METHODOLOGICAL ASPECTS AND CASE STUDIES OF BUSINESS INTELLIGENCE APPLICATION TOOLS IN KNOWLEDGE MANAGEMENT AS CORPORATION'S STRATEGY DEVELOPMENT

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Abstract:

The study shows the evaluation of the conducted research and analysis regarding the methodology and case study of Business Intelligence application tools as part of the co-operation between science and organizations. As an example of Business Intelligence proficiency there are chose two representative companies from the region of Kujawsko-Pomorskie, Poland. The area of expertise of the first company is related to train and trams production, second is active in Information Technology services. There are also two areas of possible co-operation between science and business. The first one is preparing future employees by means of training them on post-graduate studies. The second area is using information regarding the effectiveness of the ERP system, obtained through questionnaires, by the management of a developing organization. In the paper there is also underlined the difficulties related to implementation of ERP system. The use of these solutions provides access to any personally identifiable information to a variety of information to enable an assessment of the impact of the parameters identified in the information system on the effectiveness of the company's operations.

Keywords: business intelligence tools, ERP system, questionnaire, modernization of IT system, knowledge management

1. INTRODUCTION

The performed concise studies can be used as the ground for future co-operation between business partners, focusing on those areas, which can improve the functioning of their respective organizations. The scope of the co-operation can vary and largely depends on partners' research potential, and their tools such as information resources transformed into data warehouses, BI software and powerful computers, capable of performing complicated calculations in short time. In the case when a university faculty is acting as a partner, the important thing is having a modern computer room and up-to-date software, which can be used for teaching as many as 60 students at the same time. Promising research results can motivate partners to arrange certain space, where each of them could strive for leadership, and produce measurable outcome. It can be assumed that the monograph "Methodological aspects and case studies of Business Intelligence application tools in Knowledge Management" [4], published in 2012, plays an important role in stimulating the effective co-operation between partners in science, business, administration and professionalization.

We believe that the following statement from the monograph is significant: "The above-referred basic terms should be supplemented with a key aspect from the point of view of managing knowledge, comprising tools which support automatic content analysis (data mining and text mining, data warehouses), developed in the implementation of economic and social processes. Resource-based aspects, indispensable in the creation of data warehouses and suitable for automatic analysis of their content, are implemented as part of the generation and processing of data obtained from integrated systems of the ERP or ERP II class, used in large and – increasingly – medium-sized business organizations [2,3,7,8,9,11,12]. Tool-based aspects of the application of knowledge management solutions in organizations include various standards, falling under the umbrella term of Business Intelligence, which include a wide range of OLAP (On Line Analytical Process) software, Data Mining or Text Mining (acquisition of knowledge from text sources) tools [4,6]. The proposed monograph approaches the problem of picking the right BI software tools in a selective way, depending on preference for the standards which are analyzed in the examples of application discussed in the monograph. Specified above knowledge management acquisition authors join with access to transaction processes, within which are created transactional data bases, which transformed into data warehouses let acquire knowledge with tools of OLAP or data mining types".

The following authors' observations should also be kept in mind: "In its entirety one can underline a fact, that only with difficulty authors succeed with proving the a scale of application of effects of discussed BI tools in management is determined essentially more a complex and more difficult identified process of communication and knowledge exchange in interpersonal contacts. Perfectly designed interactive automatic data processing, transformation and analysis systems create sustained infrastructure in which functioning of any organization can be more stabilized and adaptive being interactive directly for shaping a standard of represented by it organizational culture".

The examples included in the monograph presents the application of business intelligence tools in different business and healthcare organizations as well as in research based on the text-mining techniques. Each case study has its particular methodological characteristics, which determine its analysis, presentation and formulated conclusions. These characteristics determine the available amount of information available for particular study subjects. The monograph has been used as an aid in teaching students and employees who incorporate the BI systems in management. Their opinion would be valuable for preparing similar works in the future. Time will show to what extent the monograph has helped to tighten partnership between business organizations, public administration and other professional associations.

