REBS Review of Economic & Business Studies

Volume 15, Issue 1/2022, pp. 47-59
ISSN-1843-763X
DOI: 10.47743/rebs-2022-1-0003

ERP AND FINANCIAL PERFORMANCE – CASE STUDY ON ROMANIAN COMPANIES

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Abstract *This study is conducted based on analysis of 397 companies from Romania. The study evaluates the impact of ERP solutions on the financial performance of companies, viewed from the perspective of the business model, in the sense of decreasing expenditures or increasing revenues and turnover. Using the Least Squares method (OLS) and the Difference in Difference model, the study results show that there is a strong correlation between the implementation of ERP solutions and the increase in turnover, respectively the decrease in revenues. The results obtained do not reveal an influence of the ERP implementation on the expenditures.*

Keywords: *ERP, financial performance, organizational performance, accounting and finances, efficiency, business model.*

JEL Classification: *M29*

1. INTRODUCTION

The Enterprise Resources Planning (ERP) systems are computer systems that integrate databases from a company. These systems are modular and allow further developments by adding new modules or functionalities (Ungureanu, 2020). The simplest ERP systems have in their structure databases representing accounting operations and databases with customers and suppliers, and the most complex ERPs integrate production flows or Business Intelligence modules. An ERP is a tool for implementing the company's strategic vision (Teittinen et al., 2013). Among the benefits of ERP implementations for top management, transparency and control are the most important. An advanced information technology of business flows directly impacts net sales (Edith Galy, Mary Jane Sauceda, 2014).

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The flow and the business model must be very carefully integrated in the ERP implementation, so that it has the expected effects. Inefficient workflow configuration can cause a loss of performance (Davenport, 2000) The implementation of ERP systems is not a simple process and due to an incorrect analysis of the business process and due to the lack of expertise in the testing process, major problems may arise in the implementation of these systems. In the absence of an efficient and correct implementation, the process itself can fail and can generate irrecoverable cost for the company.

With the help of ERP systems, all the business flows and the business model in a company can be designed, so that the company's activity turn out to be transparent, easy to transpose and analyze in various reports, based on which the management factors can take the best decisions in the shortest time. Most ERP systems integrate flows with customers, suppliers, and employees (Davenport, 1998). The central database of an ERP routes the data and it transposes into reports for managers and decision makers in the company.

In this article we aim to analyze how the implementation of an ERP system influences not only the revenues and the turnover, but also the impact that if may have on the expenditures of Romanian companies, given that this country is ranked, according to the index of the digital economy and society (DESI-2021), on the last place in the 28 EU Member States. Also, in Romania the level of acquisition of digital skills is among the lowest in Europe. ERP implementations and implicitly obtaining results that are reflected in the performance of companies require that both those who design the implementation and those who test, implement and effectively use in the Go-Live phases the ERP system to have advanced digital skills. The results of the study show that the implementation of such systems influences the revenues and turnover of companies, but does not influence in any way the expenditures of Romanian companies.

The remainder of our paper is structured as follows: Section 2 summarizes the literature review. Section 3 describes the data and methodology employed. Section 4 reports the empirical findings, while Section 5 presents the concluding remarks.

2. LITERATURE REVIEW

The implementation of an ERP system influences the performance of companies, approached from several points of view. Optimized long-term operational performance has been observed for companies that have adopted an ERP system (Nicolaou A.I, 2011). Also, companies benefit from the

implementation of ERP which results in simplifying processes, improving data accuracy and obtaining quality data / reports (Mabert V.A., 2001). Because performance is a generic term, it is possible to refer to it by denoting the company's "gain" from an economic, financial, social, management, technical perspective etc.

From a business model perspective, the utility and the benefit brought by the implementation of an ERP system is proven when a company achieve cost savings or increased revenues and turnover. Although the acquisition and implementation cost of these ERP systems are quite high and may increase over time with further developments (Shadi A., 2019), studies show that the benefits of owning and using such systems are likely to justify the high cost and they can increase the performance of the companies that implement them.

