DECISION SUPPORT SYSTEM INTERFACE WITH BUSINESS INTELLIGENCE SOLUTION FOR ROMANIAN SMALL AND MEDIUM-SIZED ENTERPRISES

Rocsana ŢONIŞ, Radu BUCEA-MANEA

INTERFAŢA SISTEMULUI INFORMATIC DE ASISTARE A DECIZIEI CU SOLUŢII BUSINESS INTELIGENTE PENTRU IMM-urile DIN ROMÂNIA

Globalization is a new challenge for small and medium-sized enterprises. On one hand pose a threat, because new companies are going to enter the domestic market, but, on the other hand, represent an opportunity to enter the new emerging and growing markets.

In order to win this challenge SMEs must focus on the inter-network connection; in fact, is well recognized that SMEs forming networks can improve the efficiency and effectiveness absolutely necessary to win the globalization battle.

Cuvinte cheie: SIAD, IMM, tablou de bord, indicatori economico-financiari

Keywords: DSS, SME, dashboard, financial-economical indicators

1. Introduction

This article present a decision support system dedicated to the small and medium size enterprises from Romania, containing SMEs economic and financial data that they submit it annual to Register of Commerce. These data are then processed and integrated into a data warehouse, one component of the developed DSS. SMEs access to the data warehouse is possible through a DSS interface.

The article focuses on distributed services applications philosophy (SOA) and more on fundamenting and implementing a virtual environment dedicated DSS of cloud type. In that respect the interface is published through a service with graphic (ASP.NET) and command line interface. Communication between application modules is ensured by .NET Removing technology which involves serialized transmission of the objects. The objects are created starting from a generic type which implements a common interface. The access to its members is obtained through reflection. The generic type results by mapping various heterogenic external data sources followed by making dynamic conversion between data types. In order to obtain dynamic views aggregation onto objects, a client language is used, that provides parameters and tokens to an original dedicated API interface.

If we take the case of one SME, it may find its economic and financial data collected in the DSS. It has also access to different types of analyses:
- sales analyses (preferences, periodicity, budget cycles, appetite for buying etc.);
- operations analysis and searching for alternative sources of profit;
- asset management analysis;
- what IF analyses;
- forecast analyses etc.

The mentioned SME has access to the same type of analysis about other SMEs, which it considers competitors or potential business partners. This creates a network business environment in which competition is fair; in which SMEs enter the business based on compatibility.

2. DSS components

It is desirable that the data warehouse access to be free of charge, but dedicated only for members: any SME wishing to join and provide additional information about its business. Other potential members would be institutions, state or private organizations, which support SMEs activity, such as CNIPMMR- National Council of Small and Medium Sized Private Enterprises in Romania, AIPPIMM - the Agency for Implementation of Projects and Programmes for SMEs etc. The DSS developed contains:
- *data management module*, represented by the date warehouse conducted in SQL Server 2008 Express Edition; the data

warehouse was populated from the list of Romanian companies [1] and Finance Minister [2];

- *decision management model module* allows assisting decision; as a main model we chose ID3 decision tree, but we implemented other models as well, such as linear regression model, what-IF models, forecast models; we have also calculated indicators often used in company financial situation analysis (rates of assets, liabilities, financial stability, solvency, economic profitability, financial profitability, commercial profitability etc.);
- *user interface* developed in Microsoft C# and Express Edition
- *communication module* with other types of applications or components software e.g decision component, Reporting Services, SOAP, QlikView etc.

Figure 1 present data trace in DSS and its conversion process into knowledge.
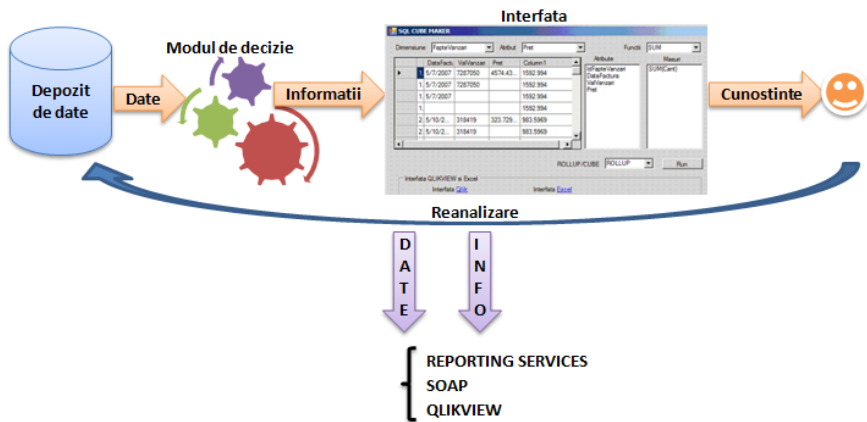

Fig. 1 DSS with BI solution for Romanian SMEs

Within this article we present especially the DSS interface and examples of analysis that can be achieved.