2. ORDERED POSTGRADUATE STUDY PROGRAM AS SUPPORTED BUSINESS ORGANIZATION FOR EMPLOYS ACQUISITION

Sadly, the current student teaching curriculum is insufficient in preparing graduates to meet the potential employers' requirements. For example, a multinational company of IT Services – a company branch based in Bydgoszcz, Poland is going to need experts in Business Intelligence Tools Application in Organization Management. The Chair of IT, at the Faculty of Management at the University of Technology and Life Sciences has suitable infrastructure to offer post-graduate studies in

Business Intelligence Tools Application in Organization Management. The following study subjects can be used to draw up a calculation of post-graduate course to be discussed with the potential employer:

Table 1. Subject Lecture/Lab Seminars

Knowledge Ontology	15 hours
The Basis of Project Management in IT service company	15 / 30 hours
Elements of Database Software	30 hours
Designing and use of the ERP systems	30 hours
Data Warehousing	30 hours
The use of OLAP tools and Data Mining for Data Warehouse analysis	40 hours

The projected job market requirements make it possible to legally seek and obtain funds for the post-graduate studies. Even better, the timetable, especially laboratory seminars, could be arranged in a flexible way and tailored for individual needs. Employers can also order tailored training courses, which provide the participants with the knowledge on defining automatic analysis and report procedures. They are essential for automatic control of the key delivery processes.

Special training courses can play an important role in using Business Intelligence tools to assist management. A course in automatic user performance assessment and report preparation could improve the coordination and efficiency of a company, especially if the users work in different sections, departments, etc. It is imperative that training courses have different software and are adjusted to different needs and skills of staff, which use particular tools of automatic analysis.

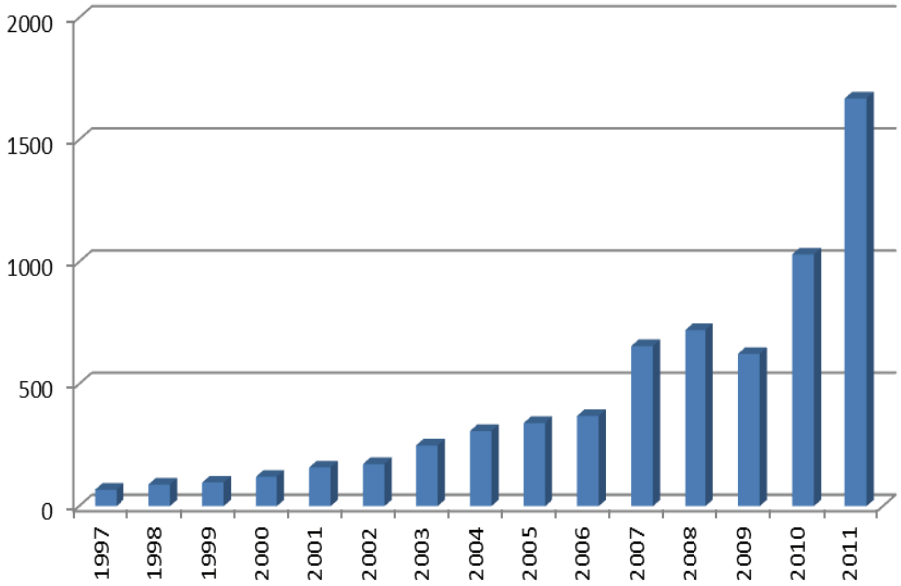
3. THE NEW GENERATION OF THE ERP SYSTEM AND THE USE OF BI TOOLS IN PESA BYDGOSZCZ S.A.

The second corporation which was analyzed is PESA Bydgoszcz S.A. and their owners and managers created very fast development strategy. This strategy decided at necessity many parallel innovations which realized technical, economic or Information Communication Technology goals. These principles decided that in 2013 corporation PESA SA are going to get implemented new version IFS Application ERP system 8.1. Strategy necessary for future fast development this corporation decided that implementation new version of IFS Application ERP system will be realized with Business Intelligence tools used for Decision Support System. Some aspects very complicated problems with creates for practice Inter-organizational Information Systems necessity for coordination's Supply Chain Management System necessary for JIT (Just In Time) production control. Next are display some more impotent aspects PESA SA development, on the figure 1 total income and table 1 present development of new products in 2002-2011 more detail present in [7,8].

Figure 1 illustrates the sales dynamics achieved by PESA Bydgoszcz S.A. in the next few years.

Interestingly, while most figures for the years 1997-2011 are soaring, a slight dip was recorded in 2009. It suggests that the company must be prepared to deal with periodic lower sales without introducing any major changes to the organization of production, and this is why some of the work is outsourced.

Picture 1: Total income in years 1997 – 2011 (million PLN)



3.1 Developing product and quality systems in construction of new vehicles

Table 2: Development of new products in 2002-2011

Years	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
rail buses	1	2	6	24	13	35	32	34	34	72
trams						6	15	12	38	95
TOTAL	1	2	6	24	13	41	47	48	72	167

The above data clearly shows that in 2010-2011 the development of company dramatically increased and the sales of new vehicles soared by 250 percent. The development was possible thanks to the modern supply chain management, co-operation with suppliers and introducing new technological measures. The success can also be ascribed to the newly implemented IT systems such as ERP which is used to manage logistics, production, finance and projects. The company also introduced the project- and process-oriented types of management, both involving controlling principles. The Integrated Quality Support System, compliant with the IRIS:02, ISO 9001, ISO 14001, PN 18001, ISO 3834, EN 15085, DIN 6701 norms, and based on HTML internet browsers, has facilitated the fast exchange of information.