Studies show an improvement in productivity and the ratio between the cost of goods sold and revenues (Poston and Grabski, 2001). Moreover, (Legare, 2002) shows that the implementation of ERP determines a decrease in personnel expense (direct and indirect), but also a decrease in procurement and administrative expense as well as an increase in productivity.

If these effects may not be seen immediately after the implementation of such a system, after a more careful or improved configuration of the implemented system, the benefits will start to come. Thus, three years after the implementation of an ERP system, there is an improvement in performance resulting from a decrease in the cost of goods sold and an increase in productivity (Poston and Grabski, 2001). Due to the efficient configuration of flows with the help of ERP systems, companies can obtain important competitive advantage that materialize through the increase of revenues but also through the reductions of personnel cost (Allen, 2008). Cost and time savings in core business are direct benefits of an ERP implementation (Davenport, 2000).

As much as companies that adopt ERP systems adapt to change, they will improve the benefits of implementation until they achieve the desired performance. According to the studies, the performance obtained after the implementation of an ERP system will be even more visible, in general, starting with the second year from the implementation (Ross and Vitale, 2000; Betts, 2001; Al-Mashari et al., 2003; and Cosgrove Ware, 2003). Moreover, the performance obtained by the companies that realize various subsequent developments and upgrades, is superior to that of the companies that do not invest in improvements (Nicolaou and Bhattacharya., 2008).

The effects of implementing an ERP system propagate in both revenues and expenditures. An ERP implementation can significantly reduce costs, but it can

also have an effect on revenues. According to Rikhardsson and Kræmmergaard (2006), the effects on expenditures are easier to quantify, but in terms of revenues growth as an effect of implementation, such a result is more difficult to isolate from other variables that influence their growth. The implementation of an ERP system itself does not increase revenues. The improvement of services, products or processes with the help of ERP, along with the increase of capacity without an increase in cost, influences the increase of revenues.

3. DATA AND METHODOLOGY USED

3.1. Methodology

The impact of ERP implementation on company performance was estimated using the following regression equation and the least squares method (OLS):

$$Performance_{i,t}=\beta_0 + \beta_1 \times ERP_i + \Phi \times Control\ variables_{i,t} + \varepsilon_{i,t} \quad (1)$$

The dependent variable is represented by the company's performance indicators in year t expressed by a series of alternative indicators such as: Turnover, Expenditures, Revenues. The variable of interest is ERP which reflects the fact that the company has implemented an ERP system in the analyzed period taking a value 1 for companies that have implemented an ERP system and 0 for companies that have not implemented an ERP.

In the analysis, we used as Control Variables the following variables: Equity, Field of activity, BVB Listing and Number of Employees.

The coefficient β1 reflects the impact of adopting an ERP system. A positive value of β1 indicates that the adoption has led to an increase in performance, and a negative coefficient indicates a decrease in the performance of companies that have adopted an ERP system.

In the second part of the analysis, we considered impact quantification of the implementation of an ERP system on the performance of companies taking into account the time when they adopted the ERP system. To perform this analysis, we used the following Difference in Difference model:

$$Performance_{i,t}=\beta_0 + \beta_1 \times ERP_i + \beta_2 \times ERP_i \times Time + \Phi \times Control\ variables_{i,t} + \varepsilon_{i,t\,t} \quad (2)$$

The variable Time takes the value 1 for the companies that implemented an ERP system in the post-implementation years and 0 for the companies that did not implement an ERP system and for the period before implementation for the companies that implemented an ERP system.

Thus, the coefficient β1 quantifies the overall impact of the adoption of an ERP system by some companies, compared to the companies that have not adopted, and the coefficient β2 quantifies the impact of the adoption of an ERP system, compared to the pre-adoption period.

Methods for comparing changes in groups over time (e.g. difference-in-difference) have been discussed in the literature (Singer, 2003) (Nichols, 2007) and (Skrondal, 2004).

Given previous studies, we anticipate that there is a positive influence of ERP implementation on turnover and revenues of Romanian companies, in terms of increasing these indicators, following the adoption of an ERP, and a negative influence on the Expenditures of companies that have adopted an ERP in the sense of decrease in Expenditures. Therefore, we have established the following hypotheses:

Hypothesis 1: The implementation of ERP systems causes an increase in the company's turnover.

