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IMPACT OF HUMAN ASSET VALUE ON BUSINESS FINANCIAL RESULTS ON SOFTWARE BUSINESS IN ROMANIA

Abstract:

The relative low salaries of the IT employees compared to the Western countries, the employees skills and the location of the country have supported outsourcing become one of the most competitive Romanian sectors. The IT sector in Romania maintains a steady growth sustained by outsourcing companies. The Romanian IT software development sector is highly competitive when we take into account the level of technical proficiency of the IT employees in the country and the financial performance of the companies.

The article presents the structure of the industry and competition between actors based on the multivariate analysis of the data from 301 Romanian IT companies. An outliers mining research approach is used to discover the data records for companies which have an exceptional behavior comparing with other records of the companies in the remaining dataset. Further on are presented the results from a regression analysis applied to understand the influence of human capital force on financial performance of the IT software companies in Romania.

In general the human capital dimension does improve the companies financial performance and creates value, but on the other side there are outlying performers - IT companies with a peculiar financial performance for which human capital is not the main business driver.

Keywords:

software business, outsourcing, outliers analysis, industry competition

JEL Classification: J21, C38, D24

Introduction

In order to achieve a sustainable competitive advantage companies do not rely only on new product development product and innovation but also on low-cost manufacturing and suppliers' capabilities to develop new products. When companies use an external company to provide them services as human resources functions, IT services, customer services and technical support they use the business process outsourcing. The outsourcing is an allocation of specific business processes to an external specialized service provider. Cost reduction reasons drive companies to outsource some activities of the value chain (Boscor and Baltescu, 2014).

For the Western Europe countries companies, Romania is emerging as a valuable alternative supplier of IT outsourcing services in addition to India, China and Russia, according to a study published by Pierre Audoin Consultants (PAC). The study claims that the Romanian market for offshore IT services increased 43 per cent in 2002, compared to the year before. The consultancy estimates that over 460 companies have outsourced parts or all of their IT operations to Romanian firms (Computer World Study, 2003).

The economic slowdown that spread to Europe in 2008 has had an adverse effect on Romania. Moreover Romania's proximity to Western Europe combined with its low corporate taxation policies and low-cost labor force has made global companies recognize it a very good location for outsourcing business. In the last years Romania gained the edge over other countries in the region ("Frost & Sullivan," 2009).

One of the main conclusions of the first edition of the Romanian Outsourcing Summit 2015 organized in late March in Bucharest is the fact that the last couple of years Romania started to be no longer considered a low cost country, shifting its focus towards more sophisticated services. In the conference Varujan Pambuccian, member of the Commission for Information Technology and Communications of the Chamber of Deputies said that every population has a limit for each job in hand, and Romania's outsourcing will start to feel the threshold in five to six years from now (2015). He also said that "Labour force in Romania is not so cheap anymore, and it's not cheap in the context of a taxation that is increasingly favorable for business, with zero income tax". The problem, however, is that there is an increasingly acute competition on the limited resources.

In the further years the business growth of IT companies centered on outsourcing services might be affected due to the diminishing of the human resources force and due to increasing of its cost. In the regression analysis run we will try to understand the impact of human resource force on IT companies profit in the last five years in general, and also cross time and by major counties in Romania. Also using data mining approach of outliers' analysis we will try to find different patterns of companies which do not earn

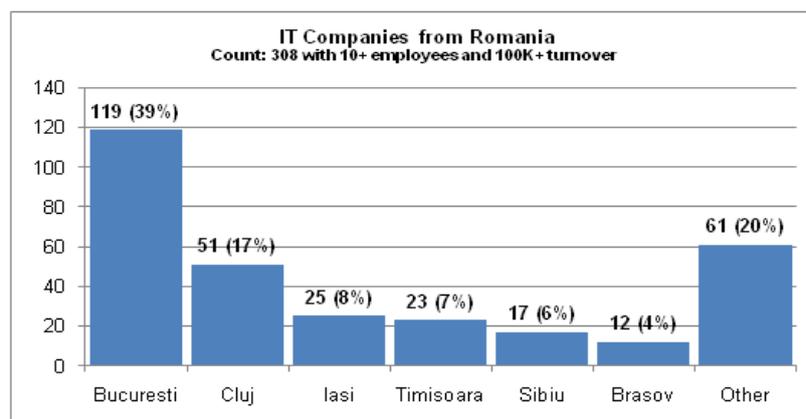
profit by scaling up human resource asset. This kind of companies might be general case studies for the ones who want to understand how to shift from outsourcing success to business success built on added value.

