ERP AND BI IMPLEMENTATION IN ROMANIAN ORGANIZATIONS AND THEIR INFLUENCE ON MANAGER'S DECISION: A CASE STUDY

EDUARD EDELHAUSER [*]

ABSTRACT*: ERP systems are usually complex, expensive, powerful, proprietary systems which are used widely as integrated multi-module commercial packages suitable for tailoring and adding "add-ons" as and when required. A lot of research has been done over ERP and implementation of ERP. However, most of the research so far has been done over ERP in an effort to implement it successfully in an organization. In this paper I offer the results of a case study undertaken to see the effect of ERP implementation on a few variables of manager's decision. This study has found that the job tenure and job type of an employee influences the attitudes towards ERP system.*

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

JEL CLASSIFICATION: *C12, M1, L86.*

1. OPPORTUNITIES TO IMPROVE THE MANAGEMENT METHODS OF ROMANIAN ORGANIZATIONS

Respondent organizations under investigation were chosen from Romanian SIVECO portfolio implementation and provided answers for the ERP implementation for the 2010 year. I made some reference throughout the paper to concepts as Management Information Sysytems (MIS) and Decision Support Systems (DSS), known in the IT economical literature as well as ERP (Enterprise Resource Planning) and BI (Business Intelligence). These concepts have long ceased to be considered software applications, in fact these tools are advanced management methods that provide both data management organization to the managers and are used as management tools for modeling and forecasting. The data themselves are of two types: current from the current activities of the so-called dedicated transactional processes,

---

[*] *Assoc. Prof., Ph.D., University of Petroşani, Romania,* edi1ro2001@yahoo.com

and operational management data made of historical data from the activities carried out in a longer period of time, called data warehouses that are dedicated to strategic management of an organization's strategic decisions.

Research methods used were diverse and included methods of gathering, recording and processing data and information such as questionnaire, interview and study documents, benchmarking to highlight "best practices" from other countries and holding companies in Romania, and also creativity sessions and meetings that we have conducted through the research in the company, where managers, implementers and designers who implemented advanced management tools.

2. INVESTIGATED ORGANIZATIONS THROUGH THE SITUATION BEFORE THE IMPLEMENTATION OF ERP AND BI APPLICATIONS IN THESE ORGANIZATIONS

The 14 organizations under investigation come from both public and private sectors. So we submitted the questionaire to 10 public organizations in various fields as follows:

- 3 energy organizations (with branches at present as the power plants, but probably in the process of reorganization in which the will call it) - SE
- 2 organizations providing services to the energy sector's - Hidroserv
- 2 organizations from utility services of water and heat - CET and Apaserv
- 2 organizations from air and naval transport
- 1 land management organization
  The four private firms under investigation are:
- SC Aerostar SA Bacau (Aerostar Bacau), is an industrial group specializing in manufacturing aircraft parts and equipment specific to general and civil aviation.
- SC Meva SA Drobeta Turnu Severin (Meva Severin), a company specialized in building railway wagons.
- SC Romvag SA Caracal (Romvag Caracal), a company specializing in the construction of railway wagons.
- SC Cam Serv SRL Berceni (Cam Serv) is a family business located in Ilfov county and focused on construction, excavation, demolition, pilots and platforms.

3. DESIGNING A QUANTITATIVE QUESTIONNAIRE AND A QUALITATIVE INTERVIEW DEDICATED TO THE MANAGERS OF THE ORGANIZATIONS THAT USE MANGEMENT INFORMATION SYSTEMS

After the development of quantitative survey I proposed 27 questions, a number of questions that if I exceeded, I would abused the respondents. Than I found it necessary to elaborate a qualitative survey in which the managers responded by presenting a case study for each organization. The quantitative survey respondents were also responsible for IT departments of organizations investigated, and the implications of the use of advanced methods in the Romanian organizations were investigated through the managers who apply these methods in those organizations.

The 19 questions of the second questionnaire were conducted on the influence, impact, consequences and organization involved in the use of advanced management methods. My objective was that these data could assess the implications of implementing these methods and also to highlight the risks that arise during the use of these methods in an organization.

After the data collection phase was accomplished through there two questionnaires, I have identified the need for direct dialogue with the managers of organizations about the subjective element that was missing in these questionnaires.

The interview for the investigated organizations dedicated to the managers have tried to capture the image of the organization in terms of using advanced management methods through modern methods of IT enterprise resource planning and through decision support system.

