INTERACTIONS BETWEEN ORGANIZATIONAL SIZE AND SOME IT FACTORS IN THE CONTEXT OF ERP SUCCESS ASSESSMENT: AN EXPLORATORY INVESTIGATION

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ABSTRACT: *The study set sights on Romanian organizations which implemented a SIVECO ERP and BI software. The methodology used is both quantitative and qualitative. The research results were obtained with the use of a questionnaire, and our purpose was to demonstrate some hypothesis concerning the size of the organisation, the management method and the IT&C based decision. The questionnaire was operated with SPSS 17, through a linear regression analysis. The research has revealed how the organizational size and the IT factors interaction in the 2010 Romanian organizations. The research has a high level of originality, such a study has been never conducted before for computer based advanced management methods implementation.*

KEY WORDS: *enterprise resource planning; business intelligence; industry studies via computer software; hypothesis testing; IT management.*

JEL CLASSIFICATION: *C12; M1; L86.*

1. SIVECO APPLICATIONS 2011 AN INNOVATIVE SOFTWARE PRODUCT FOR BUSINESS ADMINISTRATION

The complex IT systems of SIVECO Romania connect companies to a set of resources ordered and related within a system, on several levels: operational, business, management etc. By accessing these tools, the business environment representatives have a global and comprehensive vision on the development of their companies, from general aspects up to the highest degree of customization for each type of company.

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SIVECO Romania solutions address both large companies and multi-national corporations as well as medium enterprises, from various sectors. Facilitating the beneficiaries a higher control of the business processes and relationships between them, these solutions offer economic agents the opportunity to effectively communicate between departments, but also when collaborating with partners, customers or third parties. Choosing to adopt the new IT model proposed by SIVECO Romania, companies from the main economic sectors can synchronize their financial- accounting and budgetary activities with the management of fixed assets and inventory objects, while maintaining also a rigorous control on the stocks and acquisitions and wisely managing human resources. The control and optimization of operational flows provided by the integrated package SIVECO Applications 2011 finally lead to an increase of efficiency and economic performances within the companies. Based on an in-depth analysis of all factors involved in the proper functioning of the economic units, SIVECO Applications 2011 radically changes the discipline of internal operation within the organizations.

SIVECO Applications 2011 runs, currently, at over 550 clients from all sectors of activity, including manufacturing, utilities, banking, transport, telecom, public administration etc. Respecting the requirements of the European IT industry, the ERP system developed by SIVECO Romania significantly contributes to increasing efficiency of business processes and activities, being the open, fully integrated and unitary system that improves the main aspects of resources organization and management - human, material and financial - from different economic structures.

2. SIVECO BUSINESS ANALYZER A HIGH PERFORMANCE INFORMATION MANAGEMENT SYSTEM

Business Intelligence Solutions of SIVECO Romania monitors and correlates all the levels of company activities, positively influencing its performances. Through configuration and specific attributes, our Business Intelligence solutions provide you the ideal tool in drafting of analyses, statistics and reports, extremely useful for business decision making.

SIVECO Business Analyzer (SBA) is a high performance Information Management System, capable to be adapted and customized according to the business particularities of any company. Already a reference product on the Romanian market, SIVECO Business Analyzer has been successful implemented both in the private and public sector. SBA supports the decision making process during the activities of planning monitoring, control, forecast and prognosis, provides information support for the adoption of strategies for cost control and the identification of sources to increase profit, provides synthesis, coherent, consistent and real-time information, represents the requested analyses under the form of graphs and tables in an appealing manner, easy to manage and customize. The online real-time analytical processing technology (OLAP) is one of the newest and most performing technologies in the field of information processing as a support for analysis and economic decision in a competitive environment.

The second application in the field of BI is SIVECO Balanced ScoreCard (SBSC), a software solution for strategic management and a latest generation information product launched on the Romanian market, able to monitor, analyze and compare the organization's performance in order to improve it. Placing the strategy at the centre, the proposed solution provides the beneficiary with relevant information regarding the manner in which the organization is heading towards reaching its strategic objectives. SIVECO Balanced Scorecard is a strategic management software solution implemented with Oracle Express technology aimed at providing primary data and structured information to shareholders and top management, as a real support for the decision-making process within the company.

