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*The analysis of the most important financial and economic indicators at the level of some organizations from the same sector of activity, the selection of performance ratios and generating a particular analysis model help companies to move from the desire to obtain performance to action through better and faster decisions. Using advanced technologies like Business Intelligence and new software applications can also bring added value to the multidimensional analysis of the financial indicators.*

*Starting with the multidimensional design of a data warehouse fated to the financial analysis of the performance indicators the level of an economic and financial entity and continuing with the implementation of this system will reflect once more the benefits of Business Intelligence components, the importance of the decision maker in the management activity and the necessity of making correct and pertinent decisions for the continuous improvement of the economic and financial performances.*

*Keywords: performance, financial ratios, Decision Support Systems (DSS), Business Intelligence (BI), econometric model, information system*

*The article's JEL code: C51, O12, L15*

**1. The performance as main objective within the framework of the economic and financial analysis**

The analysis of the economic and financial performances is a frequently debated matter in the economic media from the last decades, covering a very large spectrum, comprising various meanings and tendencies which will continuously capture the interest of the economists, the accountants and the IT specialists<sup>564</sup>.

The information rising from sources both internal and external to the company, the processing of this information, the obtaining of financial statements and determination of the representative indicators apt to illustrate the real status of the factors which influence the performance of the company and the wide range of potential users (investors, managers, employees, clients, banking institutions, state authorities etc.), all of these bring into light various systems for assisting the decision in an informational environment, with favorable results for all the actors involved in this project.

The process of decision making, regardless of the size of the company, is a rather complex one, implying data processing, information and knowledge. The data warehouse (DW) and business intelligence (BI) systems, as well as the Decisions Support Systems (DSS) are designed to help the companies to answer in real time to complex questions<sup>565</sup>. There are more different techniques in this respect, and the choice of the right instrument leads to finding the relevant answers for a certain company. The process is a dynamic one, and these answers are changing along with the business strategy of the respective company.

The business environment of today's world is driven by new concepts like stakeholder value and service management, concept which have become extremely important to satisfy employees, customers and shareholders. The way in which a service company can use different performance measurements for management control purposes is very important as it should make possible the identification of the most appropriate measures applicable for strategy implementation.

Managers and stakeholders are in need for special tools for allowing them to analyze this amount of data in a quickly and accurately manner. For this matter data mining algorithms and techniques represent one class of such tools and they are used to automatically extract predictive hidden knowledge from the raw data.

**2. Econometric Modeling of the economic and financial performances**

Within the economic-financial analysis, there is a series of models, methods and procedures which are either specific or borrowed from other sciences. At present there are several basic methods and procedures designed for the diagnosis analysis of a company and for setting its financial-economic performances. Such methods help to set up a direct link between the identified economic performances and the overall strategy of the company<sup>566</sup>.

<sup>563</sup> The paper represents a portion of the results provided by the ongoing research for the Grant 1805 under the IDEI Program PN. II 2009-2011 with the title: "Exploratory research concerning the development of an intelligent system meant to optimize financial decisions"

<sup>564</sup> Boldeanu, D. "Information system for the analysis and assessment of the economic and financial performances at microeconomic level", PhD thesis, Bucharest Academy of Economic Studies, October 2008

<sup>565</sup> Boldeanu, D., Gheorghe, M. "Performance indicators in multidimensional analysis", Journal of Accounting and Management Information Systems, Supplement/2007, pg. 733-747, 2007

<sup>566</sup> Boldeanu, D. "Information system for the analysis and assessment of the economic and financial performances at microeconomic level", PhD thesis, Bucharest Academy of Economic Studies, October 2008

The mathematical-economic methods which use the various financial ratios proved their usefulness in the decision-making process of capital investors. Most of the time, these models involve linear relations between a set of financial ratios and the company return ratio.

Rees<sup>567</sup> considers that in the financial analysis, the wide use of financial ratios is an answer to the high amount of data contained in a set of financial statements and to the issue of comparing companies of different sizes. Financial ratios may be used individually or in groups, in order to compare companies among themselves or against industry benchmarks. In most cases, the result of such analyses depends to a high extent on the financial analyst's skills and expertise.

A company performance measures in determining the financial state should not be sensitive to the choices of accounting methods and procedures, but must assess the current management decisions, the risks of investment decisions and not punish managers for circumstances that are beyond their control<sup>568</sup>. Under these circumstances a good better choice could be EVA (Economic Value Added) or any other performance measure that would consider "adding" value through previous investments. Nevertheless, ROE (Return on Equity) is often used in econometric analyses with financial data<sup>569</sup>. Due to the data accessibility and the ease in being understood, as well as to the interest granted to this ratio by capital investors, we decided to apply ROE instead of EVA in generating an econometric model to empirically investigate the relation between various ratios from the financial situation of a company and the performance thereof.