Hypothesis 2: The implementation of ERP systems causes an increase in the company's revenues.

Hypothesis 3: The implementation of ERP systems causes a decrease in the company's expenditures.

3.2. Data used

The study of ERP systems influence on the business model of Romanian companies was conducted using a database containing information on 397 companies in Romania, of which 267 companies (67.25%) implemented an ERP system and 130 companies (32.75%) that did not implement such a system, for the period 1999-2020. Information on the implementation of ERP systems by companies was collected using a questionnaire distributed online (LinkedIn, e-mail, other social media networks). Thus, we collected data on ERP systems owned by companies, regarding the respondents' perception on the benefits or adverse effects of implementing ERP systems in companies, information on the type of modules implemented within the ERP system and the time of ERP implementation. The questionnaire was applied to a number of 500 companies, of which 446 companies completed the questionnaire. The final database contains a number of 397 companies, which provided all the information regarding the implementation of ERP systems and for which we found the financial data in the ORBIS database.

Out of the total of 267 companies that implemented an ERP type system, most of them, respectively 87.64%, implemented the Accounting module, followed

by 83.15% that implemented the Human Resource module, 79.03% which implemented CRM, 59.93% implemented the Procurement module, 50.19% implemented the Financial module, 26.97% implemented the Production module, 24.72% implemented the Project Planning module, 23.60% implemented Records office module, and 19.85% have implemented the Business Intelligence module. On average, each company implemented in the first ERP run, a number between 4 and 5 modules (Average: 4,550562). The minimum number of modules implemented by a company at the first ERP run is 1 and the maximum number of modules implemented is 9.

In Romania, the legislative regulations related to fiscal declarations, impose the necessity of having an ERP system that will automatically process the accounting data in the format requested by the authorities. Also, the declaration of salary income through the d112 declaration requires the use of software / modules to process the salary data and to automatically include it in the fiscal declaration. Declaration 394 regarding the deliveries / services and purchases made requires the use of CRM software to keep track of them. For this reason, companies that do not decide to outsource activities such as accounting or human resources decide to acquire and implement ERP systems that facilitate data management and processing.

In the studied sample, out of the total of 267 companies that implemented an ERP system, 64.79% of the companies, respectively 173 companies, implemented at least the Accounting, Human Resources and CRM modules. This could lead to the conclusion that these companies have implemented ERP for administrative purposes, and have less considered a possible increase in performance. But 50 of these companies have also implemented a Business Intelligence module, a module that is often used by companies that have made successful ERP implementations and want to optimize the business model with the help of analysis performed by the BI module. Out of the total of 267 companies that implemented ERP, 14.18% had a second implementation, respectively 38 companies. On average, these companies adopted 2 modules in the second implementation. Most companies have implemented the Business Intelligence module in the second implementation. It is interesting to note that in the second implementation, the companies added more modules and did not resume the initial one. This indicates that companies have improved the system implemented by adding new modules. The second implementation of ERP was adopted by companies with a performance well above the average of those who adopted ERP. Therefore, we can interpret that the most performing companies have subsequently implemented ERP modules due to the

recognition of the effects and the positive impact that the ERP implementation produces on the performance and the business model.

Most of the companies that completed the questionnaire are from the private sector, respectively 93.45%. Of these, 242 companies have implemented an ERP system and 129 companies have not implemented such a system. Only one public sector company did not implement ERP. The higher implementation rate for the public sector can be explained by the high cost of implementation, and by the fact that these companies had access to financing through projects with funds from the state budget or European funds, projects more difficult to access for private companies due to the eligibility criteria imposed.

225 companies (56.68% of the total number of analyzed companies) have less than 50 employees, followed by those in the range of 151-500 employees, respectively 15.37%. Therefore, most companies that responded to the questionnaire are companies with up to 500 employees. As expected, most companies that have not implemented an ERP system are in the range with the lowest number of employees, respectively a number of employees less than 50. All companies with more than 150 employees implemented ERP. Probably the high cost of an ERP implementation can be the cause of the implementation in a higher proportion by companies with over 150 employees. Large companies have easier access to financing through the implementation of projects financed by European funds.

