

APPROACHES TO THE CONCEPT OF BUSINESS INTELLIGENCE SYSTEMS IN SLOVAK ENTERPRISES

ANNA HAMRANOVÁ – ANITA ROMANOVÁ

Abstract: Comparison of approaches of Slovak companies in the area of BI in different time periods. Selection and set-up of research tools – a concept of research hypotheses, set-up of a model of measured indicators in classification on: exploration of assumptions and approach to BI, realisation of research, statistical processing of results, assessment of an indicator model and verification of hypotheses and conclusion. Setting of indicators and measurement model. Approach to BI system in Slovak companies is positively developing in measured time periods, this relates to a significant development in IS/IT area. At the same time, it is assumed that the company has implemented a properly working information system.

Keywords: BI, management, data, implementation, information system

JEL Classification: M15

1. INTRODUCTION

Management of enterprises depends on the ability of the managers to obtain key data necessary for management quickly and accurately. Most of the time the data is hidden in the companies' databases or they are originated from several sources. In order to find the right data and its early procurement according to the requirements of the managers we use BI solutions which are implemented as an extension of the source data systems [5], [12].

BI topic is included in other foreign works [7] [18], where the BI characteristics are more specified. Based on these publications BI serves to utilize information assets in key company processes, to gather new information about the company itself, to analyse and the lead to increase the profit and performance of the company. Company dealing with information management at Northwestern University in Chicago understands BI as gathering knowledge: „Business Intelligence is made by the knowledge of the company gathered through different hardware and software technologies, which enable the company transform data to information“ [2]. This definition understands technologies only as a way not as a substance of Business Intelligence. Authors in Slovakia [3], [6], [9] usually tend to define BI systems according to [12] and [18].

BI solution is a combination of more components according to the general conception of BI systems [12], while the concrete form, extent and complexity is given by needs and conditions of a company or institution. Tools of Business Intelligence can be characterised as technological components of BI systems used for gathering of information, transforming, saving and providing the needed outputs to end-users. Based on mentioned, BI tools can be classified as transformational (ETL), integration (EAI), database-based (DSA, ODS, DW, DMA), analytical (OLAP), reporting, data mining, data accuracy (NKV) metadata management (MTD).

Successful and efficient implementation of Business Intelligence requires a symbiosis of knowledge of company processes, information technologies and a proper method

for implementation of BI solution based on standards [1], [7], [9]. Because of the large scale of BI area we focused on those areas, which relate to company informatics and information technologies.

According to Gartner agency, implementation and utilization of BI systems to build complex analyses in companies is one of the main trends in IS/IT area [8]. Conclusions of foreign research surveys confirm increasing need of gathering early and quality information by managers [4], [14], according to the survey by J. Šupšák „Global and business priorities of Slovak companies“ [16] they predict massive spread of BI applications in companies and include BI into one of the areas, which investments will flow in upcoming years to [15]. Mentioned conclusions lead us to explore the status and readiness of Slovak companies for implementation and utilization of BI.

Development in area of implementation of BI systems is described in Models of BI maturity [4], [10], [13], [17]. Simultaneously, according to Gartner agency [8] the scale of BI systems is evolves together with IS/IT development.

2. CONCEPTUALISATION OF THE RESEARCH MODEL

Following picture displays the model of scientific exploration (Figure 1).

When focusing on different foreign surveys, we have realized there is a lack of publications from real business experience. An example is a study Integration Trends in Business Intelligence systems by German authors Chamoni – Gluchowski [4] which scans BI approaches, relationship of BI and business goals, running and development of BI systems, responsibility for BI strategy and defines maturity levels based on the maturity model.

We were inspired by the results of this study when setting up our survey model as well as other surveys from IS/IT in Slovakia, e.g. Survey of ERP systems in the Slovak Enterprises [11]. We propose our two hypotheses:

H1: Existence and utilization of IS in a company significantly influence approach to BI systems.

H2: A positive shift in approach to BI systems in Slovak companies evolves in time.