As a dependent variable used, we employed ROE, as we believed that it synthesizes best the concept of company performance if it is to synthesize it by means of one indicator only. Return on Equity is perhaps the most commonly used profitability measure<sup>570</sup>.

The data set refers to the financial statements for the financial year 2007 and 2008. These are stock market companies having as main object of activity "pharmaceutical substance manufacturing". We considered the companies with activity in the same field, since there are factors specific to each industry and we wanted to avoid adding dummy variables for the industry. In fact, if we were to compare the rating models of various commercial banks, they would come up with quality criteria, including with respect to the industry category, in order to be able and grasp the specifics of the said field of activity.

Starting from these goals, the research carried out an analysis to identify possible connections between the data to analyze and result of an economic and financial performance characteristic to a number of 162 companies<sup>571</sup> from the pharmaceutical sector grouped on geographical regions, using an ordinary regression of the type of the least squares method (OLS).

The purpose of the model we want to develop is to empirically investigate the relation between various indicators resulting from the financial situation of a company and the performance thereof. Furthermore, besides the specific company factors, we also added effects related to the company country of origin (Inflation GDP deflator, GNI/capita, health expenses/GDP), as assessment through experimental analysis of their impact. We preferred this approach to adding dummy country variables.

The set of analyzed data contains a group of eight financial ratios which characterize the financial standing and performance of the companies. As to the company specific factors (included among independent variables), we decided to group them in 3 major categories:

- **Risk factors** (solvency):
  - Beta
  - Leverage
  - Cash flow/Liabilities
  - EBITDA/Interest cover
- **Liquidity factors**:
  - Quick Ratio
  - Current Ratio
- **Growth dynamics factors**:
  - ROA
  - EBITDA Margin
  - Assets Growth
  - Sales Growth
  - Value-to-Book ratio

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567 Rees, B. *Financial Analysis* (second ed.), London: Prentice Hall, 1995

568 Damodaran, A. *Investment valuation - tools and techniques for determining the value of any asset*, 2nd Edition, John Wiley & Sons Inc., 2002

569 Han, K., Lee, S., Suk, D. "Ownership structure and firm performance: international evidence." *Multinational Business Review* 7, 1999, pp. 92-97

570 Bertoneche, M., Knight, R. "Financial Performance Butterworth- Heinemann", Oxford, 2001

571 Data sources from website <http://www.onesource.com>

**-Company size factors:**

- Market Capitalization
- Total Assets
- Operating income

In this case, the analysis performed focuses on the explanation or prediction of the Return on Equity (ROE), using all available data within the company. The most frequently used method for this type of analysis is multiple regression, a method we will also use but with a few elements, let's call them experimental, as a variation from the traditional regressions.

$$\begin{aligned} ROE = & \beta_1 + \beta_2 Beta + \beta_3 Leverage + \beta_4 (Cashflow / Liabilities) + \\ & \beta_5 EBITDA / Interestcover + \beta_6 CurrentRatio + \beta_7 QuickRatio + \\ & \beta_8 ROA + \beta_9 EBITDA\_Margin + \beta_{10} AssetsGrowth + \\ & \beta_{11} SalesGrowth + \beta_{12} Value - to - Book\ ratio + \\ & \beta_{13} MarketCapitalization + \beta_{14} TotalAssets + \\ & \beta_{15} OperatingIncome + \beta_{16} (GNI / capita) + \\ & \beta_{17} GDPdeflator + \beta_{18} (health\_expenses / GDP) + \varepsilon \end{aligned}$$

We do not claim that the list of the variables above is exhaustive; the ROE indicator may also be influenced by other factors besides the ones already specified, which we will gather in a stochastic variable called error by obtaining a classic regression equation.

The econometric model is interesting through the large number of factors which contribute to the changes of the ROE indicators and helps us to identify and validate the main, essential factors, in our opinion and the one of other specialists mentioned all along the paperwork, factors which determine the financial and economic performances of the company.

The regression equation obtained in the end reflects the relationship between the return rate ROE and factors belonging to the efficiency and the growth dynamic, as well as factors related to liquidity.

$$ROE = - 239 - 0,00400 SalesGrowth + 908 AssetsGrowth - 0,0205 EBITDAMargin - 1,99 ROA - 241 LN^2(Quick Ratio)$$

From the model presented we can state that the main ROE factors are:

- the asset growth ratio, with the highest influence, which proves that the pharmaceutical industry is a place where large players enjoy success, since they have the resources to support significant expenses for research and development.
- ROA
- EBITDA Margin
- Immediate liquidity
- Sales increase ratio

There is no predefined solution to develop a good model. A satisfactory result comes more from the application of econometric rules and from the high number of trials and the analyst's intuition regarding the factors to be added, the relationship type (linear, quadratic), the effects of the combined factors type.

