Using the Multidimensional Data Models for Forecasting, Calculation and Cost Analysis

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Abstract: A step forward for intelligent decision-making systems is the use of models that take into account the specificities of decision-making processes and analysis criteria and build the decision-making variants that are evaluated and presented to the decision-makers. This involves analytical knowledge of the decision-making mechanism to identify the elements involved in the decision-making process, the links between them and the interdependencies with the decisional environment, as well as the laws, the criteria on which the act of the proper election is conducted. It is needed such a comprehensive perspective on the decision-making mechanism to understand that the decision is not a singular act of a simple choice of two or more alternatives, it is an act with a thorough informational foundation. The complex foundation of the decision-making process must start with the analysis of the objectives and their correlation with the resources, so only we can reach the intuition and formulation of the decisional problem, which is the first stage of modelling the decision-making process.

Keywords: *decision-making; data models; cost analysis; information system; OLAP analysis.*

How to cite: Tofan, C.A. (2020). Using the Multidimensional Data Models for Forecasting, Calculation and Cost Analysis. In I. Panagoreț & G. Gorghiu (vol. ed.), *Lumen Proceedings: Vol. 10. International Conference Globalization, Innovation and Development. Trends and Prospects (G.I.D.T.P.)* (pp. 145-153). Iasi, Romania: LUMEN Publishing House.
<https://doi.org/10.18662/lumproc/gidtp2018/17>

1. Introduction

The collection of company balance data is done through extraction procedures in the previously specified format and is permanently accompanied by the completion of the registration date in the data warehouse. The following diagram briefly summarizes the data transformation processes which preceding OLAP analysis.

Figure 1 - Processes preceding OLAP analysis
(scheme developed after the model of: Zaharie D, Albescu F. *Sisteme informatice pentru asistarea deciziei*, Bucharest: DualTech Publishing House; 2001) [1]

2. Theoretical Background

In the development of the proposed predefined solutions for data analysis, the modularisation of the system and the exploitation of the data table *Indicators* from the data warehouse, which was specifically designed for a faster development of the OLAP solutions, will be followed.

We must emphasize that under the conditions of using the system at the enterprise-level without requiring facilities benchmarking with other

companies, OLAP analyzes will only be limited to exploiting the *Time* dimension and, eventually, the *Accounting* dimension for performing aggregation of balances. So the system will mostly use bidirectional analysis tables (pivot tables) and less authentic OLAP cubes.

Using multiple dimensions may be necessary in the case of comparative analyzes between the results of several organizations, such as comparative analysis of expenditures incurred or income of the company.

The following figure shows a way of aggregating account balances by the expenditure groups and their projection both in time dimension and the firms' dimension, using its geographic hierarchy.

Figure 2 OLAP solutions for expenditures analysis by cost groups.
(scheme developed after the model of: Zaharie D, Albescu F. *Sisteme informatice pentru asistarea deciziei*, Bucharest: DualTech Publishing House; 2001) [1]

A similar solution can also be designed for income analysis. For the *Firms* dimension, the following example uses the specialized hierarchy on objects of activity and economic branches instead of the geographical hierarchy.

Figure 3 OLAP solutions for analyzing the firms' income by revenue categories and activity fields

(scheme developed after the model of: Zaharie D, Albescu F. *Sisteme informatice pentru asistarea deciziei*, Bucharest: DualTech Publishing House; 2001) [1]

Using one or other of the alternative hierarchies of the dimension of the firm would lead to a reorientation of the analysis in the perspective of the geographical space or the subsidiaries of the enterprise.

As it was mentioned above, the way of calculating the indicators for financial assets analysis is described in the data warehouse using a similar solution to the aggregation of the balance sheet.

The analysis of enterprise results can be treated in a similar way, with the proposed model allowing for multidimensional representation for the comparative analysis of the indicators described in the previous paragraphs.

Additional dimensions can be added for budgeted or predicted values.
(scheme developed after the model of: Zaharie D, Albescu F. *Sisteme informatice pentru asistarea deciziei*, Bucharest: DualTech Publishing House; 2001) [1]

Returning to the set of proposed analysis indicators to be pre-calculated in the facts table, we can point out that, based on their composition, OLAP solutions can be developed to follow the analysis of some other derived indicators or analytical rates obtained by reporting them.