3. DSS interface

The interface is emulated on data warehouse structure and on decision module, responding to the data reporting requirements. Thus in the C# development environment is created a container, in which it operates four tabs: SQL generator, Decision, Dashboard, Report.

The SQL code generator allows selecting dimensions, attributes, measures in data warehouse and selecting the query type: cube or rollup (Figure 2), the result being displayed in Report tab.

Decision tab allows choosing various decision trees, implemented within application. The figure 3 displays the second type of decision tree, allowing companies classification into profitable (tree output value 1), or unprofitable (tree returns value 0), according to profitability economic ratio, profitability financial ratio and interest ratio.
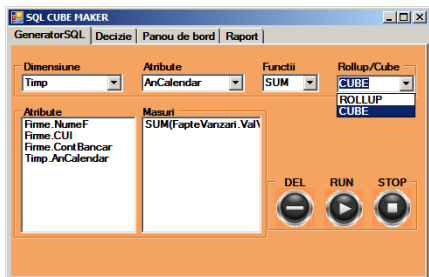

Fig. 2 SQL CUBE MAKER interface: SQLgenerator tab

Fig. 3 SQL CUBE MAKER interface: Decision tab

Dashboard tab allows choosing and displaying various types of analytical reports (enterprise turnover value on geographical region, on unit time - criteria chosen by the user), synthetic reports (profitability rates, solvency, financial autonomy of all SMEs, or for certain SME chosen by the user) and forecast reports. We keep in mind a web implementation for this DSS. In this respect there have been developed reports web, using Reporting Service technology, after a service oriented architecture.

DSS dynamic reports have been carried out by QlikView BI solution available at [3]. For downloading the package (free trial) is enough to register with personal data.

In figure 4 we notice a graphic, a map tree for SMEs turnover in the representative sample amounted on years, counties and CAEN. Notice that the counties with highest turnover were: București, Brașov, Arad, Argeș, Alba. Choosing one of these counties will change the other two graphs that display the turnover for years and CAEN for all SMEs in the representative sample, only for the selected county. Similar the selection of year will change the other two graphs, returning all SMEs turnover in the data source for all categories of activity (CAEN), for all counties in the year selected. And the CAEN selection

will change the other two graphs, returning all SMEs turnover in the data source for all counties, of all the years for the category of activity selected. Notice that in 2008 the SMEs turnover in the sample has come to value 1.340.997.748 Ron, more than in the 2009 or 2010 year when it amounted to 1.114.387.808 Ron, because of the world economic crisis influence. The categories of activity with the highest turnover for the period 2008-2010 have been 5139- Non-specialized wholesale of food, beverages and tobacco, 6024 - Freight transport by road, 5119 - Agents involved in the sale of a variety of goods, 6330 - Activities of travel agencies and tour operators; tourist assistance activities, 5153 - Wholesale of wood, construction materials and sanitary equipment. Thus the DSS becomes useful for institutions that assist or coordinate the SMEs activities (such as CNIPMMR - National Council of Small and Medium Sized Private Enterprises in Romania, AIPPIMM - Agency for Implementation of Projects and Programmes for SMEs). They may create policies for the development of certain niches of activity with potential, but insufficiently supported. Practically user can achieve countless queries with the mentioned selected criteria. The DSS allows successive queries, with several criteria. It can be chosen, for example, first year, county and then finally CAEN and DSS will take account all three criteria.
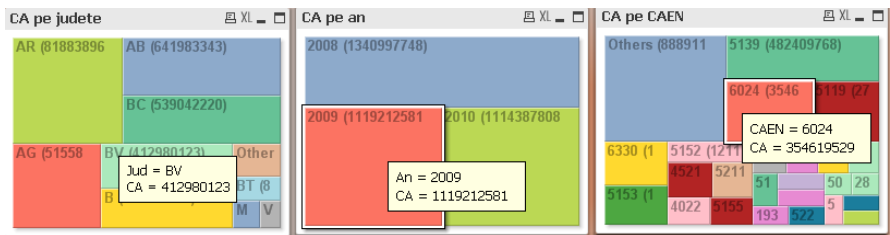