The research presented in [7] let summarized the next conclusion “In order to continue its dynamic development, PESA Bydgoszcz S.A. must ensure a continuous flow of component supply which have to meet strict quality standards. This task requires prior supplier qualification. “PESA Bydgoszcz S.A.” only co-operates with suppliers who use modern production management and organization systems, and guarantee the high quality of their products, which meet customer requirements. The procedures described in this study are stages in achieving high standard of inter-organizational communication and standardization of products.”

The research presented in [8] next conclusion using dedicated internet-based software, a system supervising machines and measuring equipment, and successful inter-organizational communication, allowed “PESA Bydgoszcz S.A.” to make considerable savings. The software was relatively inexpensive (it cost less than 100 000 PLN) and it was introduced at the time when the company was developing rapidly. Without it, the effective management of the company and combating numerous obstacles, such as preparing budgets, applying for grants from the EU, introducing quality management systems, would not be possible. [8, 10, 15, 17] Currently, the company can be described as “knowledge-based” and to continue its successful development, it must introduce Business

Intelligence tools, which support the coordination of inter-organizational functions and facilitate knowledge transfer."

Bath conclusion from presented in papers [7, 8] research work creates recognition very important areas decided at the result of chain management by used inter-organizational data processing systems. The second aspect present in [8] show that, dedicated internet-based software, a system supervising machines and measuring equipment, and successful inter-organizational communication, allowed "PESA Bydgoszcz S.A." to make considerable savings. Internet – based software can be a very efficiency solution necessary for realized unusual complex data processing system used in corporation PESA Bydgoszcz SA.

Next research work step based on the methodological solution [15, 16] with questionnaire has just printed end help us recognized end user's knowledge issues in ERP solutions use. We received 51 questionnaires which help us recognized different opinions of end users ERP IFS Application system used by different level managers from 2007. It can be very interesting information necessary for more efficiency implemented new version of IFS Application system 8.1. The questionnaire study was based on work [16, 18, 19, 20, 21, 22], allowed the diagnosis of preparation and attitudes of employees in the use of information technology.

3.2 Preliminary analysis of the survey results will be demonstrated in five separate categories

In this subchapter we will illustrate the status quo and much more effectively guide the training related to the implementation of a new version of IFS. The first group of questions focuses on identifying those employees who are efficient in the use of IT technologies. The level of their expertise was identified on the 7-point Likert's scale. The average Likert's scale in answers to the questions was 1.74 and 1.98 for question 1.8 "working with a computer makes me nervous," and questions 1.9, "I have a bad feeling in connection with work on the computer," which means decisive in such a state of denial of the respondents. In other questions, the mean response was obtained in the range 3.92 to 5.67, the variation could be due to the specific questions formulated.

The second group of 25 questions covered various aspects of the use of the ERP system by the respondent as of meeting information needs through technology use, assessment of operational parameters and performance of various solutions of user's support.

Mean values of Likert's response scale ranging from 2.8 to question 2.10 "or work with the ERP system is very complex, mark strong rejection by the respondents of this thesis.

The highest ratings achieved 4.8 points Question 19 "description of the functions, commands, and commands on the screen is bright and clear," and the question 1, "an ERP system provides the information you need to" 4.71. Quoted synthetic results demonstrate presence of dependent scatter response seniority employees in the corporation, the type of job performed and age. Detailed analysis of these responses will be very helpful in assessing the training programs and their orientation in groups of employees.

The third group included twenty questions. They were based on questionnaires and presented information about using the ERP system and its popularity among employees. The second subgroup of questions regarded organizing training courses for employees, their support, and the way changes can be introduced to the system. Other questions tackled the problem of employees' changing IT requirements.

The answers provide interesting feedback. Answers to the majority of questions were fairly similar as far as their value is concerned – they ranged between 3.7 to 4.71. On the other hand, questions 3.9 to 3.18 and 3.10 to 2.8, which concerned the evaluation of the system development and the lack of proper training received low notes. It can be said that procedures used in the organization are successful for this group of questions, however the system was opined as not yet satisfactorily modernized. This can be explained by the high dynamics of organization development.