Software Business in Romania and Data Sources

Data source for the research was obtained from the Romanian Registry of Commerce in 2015 and it covers capital and financial data for 301 IT companies from Romania for a period of five years (2009-2013). Out of all Romanian companies were selected only companies with more than ten employees and a turnover greater than 50000 euro in 2013. The motivation for this threshold filter is based on the consideration that in Romania IT outsourcing oriented industry there are many freelancers, self-employed or contractors which in general has companies with one, two or even three employees since they tend to have the accountant and the administrator company employees. The main data variables that characterize companies' performance for the selected period are: number of employees, turnover, revenue, expenses, capital and profit. In exploratory data analysis step were created derivate or aggregate variables for investigative purposes or for the data mining approach - outliers analysis (e.g. revenue per employee, profit per county, or turnover per year).

The Figure 1 contains a representation of the number of IT companies by county. We can notice that Bucuresti (119; 39%) and Cluj (51; 17%) are the Romanian counties with the highest concentration of software businesses. Together Bucuresti and Cluj contains more than 50% IT Romanian companies with over ten employees. Bucuresti is the capital of Romania while Cluj is one of the biggest academic city centers in Romania, with more than three faculties that have programming or IT engineering study programs, hosting the largest university in the country "Babes-Bolyai".

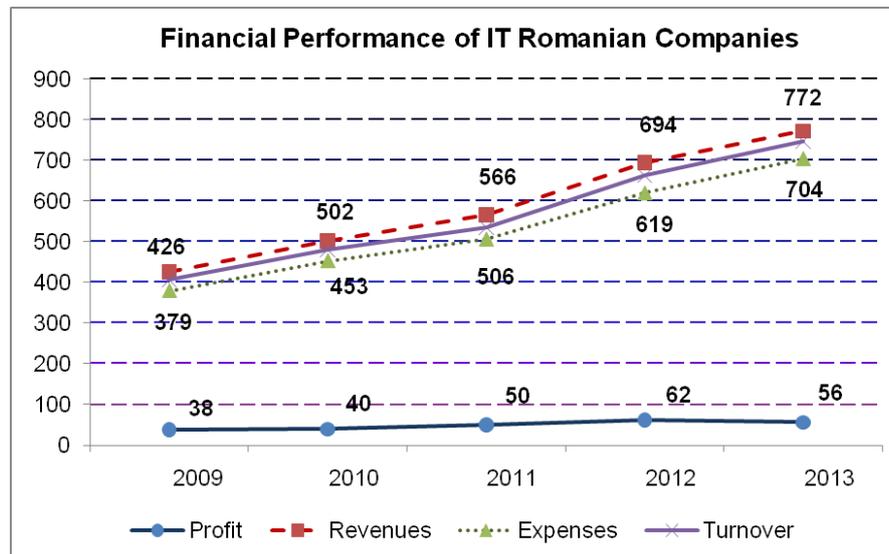
Figure 1: Financial public information for Romanian IT Companies



Source: Own adjustment based on Romanian Registry of Commerce data (Romanian IT Companies, 10+ employees)

In the last seven years Romanian IT sector increased from the turnover and revenues (Figure 2). The profit remains steady in this period and this aspect might be related with the struggle between the Romanian taxation approach and the desire of companies to maximize their capabilities and the stakeholder's wealth.