Fig. 4 Dashboard regarding turnover for all SMEs from the representative sample, grouped by county, year and CAEN

BI interface can be further improved by adding statistics. Selecting the year 2010 and Bucharest, notice the categories of activity on the combo list (only the companies with white background are specific to Bucharest). Among these the most frequent are 6330 - Activities of travel agencies and tour operators; tourist assistance activities, 5144 - Wholesale of china and glassware, wallpaper and cleaning materials, 5134- Wholesale of alcoholic and other beverages. The statistics cover the minimum values, the maximum, the amount,

the average and kurtosis and skewness tests for net profit and the number of employees from Bucharest in 2010. It has been taken into account 31 companies whose net profit summed has a value of 2.573.465 Ron, with an average of 83,015, a minimum of 963542 and a maximum of 1598877. Skewness and Kurtosis tests show the chart asymmetry comparing with "chart of gauss's normal curve", for which Skewness=0 and Kurtosis=3. The skewness value for Bucharest 2010 is 1.44 and indicates a right positive asymmetry and the value of Kurtosis 3.77 indicate a positive distribution curve that is higher than Gauss curve.

Similar are interpreted the values of number of employees, for which chart curve is flattened and moved to the right. The values are close to the normal curve, being an indicator that the sample is representative.

Thus a SME which wants to learn how is situated in comparison with other SME will choose as criteria its own CUI, the year and the county if has activity in several county. (Figure5)
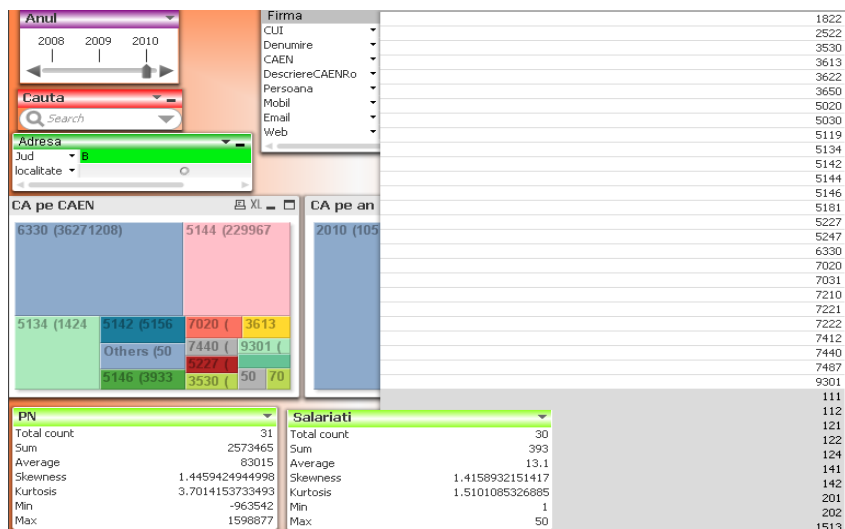

Fig. 5 Dynamic dashboard on turnover of the SMEs representative sample, or a specified SME having as criteria company, CAEN, year, locality

In the panel in figure 5 it may be seen how selecting a company name fill all the objects in the dashboard with information relating to the company, such as CUI, CAEN, We notice that the

company had a small solvency of 2.01 in 2010, but this value is linked with other indicators (Figure 7). Also are returned the profit net and the turnover. They appear in green, when they have a value above all companies Net Profit average, or Turnover, or in red if the value is below the average (it is our case, too).