The fourth group included fourteen questions regarding employees' opinion about the influence of the system on their work (questions 4.1-4.5) and employees' interaction with the system (questions 4.6-

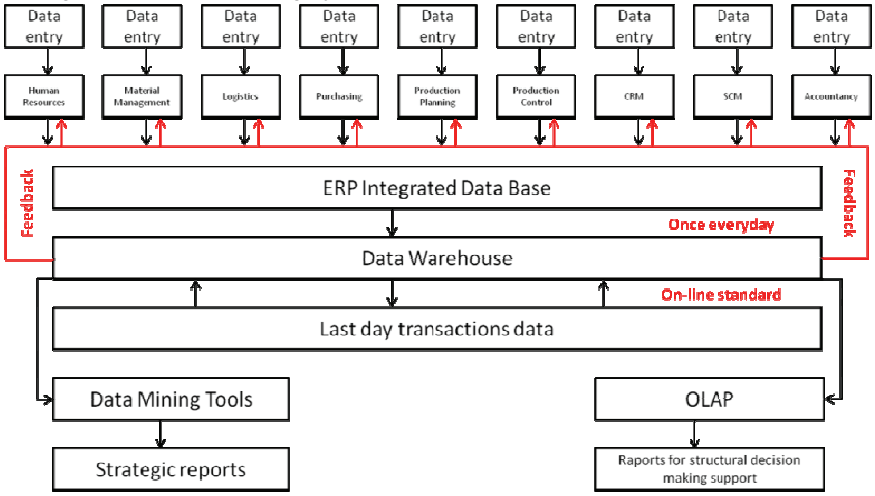
4.14). The first five questions were valued in a similar way, within the range of 5.22-5.51. However, the remaining questions received values from 4.17 to 5.48, which shows that the answers were more extreme.

The fifth group of questions regarded the time employees spent working with the system, verified by six parameters. The answers were included within the range of 3.08 to 5.0. This proves that different employees spend different amount of time using the system, depending on their position.

All strategy level managers are convinced; that the next step develops Information and Communication System must include efficiency solutions Knowledge Management in Corporation PESA Bydgoszcz SA. In chapter seven monographs [4] we analyzed the most important reason great success successful exploitation data warehouse and OLAP system in POSKAL printing corporation.

The most important solution based on dynamic end dominate role data warehouse in the operational and strategy organization data processing system which must be only one place stored actual information. It has to change by actualizations data processing realized in all areas corporations activities. In the figure 2 is presented block diagram which illustrated correct organization data processing system which will be created for used Business Intelligence tools in corporation PESA Bydgoszcz SA.

Picture 2. Integrated data processing system with feedback solution



These concerns may be justified because the decision to implement the complex data warehouse update process as a single operation in the organization (Figure 2) was risky and challenging. The application of precise data warehouse and update algorithms that have been tested before implementation and its merging with the last day transactional data analysis could raise the doubts about the precision of these operations. The results of the three-year application of this solution at the POZKAL company proved to be fully effective from the perspective of long-term implementation. The benefits of these solutions are obvious, because the transaction data records are valid only if they are regularly verified by all data processing functions within the organization have been widely discussed and presented in the work [3,4].

4. SUMMARY

The growing share of uses Business Intelligence tools in the management of organizations can be a potential source of competitive advantage especially when the scale of the activity, the degree of competitiveness of the sector and its innovation forces the direction of research. A positive experience in the operation of an ERP system is important condition for determining the possibility of obtaining success through the use of data warehousing and Business Intelligence tools.

Other key elements are related to efficient functioning of the organization in the area of Inter-Organizational cooperation and the use of Internet technologies to improve the interactive exchange of the instruments used in the production, transmission and processing of information between business partners.

The use of these solutions provides access to any personally identifiable information to a variety of information to enable an assessment of the impact of the parameters identified in the information system on the effectiveness of the company's operations. The complexity of the determinants of the decision-making processes, information and solutions used in matrix management organization makes it difficult to identify cause and effect conditions effective measurable results of an organization.