Figure 2: Key performance indicators of IT companies in Romanian IT sector during 2009-2013



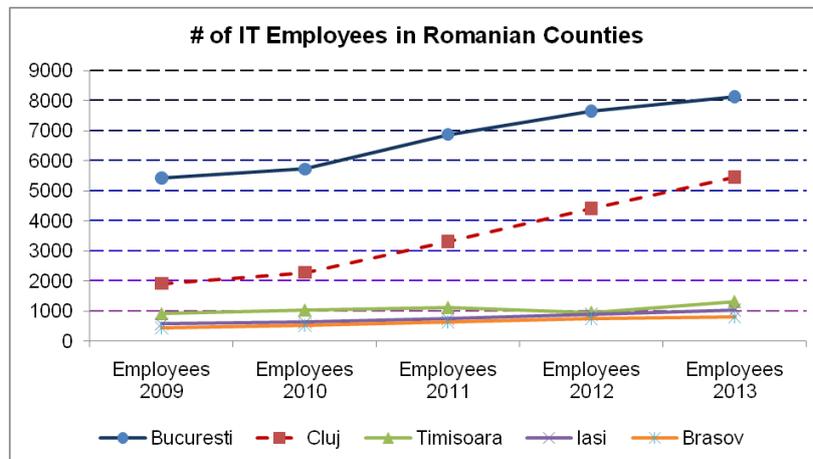
Source: Own adjustment based on Romanian Registry of Commerce data (Romanian IT Companies, 10+ employees)

In the same period the number of employees of the IT companies is increasing. This might be related with the increase of demand for the outsourcing services in the software business sector. From the Figure 4 we can see that the profit per employee cross time has different patterns from county to county. While in counties with a higher IT businesses concentration (e.g. Bucuresti and Cluj) the profit per employee is decreasing in the smaller IT businesses concentration cities (e.g. Brasov, Iasi) we can see increasing trend of profit per employee performance indicator.

The first chart helps us to formulate a hypothesis that is assessed using regression analysis: The profit of the IT companies is mainly driven by the number of the employees. The second chart regarding the profit per employee's number cross time trend gives us the insight that IT businesses are emerging in smaller counties while the relative profit is decreasing in the main IT counties. This chart (Figure 4) sustain big outsourcing IT companies concerns for the future of regional software business: In the next five years will the IT industry still be an outsourcing driven sector, or the players should reorient their strategies with a focus on the added value (e.g. new product development, innovation) in order to adapt to new macroeconomic forces and global competition

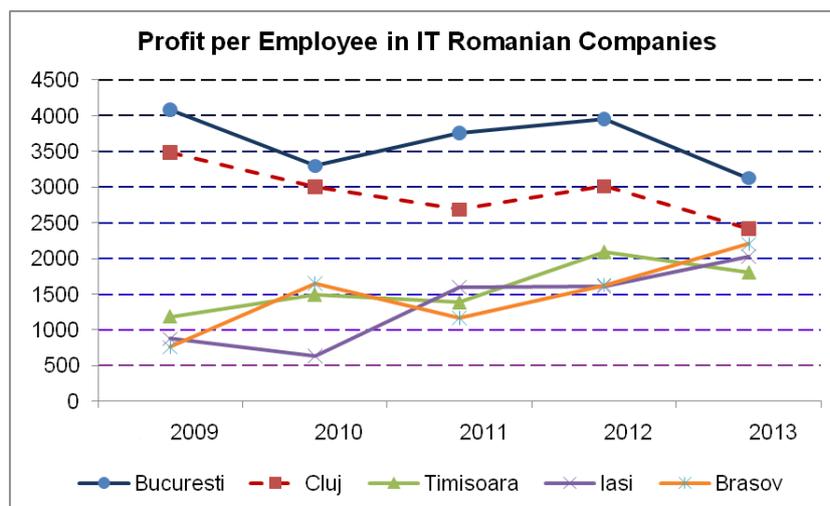
exigencies? This might be a second research hypothesis but we will not treat this aspect in the present article.