In the panel in figure 6 is analyzed the influence of total revenue variations on net profit. The model designs the polynomial regression of second degree for net profit. The determination coefficient R^2 takes the maximum value 1, meaning that the regression model adjusts very well the data series.
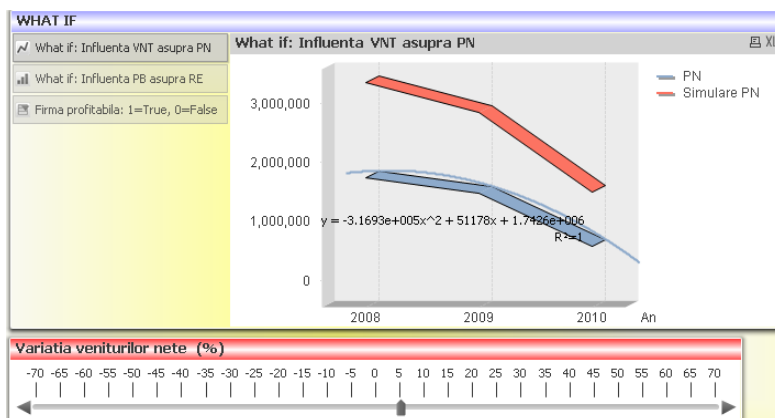

Fig. 6 What IF Analysis on the Net Profit value of certain SME chosen by the user under the influence of Net Income

The interface is dynamic: any selection update properly values in the interface objects. Company name may be selected from a dynamic list, or from the searching module by filling it in. Selecting a county results in showing the entire active companies name in that county, of which one can select the firm he is interested in. It is similar when selecting the year or total assets, for example.

The DSS allows complex analyses such as "What if". In the figure 6 it can be observed as a variation of total revenue growth with 5 percent, would determine an increase in net profit, in case of maintaining constant total expenditure (curved red superior in graph). In the graphic is observed that in 2010 the net profit dropped to about half the amount profit in the year 2009, the difference is growing more for 2008. The chart is similar to that of a polynomial function of the second

degree, whose equation of regression is observed in the image. The R^2 coefficient takes the maximal value 1, meaning that regression equation adjusts very well data series.

Further information on economic and financial profitability, overall solvency ratio overall debt, financial stability and the autonomy rates, the rates of assets for a SME chosen by the user are presented to the figure 7. Like other dashboard and this one is dynamic too, and is updated in real time on any selection of objects contained
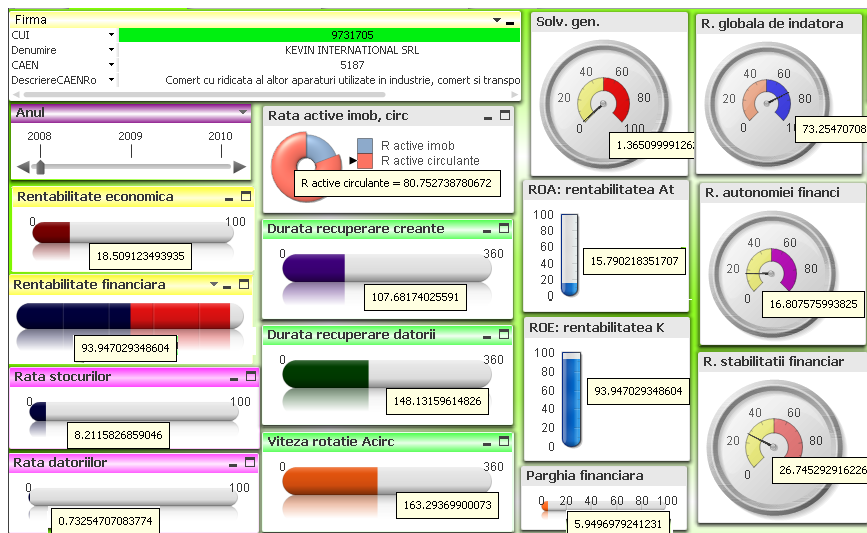

Fig. 7 Economical-financial indicators for a SME chosen by the user

According to these values it can be seen whether a company is profitable or not. For the selected company the economic profitability ratio RE (18.51) is not very high, but financial profitability ratio RF is very small (0.93). Total assets profitability ratio is not very high, too, having the value of 15.79. The company is not profitable because they are not met concurrently conditions RE> interest ratio and RF>RE. The company must review their activity and increase the net profit, which is too small having in mind the capital and increase the gross profit, which is too small having in mind total assets, resulting a small economic profitability.

The company should pay attention to the general solvency who is very small, 1.36, by reducing debt total. Financial autonomy ratio is

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16.08: the company can increase own capital, which is small compared with total liabilities. Financial lever has the value 5.94, above the threshold of 5, indicates an undercapitalized company. Financial stability is not very good, too, its ratio having a value of 26.74. This may be increased by an increase of working capital value. Overall ratio of debt of 73.27 is high and is recommended lowering total debt, having in mind the weak financial stability and autonomy. Profitability ratio of its own capital - ROE is 93.94 and exceeds current interest ratio, which means that the company may invest.