Such an approach needed a few standard steps such as: required to achieve a successful implementation, namely: the situation prior to the implementation of the organization, assess the possible benefits of implementing and evaluating the methods of implementation, how the implemented solution is used, the advantages of its use and the effect induced in the organization and also how implementation has affected the organization's management.

4. INDUCED EFFECTS OF THE IMPLEMENTATION OF ERP AND BI APPLICATIONS IN THE MANAGEMENT OF ROMANIAN ORGANIZATIONS

4.1. Implementations of the DSS Packages to Assist Managerial Decision through SIVECO Business Analyzer, and the Integrated ERP Systems through SIVECO Applications

In Romania the main SIVECO implementations are considered: Aerostar Bacau, Meva Drobeta Turnu Severin, Romvag Caracal, Anticorosiv Bucharest, General Turbo Titan Heavy Machinery, Romanceram Roman, CNE Prod Cernavoda, Constanta Maritime Port Administration, Congaz Constanta, Butane Gas, OMV / Petrom, Termoficare 2000 Pitesti, Timisoara Colterm, SE Constanta, Mures Termoserv, Hidroserv Hateg, Hidroserv Portile de Fier, and six of them responded to our questionnaires and qualitative interviews. (http://www.siveco.ro)

In the public services and utilities, SIVECO is well represented in fields as: suppliers of gas, water, steam, heat, electricity, sanitation or recycling services, where companies can benefit from flexible and configurable tools depending on the particular requirements of each category.

In the private sector SIVECO is mainly addressed to the industrial environments with over 1,000 employees. A study by SIVECO Romania among 330 companies in the country who work in production, reveals that they seek solutions to reduce costs and this is based on the benefits of implementing IT solutions. Industrial companies – such as companies or firms that produce continuous production or small series volume - believes that cost-control tools are absolutely necessary for the production process, the more need as the crisis deepens efficiency savings and

spending. Production component of the integrated package SIVECO Applications is one of the most powerful and advanced software tools that currently exist on the Romanian market, easier to manage the preparation, programming, launch, tracking and control of production processes. The product is used by a large number of prominent companies in the Romanian industry and its consolidation and validation as a product is based on customer comments and and needs of different industries: aircraft (Aerostar), machine building and cars (Astra Bus, Meva, Romvag), producing furniture (Libertatea), telecommunications (Topex), manufacturing equipment (Anticorosiv, Romceram, Uztel) etc.

5. STATISTICAL ASSUMPTIONS ON TESTING LINKS BETWEEN MANAGEMENT DECISION AND INFORMATION TECHNOLOGY

Hypothesis 1. Implementation of ERP applications in all functions of an organization can lead information technology in a strategic resource of the organization (Jones, 2006).

To prove this hypothesis we started to quantify the effects induced by the implementation of ERP applications in all functions of an organization. Thus we used data on turnover and clear profit for eight organizations (six public capital organizations were exempted from this investigation as part of organizations like the ANR or Termoelectrica) We took additional data that were not in the quantitative questionnaire from: http://www.doingbusiness.ro/financiar/, http://www.siveco.ro/web/.

Table 1. Organizations' financial statements

Organizatia		2004	2005	2006	2007	2008	An implementare Siveco	influenta ERP	crestere CA	crestere PN
aerostar sa	CA		102.734.723	140.976.614	139.190.732	152.690.000	2.005	15%	1,37	1,98
	Profit Net		6.800.130	13.450.668	10.146.868	10.918.559				
meva sa	CA		90.802.614	155.011.404	209.629.504	328.826.131	2.005	15%	1,71	2,65
	Profit Net		-6.992.582	11.528.766	4.747.312	7.867.540				
romvag sa	CA		60.911.735	130.263.915	235.895.459	302.726.345	2.005	15%	2,14	3,13
	Profit Net		4.745.474	14.874.455	15.325.519	9.082.897				
Camser Sa	CA		26.955.087	47.580.665	73.061.618	110.160.481	2.005	15%	1,77	1,45
	Profit Net		443.074	641.107	822.363	1.077.039				
Anif RA	CA		179.696.769	214.390.573	288.268.864	324.877.828	2.007	15%	1,13	0,42
	Profit Net		526.938	4.271.825	9.211.456	3.855.090				
Apaserv SA	CA	11.859.977	11.593.374	10.745.401	10.704.345	12.258.359	2.004	15%	0,98	0,84
	Profit Net	338.915	283.794	-429.255	-1.825.127	-6.152.954				
Aeroport TV SA	CA		17.122.761	19.634.749	23.472.912	30.544.667	2005	15%	1,15	0,52
	Profit Net		294.102	152.459	2.417.314	4.873.558				
Hidroserv Hateg SA	CA		13.971.037	15.016.682	18.628.756	26.569.491	2.005	15%	1,07	0,70
	Profit Net		76.170	53.158	178.185	247.465				

We then gathered the information related to the increase of turnover and clear profit for the year following the implementation, and data on the average ERP implementation in organization business functions. We used five variables for this purpose.