Figure 3: Number of Employees of IT companies in Romanian IT sector during 2009- 2013



Source: Own adjustment based on Romanian Registry of Commerce data (Romanian IT Companies, 10+ employees)

Figure 4: Profit per Employees of IT companies in Romanian IT sector during 2009- 2013



Source: Own adjustment based on Romanian Registry of Commerce data (Romanian IT Companies, 10+ employees)

The Figure 5 contains Herfindahl-Hirschman coefficient for the distribution of employment by main IT Counties in Romania. An H below 0.01 (or 100) indicates a highly competitive index and an H below 0.15 (or 1,500) indicates an unconcentrated index. From this table we understand that there are no competition limitations of human resource assets capabilities of companies due to an asymmetrical concentration across companies in Romanian counties. On the other hand scaling up IT business in general and IT

outsourcing business in particular might be threatened by the geographical and demographical limitation of resources.

Figure 5: Financial Herfindahl–Hirschman coefficient for the distribution of employment by main IT Counties in Romania

County	Herfindahl–Hirschman Index
Bucuresti	0.07
Cluj	0.07
Brasov	0.16
Iasi	0.12
Sibiu	0.14
Timisoara	0.11
Other	0.02

Source: Own adjustment based on Romanian Registry of Commerce data (Romanian IT Companies, 10+ employees)

The regression analysis evaluates the influence of human resource asset volume on the financial performance of IT companies in Romanian industry cross time and counties, but to have relevant beta estimates and a clearer image upon IT companies in Romania we run an outliers analysis. The next paragraphs present the analytical approach and the main results.

The Outlier Analysis of IT Companies Balance-sheet Data

The Outlier Analysis Scope

An outlier is an observation that appears to deviate considerably from other observations in the sample. Dixon mentioned an outlier being a value that is "dubious in the eyes of the researcher" (Dixon, 1950); moreover Hawkins described it as an observation that "deviates so much from other observations as to arouse suspicions that it was generated by a different mechanism" (Hawkins, 2013).

There is a main difference between the extreme values of a data distribution and data outliers: outliers originate from a different process and are not necessarily the extreme values of a normal distribution. The outliers may occur anywhere in a given data distribution. As Pearson mentioned the terms "outlier" and "bad data" are not synonymous: The outlier detection procedures implement various rules for identifying points that appear to be anomalous with respect to the nominal behavior of the data, but they will not explain why these points appear to be abnormal. The detection of outliers in a set of data can be approached as a mathematical problem, but the interpretation of these data observations implies reasoned argument, and thoughtful consideration (Pearson, 2011).

Whether we include or exclude outliers from a data analysis depends on the reason why the case is an outlier and the purpose of the analysis. In the further analysis identification of potential outliers is important for two reasons:

1. Since data represents capital (human and financial) characteristics of the IT companies gathered from audits and balance-sheets we can't consider this outliers being bad data, outliers due to random variation (data errors, sampling error, or standardization failure). In the first approach we consider these outlining data indicators of peculiar business behavior in the market. The outlier analysis part of the article will depict such particular data points and will zoom into the business related details of these companies.

2. Secondly an outlier may be considered bad data or noisy elements when we want to infer conclusions at a larger level considering a whole sector or group of companies. The presence of outliers can lead to inflated error rates and substantial distortions of statistic estimates when using either parametric or nonparametric tests (Zimmerman, 1998). More precisely the article will present a regression analysis results run to understand influence of human capital on financial performance in the Romanian IT sector. In our case the outliers are a legitimate part of the data but to get the most honest estimates of population parameters, or to get estimates more representatives for the relation studied from a whole perspective upon IT Software Business in Romania we decided to discard them from the regression analysis data sample.

Univariate Outliers vs. Multivariate Outliers Analysis

An univariate outlier is a data point that consists of an extreme value on one variable. A multivariate outlier is a combination of unusual scores on at least two variables. Both types of outliers can influence the outcome of the panned statistical regression analysis. Multivariate outliers are data cases that have a markedly abnormal combination of values for a set of variables. The value for any of the individual variables may not be a univariate outlier, but in combination with other variables. In our analyses, we will focus on multivariate outliers for the set of variables in our data analysis (Reimann et al., 2008).