We exemplified four simulation analysis and models of SBA and SBSC that are useful in the management activity and in the researches very much used by the managers of Romanian enterprises that purchased this type of product. The analysis of the evolution of an indicator allows the representation of the values in the database under the form of diagrams or charts. "What if?" Analysis consists of the possibility to modify the entrance parameters of an indicator and to see how this indicator varies after this modification. One can easily imagine potential situations when this type of analysis would be useful. For example, what happens with costs and profit if there is a certain percentage increase of the salary or power costs? What happens if the number of employees decreases or increases? Or if the value of certain taxes is modified (VAT, income taxes). TOP/BOTTOM Analysis. This analysis enables one to select the most important types of incomes or the most important customers. The existence of this possibility is necessary especially in case the dimensions have many values that cannot be monitored each at large, but you want to monitor the extreme values: the highest ones and the lowest ones. Forecasting is a simulation process in which the forecast values are based on the existing data history and the richer this history is the higher the accuracy of the forecast. In selecting the forecasting method out of the preset one can take into account the linear, exponential or periodic evolution of the indicators. In order to augment its value, the forecast can be used together with "what if ?" analysis.

3. RESEARCH OVER THE USE OF ERP AND BI SOFTWARE IN ROMANIAN ORGANIZATIONS

In the virtue of the questionnaire we achieved the results and we were able to formulate and validate hypothesis. Thus we formulated a hypothesis that in the private domain there is a more efficient usage of money than in the public domain and we have reached the conclusion that providing with excessive hardware is not necessarily a useful thing to do, if that hardware is not correlated with the software applications.

Another objective of this study was to test die impacts of contingency factors, including size, on die one hand, and ERP systems success, on the other. We demonstrate that there would be a relationship between firm size and ERP success; the relationship between firm size and ERP success will be moderated by IT assets, such diat success will be higher in larger firms and that the relationship between firm size and ERP success will be moderated by IT resources, such that success will be higher in larger firms. We concentrated on public organizations because we believe the adoption

of ERP systems might be higher there than in private sector organizations. We analyzed our data using SPSS 17.0, and our respective response rates, excluding the unusable questionnaires received, was 14 organizations.

We also used statistical techniques in order to define the differences between the groups, using t test. In order to analyze the statistical connections we used correlation analysis for the intensity of the connections between the variables and regression analysis to estimate the value of a dependent variable (effect) taking into account the values of other independent variables (causes). We carried out a multiple regression analysis in order to identify the effect that the number of employees, the number of de computers as well as the number of computers interconnected in a network has upon the software devices materialized under the form of computers on which an ERP,BI or BSC application is running. Thus there was validated the hypothesis referring to the better efficiency of investing money in the private domain, and also a better correlation between the efficiency of the hardware and employee resources and the implementation of a ERP, BI and BSC in the private domain in comparison to the public one.

3.1. Methodology

Questionnaire, the research instrument. The study set sights on Romanian organizations which implemented a SIVECO ERP and BI software, and were collected in 2010 year. The instruments used for collecting data were a quantitative questionnaire, an qualitative one and an interview. The research based on the quantitative questionnaire was structured on 27 questions focused on hardware and software endowment (8 questions), implementation of the ERP business software for five business function such as manufacturing, SCM, financial, HRM and CRM (6 questions), other 6 questions were dedicated only to Human Resource Management function and the last 7 questions were dedicated to BI management methods.

Table 1. ERP instruments implementation

Organizatia	MP	MFC	MCG	MAD	MRU	MS	MIX_ERP
ANR Drobeta Turnu Severin	0	1	0	1	1	1	0,67
Aeropotul Timisoara	0	1	0	0	1	1	0,50
ANIF Dunare Olt	0	1	0	0	1	1	0,50
Hidroserv Hateg	0	1	1	1	1	1	0,83
Hidroserv Severin	0	1	1	1	1	1	0,83
SE Braila	0	1	1	1	0	1	0,67
SE Mureş	0	1	1	1	1	1	0,83
CET Brasov	0	1	0	1	0	0	0,33
Apa Serv Valea Jiului	0	1	1	1	1	1	0,83
Aerostar Bacau	1	1	1	1	1	1	1,00
Meva Severin	1	1	1	1	1	1	1,00
Romvag Caracal	1	1	1	1	1	1	1,00
Cam Serv	0	1	0	1	0	1	0,50

Respondents. Even data were collected only from 14 organizations, these are representative for the 2010 Romanian economy, because in this economical moment Romania has only 5,000 companies that need an ERP and a BI software instrument as a advanced management method. So we have only 2,000 big companies having more than 250 employees which can afford to implement a SAP, Oracle or SIVECO ERP software. But these 2,000 companies generate incomes two times higher

than the other 10,000 SMB, and equal those of the 500,000 small Romanian companies, that have under 50 employees. From these 2,000 big organizations most of them are branches from transnational companies, and have mostly implemented ERP existing in their main organization, usually SAP or Oracle. So, are likely to be investigated public organizations and private Romanian capital organizations. These two categories have a hundred percent Romanian management, and had to optimize it. The data were collected during January and June 2010, with the help of Sorin Dimofte Implementing and Consultancy Manager of SIVECO Romania.