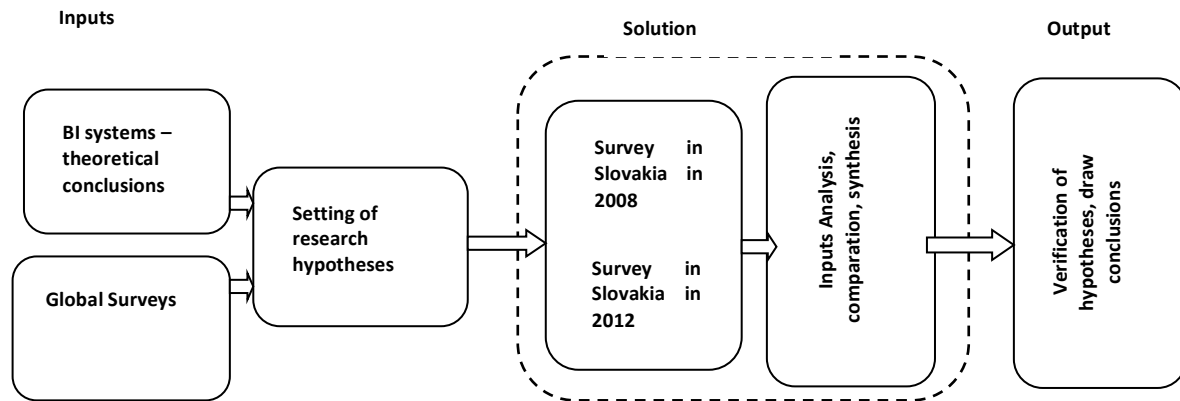


Figure 1 Research model
Source: Own processing

3. RESEARCH FRAMEWORK AND METHODOLOGY

Research framework includes selection and setting up tools of research – concept of research hypotheses based on studying materials, creation of a model of measured indicators, questionnaire survey, statistical processing of data, assessment of indicator model, verification of hypotheses and conclusion

Research instrument

We started developing our questionnaire by building on the previous theoretical basis to ensure content validity. The survey was made in 2008 and 2012 and managers of Slovak companies were respondents.

Measures

Table 1 describes Indicators and measurement model, while specific indicators are divided into 2 groups. The first group of indicators relates to the status of research of BI system in a company as a needed condition for implementation of BI systems, the second group of indicators relates to approach to BI systems from the Slovak managers' point of view.

Table 1 Indicators and measurement model

Construct	Label	Indicator
Conditions for BI	A1	Implementation of Information system in a company
	A2	Coverage of functional areas of a company by IS modules (IS functionality)
	A3	Connectivity of IS modules
	A4	Plan to invest into coverage of more areas by IS modules
Approach to BI systems	B1	Knowledge of BI terminology
	B2	Implementation of BI system
	B3	Improvement of management using tools of BI
	B4	Identification of missing BI tools

Source: Own processing

Assessment of indicators was following:

- Indicators A1, A2, A3, A4, B2, B3, B4 – respondents received answers, and choosed the most suitable. Percentual shares of answers were taken into account.
- Indicator B1 – Respondents responded on their knowledge of the BI terminology from 1 to 5, where 1 means – I know, I use it on a daily basis and 5 means – I have never heard about it. Arithmetic average of responses was assessed.

For verification of statistical significance of results were used statistical tools, Independent samples t-test (for

variables nominal – scale) a Chi-Square test (for variables nominal – nominal) using the SPSS software.

Data collection

Survey took place in 2008 at randomly selected sample of 212 companies operating in Slovakia and sample of 64 companies operating in Slovakia was used in 2012. Structure of research samples was analysed based on 3 parameters: size of a company, ownership and branch.

Research sample in 2008 was made of 13% of micro-enterprises, 22% small, 28% middle-size and 27% of large companies. From the ownership structure point of view we analysed 30% of companies with 100% foreign ownership, 14% of companies have a major foreign ownership, 44% with 100% domestic ownership, 4% of companies have a major domestic ownership and 8% of companies with public ownership. Sample contains 30% of manufacturing companies, 19% from IT and telecommunication. Share of other sectors, e.g. building industry, consulting, trade, agriculture, transportation was less than 10%.

Research sample in 2012 included 8% micro-enterprises, 17% small, 31% middle-size and 44% of large companies. From the ownership structure point of view there was analysed 35% of companies with 100% foreign ownership, 17% of companies with major foreign ownership, 36% was with 100% domestic ownership, 6% have a major domestic ownership and 6% of companies with public ownership. The sample contained 38% IT and telecommunication companies and manufacturing sector 16%. Other sectors were included in the sample with share less than 10%.

4. RESULTS AND DISCUSSION

All the measured indicators were statistically processed; aggregate results are displayed in Tables 2, 3, 4 and 5.

We verified the dependency of indicators B1 to B3 from the necessary condition for implementation of BI systems which is the existence of IS in the company (for verification the hypothesis H1). At the same time, we compared values of respective indicators in 2008 and 2012 (for verification of hypothesis H2).

Indicators B3 and B4 is possible to be assessed only in companies, which have already implemented BI solution, therefore we have verified them only for those. Results are displayed in Tables 4 and 5.