3. Argument of the paper

Designing a support application for expanding data analysis facilities

Making an application support for data analysis that benefits from the extensive functionality of forecasting and assisting decision tools or means of graphical representation provided by a spreadsheet processor and, at the same time, to exploit a large amount of data stored in the relational databases or in the data warehouses can be considered as a viable solution for assisting the decision in the financial-accounting activity.

4. Arguments to support the thesis

The idea of making such a support application for financial analysis came from the initiative to use Microsoft Excel as an interface component and analysis tool for the previously presented data warehouse. This alternative will give the advantage of using Excel specific facilities on the one hand, and on the other hand, the ability to exploit data through an efficient database management system.

Whereas in the case of small initiative, to develop a data warehouse project might face some difficulties mainly due to implementation costs, but

also because the small volume of data is not necessary to adopt such a solution, we proposed the support application for analysis data so it can be used on the basis of data acquisition from the data warehouse, but also as an independent data analysis tool.

Positioning of the application in the context of its use as an interface component of the data warehouse system and, on the other hand, as an independent analysis tool is shown in the following figure:

Figure 4 How to query the application as an independent analysis tool with data warehousing facilities. (scheme developed after the model of: Zaharie D. Roșca I. *Proiectarea obiectuală a sistemelor*. Bucharest: DualTech Publishing House; 2002) [2]

This tool is intended to materialize itself in a decision-support computer system even under the conditions of its use without the specific data warehouse facilities (for these cases we propose the archiving of the data necessary for the analysis either in spreadsheets or in the relational databases how it would be, for example, Microsoft Access).

The architecture of the proposed system is shown in the following figure:

Figure 5 SIAD Architecture

(scheme developed after the model of: Airinei D. *Depozite de date*, Iasi: Polirom Publishing House; 2002) [3]

A more concise representation of how to organize and acquire the data is presented in the following figure:

Figure 6 Data flows in the context of the implementation of the support application for data analysis with access to the data warehouse

(scheme developed after the model of: Stanciu V. *Proiectarea sistemelor informatice*. Bucharest: DualTech Publishing House; 2003) [4]

Based on the above presented schemes, we can make the following remarks:

- The data subject to analysis in a computer system to assist the decision developed in the Microsoft Excel environment will be structured as spreadsheets (two-dimensional tables)
- In the context of using the application with direct access to the data warehouse, data acquisition flows can refer to both detail data (account balances) and aggregated data in the form of analysis indicators. Importing the pre-calculated indicators from warehouse data as well as the consolidated data will greatly enhance the efficiency of the intended application.
- If the application will not be used as an integrated tool in a data warehouse system, we optionally offer as a storage solution of the historical data a database managed by a relational SGBD (e.g. Microsoft Access or SQL Server).
- The application will need to incorporate an appropriate interface to retrieve the data from other existing sources within the organization, such as databases or electronic documents (e.g. Word or Excel)

As far as the application model is concerned, will track the full exploitation of the features provided by the development used tool (Microsoft Excel):

- Representation the analogue models, taking into account the extensive facilities for creating graphs of this type of applications.
- Implementation the predictive methods based on predefined functions.
- Establish the optimization models based on Excel facilities.
- Synthesis the information based on specific tools such as pivot tables or hypotheses tables.

5. Arguments to argue the thesis

In the development of IT systems for assisting the decision, especially in terms of use of data warehouses, the iterative strategies are most often used, and less the classical methods of designing the information systems.

The developing strategy of the IT systems for assisting the decision that includes data warehouse technologies will involve: making a preliminary data warehouse plan and defining an appropriate architecture, and then selecting the development tools and environments to be used.

Making a preliminary plan of the system is to highlight the priorities of different future users and to incorporate these requirements into the

modules of the projected system. Such an iterative strategy will allow for further expansion of the data warehouse functionality by providing the flexibility to the system.

Establishment of selected development environments for making the decision support system involves choosing a standard set of tools and reducing the possibility of occurrence of some subsequent problems of application integration.

References

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