DSS MODEL BASED ON RULES AND OLAP FOR MANAGEMENT BY BUDGETS

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Abstract

Implementing Decision Support System (DSS) for the management by budgets has become one of the top priorities for the vast majority of today's organizations. This system represents a powerful tool for planning and controlling in the managerial activity. The new technologies for Business Intelligence as OLAP, Data Warehouse, Data Mining, emerged nowadays in very competitive DSS needed for the managerial process. Such systems are capable of processing and analyzing in real time large volumes of data from various sources and with different displaying criteria. This paper depicts a DSS model (B-Admin) developed in DSS-UNIDEF framework, based on rules and OLAP for the management by budgets, implemented at „County Forestry Department".

Key words:

Decision Support Systems, OLAP, UML, Business Intelligence, management by budgets

INTRODUCTION

Budgets and costs management is a very complex activity, which requires data and information from all points of the organization's information system. The **main objectives** of this activity are **planning and control**. The decisions taken by the managers involved in the budget and cost management could have major impact on the whole organization and its market position.

The information flow supporting the manager's decision for budget and cost management is provided by the financial accounting information system.

The **management by budgets** tries to establish the actual costs level generated by the normal activity of the organization and fit them into the estimated (forecasted) costs level (Rusu, 2001).

A unique characteristic of this method is that it successfully combines, in the same application two components of the management process (Danaiata, 2002):

- Forecast the organization's future as quantifiable and achievable objectives;
- Control the organization's activity through the informational flow generated by the budget execution activity.

The most important stages of managing by budgets method are the following (Rusu, 2001):

- Budgets assessment;
- Budgets approval;
- Budgets control.

Currently it is considered that the management by budget method is efficient and effective unless it uses the information technologies. The task of planning and controlling budgets needs the support of informational flow generated by the organization's information system. Thus implementing and using a DSS (Decision Support Systems) for this task will ensure a successful management by budgets (Filip, 2007).

In the following sections we will present a practical example of a DSS model conception and development based on OLAP (Inmon, 2005), (Kimball, 1996) and rules, used for budgets management in the case of „County Forestry Department"

1. GENERAL CONTEXT OF THE DSS CONCEPTION AND DEVELOPMENT

In order to achieve a good performance the **County Forestry Department (CFD)** needs efficient and effective revenue and cost management policies. A highlight of this case study is that, even if it is a governmental institution, the Forestry Department offers a wide range of goods and services. This is the reason for the Department to be in some sectors, profit center.

The right on time decision making process, based on real and reliable information is a major problem, in a context where the information system doesn't provide data related to revenue and cost structure and volume, in a centralized and integrated manner. Decisions are based on financial data centralized and integrated through a manual process. In this way the data is late and erroneous being related to expenses centralization and allocation (Turban and Aronson, 2001), (Marakas, 2003).

To overcome the above mentioned drawbacks, the manager has created a management strategy based on a real time centralization of income and expenses for all the organization's subunits in cost/profit centers and activities. The management strategy also comprises the systematization of data and information under a multidimensional format which allows the data to be used and exploit by different point of view. Moreover the manager has chosen a system which will code the operational activities (on centers and activities) and a system of rules (allocation keys) for the indirect expense allocation. These both systems will automatically collect and allocate the cost on centers and activities.

The management needs for data to be used in the decision process of budget and expenses management can be described as following:

- Design and implementation of a coding system for all the cost/profit centers with the purpose of codes attribution for each primary document and operation.
- Design and implementation of a Decision Support System for budget and expenses management with the objectives:
  - Income and expenses collection and allocation at the level of the whole organization.
  - Integrated reports (multidimensional) for income and expenses.
  - Integrated multidimensional reporting for income and expenses per centers.
  - Integrated multidimensional reporting for income and expenses per activity.

In order to fulfill the managerial needs, **we have created, using the DSS–UNIDEF framework, a DSS model for the budget management named „B-Admin DSS"**. This system has as main functions:

- Expenses collection, centralization and allocation module
- Multidimensional reporting module based on OLAP cubes (Matt, 2007).

We consider that this system is a hybrid decision support system, which combines the elements and functions of EIS (Executive Information Systems) (Sprague an Watson, 1996) with the OLAP technology (Codd, 1993).