Table 2. Variables used in proving Hypothesis 1

organizatia1	ERP_Mediu	Proprietate	CA_efect	PN_efect
Aeropotul Timisoara	0,50	0	1,15	0,52
ANIF Dunare Olt	0,50	0	1,13	0,42
Hidroserv Hateg	0,83	0	1,07	0,70
Apa Serv Valea Jiului	0,83	0	0,98	0,84
Aerostar Bacau	1,00	1	1,37	1,98
Meva Severin	1,00	1	1,71	2,65
Romvag Caracal	1,00	1	2,14	3,13
Cam Serv	0,50	1	1,77	1,45

We used a t test and F test. By means of a t-test, we have tried to test equality media for the implementation of ERP systems and the effect induced on the clear profit organizations, for public and private case (two populations).

Table 3. Independent t test environments for testing equality

Independent Samples Test

		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
ERP_Mediu	Equal variances assumed	,130	,731	-1,336	6	,230	-,21000	,15716	-,59456	,17456
	Equal variances not assumed			-1,336	5,606	,233	-,21000	,15716	-,60121	,18121
PN_efect	Equal variances assumed	8,487	,027	-4,405	6	,005	-1,68399	,38226	-2,61935	-,74863
	Equal variances not assumed			-4,405	3,378	,017	-1,68399	,38226	-2,82708	-,54091

Significance level is .027 Sig is small for PN_efect (0,027<0.05), and higher for ERP_Mediu variable. The conclusion is that the average growth in clear profit equal to the type of property.

We conducted a regression analysis to determine the link between the degree of implementation of ERP applications on the functions of the organization and profit growth effect induced by these organizations, and I noticed that there is a good link (with a significance of correlation R = 0.73> 0.63 for 7 degrees of freedom). F-test also has a high enough value (6843), and the Sig. corresponding F statistics is slightly less

than 0.05 (0.04) which gives significant linear relationship between two variables. Because both F that has a high level, and significance Sig. is reduced, can be concluded that the results are not coincidental. (Radu, 2009)

Table 4. Regression analysis on ERP implementation degree of organization functions and the effect on profit growth

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,730[a]	,533	,455	,76035

a. Predictors: (Constant), ERP_Mediu

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3,956	1	3,956	6,843	,040[a]
	Residual	3,469	6	,578		
	Total	7,425	7			

a. Predictors: (Constant), ERP_Mediu

b. Dependent Variable: PN_efect

Hypothesis 2. Implementation of ERP and BI applications in all functions of an organization increases the influence of the advanced management methods in the decision making processes of the organization (Bach, 2007). Hypothesis 2 will be tested in particular from the perspective that BI applications influence the organization's performance management processes and less in terms of ERP applications.

Table 5. Variables used in proving the hypothesis 2

	organizatia	ERP_Mediu	Proprietate	CA_efect	PN_efect	BI_Mediu	BI_ERP_Mediu
1	Aeropotul Timisoara	0,50	0	1,15	0,52	0,25	0,71
2	ANIF Dunare Olt	0,50	0	1,13	0,42	0,75	0,14
3	Hidroserv Hateg	0,83	0	1,07	0,70	1,00	1,00
4	Apa Serv Valea Jiului	0,83	0	0,98	0,84	0,25	0,86
5	Aerostar Bacau	1,00	1	1,37	1,98	0,25	0,43
6	Meva Severin	1,00	1	1,71	2,65	0,75	0,29
7	Romvag Caracal	1,00	1	2,14	3,13	0,75	0,57

Table 6. Regression analysis BI degree of implementation and effect on profit growth, private organizations

