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ANALYSIS OF KEY SUCCESS FACTORS FOR BUSINESS INTELLIGENCE SYSTEMS IMPLEMENTATION

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Abstract **-** This research study demonstrates analysis of key success factors for business intelligence systems implementation. The analysis is based on the review of a large amount of literature on this subject matter, industrial presentations, and on the processing of data obtained from interviews with several companies.

Keywords **-** Key factors, business systems, intelligent systems

I. INTRODUCTION

IDEA of implementation of informatics systems in an enterprise has for its goal to constantly increase participation of intelligent systems in decision-making process and making of right decisions for the enterprise's business operation. Companies increasingly recognize the importance of information technologies that would support easier achievement their strategic goals.

With growing demand of information systems which support efficient decision making, new related terms were created: data storage, knowledge management, decision-making support systems, data research, online analytic data processing, whereas later the term business intelligence will largely cover all those terms [1].

Although business intelligence is a priority for enterprises, its successful implementation and use may be complicated due to numerous factors, as indeed happens with many other great information systems [1], [2].

These factors include: organizational factors (harmonization with management strategy, support, project success support, key users resistance), system factors (selection of sellers, architecture, access tools, accessibility of skills), project factors (resources, project skills, change management, successful completion of user's training), data-factors [1], [3].

II. LITERATURE REVIEW

This section is devoted to the literature that was used and studied in preparation of this paper. Its objective is to discuss the role of informatics software. Study of literature shows that understanding of informatics software in decision making differs depending on the literature that was used.

Further on, the chapter discusses questions related to use and implementation of business intelligence. Researchers tried to identify the factors contributing to business intelligence success. These factors are usually named critical success factors and their relevance for information systems is examined in this chapter, by presenting critical factors of great importance. [4]

Conceptual framework [2], [5], was made in relation to the literature which connects identified critical success factors with ERP systems related to business intelligence. This study uses three significant research question:

1) *Which key success factors are related to the implementation of business intelligence as an extension of ERP system?*
2) *Are critical success factors of ERP systems implementation deemed relevant for the implementation of business intelligence which is realized as an extension of ERP system extension?*
3) *Are some of the identified critical success factors more critical than others?*

TABLE I
BUSINESS INTELLIGENCE CRITICAL SUCCESS FACTORS [6]…[18].

Authors	*Methods used*	*Critical success factors*
Farley (1998)	Conceptual method	Fast implementation, adaptable to business requirements, useful information, easy to navigate
Watson & Haley (1997)	Research in an organization	Management support, adequate resources, change management, metadata management.
Chen & Associates (2000)	End users survey	Users satisfaction
Sammon and Finnegan (2000)	Study of organization to identify organizational success factors	Business led approach, management support, adequate resources, involved budget and skills, data quality; flexible enterprises models, data management, automatic data extraction strategy, methods and tools, integration of Data Warehouses with the existing systems,; hardware and software concept proof
Little & Gibson	Organization survey	Management support, overall organization approach, data

(2003)		prototype use for Data Warehouse, metadata, reliable implementation methodology, external support (consultants)
Mukherjee & D'Souza (2003)	Conceptual	Data quality, adequate technology, management support, defined business goals, the involvement of users, change management.
Rudra & Yeo (2000)	Research in an organization	Technical factors (data quality and data consistency)
Joshi & Curtis (1999)	Conceptual method	Project related factors (project plan has to coincide with business requirements and project management scope), technical factors, DBMS selections, data load and efficient data access)
Wixom & Watson (2001)	Research in an organization	System quality, management support, adequate resources, users participation, project team
Chenweth et al	Interviews in an organization adopting the business intelligence theory	Management support, champion, architecture (Data Mart), appropriate organization, users acceptance
Atre (2003)	Conceptual method	The wide approach in the enterprise, management support and completely business oriented involvement, qualified human resources, implementation methodology, data quality and request analysis, metadata and tool standardization.
Yeoh and Koronios (2010)	Delfi and basic studies	Vision and business cases, management, teams, project management and methodology, change, data and infrastructure management

III. METHODOLOGY OF RESEARCH

Research methodology chapter discusses various research approaches in order to compare disagreements existing between different literature.

Research concept includes four phases:

1) *Literature review*
2) *Conceptual framework*
3) *Content analysis*
4) *Interviews analysis*

Analysis of literature showed a hole in present researches, which is a result of the formulation of the conceptual framework and therewith related research questions. The qualitative approach used utilizes data obtained from two data sources: presentation validity and interview validity. When the validity of all presentations was analyzed it was decided to perform a revision of initial conceptual framework. Revised conceptual framework was then subjected to additional research and checked through interview analysis process. Each research phase is based on the previous phase findings and represents the basis for the next phase.