By employing the DSS-UNIDEF framework (Brandas, 2007), we can identify the decision-making requirements more accurate and we can elaborate rapidly (prototyping) the system model in a unified approach based on UML models (Arlow and Neustadt, 2002), (Booch, 2005).

2. B-ADMIN DSS ARCHITECTURE

The system architecture (figure 1) has a two sided structure; one side is the software structure and the other is the hardware structure supporting the first.

The software side of the system has the following elements:

- Expenses collection, centralization and allocation module
- Database management system: MS SQL SERVER 2005 – Database Engine.
- OLAP analysis module: MS SQL SERVER 2005 – Analysis Services.
- Reporting module: MS SQL SERVER 2005 – Reporting Services.
- IIS Web server.
- APACHE Web server.
- MySQL DBMS.
- Operating Systems: MS Windows 2003 Server and MS Windows XP Professional.

The hardware side of the system comprises the following base elements: CFD server which has a router and web server function, CFD application server; Terminals: CFD control center, districts; Modems; Switch.

According to the system architecture, the users can be grouped in three main categories:

- **Decision maker / Manager**: represents the decision factors (General Manager, Finance Manager, and Chief Engineer) who use the reports and OLAP cubes in order to gather data and information for making better decisions.
- **The responsible for DSS parameters and expenses allocation:** this is the person who is in charge with the system parameterization (this person has to add into the system centers, activities, expenses allocation rules, users) and with the monthly generation of expenses allocation.
- **Primary documents operator**: these are the persons responsible to input into the system the primary documents received from the subdivisions and headquarters of the County Forestry Department. Each entry will receive a code composed form the center's code and the activity's code for that entry. This code allocation, allows a direct revenue and cost collection on each center and on each activity.

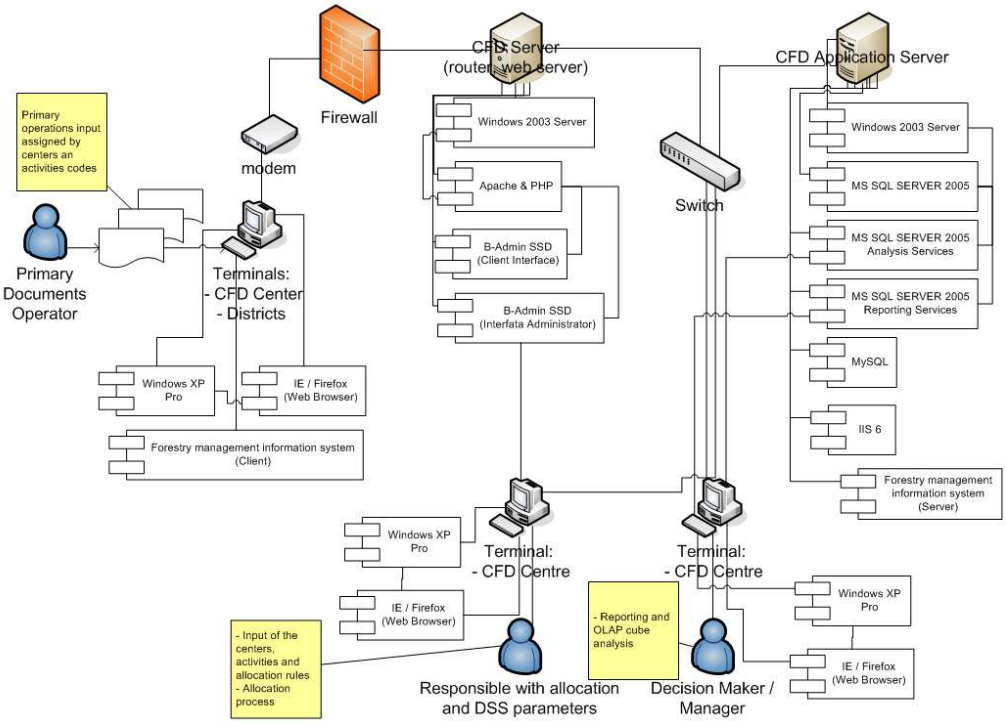

Fig. 1 B-Admin DSS architecture.

3. THE MODULE FOR COLLECTING, CENTRALIZATION AND ALLOCATION OF EXPENSES

A DSS structure consists in many modules and sub-modules depending on the flow of collecting and processing information regarding revenues and expenses.

