The role of BI and its impact on organizations and the whole society has been changed¹⁴. There are distinguished 3 ages in the development of BI: BI 1.0, BI 2.0, Bi 3.0 (Table 1).

The first age of BI, called BI 1.0. falls on seventies and eighties of XX century. It is closely related with the management information systems (MIS), executive information systems (EIS), and decision support systems (DSS). Generally, the first applications from this age were dedicated on mainframes. They were able to process the simple tasks for operational and tactical management. They were characterized by production the simple reporting and represented simple, static applications. Individual reports were written by expert programmers. BI 1.0 was focused on “delivery to the consumer” and market leaders include: SAS, IBM¹⁵.

¹² J. Reinschmidt, A. Francoise: *Business Intelligence Certification Guide*. “International Technical Support Organization”, IBM, San Jose, CA 2000.

¹³ C.M. Olszak, K. Batko: *The Use of Business Intelligence Systems in Healthcare Organizations in Poland*. Computer Science and Information Systems (FedCSIS), 2012, pp. 969-976. IEEE online, <http://www.ieeexplore.ieee.org>.

¹⁴ P.R. Clavier, H. Lotriet, J. Loggerenberger: *Business Intelligence Challenges in the Context of Goods-and Service-Domain Logic*. 45th Hawaii International Conference on System Science, IEEE Computer Society 2012, pp. 4138-4147.

¹⁵ S.J. Gratton: *BI 3.0 The Journey to Business Intelligence. What does it mean?* <http://www.capgemini.com.technology> (retrieved: 14.10.2012).

Table 1

The three ages of Business Intelligence

Specification	BI 1.0 (Tool-centricity)	BI 2.0 (Web-centricity)	BI 3.0 (Application-centricity)
User interface	Client	Web	Multi-device
Design priority	Capability	Scalability	Usability
Functionality	Aggregate and present	Explore and predict	Anticipate and enrich
Frequency/detail	monthly/detailed	weekly-daily-summary	Real-time/processes
Client use case	Operational reconciliation	Enterprise alignment	Social empowerment
Insight scope	Mile deep inch wide	Mile wide inch deep	Outcome-specific
Uptake/reusability	<1%/limited	<15%/some	>25%/entire application
Foundational Influences	Delivery only	Creation & delivery	Creation, delivery & management

Source: S.J. Gratton: *BI 3.0 The Journey to Business Intelligence. What does it mean?* <http://www.capgemini.com.technology> (retrieved: 14.10.2012).

The second age of BI (1990-2005) – BI 2.0 is the type of enterprise scale BI we see today. It means a concept and methodologies for improvement of business decisions using facts and information from supporting systems¹⁶. It is characterized by end-user friendlier client-based BI tools and centralized. Data warehouse configured to deliver preformatted information to specialists analysts and users within management. So, the role of BI 2.0 and its impact on organizations (compared to BI 1.0) has been changed. From simple, static analytical applications, BI 2.0 has evolved into solutions that can be used in strategic planning, predictive modelling, forecasting, monitoring operations, and studying the profitability of products¹⁷. BI 2.0 is focused on “creation and delivery for consumers” and market leaders include: Business Objects, Cognos, Hyperion, Microsoft, Teradata, Oracle.

BI 3.0. presents a new era in the evolution of BI. Thanks to web and mobile technologies it appears intelligent business network for every one. There is a growing acceptance of the idea that analysis is a collaborative (not only singular) and social effort. It focuses on a collaborative workgroups (which are self-regulated) and on information outcomes within the confines of core business interaction with customers, employees, regulators etc. There is common sense that BI 3.0 should go beyond reliance on structured data available in internal sources but should use also external, mostly unstructured data in various formats (so-

¹⁶ D.J. Power: *A Brief History of Decision Support Systems*, <http://www.dssresources.com/history/dsshistory.html> (retrieved: January 2007).