REFERENCE LIST

1. Choe J.(2008). Inter-organizational relationship and the flow of information through value chains. *Information & Management, 45*, s.444-450.
2. Drelichowski L., Parafian A. (2009). Appliucation analysis of Prince 2 and AIM ORACLE as tools stabilizing the process of ERP system implementation. Studies & Proceedings PSZW nr 24 Bydgoszcz s. 17-25.
3. Drelichowski (2012). L. Evaluation of the efficiency of integrated ERP systems and Business Intelligence tools based on some diagnostic cases. Business Informatics, *2*(24); Publishing House of Wroclaw University of Economics; Wrocław 2012; ISSN 1507-3858 p.9-23.
4. Drelichowski L., Bobek S., Bojar W., Chęsy W., Cilski B., Czechumski W., Feoli E., Fronczak E., Ganis P., Graul C., Gruden T., Gvozdenović M., Kołodziejski M., Lewandowski R., Łagodziński M., Oszuścik G., Siwiec J., Sternad S., Wawrzyniak K., Zarzycki H. (2012). Methodological aspects and case studies of Business Intelligence applications tools in Knowledge Management. Studies & Proceedings v. 59 Polish Association for Knowledge Management Bydgoszcz.
5. Drelichowski L., Oszuścik G., Zarzycki H., Lewandowski R. (2012). The supportive role of Business tools for the analysis of economic development in EU countries in turbulent environment. Studies and Proceedings PAfKM v. 58 p.20 - 33. Bydgoszcz.
6. Drelichowski L., Siwiec J. (2012). Application of text-mining for analysis and knowledge clustering published in scientific journal studies and proceedings of the polish association for Knowledge Management. Studing and Proceedings PAfKM v. 58 p. 33 - 47. Bydgoszcz.
7. Drelichowski L., Mierzejewski J. (2012). Shaping knowledge for creating inter-organizational restructuring processes of management systems of quality and manufacturing organization. Studies and Proceedings PAfKM v. 60 p.20 - 33. Bydgoszcz.
8. Drelichowski L., Mierzejewski J.(2012). Internet Technology application in quality management system and machine exploitation in PESA SA Bydgoszcz Corporation.
9. Kwahk, K.Y., Lee, J.N. (2008). The Role of Readiness for Change in ERP Implementation: Theoretical Bases and Empirical Validation. *Information & Management, 45*(7), 474–481.
10. Lech P. (2004)80/20 Role in ERP System Implementation – A Case Study on Maximizing ROI, Preceedings of then 11 th Europien Conferenceon Information Technology Ewaluation Genoa, s. 342-352.
11. Lee, D.H., Lee, S.M., Olson, D.L., Chung, S.H. (2010). The Effect of Organizational Support on ERP Implementation. Industrial Management & Data Systems, 110(1-2), 269–283.
12. Lewandowski R., Wawrzyniak K., Lagodziński M., Fronczak G., Czechumski W.: The application of business intelligence solutions in a health care organization. Studies & Proceedings PSZW vol. 58 Bydgoszcz s.
13. Pondel M. (2012). Data mining with Microsoft SQL Server 2008. Knowledge Acquisition and Management. Research papers of Wroclaw University of Economics v 232 p. 98-107.
14. Shih, Y.Y., Huang, S.S. (2009). The Actual Usage of ERP Systems: An Extended Technology Acceptance Perspective. *Journal of Research and Practice in Information Technology, 41*(3), 263–276.
15. Sternad S., Bobek S., Deželak Z., Lampret A. (2009): Critical success factors (CSFs) for enterprise resource planning (ERP) solution implementation in SMEs : what does matter for business integration. International journal of enterprise information systems, 5(3), 27-46.
16. Sternad S., Bobek S. (2012): End user's knowledge issues in ERP solutions use. *Studies & Proceedings PSZW*, *58* Bydgoszcz pp.129-142.
17. Umble, E.J., Haft, R.R., Umble, M.M. (2002): Enterprise Resource Planning: Implementation Procedures and CSF. European Journal of Operational Research, *146*(2), 241-257.
18. Shih, Y.Y., Huang, S.S. (2009): The Actual Usage of ERP Systems: An Extended Technology Acceptance Perspective. *Journal of Research and Practice in Information Technology, 41*(3), pp. 263–276.

19. Calisir, F., Gumussoy, C.A., Bayram, A. (2009): Predicting the Behavioural Intention to Use Enterprise Resource Planning Systems – An Exploratory Extension of the Technology Acceptance Model. *Management Research News, 32*(7), 597–613.
20. Lee, D.H., Lee, S.M., Olson, D.L., Chung, S.H. (2010): The Effect of Organizational Support on ERP Implementation. *Industrial Management & Data Systems, 110*(1– 2), 269–283.
21. Sun, Y., Bhattacherjee, A., Ma, Q. (2009): Extending Technology Usage to Work Settings: The Role of Perceived Work Compatibility in ERP Implementation. *Information & Management, 46*, 351–356.
22. Youngberg, E., Olsen, D., Hauser, K. (2009): Determinants of Professionally Autonomous End User Acceptance in an Enterprise Resource Planning System Environment. International *Journal of Information Management, 29*, 138–44.