The module for expense collecting, centralizing and allocating plays a very important role in developing a DSS database. Expenses collection, centralization and allocation module allows:

- data import from the financial accounting information system. The data gathered from this system are exported in MS Excel and than further are imported in the B-Admin DSS;
- data centralization from all centers in one common database;
- indirect expenses allocation base on the allocation rules;
- revenues and expenses reports display.

This module is organized in two sub-modules:

- The sub-module for operating and importing data from the financial accounting information system module.
- The sub-module for system administration, expenses allocation and reporting.

The sub-module for operating and importing data from the financial accounting information system module

This sub module is used by the operators from the county forestry department and its subsidiaries. The sub module is employed to import data from the financial accounting information system of the centre to which they are affiliated at.

Each operator access the subsystem's client interface with a username and password trough web browser like Internet Explorer or Mozilla Firefox. The username and password is assigned to a specific unit from the organization (the forestry department headquarters or its subsidiaries). Once the user is logged in he can choose the time span for which he is importing the data and then he would load the Excel file with the income and expenses assigned to the centre.

The sub-module for system administration, expenses allocation and reporting

This sub module can be accessed only by the system administrator, with a username and password, being his task to start the expenses allocation process. After the data import was completed, the user can see the import status, namely the months and the organization's units for which the import was made. The process of allocating the indirect costs can be started only after a successful data import, accessing the option "Allocation" from the "Operations" menu.

In our opinion the data collection, centralization and expenses allocation module is a powerful tool used in tracking, allocating and projecting income and expenses, being an important component in the management by budget DSS.

4. THE MULTIDIMENSIONAL DATA ANALYSIS AND PRESENTATION FUNCTION

In order to complete a multidimensional analysis of the processed and centralized data, received from the collecting, centralizing and expense allocation module, we implemented an OLAP cube using the special features offered by the Business Intelligence component of MS SQL SERVER 2005.

The OLAP cube (Sueli Almeida, 1999) allows the managers of an organization to visualize a series of reports having a dynamic and multidimensional structure. Therefore the expenses and revenues can be presented in a multidimensional structure, being assigned to budgets, cost centers, activities, year, month or quarter.

The figure 2 depicts the dimensions structure of a data analysis OLAP cube.

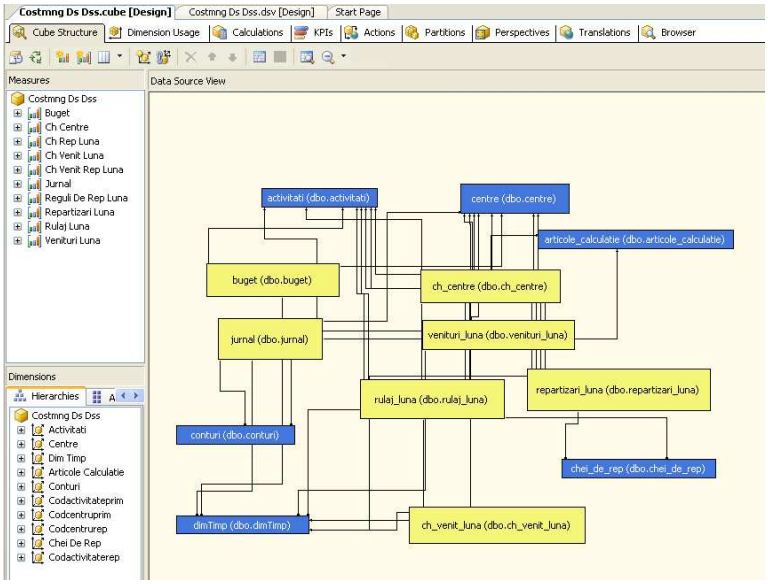

Fig. 2 OLAP cube structure.

The income and expenses report assigned to centres, activities, accounts, years, months (quarter) are presented in figure 3.