Model Summary

Model	R Proprietate = 1 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	,908[a]	,825	,650	,34347

a. Predictors: (Constant), BI_Mediu

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,556	1	,556	4,717	,275[a]
	Residual	,118	1	,118		
	Total	,674	2			

a. Predictors: (Constant), BI_Mediu

b. Dependent Variable: PN_efect

c. Selecting only cases for which Proprietate = 1

We conducted a regression analysis to determine the link between the degree of implementation of BI applications such specific BI tools and profit growth effect induced by these organizations, and noticed that it is a very good (with a significance of correlation R = 0.908> 0.63 for only two degrees of freedom). Due to the low number of degrees of freedom F ratio is small and value Sig. is greater than 0.05 (0.275), and although the linear relationship between two variables which is very good (R = 0.908) is not necessarily explained by the influence of variable change on the dependent variable PN_efect and indepenedent variable BI_Mediu for private organizations. (Radu, 2009).   In public organizations R is 0.19, so there is no correlation.

Table 7. Regression analysis grade ERP & BI implementation and the effect on profit growth in public organizations

Model Summary

Model	R Proprietate = 0 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	,800ᵃ	,641	,461	,13682

a. Predictors: (Constant), BI_ERP_Mediu

ANOVAᵇ,ᶜ

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,067	1	,067	3,567	,200ᵃ
	Residual	,037	2	,019		
	Total	,104	3			

a. Predictors: (Constant), BI_ERP_Mediu

b. Dependent Variable: PN_efect

c. Selecting only cases for which Proprietate = 0

We conducted a regression analysis to determine the link between the degree of implementation of the mix type BI and ERP applications and profit growth effect induced by these organizations, and noticed that it is a very good correlation with a significance of R = 0.908 > 0.63 for only two degrees of freedom). Due to the low number of degrees of freedom, F ratio is small and value Sig. is greater than 0.05 (0.2), linear relationship between two variables that is good (R = 0.8), so this is not necessarily explained by the influence of variation in the independent variable on the dependent variable PN_efect BI_ERP_Mediu for public organizations. (Radu, 2009) In private organizations R is 0.418, so there is no correlation.

6. CONCLUSIONS

In the case of Hypothesis 1 we have concluded that the increasing of average clear profit is equal to the type of property. Regarding the link between the degree of implementation of ERP applications on the functions of an organization, and the effect induced by the increase in profit in these organizations have noted that there is a good link. F-test also has a high enough value, and value Sig. corresponding F statistics is slightly less than 0.05 which gives significant linear relationship between two variables. So the Hypothesis 1 is confirmed. In the case of Hypothesis 2 because of the low number of degrees of freedom (we received responses on the issue of BI only from 6 organizations, 3 public and 3 private), and although because the linear relationship between variables that quantify the implementation of BI type applications and the effect induced in profit organization, this relationship is not necessarily explained by

the influence of variation in the independent variable. So the Hypothesis 2 is not confirmed.

As a general conclusion I would say that public organizations successfully implement ERP applications, the private one are already focused on the implementation of BI applications, and the HRM field is an deployment vanguard of advanced methods that combining computer science with management.

In this context the basic concepts of computer system provides the technical and behavioral foundation that helps applications such as ERP and decision-making process for building a company's strategic advantage over competitors. IT systems are reflected by the structure and IT hardware equipment and base software. Using the IT systems and their applications in operational management, can develop a competitive advantage for the organization at local, national and up to forms of electronic commerce and information exchange level.

REFERENCES:

[1]. **Bach, P.; Strugari, M.; Jakov, M.** (2007) *Business Intelligence Implementation in Croatian Banking Sector*, Annals of DAAAM & Proceedings, January

[2]. **Edelhauser, E.; Lupu-Dima, L.** (2010) *Implementation of Integrated Business Management Software in the Romanian Mining Companies, Enterprise Resource Planning used in Romanian Mining Companies*, Mining Magazine, No. 4, Deva, Infomin Publishing House

[3]. **Jones, M.; Zound, R.** (2006) *ERP Usage in Practice: An empirical Investigation*, Information Resources Management Journal, January-March, pp. 23-42

[4]. **Moshe, Z., et al.** (2005) *Measuring Customer Satisfaction and Perceived Usefulness in the ERP context*, The Journal of Computer Information Systems, April

[5]. **Negrea, A.** (2007) *Moda implementarii ERP-urilor*, IT & C The Investor Magazine, May

[6]. **Radu, C., et al.** (2009) *Economic Statistics*, Editua Universiatria Craiova, Craiova

[7]. http://www.doingbusiness.ro/financiar [Accessed 15 september 2010]

[8]. http://www.siveco.ro/web/, [Accessed 15 september 2010]