¹⁷ S. Negash, P. Gray: Op. cit., pp. 175-193; T.H. Davenport, J.G. Harris, R. Morison: *Analytics at Work: Smarter Decisions, Better Results*. Harvard Business Press, Cambridge 2010.

cial media posts, free form web content, images, and video files)¹⁸. BI 3.0 is concentrated on “creation, delivery and management for consumers”¹⁹. According to Scott²⁰ there are 5 core attributes that support BI 3.0 philosophy: proactive, real-time, integrated with business processes, operational (available to line workers), and extended to reach beyond the boundaries of the organizations to improve information delivery and decision support functionality for all. According to Chatter²¹ there are 3 prerequisites for software tools to be recognized as a BI 3.0 tools: be social, relevant (automatically delivers relevant insights that users really need according to their situation and user profile), fully self-service (intuitiveness). It is indicated also that there is no reason to depreciate in BI 3.0 the functions (known from BI 2.0) like: reporting, OLAP, data mining. They have still their strong position. BI 3.0 philosophy is to raise the added value of BI tools’ architecture by anchoring collaborative style of information search and analysis with intuitive and self-service user interface that delivers timely and highly relevant insights to anyone who is properly authorized and needs them²².

1.3. Business Intelligence in enterprises

BI systems beneficiaries include a wide group of users starting from specialists in controlling, financial reporting and finance, through salespeople, members of the board up to individual users. Sectors that use BI systems most frequently include: trading companies, insurance companies, banks, financial sector, health sector, telecommunications, and manufacturing companies.

Many case studies confirm that BI may be utilized in an organization for:

- increasing the effectiveness of strategic, tactic and operational planning including first of all: (a) modelling different variants in the development of an organization; (b) informing about the realization of enterprise’s strategy, mission, goals and tasks; (c) providing information on trends, results of introduced changes and realization of plans; (d) identifying problems and ‘bottlenecks’ to be tackled; (e) providing analyses of “the best” and “the worst”

¹⁸ R. Nemeč: *The Application of Business Intelligence 3.0 Concept in the Management of Small and Medium Enterprises*. In: *IT for Practice 2012*. Ed. M. Tvrđiková, J. Minster, P. Rozenhal. Ekonomická Faculta, VSB-TU Ostrava, 2012.

¹⁹ S.J. Gratton: Op. cit.

²⁰ N. Scott: *The 3 Ages of Business Intelligence: Gathering, Analysing and Putting it to Work*, <http://www.excapite.blogspot-ages-of-business-ontelligence.html> (retrieved: January 2013).

²¹ R. Chatter: *Decoding BI 3.0*, <http://www.searchbusinessintelligence.techtarget.in/answer/decoding-BI-30> (retrieved: January 2013).

²² R. Nemeč: Op. cit.

- products, employees, regions; (f) providing analyses of deviations from the realization of plans for particular organizational units or individuals; (g) and providing information on the enterprise's environment;
- creating or improving relations with customers, mainly: (a) providing sales representatives with adequate knowledge about customers so that they could promptly meet their customers' needs; (b) following the level of customers' satisfaction together with efficiency of business practices; (c) and identifying market trends;
 - analysing and improving business processes and operational efficiency of an organization particularly by means of: (a) providing knowledge and experience emerged while developing and launching new products onto the market; (b) providing knowledge on particular business processes; (c) exchanging of knowledge among research teams and corporate departments²³.

Practice shows that the most significant business effects are obtained while using the following analyses offered by the BI systems: (1) analysis that supports cross selling and up selling; (2) customer segmentation and profiling; (3) analysis of parameters importance; (4) survival time analysis; (5) analysis of customer loyalty and customer switching to competition; (5) credit scoring; (6) fraud detection; (7) logistics optimisations; (8) forecasting of strategic business processes development; (9) web mining (analysis and assessment of the Internet services performance); and (10) web-farming (analysis of the Internet content)²⁴.