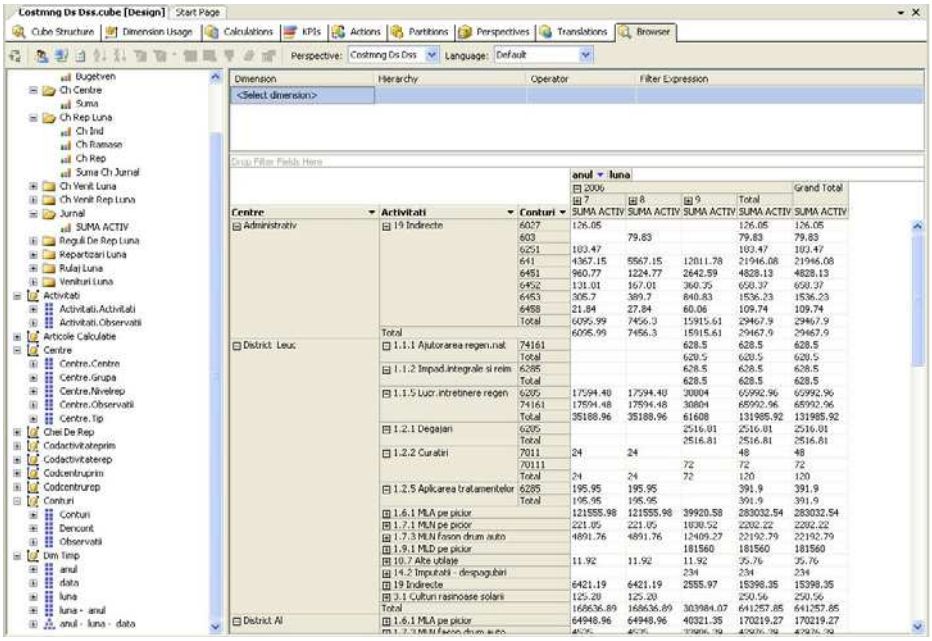

Fig. 3 Income and expenses report assigned to centres, activities, accounts and time.

The graphical display of data and the generated reports export can be done using the "Reporting Services" tool from MS SQL SERVER 2005.

5. THE KEY PERFORMANCE INDICATORS PRESENTATION FUNCTION

The DSS includes a set of key performance indicators employed by the decision makers in the surveillance of revenues and expenses evolution, enabling them to visualize graphically and in real time the budget variation.

The MS SQL SERVER 2005 environment for developing Business Intelligence applications, provide a very powerful tool in defining the key performance indicators. They are presented as graphic symbols (traffic light, arrows) which depict their status and trend.

As it is show in figure 4, together with the management of the organization where this DSS was implemented, we elaborated three such indicators which are meant to help them in the decision-making process.

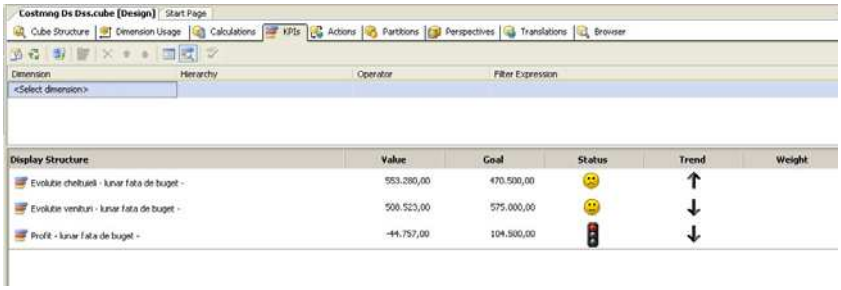

Fig. 4 Organization's Key Performance Indicators.

We consider this method as being highly efficient, helping the organization's management to observe the status and tendency of these indicators in an easy to interpret form.

CONCLUSIONS

Today there are significant improvements of these decision support technologies, concerning the data storage volumes, data processing as well as data extraction, visualization and communication. The fast development of Internet and WEB technology revealed new directions in conception and development the DSS.

Implementing a Business Intelligence based DSS for the management by budgets will allow managers to plan and control the organization's activities more efficiently and effectively. Projecting and analyzing some strategic indicators these systems will lead to an increase in the organization's success.

The latest trends in the theoretical an practical research concerning the conception and development of DSS (including its derivates and subsystems) bring forward more and more the usage of UML language for modelling these systems.

Concerning the delivery of an effective decision support for the budget management, we propose the employment and improvement of a DSS model based on rules and OLAP, which was discussed in this paper and also implemented in an organization („County Forestry Department"). The model named above, has a quite general structure which allows it to be implemented in almost all organizations who have implemented the management by budgets. Simultaneously we want to improve and develop this model, fitting in some new functions which will allow us to determine and manage the costs trough the ABC (Activity-Based Costing) method. Being designed and developed on a DSS-UNIDEF framework, updating and extending this model will prove to be very fast and highly efficient.

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