For our multidimensional data set we use multivariate techniques to find the data outliers. The graphical techniques assist in pinpointing extreme outliers and determining if the data might usefully be categorized or clustered further on in the data analysis process. The bi-dimensional charts procedures are used to project a visual representation of the structure of multidimensional data variables. These help us to understand the presence of multivariate outliers. Multivariate outliers can be identified with the use of Mahalanobis distance, which is the distance of a data point from the calculated centroid of the other cases where the centroid is calculated as the intersection of the mean of the variables being assessed. Each point is recognized as an X, Y combination and multivariate outliers lie a given distance from the other cases.

The Multivariate Outliers Analysis Approach

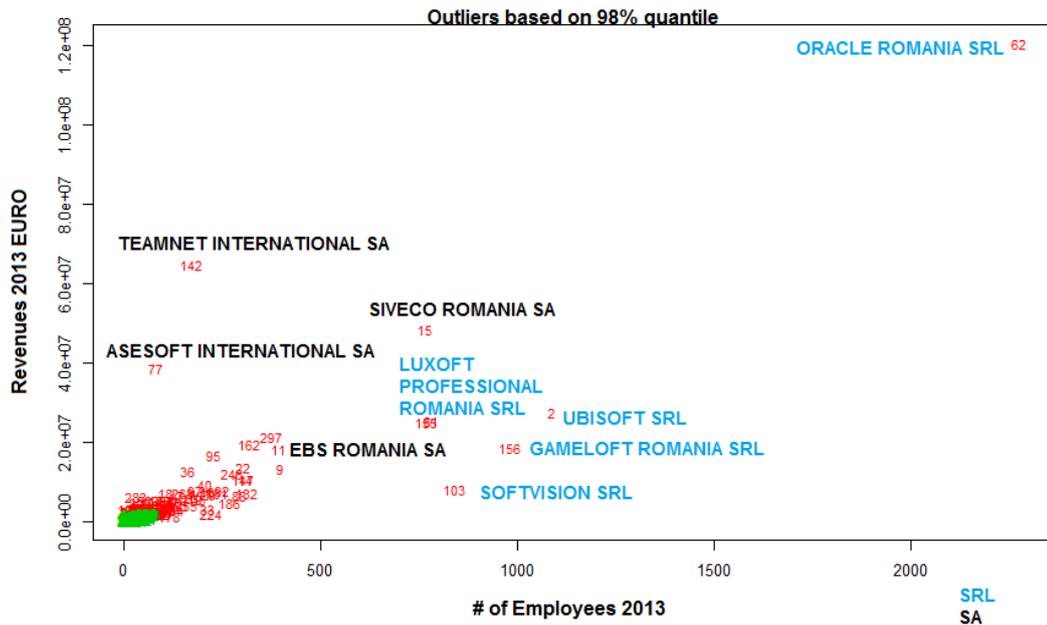
The Mahalanobis distance is of special importance: it considers the spatial distribution of the data points - the correlation between the data variables. The outliers can be identified using the Mahalanobis multivariate distance; this distance is based on the covariance matrix of data set variables. Covariance matrix plays a central role in multivariate data analysis and should be estimated by adequate robust methods. Robust estimators have to be taken for the Mahalanobis distance, like the center and covariance matrix coming from the Minimum Covariance Determinant (MCD) estimator (Varmuza and Filzmoser, 2009). Robust covariance estimators like the MCD estimator need more objects (companies in our case) than variables, and thus for many applications with number of cases greater than number of variables this approach is not possible. Other multivariate outlier detection techniques like a method based principal components analysis can be used in this cases (Wehrens, 2011).

For the graphical representation of multivariate outliers from our data set we use mvoutlier library from R statistical environment. The distance calculations are based on the MCD estimator. For outlier detection two different methods are used. The first one marks observations as outliers if they exceed a certain quantile of the chi-squared distribution. The second is an adaptive procedure searching for outliers specifically in the tails of the distribution, beginning at a certain chisquare-quantile. The function behaves differently depending on the dimension of the data. If the data is more than two-dimensional the data are projected on the first two robust principal components.