Table 2. ERP & BI instruments implementation

Organizatia	BI_SBA	BI_SBSC	BI_Querry	BI_Rapoarte	BI_OLAP	BI_Excel	BI_Etc	MIX_ERP+BI
ANR Drobeta Turnu Severin	1	0	1	1	1	0	0	0,57
Aeropotul Timisoara	1	0	1	1	0	1	1	0,71
ANIF Dunare Olt	0	0	0	1	0	0	0	0,14
Hidroserv Hateg	1	1	1	1	1	1	1	1,00
Hidroserv Severin	1	0	1	1	0	1	0	0,57
SE Braila	1	0	1	1	0	1	0	0,57
CET Brasov	0	0	1	1	0	0	1	0,43
Apa Serv Valea Jiului	1	0	1	1	1	1	1	0,86
Aerostar Bacau	1	0	0	1	0	1	0	0,43
Meva Severin	1	0	0	1	0	0	0	0,29
Romvag Caracal	1	0	1	1	0	1	0	0,57

Table 3. BI instruments implementation

Organizatia	SBA_Scenarii	SBA_Previziune	SBA_What_If	SBA_Drill_Up	MIX_BI
ANR Drobeta Turnu Severin	0	0	0	0	0
Aeropotul Timisoara	0	1	0	0	0,25
ANIF Dunare Olt	1	1	1	0	0,75
Hidroserv Hateg	1	1	1	1	1
Hidroserv Severin	1	0	0	1	0,5
SE Braila	1	1	1	1	1
CET Brasov	0	0	0	0	0
Apa Serv Valea Jiului	1	0	0	0	0,25
Aerostar Bacau	0	0	0	1	0,25
Meva Severin	1	1	0	1	0,75
Romvag Caracal	1	1	0	1	0,75

Table 4. Raw data collected through the questionnaire, used as variable for testing the hypothesis

	organizatia	proprietate	personal	calculatoare	ERP_BI	BI	ERP
1	ANR Drobeta Turnu Severin	0	146	25	0,57	0,00	0,67
2	Aeropotul Timisoara	0	245	66	0,71	0,25	0,50
3	ANIF Dunare Olt	0	647	100	0,14	0,75	0,50
4	Hidroserv Hateg	0	185	74	1,00	1,00	0,83
5	Hidroserv Severin	0	520	117	0,57	0,50	0,83
6	SE Braila	0	350	77	0,57	1,00	0,67
7	SE Mureş	0	370	90	0,00	0,00	0,83
8	CET Brasov	0	790	185	0,43	0,00	0,33
9	Apa Serv Valea Jiului	0	527	85	0,86	0,25	0,83
10	Aerostar Bacau	1	1679	400	0,43	0,25	1,00
11	Meva Severin	1	1071	121	0,29	0,75	1,00
12	Romvag Caracal	1	1754	110	0,57	0,75	1,00
13	Cam Serv	1	205	34	0,00	0,00	0,50

Table 5. t-test for Equality of Means

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
personal	Equal variances assumed	8,450	,014	-3,017	11	,012	-757,250	251,003	-1309,704	-204,796
	Equal variances not assumed			-2,071	3,248	,123	-757,250	365,603	-1872,010	357,510
calculatoare	Equal variances assumed	7,796	,018	-1,366	11	,199	-75,250	55,087	-196,495	45,995
	Equal variances not assumed			-,922	3,197	,420	-75,250	81,577	-326,039	175,539
ERP	Equal variances assumed	,377	,551	-1,699	11	,117	-,20944	,12330	-,48083	,06194
	Equal variances not assumed			-1,502	4,548	,199	-,20944	,13947	-,57897	,16008
BI	Equal variances assumed	,162	,695	-,086	11	,933	-,02083	,24288	-,55540	,51373
	Equal variances not assumed			-,089	6,433	,931	-,02083	,23292	-,58161	,53995
ERP_BI	Equal variances assumed	,242	,633	1,213	11	,250	,21825	,17990	-,17770	,61421
	Equal variances not assumed			1,351	7,605	,215	,21825	,16153	-,15764	,59415

Independent Samples Test

3.2. Results

Research Hypothesis. H01 The number of employees in an organization influences the role of the ERP applications within the respective organizations. The organization dimension is directly connected with the role of the ERP applications within the respective organization.