Table 2 B1 - Knowledge of BI Terminology

Year	IS implemented	B1 - Knowledge of BI Terminology (average values)										
		OLTP	ETL	EAI	DSA	ODS	DW	DMA	OLAP	Data mining	NKV	MTD
2008	Yes	3,51	3,85	3,68	3,29	3,21	2,71	3,53	3,33	3,19	3,32	3,76
	No	4,11	4,42	4,21	3,84	3,89	3,21	3,74	4,00	3,68	3,68	4,47
	Partially	3,57	3,90	3,73	3,35	3,28	2,76	3,55	3,40	3,24	3,35	3,83
2012	Yes	3,12	3,14	3,05	2,60	2,71	2,41	3,09	3,10	2,91	2,66	2,95
	No	4,33	4,00	3,33	3,33	3,67	2,83	4,00	3,67	3,33	3,50	3,67
	Partially	3,23	3,22	3,08	2,67	2,80	2,45	3,17	3,16	2,95	2,73	3,02

Source: Own processing

Table 3 B2 – Implementation of BI system

Year	IS implemented	B2 – Implementation of BI system			
		Yes	Elements of BI within ERP	No, we think of BI	No, we don't think of BI
2008	Yes	22%	0%	30%	38%
	No	0%	0%	1%	9%
2012	Yes	44%	27 %	6 %	14 %
	No	0 %	0 %	5 %	5 %

Source: Own processing

Table 4 B3 – Improvement of management using BI tools

Year	Implemented BI Solution	B3 - Improvement of management using BI tools		
		Yes	Perhaps	No
2008	Yes	20%	2%	1%
	Elements of BI within ERP	0%	0%	0%
2012	Yes	29%	12%	0%
	Elements of BI within ERP	15%	11%	0%

Source: Own processing

Table 5 B4 – Identification of missing BI tools

Year	Implemented BI Solution	B4 - Identification of missing BI tools		
		Nothing is missing	At least 1 Missing	No Answer
2008	Yes	0%	50%	50%
	Elements of BI within ERP	0%	0%	0%
2012	Yes	18%	27%	18%
	Elements of BI within ERP	2%	27%	9%

Source: Own processing

Statistical significance was verified by Sample t-test and Chi-square test with examples of selected results displayed in Tables 6 and 7.

Based on gathered and verified results can be stated, that hypothesis H1 was confirmed in both periods. This was confirmed not only by gathered results in explored indicators (Table 2, Table 3), but also by verification of statistical significance (p-value within interval from 0,000 to 0,05). P-value for all verified elements of B1 indicator was within the range from 0,000 to 0,005, which is evidence of a fact, that the dependencies are statistically significant.

Comparison of resulting values of indicators B1 and B2 shows much better responses from respondents who use company IS versus respondents who have not implemented the IS. Indicators B3 and B4 assume that company already implemented IS since here we included only companies which already utilize systems or elements of BI.

Table 6 Verification of statistical significance depending B1 implementation of IS

Indicator		Levene's test for Equality of variances		t - value	p - value	Mean	95% Confidence Interval of the Difference	
		F	Sig.				Lower	Upper
2008	B1 - OLTP	8,509	0,04	-1,717	0,045	-0,597	-1,282	-0,089
				-2,350	0,026	-0,597	-1,117	-0,076
2012	B1 - OLTP	3,146	0,081	-2,020	0,048	-1,213	-2,413	-0,13
				-3,164	0,012	-1,213	-2,085	-0,340

Source: Own processing

Hypothesis H2 was confirmed as well, because indicators B1 and B2 showed a significant positive move in 2012 in comparison to 2008. For analysis of indicators B3 and B4 we focused only at companies which have already implemented BI and we also recorded a positive move.

Table 7 Verification of statistical significance depending B1 implementation of IS

	2008			2012		
	Value	df	Asymp. Sig. (2-sided)	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	232,313	6	,000	21,404	6	,002
Likelihood Ratio	70,061	6	,000	20,050	6	,003

Source: Own processing

For the advantages from BI implementation we recorded increase of „yes“ answers from 20% to 29% and decrease of „no“ answers from 1% to 0%. Similarly positive trend was identified also in the group of companies which have already implemented elements of BI within ERP system, where we see a change from 0% to 14% on the recorded advantages of BI, negative remained unchanged at 0%.

Indicator B4 is considered as positive when companies are able to define a tool which is missing in their BI solution as well as identify the complex solution as satisfactory (no BI tool is missing).

A positive move was recorded in both options: „no tool is missing“ from 0% to 20%, „at least 1 is missing“ from 50% to 54%. As the most significant move we consider recorded decrease from 50% to 27% at „no answer“ responses. The statistical significance of above mentioned dependencies was confirmed also by Chi-Square test when p-value reached values from 0,000 to 0,048.

5. CONCLUSIONS

With the development of Information technologies and larger use in praxis, either in existing IS solutions or in implemented new solutions, BI systems are used more often. We verified condition of existence of IS in a company as one of the most important factors influencing approach to the BI solutions using hypotheses which were confirmed. At the same time, another one of the confirmed hypotheses shows that a positive approach to BI evolves in time in Slovak companies. This definitely relates to the dynamically developing situation in IS/IT.

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Ing. Anna HAMRANOVÁ, PhD.

Ing. Anita ROMANOVÁ, PhD.

University of Economics in Bratislava, Faculty of Business Management, Department of Information Management

e-mail: anna.hamranova@euba.sk, anita.romanova@euba.sk