The Outliers Analysis Results

The chart regarding outliers based on number of employees in 2013 and company revenue in 2103 pinpoints some interesting companies in the Romanian IT sector. The main outlier is Oracle Romania SRL. This company has a large number of employees and a considerable revenues figure for 2013 in regard with the other companies from industry. This company can be considered a kind of benchmark since it follows the ellipsoid main dimension balance between employee's number and revenues for 2013. Moreover we can see two companies with very high revenue and low number of employees (Set 1 – Table 1). These companies appear to be the most performing from the ratio revenues vs. employees' number point of view Table 1.

Figure 1: Outliers chart based on revenues end employees number in 2013



Source: Own adjustment based on Romanian Registry of Commerce data (Romanian IT Companies, 10+ employees)

If we look further with an internet search to their websites or related news to understand the IT products and value proposition of these companies, we will see that these companies business advantage consists in contracts with Romanian state institutions like Ministry of Foreign Affairs or Special Telecommunication Service, an agency with military status.

Table 1: Outliers indicators – Companies Set 1

Company	Employees 2013	Profit 2013 Euro	Revenues 2012 Euro	Revenues 2013 Euro
ORACLE ROMANIA SRL	2276	4710501	105835515	120548659
ASESOFT INTERNATIONAL SA	80	36013	27446931	38554185
TEAMNET INTERNATIONAL SA	171	4130869	55208127	64630692

Source: Own adjustment based on Romanian Registry of Commerce data (Romanian IT Companies, 10+ employees)

On the bottom side of the chart we can see outliers companies with a large number of employees in respect with the industry mean, and with relevant revenues in report with the other companies from the market (e.g. Ubisoft, Gameloft Romania or Softvision, Set 2 – Table 2). We might consider these companies financial performance is based on their capabilities to scale up the employee force in regard with their operation. From this visual insight that we get using the chart above further we can visually assess the hypothesis: “The employee asset force influence positively the financial performance of the IT

companies in Romania”. This hypothesis was assessed using regression analysis and the results are presented in the following part of the article.

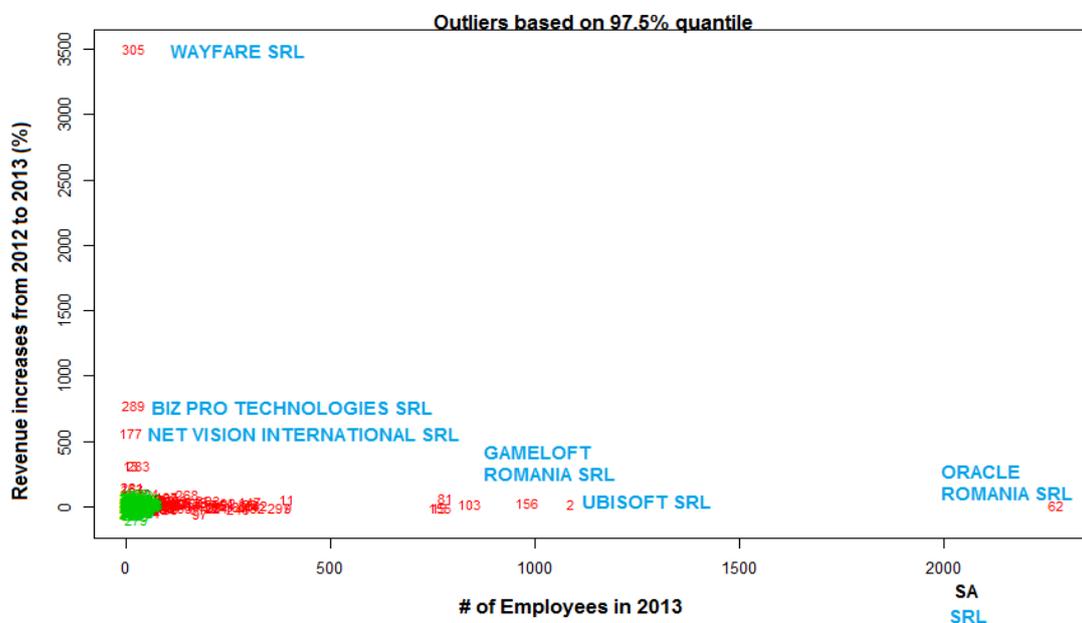
Table 2: Outliers indicators – Companies Set 2