Testing the Hypothesis. We used regression analysis, as a statistical method to evaluate the relation between one independent variable (personal - size of organization) and another continuous dependent variable (ERP_BI given to the ERP and BI level of implementation). With this analysis tool we have performed a linear regression analysis using the method of the least square in order to plot a line by a set of observations. Thus we have performed the analysis of the dependence and we have appreciated the extent to which the independent variable influences the dependent.

Table 6. Linear regression analysis between an independent variable called personal and a dependent variable called ERP_BI for private cases (proprietate=1)

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,172	1	,172	49,352	,020[a]
	Residual	,007	2	,003		
	Total	,179	3			

a. Predictors: (Constant), personal

b. Dependent Variable: ERP_BI

c. Selecting only cases for which proprietate = 1

Model Summary

Model	R proprietate = 1 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	,980[a]	,961	,942	,05897

a. Predictors: (Constant), personal

With linear regression we output the regression coefficients necessary to predict one variable ERP_BI from the other personal. The model has been confirmed to be valid because the F test value were 49.35, with significant sig. <0.05 (0.02). The regression coefficient R=0,980 shows a very strong link between the variable ERP_BI given to the ERP and BI level of implementation and the independent variable personal showing the size of the organization, for the private sector. The model explains 96.1% from the total variation of the variable personal ($R2 = 0.961$). The rest of 3.9% is influenced by other residual factors not included in the model (Table 6). In conclusion, hypothesis H01 has been confirmed.

But in BI methods we found a weak link (R = 0.167) and also for the private sector we found R = 0593 < 063. This regression coefficient R = 0.593 shows an intermediate link in these case (Table 7).

Table 7. Linear regression analysis between an independent variable called personal and a dependent variable called BI for private cases (proprietate=1)

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,148	1	,148	1,086	,407[a]
	Residual	,273	2	,137		
	Total	,422	3			

a. Predictors: (Constant), personal
b. Dependent Variable: BI
c. Selecting only cases for which proprietate = 1

Model Summary

Model	R proprietate = 1 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	,593[a]	,352	,028	,36973

a. Predictors: (Constant), personal

Table 8. Linear regression analysis between an independent variable called personal and a dependent variable called ERP for private cases (proprietate=1)

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,153	1	,153	8,984	,096[a]
	Residual	,034	2	,017		
	Total	,188	3			

a. Predictors: (Constant), personal
b. Dependent Variable: ERP
c. Selecting only cases for which proprietate = 1

Model Summary

Model	R proprietate = 1 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	,904[a]	,818	,727	,13066

a. Predictors: (Constant), personal

Table 9. Linear regression analysis between an independent variable called personal and a dependent variable called ERP

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,543[a]	,295	,231	,19351

a. Predictors: (Constant), personal

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,173	1	,173	4,611	,055[a]
	Residual	,412	11	,037		
	Total	,585	12			

a. Predictors: (Constant), personal
b. Dependent Variable: ERP

**Table 10. Linear regression analysis between an independent variable called personal and
a dependent variable called calculators**

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,718ᵃ	,516	,472	68,979

a. Predictors: (Constant), personal

ANOVAᵇ

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	55779,255	1	55779,255	11,723	,006ᵃ
	Residual	52338,437	11	4758,040		
	Total	108117,692	12			

a. Predictors: (Constant), personal

b. Dependent Variable: calculatoare

4. CONCLUDING REMARKS

For hypothesis H01 we have found out that only the dimension off the organization and the number of installed computers are of equal average according to the type of property (independent samples t test); There is also a good link between the above mentioned characteristics. One the other hand concerning the role played by the ERP applications, in the private sector, considered by us more performing, their isn't a strong link between dimension and the role of the ERP applications, although the correlate coefficient is good. When using advanced methods, of BI type, and analyzing their effect on organizations management the situation is discouraging as there is no good connection even in the private sector, but on the other hand there is an strong link between dimension and the implementation of the ERP an BI mix in private organizations. Therefore the hypothesis is only partial confirmed.

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