The ratio of the fixed assets for the selected company is 19.25, and that of current assets is 80.75. It may be considered that the company doesn't pay attention on capital investment, and it is advisable to review its investment policy. According to the company activity characteristics further conclusions and decisions may be taken.

The stocks ratio is 8.21 having a small amount, unfavorable situation for the company. The debts ratio is 0.73 what favors creditors, because the lower the ratio is the more protected is the company to creditors losses, in case of liquidation.

An What IF analysis simulates the operating result variations influence on economic profitability and financial profitability. (Figure 8) It can be calculated how must increase gross profit so that the company have a high economic profitability and to be profitable. However there are companies with greater economic profitability than financial profitability, when the analysis is based on the net profit and capital. The company analyzed in previous example is in the same situation.

The same interface BI allows defining new types of reports, without being necessary knowledge about the business model or economical context.

These reports may be accessed according to user requests. After defining reports models, users will only have to call the report, to choose different criteria for query, to interpret the results and fundament their decisions.

This interface allows defining new type of reports, without being necessary IT insight.

It is enough knowing the objects that can be activated in the interface and knowing how they are associated with different warehouse data attributes or measures.

In order that the warehouse not be overloaded it is used the volatile memory area for the data to be temporary loaded.

Thus the data warehouse may be used for making concurrent ad-hoc queries.

4. Conclusions

A constructive trend in the context of globalization is associating SMEs within a virtual networks business, to promote communication and making business in real time. This virtual business environment bases on a data warehouse with economic and financial data for Romanian SMEs stored on a server. Virtual business environment allows access to a BI solution through a friendly interface described in the article, solution that allows complex economic and financial analysis. Analyses above demonstrate the utility of online business association, for both SMEs and to institutions that assist theirs activity.
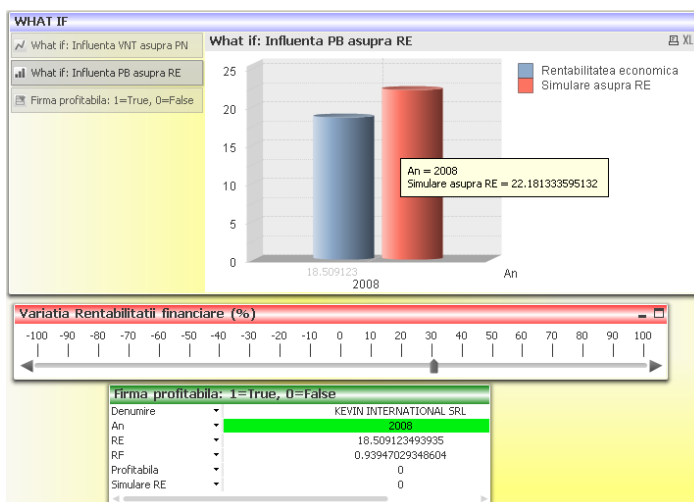

Fig. 8 What IF analysis regarding gross profit influence on economic profitability for a company chosen by the user

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Rocsana ŢONIŞ,
Radu BUCEA-MANEA
Center for European Studies and Mobility

METODA ELEMENTULUI DE FRONTIERĂ CU ELEMENTE LINIARE,
PENTRU O REŢEA AXIALĂ ÎN "S"
Partea I

Ionel Doru BACIU, Ilare BORDEAŞU

BEM WITH LINIARE ELEMENTS, FOR AN AXIAL"S" CASCADE
First part

This paper presents boundary element method (BEM), with linear elements, for the numerical simulation of ideal incompressible fluid, for a reversible cascade"S" axial profiles. BEM apply for Laplace's equation depending on flow and hydrodynamic field, speed and pressure are obtained, inside of domain analysis.

Cuvinte cheie: elemente liniare, BEM, ecuaţia lui Laplace, puncte unghiulare
Keywords: linear elements, BEM, Laplace equation, angular points

1. Introducere

Pentru exploatarea eficientă a potenţialului hidroenergetic în regim de funcţionare şi de stocare a energiei hidraulice, este necesar ca centralele hidro-electrice, să fie echipate cu maşini hidraulice reversibile, numite pompe-turbine.

Cu ajutorul metodei elementului de frontieră, se pot crea astfel de profile.