2. Research methodology

The study was based on: (1) a critical analysis of literature, (2) a observation of different BI initiatives undertaken in various enterprises, as well as on (3) semi-structured interviews conducted in polish enterprises in 2012. Some interviews, conducted in 20 polish enterprises, were held with over 80 responders: executives,

²³ C.M. Olszak: *The Business Intelligence-based Organization – New Chances and Possibilities*. Proceedings of the International Conference on Management, Leadership and Governance. Ed. V. Ribiere, L. Worasinchai. Published by Academic Conferences and Publishing International Limited Reading UK 44-118-972-4148, 2013, pp. 241-249; T.H. Davenport, J.G. Harris, R. Morison: Op. cit.; P. Hawking, S. Foster, A. Stein: *The Adoption and Use of Business Intelligence Solutions in Australia*. "International Journal of Intelligent Systems Technologies and Applications" 2008, Vol. 4, No. 1, pp. 327-340.

²⁴ C.M. Olszak, E. Ziembra: *Business Intelligence Systems in the Holistic Infrastructure Development Supporting Decision-making in Organizations*. "Interdisciplinary Journal of Information, Knowledge and Management" 2006, Vol. 1, pp. 47-58.

senior members of staff, and ICT specialists They represented the service sector: telecommunications (T)-4, consulting (C)-4, banking (B)-4, insurance (I)-4, marketing agencies (MA)-4. All of them had at least 5 years of experience in BI. Interviewees were selected on their involvement in BI or on their ability to offer an insight based on experience in BI and related decision support systems. The survey was conducted in 2012 among purposefully selected firms (in Poland) that are considered to be advanced in BI.

The research was of qualitative nature and was conducted within wider research project “*Using BI tools in polish enterprises*” and partly within project devoted to “*Using software tools in Polish and Czech border region*” (CZ.3.223.2.0412.02994). Types of core interviews questions relevant to this paper are reflected in Table 2.

3. Research findings

My research confirmed that BI identified in the literature was also experienced in selected organizations. Table 2 presents the selected answers for asked questions.

Table 2

Types of asked questions and selected answers

No	Asked questions during interviews	Answers (number of organizations)
1	2	3
1	How do you define BI?	Tools to manage information (9), data warehouse (5), analytical applications (4), new way of doing business (2)
2	What do you use BI for (reporting, ad-hoc reporting, analyzing, alerting, predictive modeling, operationalizing, optimization, activating, etc.) ?	Reporting (15), ad-hoc reporting (9), analyzing (12), alerting (2), predictive modeling (2), optimization (3), activating (2)
3	Assess the quality of data used in your organization (complete, correct, consistent; high/medium/poor quality data, etc.)	High quality data (6), medium quality data (11), rather poor quality data (3)
4	Are you skilled enough in order to take advantage of BI systems?	Skilled enough (7), not skilled enough (8), poor skilled (5)
5	Do you use management dashboards?	Used management dashboards in limited scope (14), used management dashboards in whole organization (4), not used (2)
6	Is your BI (un)limited to the part/department of organization?	BI limited to the part of organization (15), unlimited (5)
7	Are you motivated to use BI (how)?	Users motivated by training (8), motivated by bonuses (6), not motivated (6)

Table 2 contd.

1	2	3
8	Do you use BI for analyzing customers, suppliers, competitors and other business partners?	BI for analyzing customers (17), suppliers (14), competitors (5), other stakeholders (4)
9	What kind of BI software do you use?	Regional data warehouse (9), centralized data warehouse (5), operational data bases (6)
10	Describe some successes/failures from using BI	Success: acquiring new customers (14), acquiring new suppliers (11), increase of sale (8), fraud detection (6), launching new channels of sale (3), launching new products (3). Failures: not trust in BI (4), gap between BI/ business (12), users do not recognize their own data after it is processed (7), decision-making skills absent (6), BI is expensive (5)
11	Indicate some benefits from using BI	Better access to data (13), better decisions (12), improvement of business process (9), improved business performance (8), costs saving (7), transparency of information (5), new way of doing business (2)

4. Discussion

The survey has shown that BI may provide a balanced picture of the enterprise and its environment to the managers. BI may be treated as an analytical process that transforms scattered information about internal business processes, customers into relevant, accurate and usable strategic knowledge on market evolution, business opportunities and threats (Table 3).