The model can help the decision maker to obtain a qualified answer to at least the following issues<sup>572</sup>:

- *What will be the ROE evolution in the next period and which are the factors that positively influence ROE and which is their degree of influence?*
- *Which are the factors that negatively influence ROE and which is their degree of influence?*
- *Which are the other factors that influence the company performance and that may be considered in order to improve the model?*

A multidimensional analysis of the financial data provides a clearer image on the "business" of decision making factors in every company, as such data may be classified according to various criteria imposed by the decision maker, statistics and even forecasts may be issued.

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### **3. Information system for the analysis of the economic and financial performances**

The system is made for the decision maker, starting with the manager of a department to a general manager (CEO), to a shareholders or a financial institution. Particularly, the system may provide a number of situations and reports depending on the final decision and the power of intervention can be achieved by actions taken as a result of consulting important situations.

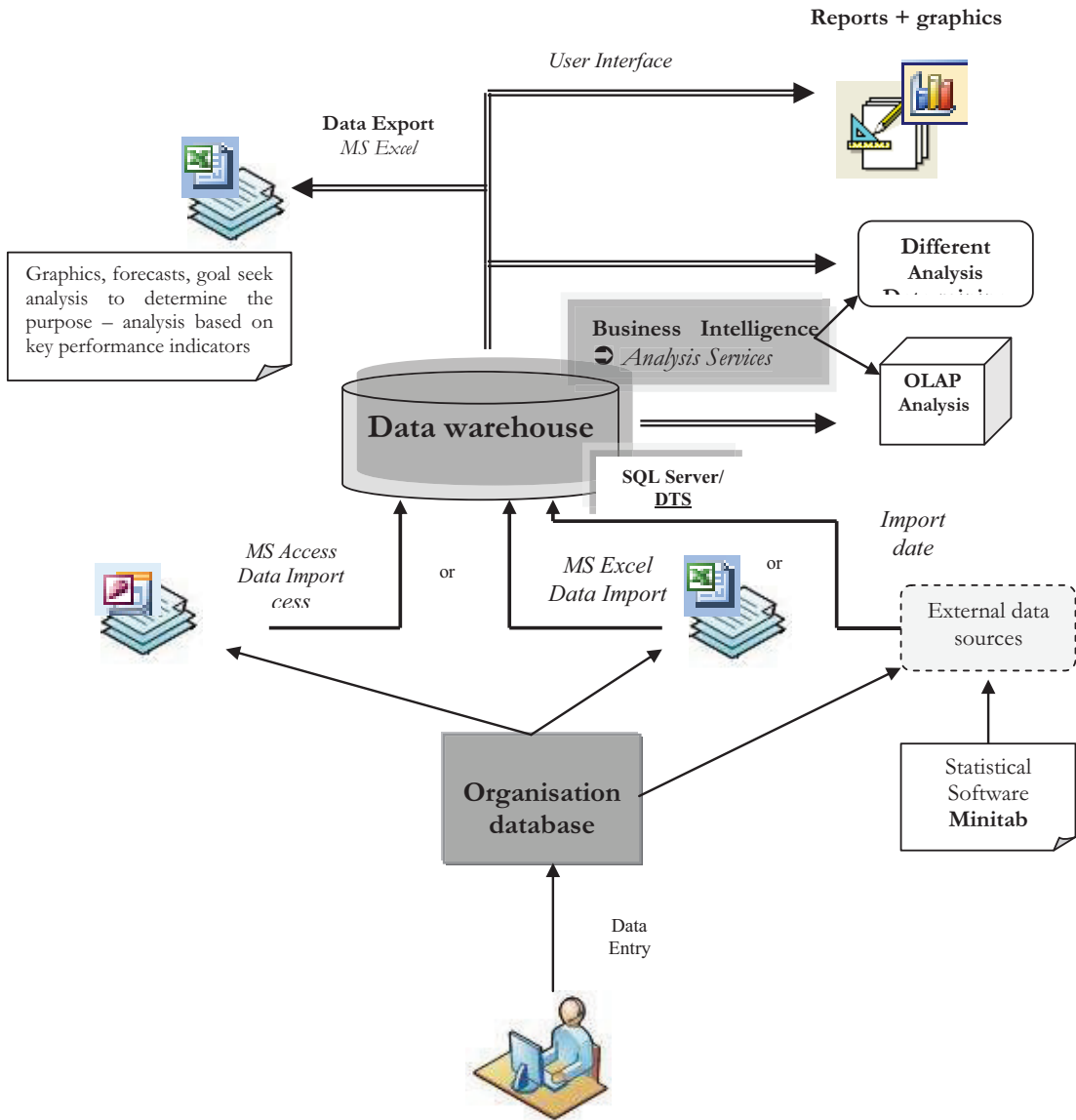
We propose the system to facilitate calculation and interpretation of a set of economic and financial indicators, comparative analysis of these indicators, from a current level to a budgeted one and a time analysis of these indicators to see their trend and to make predictions for the future. An experienced manager can act on some key factors of influence, identified during the activity, may adjust a forecast automatically generated by the essential and relevant changes and decisions that have beneficial effects and long-term.