141 companies, belong to different domains, that of services, production and trade, followed by 130 companies belonging of services. Most companies that have implemented an ERP belong to different domains of services, production and trade, respectively 91 companies, followed by 81 companies belonging to the production domain and 66 companies belonging to the services. Analyzing the data by activity sectors, the higher percentage of companies that have implemented ERP is related to companies in the Production and Trade sectors (over 80%). This can also be explained by the fact that recently the online commerce has developed a lot and the possession of an ERP system (CRM) is necessary for the evidence and organization of information. Also, most companies operating in the field of production are large companies that can bear the cost of an ERP implementation. (Ungureanu, 2021).

Table 1: Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Turnover	6,089	279.5202	1414.691	-.085655	33350

Variable	Obs	Mean	Std. Dev.	Min	Max
Employee	6,089	492.6451	2013.714	0	44917
Equity	6,089	251.4033	2022.069	-4558	52850
Revenues	6,089	303.1958	1501.1	-.062989	35330
Expenses	6,089	289.2557	1481.84	-10.35286	39800
Productivity	6,089	.905217	4.548931	-.000043	130.1

To study the influence of ERP implementation on the business model explained by the variables Turnover, Expenditures and Revenues, we considered the database containing information for 397 companies, for the period 1999-2020. Due to the fact that there were no annual observations for all companies, an Unbalanced Panel database containing 6089 observations resulted. Descriptive statistics of the variables are presented in Table 1.

Table 2: Differences between companies that have implemented and those that have not implemented ERP systems

	No ERP	ERP	Difference	Mean
Turnover	7.963567	371.4519	-363.4883***	279.5202
Revenues	9.828012	402.5113	-392.6833***	303.1958
Expenditures	9.866793	383.8389	-373.9721***	289.2557

Note: ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively

Univariate statistical analysis using the T test on the sample data reveals that companies that have implemented an ERP system record higher values for all variables related to the business model (Table 2).

4. RESULTS

Table 3 shows the results of the regression analysis on the impact of ERP adoption on the business model for 397 companies in Romania using the OLS method. Models 1, 2 and 3 show the estimates for each performance indicator: Turnover, Expenditures and Revenues.

Table 3: Results regarding the influence of ERP on the business model

	Model 1 Turnover	Model 2 Expenditures	Model 3 Revenues
ERP	5.5669***	-1.3939	-6.3728***
	(1.6301)	(3.5291)	(1.7630)
Equity	-0.0107**	-0.0106	0.0158***
	(0.0042)	(0.0188)	(0.0043)

	Model 1 Turnover	Model 2 Expenditures	Model 3 Revenues
Domain	3.4014***	1.1661	-4.4948***
	(1.2787)	(1.5327)	(1.4668)
BVB Listed	-10.4270	-221.4874**	1.7766
	(16.6320)	(86.1394)	(17.9338)
Employee no.	-9.0361***	-1.7760	12.2724***
	(2.4372)	(6.9501)	(2.7914)
Cons	1.3529	-0.0625	-2.4195
	(2.6355)	(6.2325)	(2.7927)
N	6089	6089	6089
R^2-adj	0.9933	0.9810	0.9935

Note: ***, ** and * to indicate statistical significance at 1%, 5% and 10% respectively. Standard errors are reported in parentheses.

The results of the regression analysis, show that the implementation of the ERP system had a statistically significant impact on the Turnover and Revenues.