Table 3

Selected answers concerning using BI models and obtained benefits

Enterprises	Used BI models and BI analysis	Benefits from BI using
1	2	3
Telecommunication	Enterprise-wide BI architecture, BI-PA, customer profiling and segmentation, customer demand forecasting	(1) Determine high-profit product profiles and customer segments, provide detailed, integrated customer profiles, develop of individualized frequent-caller programs, determine future customer needs; (2) Forecast future product needs or service activity, provide basis for churn analysis and control for improving customer retention
Consulting	Data warehouse, BI-PA, data marts, analysis of parameters importance, identification of sales and inventory, optimization orders, marketing companions	(1) Reduction in the turnaround time for preparation of reports, direct and faster access to the data needed to support decision-making, analyze the flow of businesses across services, regions, clients, pricing, currencies, and market factors in time etc.; (2) Forecasting and estimating of customer demand (in short and long term); (3) Service and product distribution plans of a companies are in place to meet its customer expectations, inventory requirements are more accurately

Table 3 contd.

1	2	3
Banking	Data warehouse, BI-PA, customer profitability analysis, credit management, branch sales	(1) Determine the overall profitability of individual customer, current and long term, provide the basis for high-profit sales and relationship banking, maximize sales to high-value customers, reduce costs to low-value customers, provide the means to maximize profitability of new products and services; (2) Establish patterns of credit problem progression by customers class and type, warn customers to avoid credit problems, to manage credit limits, evaluate of the bank's credit portfolio, reduce credit losses; (3) Improve customer service and account selling, facilitate cross selling, improve customer support, strengthen customer loyalty
Insurance	Regional data warehouses, data mining, OLAP, data marts, claims and premium analysis, customer analysis, risk analysis	(1) Analyzing detailed claims and premium history by product, policy, claim type, and other specifics; (2) Developing marketing programs on client characteristics, improving client service; (3) Identification high-risk market segments and opportunities in specific segments, reducing frequency of claims
Marketing agencies	Regional data warehouses, OLAP, marketing companions, customer profiling and segmentation, customer demand forecasting	(1) Better understanding of customers, identification their place in a customer lifetime cycle and customer segments for marketing campaigns; (2) Providing analyses of customer transactions (what is selling, who is buying); (3) Monitor customer loyalty by evaluating which customers are loyal and which are likely to leave; (4) Identify which products are most profitable and monitor customer behavior in purchasing products. By closely tracking sales performance and consumer behavior, companies are able to set better marketing strategies and ensure proper allocation of marketing funds

The observations and conducted interviews in surveyed enterprises allow me to state that the enterprises use BI systems first of all to optimize operational decisions, improvement of internal business processes and decision making on operational level and to better access to data and static reporting. BI applications are used to customer relationship management, identification of sales and inventory, optimization orders, marketing companions. Most of the enterprises indicated the benefits from using BI like: integrated analysis for finance, marketing; improvement of decision making on all levels of management, and the possibility of demand forecasting. Unfortunately, only a few enterprises saw benefits for the whole environment like: competing in BI, new ways of doing business. They do not build the social nets and manage social capital. They are still in the age of BI 2.0.

Conclusion

The main conclusion of this study is that BI may offer different possibilities for the enterprises. They include first of all: making more effective decisions, improving business processes, and business performance. Observation and conducted discussions with interviews let me to state, that, unfortunately, the enterprises used BI very seldom for building expert' nets, social capital management, creating the active communities, and knowledge sharing. Most of them stay still at the age of BI 2.0. It means that they are focused more on the internal business processes than on the environment: competition, users in social media etc.

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Summary

The main goal of this paper is to present the basic assumptions underlying the idea of Business Intelligence (BI) and to identify the possibilities of it using for information society, and first of all in different organizations. The paper provides valuable information on the chances and the possibilities of BI applying for information society.

Keywords: business intelligence, information society, organization