Basic structure of the database contains items of the balance sheet and the profit and loss account from a period of two years (2007 and 2008) from which processed data can cause a range of indicators.

Range of indicators that can be compiled using synthetic situations and other situations such as those related to record data on employees' rights and wages, the distribution of expenditure, the situation on the movement of fixed assets and stocks, etc. can make the subject of a complex analysis beyond the limits of decision support system and the system aims at a more limited presentation and interpretation of indicators which we generically call "economic performance indicators – financial" that include both "the financial indicators" and "non-financial indicators" of an undertaking. Indicators of economic and financial analysis are those who compose the bulk of the outcome. They are found or may be calculated in the most part are in the balance sheet, the profit and loss data information, and the cash flow feature.

The model described previously may be the object of decision making support application, may allow for a complex analysis of the economic-financial indicators that might lead to making strategic decisions for the improvement of economic-financial performances. The data file (we used an Excel file) may be processed in a relational database (MS Access, SQL Server) and may further become the data source for a data storage or warehouse, basically for a multidimensional application which may also be processed to perform OLAP cubes or undirected analyses of the Data Mining type (figure 3.1.)

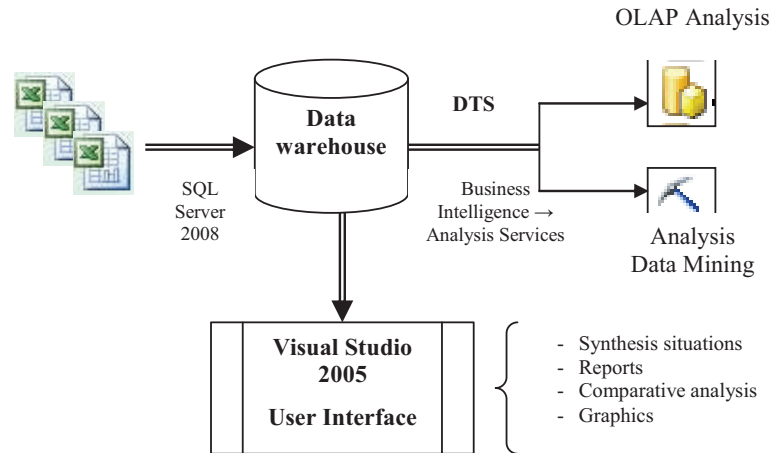
The implementation of a system for supporting decisions and identifying the economic and financial performances at the microeconomic level is aimed especially for the decision maker. The system comprises a data warehouse implemented in SQL Server 2008 based on which analyses of OLAP type can be run, as well as data mining, through Analysis Services Project, the component of Business Intelligence from Visual Studio 2005.



**Figure 3.1. The decision support system application design structure for the analysis of the financial and economic performances<sup>573</sup>**

Through an interface of type Visual Studio 2005 we develop the component of visualization of the final resulting data, through generation of complex reports regarding the financial statements and the performance indicators which are representative for the activity of an economic entity. One can make various comparisons between the actual and budgeted value of the selected performance indicators, interpretations of the profitability or liquidity ratios and their position within graphical limits (objects of gauge type), in order to ensure a better positioning and visualization of these indicators. Also, one can obtain graphs of comparative evolution in time between more categories of financial indicators.

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**Figure 3.2. Proposed architecture for the implementation of the information system**<sup>574</sup>

#### 4. Conclusions

The “*performance*” of an organization has a complex character and reflects a concrete image over the financial and economic situation of an analyzed company and the necessity of identification an intelligent and performing information systems which to support the decision makers in the strategic management process.

The information system proposed in this paper reflects once more the benefits of the components of Business Intelligence, the importance of the decision maker in the activity of management of an entity, his or hers specializations, and the necessity of making correct and pertinent decisions for the continuous improvement of the economic and financial performances.

The importance of analyzing performance ratios, to make comparisons with the companies from the same field of activity, to detect new tendencies and to make profitable changes require the use of advanced tools for multidimensional analysis, performance equipments, qualified personal for interpreting the analysis and the strengths to take important decisions for the prosperity of the company.

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