The results of the regression analysis reveal that the impact of the implementation of ERP systems on the turnover was a positive and statistically significant one. In the case of the first model (Turnover Model 1), the determination coefficient R2 shows that the variation of the dependent variable (turnover) is explained in proportion of 99.33% by the variation of the independent variables ERP, Equity, Domain of activity and Number of employees. Therefore, Hypothesis 1 is confirmed, the implementation of ERP determines an increase in turnover. In the case of Model 2 (Model 2 Expenditures), the impact of the implementation of ERP systems on Expenditures is not statistically significant, so we cannot consider that the variable of interest (ERP) has any influence on expenditures. Hypothesis 2 is not confirmed. In the case of the third model (Revenues Model 3), the results of the regression analysis reveal that the impact of the implementation of ERP systems on Revenues was negative and statistically significant. The coefficient of determination R2 shows that the variation of the dependent variable (Revenues) is explained in proportion of 99.35% by the variation of the independent variables.

An increase in turnover determined by the implementation of ERP can be the result of a closer monitoring of customer orders and a more efficient organization of the sales process, or the improvement of processes. At the same time, the decrease in revenues with the implementation of ERP may be the result of a decrease in other types of revenues that are not part of turnover, such as other operating income in which there is also the resumption of income from amortization of investments realized through projects with non-reimbursable funds.

During the period for which the data related to the study were collected, Romanian companies benefited from such funds obtained from projects with non-reimbursable financing, funds that allowed them to grow sustainably. The negative correlation of ERP implementation with revenues may be the result of significant investments made prior to ERP implementation, investments that allowed the increase of turnover and determined the decision to implement such a system.

In the second part of the analysis, on the influence of the ERP systems implementation ERP on the business model, we used the difference-in-difference methodology, to determine whether the impact of ERP was amplified or diminished by the moment of implementation. The results obtained correspond to the reference model. The significant effects of the ERP systems implementation on the Turnover and Revenues of Romanian companies were also confirmed in the estimates made using the difference-in-difference method. The results presented in Table 4 show that the impact of the ERP x TIME variable is statistically significant for models 1 and 3. Thus, Model 1 shows that there is a direct link, in the sense that ERP implementation positively influences the dependent variable - Turnover, and model 3 reveals that the impact is negative for the variable Revenues.

Table 4: Results regarding the ERP influence on the business model taking into account the moment of implementation

	Model 1 Turnover	Model 2 Expenditures	Model 3 Revenues
ERP	15,061	20,170	-25,958
	-21,900	-58,102	-23,204
ERP x TIME	11.6800***	-98,344	-10.8645**
	-44,194	-74,993	-45,055
Equity	-0.0106**	-0.0106	0.0158***
	(0.0042)	(0.0188)	(0.0043)
Domain	3.2756**	12,669	-4.3772***
	-12,875	-15,619	-14,732
BVB Listed	-113,793	-220.6701**	26,770
	-166,302	-857,209	-179,192
Employee no.	-9.0962***	-17,120	12.3260***
	-24,306	-69,101	-27,884
Cons	16,597	-0.3228	-27,037
	-26,215	-60,856	-27,821
N	6089	6089	6089
R^2-adj	0.9933	0.9810	0.9935

Note: ∗∗∗, ∗∗ and ∗ to indicate statistical significance at 1%, 5% and 10% respectively. Standard errors are reported in parentheses.

5. CONCLUSIONS

Although according to the index of the digital economy and society (DESI-2021), an index that measures digital skills, Romania ranks last in the 28 EU member states, and the level of acquisition of digital skills is among the lowest in Europe, and thus we could assume that the implementation of ERP systems would not have impacts on the performance of the companies, the conclusions of our study show that in Romania, the implementation of ERP systems have a positive influence on the turnover. Therefore, the implementation of these systems in Romania shows its efficiency by increasing sales. This increase can be explained by the rigorous organization of information related to contracts and customers with the help of ERP systems so that an increase in sales is possible. Sales departments in companies have access, through these ERP systems, to data situations that allow easy tracking of contract terms and anticipation of customer buying behavior. A good use and understanding of this information can be the cause of increased sales in companies.

Regarding the influence of ERP system implementation on Expenditures, the low degree of digital skills in Romania may affect the expected results of these implementations, if we take into account a decrease in salary expenditures following automations generated by ERP implementations. The other expected and proven effects in companies in other countries may not occur in companies from Romania that implement ERP systems, due to low digital skills of users.