TABLE II
CRITICAL SUCCESS FACTORS CONCEPTUAL MODEL [6]… [18]

Critical success factors	
ERP systems	**Business intelligence**
Top management (Strategic alignment, management support, leadership, champions)	Management support
	Champions
Project (Management, methodology, team structure, external consultants)	Means
	Users participation
Organization (Culture, discipline, change management, training, users involvement, maturity process)	Team skills
	Sources systems
	Technology development
System (Technology, organizational adjustment)	Strategic adjustment

IV. RESULTS: INDUSTRIAL PRESENTATION ANALYSIS

For the purpose of analysis a sample of 9868 industrial presentations related to stabilization and association cases was used. Once only those presentations of greater relevance to analysis were chosen, their number was brought down to 854 presentations (8,6% of original sample). The sample was further reduced to 142 presentations from 110 different enterprises.

TABLE III
CRITICAL SUCCESS FACTORS IDENTIFIED FROM CONTENT ANALYSIS

Conceptual framework – Critical success factors				
Users participation	✓	✓	42	30
Team skills (Team structure)	✓	✓	42	30
Involvement of business and technical personnel			37	26
Management change	✓		37	26
Management support	✓	✓	33	23
Training	✓		32	22
Data quality			27	19
Project management (Methodology)	✓		24	17
Project scope			21	15
Trial			20	14
Adequate resources		✓	18	13
Management			17	12
Strategic alignment		✓	16	11
External consultants	✓		15	10
Security			14	10
Business content			13	9
Interaction with SAP			12	8
Output			8	5
Reporting strategy			6	4
Sources systems		✓	5	4
Champion	✓	✓	4	3
KPI identification			3	2

Culture(discipline)	✓		0	0
Process maturity	✓		0	0
Organization harmony	✓		0	0
Technology	✓		0	0
Development technology		✓	0	0
Technical staff			71	50

The study demonstrates that many factors key to ERP systems are also relevant for business intelligence. Regardless of these factors being common for both systems, differences between systems depend on the manner they were applied.

Chapter conclusion revises conceptual framework on the basis of content analysis findings.

V. Results: Interviews

Results obtained from interviews are analyzed in this chapter.

To obtain the results interviews were conducted in enterprises. The objective is to determine are some factors more critical when compared with others and to establish a conceptual framework. This chapter identifies two new key factors: maturity process and knowledge transfer, which were added to the revised conceptual framework. The revised conceptual framework was updated to reflect these findings.

Table IV
Critical success factors identified in the interview phase

Critical success factors	Company	Revised conceptual framework component
Management support	Company B, Company A	✓
Identification of key output indicators	Company B, Company D	✓
Training	Company B	✓
Data quality	Company B	✓
Output	Company B	✓
Strategic alignment	Company B	✓
Involvement of business and technical staff	Company B, Company D, Company A	✓
Users participation	Company B	✓
Business content	Company B	✓
Change management	Company B Company A	✓
Interaction with sellers (SAP)	Company A	✓
Team skills	Company A, Company D, Company C	✓
Knowledge transfer	Company C	New
Business intelligence strategy	Company A	New
Report strategy	Company A	✓
Training	Company A	✓
External consultants	Company C	✓

VI. Discussions and contribution

The aim of this chapter is to identify key factors of business intelligence, which originated as an extension of ERP system realization.

Research questions were tested in two phases: the phase including industrial presentations content analysis and the phase including interviews with industrial practitioners dealing with business intelligence. The research shows that all of these factors are applicable to business intelligence implemented within ERP system, except development technology.

The conceptual framework also identified the accompanying critical success factors of ERP system: strategic alignment, top management support, methodology, users' involvement, tax structure, external consultants, maturity process, culture, change management, training, technology, organizational adjustment. The research showed that many ERP systems critical success factors contained in the conceptual framework is also valid for the success of business intelligence [6]…[18].

Table V
Critical success factors and accompanying studies[6][18]

Critical success factors	**Literature**
Users participation	Mukherjee and D'Souza (2003), Wixom and Watson (2001)
Team skills	Wixom and Watson (2001), Arte (2003),Yeoh and Koronios (2010)
Involvement of business and technical staff	Arte (2003)
Change management	Watson and Haley (1997), Mukherjee and D'Souza (2003), Yeoh and Koronios (2010)
Management support	Watson and Haley (1997), Sammon and Finnegan (2000), Little and Gibson (2003), Mukherjee and D'Souza (2003), Wixom and Watson (2001), Chenweth et al (2006), Arte (2003)
Data quality	Sammon and Finnegan (2000), Mukherjee and D'Souza (2003), Rudra and Yeo (2000), Arte (2003), Yeoh and Koronios (2010)
Methodology	Little and Gibson (2003), Arte (2003), Yeoh and Koronios (2010)
Project scope	Joshi and Curtis (1999)
Adequate resources	Watson and Haley (1997), Sammon and Finnegan (2000), Wixom and Watson (2001)
Sources systems	Joshi and Curtis (1999), Wixom and Watson (2001)
Strategic alignment	Little and Gibson (2003), Mukherjee and D'Souza (2003), Joshi and Curtis

	(1999), Chenweth et al (2006), Arte (2003), Yeoh and Koronios (2010)
Partnership implementation / Consultants	Little and Gibson (2003)
Champions	Chenweth et al (2006), Yeoh and Koronios (2010)
Output	Joshi and Curtis (1999)

There are critical success factors of business intelligence which were identified in this research, that were not identified in the literature. technique [6]…[18]. These are: security, business content, interaction with the seller, reporting strategy, testing, KPI identification, maturity process, knowledge transfer, management, training and

VII. Conclusions and future work

Extensive research in the field of information technologies has been carried out to identify critical factors with the aim to improve informatics systems.