Company	Employees 2013	Profit 2013 Euro	Revenues 2012 Euro	Revenues 2013 Euro
ORACLE ROMANIA SRL	2276	4710501	105835515	120548659
UBISOFT SRL	1086	1100120	22488904	27476539
SOFTVISION SRL	841	111342	6464611	7952692
GAMELOFT ROMANIA SRL	981	469620	13889476	18457853

Source: Own adjustment based on Romanian Registry of Commerce data (Romanian IT Companies, 10+ employees)

The first part of outliers analysis presented above is a 2013 snapshot of outliers in respect with revenues and employees number. In the next step of the analysis there will be captured outliers companies in respect with the cross-temporal aspects of companies’ performances during 2012-2013 time interval. More exactly going from the raw data of companies revenues during 2012-2013 were computed the beta index of revenue evolution in this period (e.g. $Revenue_Index_{2013} = 100 * (Revenue_{2013} - Revenue_{2012}) / Revenue_{2012}$). Based on this data aggregation approach we have obtained variables which characterizes companies evolution regarding revenues and number of employees cross time.

Figure 2: Outliers chart based on revenues increases percentage and employees number during 2012-2013



Source: Own adjustment based on Romanian Registry of Commerce data (Romanian IT Companies, 10+ employees)

The Figure 2 represents outliers – companies considering the revenues increases percentages and number of employees in 2013. The first outcome of this analysis is the insight that there are Romanian IT companies with a relative high revenue performance in short period of time – Table 3. Moreover it can be noticed that outliers in this chart are related with higher increases of revenue from 2012 to 2013 and there are no outliers which reflect a peculiar decrease in revenue - Figure 3.

Table 3: Outliers chart based on employees number and revenue increases during 2012-2013

Company	Employees 2013	Profit 2013 Euro	Revenues 2012 Euro	Revenues 2013 Euro
ORACLE ROMANIA SRL	2276	4710501	105835515	120548659
NET VISION INTERNATIONAL SRL	12	30407	17304	115305
BIZ PRO TECHNOLOGIES SRL	17	299793	147373	1293832
WAYFARE SRL	17	-34429	9833	354524

Source: Own adjustment based on Romanian Registry of Commerce data (Romanian IT Companies, 10+ employees

Profit, turnover and other financial descriptors of companies' performances were used also to determine the data set outliers and to understand different business aspects of correspondent companies. The main outliers obtained were discarded for the next phase: regression analysis.

Regression Analysis: The human capital asset impact on financial performance

The research questions are:

1. Is the human resource asset volume influencing positively the financial performance of the IT companies in Romania?
2. Are the financial expenses of the IT companies in Romania varying cross-time (2009-2013)?
3. Are the financial expenses of the IT companies different cross main software business cities in Romania?

Models Specification

In the attempt to understand the influences in the sector there are developed four regression models:

Model 1

$$\text{Profit}_{2009-2013(\text{Euro})} = \beta_0 + \beta_1 * \text{Employees_Number}_{2009-2013}$$

Model 2

$$\text{Expenses}_{2009-2013(\text{Euro})} = \beta_0 + \beta_1 * \text{Employees_Number}_{2009-2013}$$

Model 3

$$\text{Expenses}_{2009-2013(\text{Euro})} = \beta_0 + \beta_{11} * \text{County:Bucuresti} + \beta_{12} * \text{County:Cluj} + \beta_{13} * \text{County:Other}$$

Model 4

$$\text{Expenses}_{(\text{Euro})} = \beta_0 + \beta_{11} * \text{Year}_{2009} + \beta_{12} * \text{Year}_{2010} + \beta_{13} * \text{Year}_{2011} + \beta_{14} * \text{Year}_{2012} + \beta_{15} * \text{Year}_{2013}$$

Data analysis and Results

From the first regression analysis - Table 4 - we conclude that the number of employees of the IT companies has a directly positive impact of the companies' profit. This conclusion is somehow just a confirmation that Romanian IT industry performance depends directly on the number of the employees involve in productive activities (Table 5). This aspect is specific to any outsourcing industry. Even though we can see this generic implication in the industry, moreover from the outliers' study we have understood that there are still Romanian companies highly profitable and running businesses that are not driven by large numbers of employees.