Although Romanian companies have implemented more and more ERP systems, especially since 2015, still from the DESI perspective, our country has not made progress in the last 5 years in terms of integrating technology into business. Romania ranks at the bottom of the rankings in terms of integrating basic digital technology into companies.

REFERENCES

1. Al-Mashari M, Al-Mudimigh A, Zairi M. (2003), Enterprise resource planning: a taxonomy of critical factors. European Journal of Oper Res, Volume 146(2), pp. 352–364.
2. Betts, M. (2001) Why ERP projects cause panic attacks. Computerworld, pp. 1-4.
3. Cosgrove Ware, L. (2003), By the numbers: Enterprise systems show results. C/O Magazine.
4. Davenport, T. H. (1998), Putting the enterprise into the enterprise system. Harvard Business Review, Issue July-August, pp. 121-131.
5. Davenport, T. H. (2000), Mission Critical: Realizing the Promise of Enterprise Systems, Harvard Business School Press.
6. Edith Galy, Mary Jane Sauceda (2014), Post-implementation practices of ERP systems and their relationship to financial performance. Information & Management, Volume 51(3), pp. 310-319.
7. Legare, T. (2002), The Role of Organizational factors in realizing ERP benefits. Information Systems Management, Volume 19(4), pp. 21-42.
8. Mabert V.A., A. S. a. M. V. (2001), Enterprise resource planning: Common myths versus evolving reality. Business Horizons, Volume May-June, pp. 69-76.
9. Nichols, A. (2007), Causal Inference with Observational Data. s.l., STATA Journal 7 (4): 507–41. [http://www.stata-journal.com/article.html?article=st0136].
10. Nicolaou A.I, B. L. (2011), ERP Systems Implementation And Firm Performance. Review of Business Information Systems (RBIS), 8(1), pp. 53-59.
11. Nicolaou, A. and S. Bhattacharya. (2008), Sustainability of ERPS performance outcomes: The role of post-implementation review quality. International Journal of Accounting Information Systems, Volume 9(1), pp. 43-60.
12. Poston, R., & Grabski, S. (2001), Financial impacts of enterprise resource planning implementations. International Journal of Accounting Information Systems, Volume 2(4), pp. 271–294.
13. Rikhardsson, P. and P. Kræmmergaard (2006), Identifying the impacts of enterprise system implementation and use: Examples from Denmark. Journal of Accounting Information Systems, Volume 7(1), pp. 36-49.
14. Ross JW, Vitale MR (2000), The ERP revolution: surviving vs. thriving. Inf Syst Frontiers, Volume 2(2), p. 233–241.
15. Shadi A., A. A. H. A. (2019), Implementing Enterprise Resource Planning ERP System in a Large Construction Company in KSA. s.l., CENTERIS - International Conference on enterprise Information Systems.
16. Singer, J. D. a. J. B. W. (2003), Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence. New York, Oxford University Press. [http://gseacademic.harvard.edu/~alda/].

17. Skrondal, A. a. S. R.-H. (2004), Generalized Latent Variable Monitoring: Multilevel, Longitudinal and Structural Equation Models. s.l.: Boca Raton, FL: Chapman & Hall/CRC. [http://www.gllamm.org/books/].
18. Teittinen, H., J. Pellinen and M. Jarvenpaa (2013), ERP in action - Challenges and benefits for management control in SME context. International Journal of Accounting Information Systems, Volume 14(4), pp. 278-296.
19. The Digital Economy and Society Index (DESI), (2022)
20. https://digital-strategy.ec.europa.eu/en/policies/desi, file:///C:/Users/iulia/Downloads/DESI_2021__Romania__eng_KtpAmqacSjNHwM9aeFBRhzVl3I_80496.pdf, [Accessed 19.05.2022]
21. Ungureanu, I. (2020), ERP Systems and the performance of the companies- a literature review. Iasi, European Finance, Business and Regulation Conference – May 2020, pp. 101-107.
22. Ungureanu, I. (2021), Methods of improving company performance. Iasi, Globalization and Higher Education in Economics and Business Administration Coference (GEBA 2021).