Researches so far have been based on examination of connection with key ERP factors. The research showed that the connection exists and that a certain number of key factors in ERP systems is also relevant in business intelligence systems.

In this study, three important research questions are posed:

1) *Which key success factors are connected with the implementation of business intelligence if it represents an extension of ERP system?*
2) *Are key success factors of ERP system significant for implementation of business intelligence which may be considered to be an extension of ERP system?*
3) *Which of discovered key success factors are of more key importance than others?*

Review of more than 9000 industrial presentations demonstrated that implementation of business intelligence may differ depending on the enterprise. This variance depends on numerous factors, from that which business intelligence component is being incorporated, how it is being used, and then from the experience of the enterprise in implementation.

The need exists for further research to validate the use of industrial presentations as sources of data for research purposes. Information, communication and technology industry are developing rapidly.

A number of critical success factors have been identified, that were not identified in any of the previous studies. Further research should confirm these factors and determine if they are applicable in SAP environment only.

References

[1] N. DENIC, S. MARKOVIĆ, B. SPASIC, M. MILIC. Identification of factors influencing growth project management ERP implementation., ANNALS OF THE ORADEA UNIVERSITY Fascicle of Management and Technological Engineering *ISSN 1583 - 0691, CNCSIS "Clasa B+"*, ISSUE #2,SEPTEMBAR 2014, Volume XXIII (XIII), 2014/2

[2] N. Denic, N. Zivic, B. Dasic , „Analysis of factors of implementing ERP solutions in the enterprise“, ANNALS OF THE ORADEA UNIVERSITY Fascicle of Management and Technological Engineering ISSN 1583 - 0691, CNCSIS "Clasa B+", ISSUE #2, SEPTEMBER 2013, M24

[3] B. M. Miles, and A. M. Huberman, (1984), Qualitative Data Analysis. California: Sage Publications.

[4] J. M. Carroll, L. L. Dawson, and P. A. Swatman, (1998). “Using Case Studies to Build Theory: Structure and Rigour”, Proceedings of the 9th Australasian Conference on Information Systems, Sydney, Australia.

[5] S. Williams and N. Williams, (2006), “The Profit Impact of Business Intelligence”, Morgan Kaufmann, New York.

[6] J. Farley, (1998), “Keeping The Data Warehouse Off The Rocks”, Measuring Business Excellence 2(4), 14-15

[7] H. Watson and, B. Haley, (1998), “Managerial Considerations”, Communications of the ACM, 41(9): 32-37.

[8] L. D. Chen, , K. S. Soliman, E. Mao and, M. N. Frolick, (2000), “Measuring user satisfaction with data warehouses: an exploratory study”, Information & Management, 37(3): 103.

[9] D. Mukherjee, and D. D’Souza, (2003), “Think phased implementation for successful data warehousing”. Information Systems Management, 20(2), 82-90.

[10] S. Atre (2003). “The Top 10 Critical Challenges For Business Intelligence Success”, C. C. Publishing: 1-8. located at http://www.computerworld.com/computerworld/records/images/pdf/BusIntellWPonline.pdf, accessed June 2007

[11] T. Chenoweth, K. Corral and H. Demirkan, (2006), “Seven key interventions for data warehouse success”, Communications of the ACM, 49(1), 114-119.

[12] W. Yeoh and A. Koronios 2010, Critical success factors for business intelligence systems, Journal of computer information systems, vol. 50, no. 3, Spring, pp. 23-32.

[13] R. G. Little, & M. L. Gibson (2003). Perceived influences on implementing data warehousing. IEEE Transactions on Software Engineering, 29(4), 290-296. http://dx.doi.org/10.1109/TSE.2003.1191794

[14] K Joshi, M. Curtis (1999) Issues in the planning of a data warehouse. Information Strategy, 15(2), 28–35.

[15] , B. Wixom, H. Watson, (2001), “An Empirical Investigation Of The Factors Affecting Data Warehousing Success”, MIS Quarterly 25(1), 17-41.

[16] D. Sammon, P. Finnegan, (2000), “The ten commandments of data warehousing”, ACM SIGMIS Database, 31(4): 82-91.

[17] A. Rudra, E. Yeo, (2000), “Issues in User Perceptions of Data Quality and Satisfaction in using a Data Warehouse - An Australian Experience”, Proceedings of the 33rd Annual Hawaii International Conference on System Sciences (HICSS), Hawaii.

[18] L. D. Chen, K. S. Soliman, E. Mao, M. N. Frolick, (2000), “Measuring user satisfaction with data warehouses: an exploratory study”, Information & Management, 37(3): 103.