Table 5: Regression Analysis – Model 1

Regression Results (1)	
<i>Dependent variable:</i>	
Profit Euro (1000)	
Employees	1.726*** (1.589, 1.863)
Constant	73.463*** (52.087, 94.839)
Observations	1,438
R ²	0.230
Adjusted R ²	0.230

Note: *p<0.1; **p<0.05; ***p<0.01

Source: Own adjustment with R programming analysis on Romanian Registry of Commerce data (Romanian IT Companies, 10+ employees data)

Table 5: Expenses (1000 euro per Year) of Romanian IT Companies during 2009-2013

County	Expenses Euro (1000)	Employees (count)	Expenses Euro/Employee
Other	1621379	27123	59.8
Bucuresti	3036621	42429	71.6
Cluj	1755717	15883	110.5

Source: Own adjustment with R programming analysis on Romanian Registry of Commerce data (Romanian IT Companies, 10+ employees data)

In the Table 6 are presented the other three above specified regression models. These results reveal somehow the other side of outsourcing business: the companies expenses cross time are highly dependent on the number of employees (beta1-model2). For example in general increasing the company staff with one employee might impact an increase of 40K euro per year in company expenses. Further we can notice that the annual company expenses are impacted by the number of employees in Bucharest (beta₁₁=1,415.241) higher than in Cluj, moreover in Cluj are impacted stronger than in companies from all other Romanian counties (beta₁₂ = 134.337).

Table 6: Regression Analysis – Model 2, 3, and 4

Regression Results (2)			
Dependent variable:			
	Expenses Euro (1000)		
	(model 2)	(model 3)	(model 4)
Employees	41.099^{***} (40.010;42.188)		
County: Bucuresti		1,415.241^{***} (754.777;2,075.705)	
County: Cluj		134.337 (-732.650;1,001.325)	
Year: 2010			-62.250 (-1,036.683;912.184)
Year: 2011			504.766 (-460.519;1,470.050)
Year: 2012			938.926 (-21.621;1,899.472)
Year: 2013			1,185.818^{**} (226.813;2,144.823)
Constant	-264.376^{**} (-434.537;-94.215)	1,621.379^{***} (1,174.871, 2,067.888)	1,654.023^{***} (960.002;2,348.045)
Observations	1,434	1,434	1,434
R ²	0.729	0.009	0.005
Adjusted R ²	0.729	0.008	0.002

Note:

*p<0.1; **p<0.05; ***p<0.01

Source: Own adjustment with R programming analysis on Romanian Registry of Commerce data (Romanian IT Companies, 10+ employees data)

When it comes to temporal distribution we have noticed that starting with 2013 the IT companies expenses are significantly increasing in comparison with previous year 2009. For the period 2009 – 2013 it is noticed a significant steady growth of expenses of IT companies in Romania.

Conclusions

The IT sector in Romania presented a sustained growth due to the outsourcing contracts with Western companies. The article presented the research regarding the structure of the IT industry and the influence of the human resource assets volume on IT companies performance based on the analysis of 301 Romanian IT companies.

The outliers mining research approach discovered the data records for companies which have an exceptional behavior comparing with the other records of the companies in the remaining dataset. The utility of such an endeavor consists in determining outlying, financially performing companies of which performances are not driven by outsourcing contracts or by scaling up on human resource component. If we study further these categories of companies in business case studies, or evaluate their offer, market strategy, or business performance we might gain a better understanding of the success resulted in general from the added value created by new product development instead of outsourcing.

The regression analysis results give us a sense of magnitude upon influence of human resource assets on the Romanian IT companies' performance. In general the human capital dimension does improve the companies' financial performance and creates value for the companies but on the long run an upper level might be reached and IT companies should find alternative strategies based on innovation to respond to global competition challenges.

Acknowledgments

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