An Experimental Web-Based Decision Support System

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Abstract: The paper deals with the implementation of new concepts and models in the field of the decision support systems, which can help financial decision makers to process useful information from raw data, documents, personal knowledge, and/or business models in order to identify and solve complex financial problems and to take good decisions with a minimum amount of risk in case of failure. The information utilized in this experimental Web Based Decision Support System result from a financial database.

Keywords: DSS, dimensions, slicer, cub, measures etc.

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1. Introduction

Decision Support Systems (DSS) are a specific class of computerized information systems that supports business and organizational decision-making activities. A properly designed DSS can be an effective interactive system to help decision-makers to compile useful information from raw data, documents, personal knowledge, and/or business models, in order to identify and solve problems and to take decisions (Filip, 2007; Filip, Donciulescu, Filip, 2002). A DSS can improve the decision making ability of managers allowing them to take faster and better decisions within the constraints of cognitive, time and economic limits. It can increase productivity of the decision-makers and supplement one or more of a decision maker's abilities. Also it can facilitate one or more of the decision-making stages (such as intelligence, design, choice, and implementation), facilitate problem solving flows and can aid decision maker to address unstructured or semi-structured decisions. Thus, the decision maker's knowledge management competence is enhanced; his knowledge management (KM) skills are supplemented with the computer-based KM capabilities. Typical kinds of information that a decision support application might gather and present to the users are: accessing all the current information assets of a person, including legacy and relational data sources, cubes, data warehouses, and data marts; comparative sales figures between one week and the next week; projected revenue figures based on new product sales assumptions; the consequences of different decision alternatives, given past experience in a context that is described.

A decision-making process refers to the sequence steps (or analyses) that lead to a decision and it is often described in terms of inputs, transformations, and outputs. Decision processes are sometimes part of larger business or organization processes and hence it can be hard to identify and define a distinct one. Basic individual decision processes related to a specific decision can be often not noticeable. In 1980, Alter S. identified three major characteristics of DSS: a) DSS are designed specifically to facilitate decision processes; b) DSS should support rather than automate decision making; c) DSS should be able to respond quickly to the changing needs of the decision makers.

From a more practical point of view, decision specialists [URL 1] agree with the following DSS set of features:

- **Facilitation.** DSS helps the managers to make good decisions for complex problems. DSS facilitate and support specific decision-making activities and/or decision processes.
- **Interaction.** DSS are computer-based systems designed for interactive use by decision makers or staff users who control the sequence of interaction and the operations performed.
- **Ancillary.** DSS can support decision makers at any level in an organization. They are NOT intended to replace decision makers.
- **Repeated Use.** DSS are intended for repeated use. A specific DSS may be used routinely or used as needed for ad hoc decision support tasks.
- **Task-oriented.** DSS provide specific capabilities that support one or more tasks related to decision-making, including: intelligence and data analysis; identification and design of alternatives; choice among alternatives and decision implementation.

- **Identifiable.** DSS could be an independent system that collect or replicate data from other information systems or subsystems of a larger, more integrated information system.
- **Decision Impact**. DSS are intended to improve the accuracy, timeliness, quality and overall effectiveness of a specific decision or a set of related decisions.

This paper aims at presenting a Web Based Decision Support System which meets most of those characteristics. This paper is organized as it follows. First the general structure of the system is presented. Then the main components (front end and back end) are described. The main advantages of the proposed solution are eventually presented.

2. General Structure

The system structure is shown in Figure 1. The hardware configuration is composed out of two machines that run software applications independent of each other. They are called generically: the financial machine and the decision machine. The financial software is installed on the first machine**,** which stores the data into a Core Financial Database. It can be for example one of the following software applications: **Intelistock** [URL 3], **Alphatrade** [URL 4], **Terminal Online** [URL 4], etc. The databases used by the banking applications can be Oracle, SQL, DB2 etc. The choice of the database and the one of the financial software are independent of each other. The experimental Web-Based Decision Support System is installed on the ***decision machine***. It is composed out of the following main components: a SQL server 2000 database, an Analysis Server 2000 database and Web Applications.

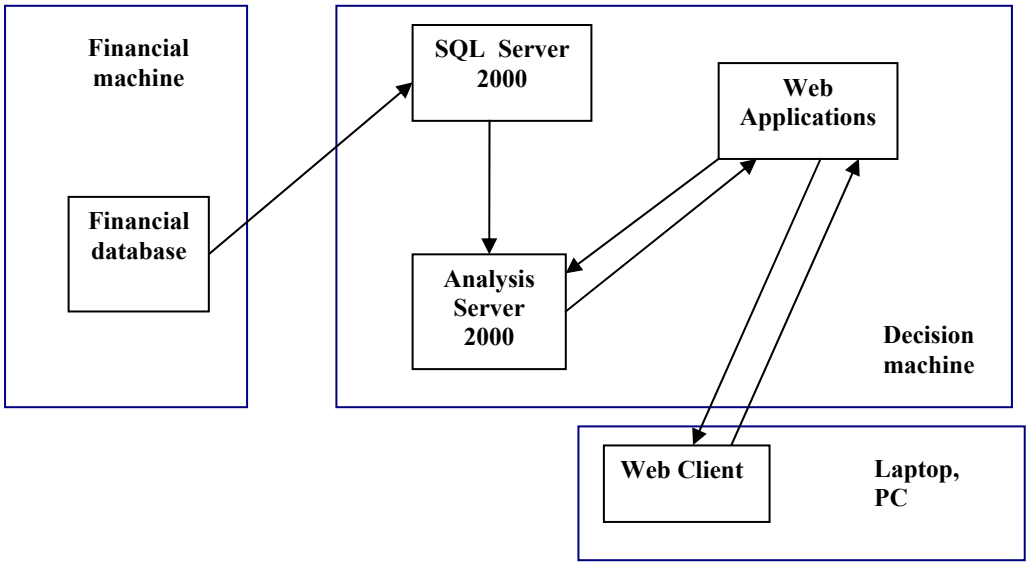


Figure 1. The General Structure of the Experimental Web Based Decision Support System

The financial information utilized in this experimental Web Based Decision Support System is stored in the financial database, which is part of the financial machine. The financial data arrives in the SQL Server Database using SQL scheduled Jobs daily or monthly. These SQL Jobs process the raw data using decision-making models and techniques, and then they store the results into the SQL Server database as tables associated to the cubs. The cubs are automatically processed by packages using Analysis Services Processing Task objects.

3. System Components

The experimental Web Based Decision Support System has two components:

- **The Back End component,** which is transparent for the decision maker, contains all the operations, the computerized methods, algorithms and techniques used in the back end, which do not directly interest the decision maker. The decision maker is interested in the correctness of the information provided by the Web application's options, but doesn't need access to all under-laying operations.

- **The Front End component** is the decision maker's Web interface with the system and contains all the modules and sub modules related to the Web Applications.

4. Back End Component

In the case of our system, this component is composed from a large set of SQL jobs that run SQL packages, which contain the business models used to identify and solve the financial problems related to the experimental system.

In the next section, we will present a SQL job that loads the brut values of the shareholders' dividends (the slice of profit that is paid out to the shareholders) paid by the companies listed to Bucharest Stock Exchange. The brut values of the shareholders' dividends are public data available from the site **www.bvb.ro**. The values of dividends provided by the companies in the period 1996-2005 were imported in an excel file from the web site of the Bucharest Stock Exchange. In this case the Financial Machine is the machine of Bucharest Stock Exchange. Using a SQL job that runs a SQL package, the brut values of the dividends arrive in the SQL Database of the Decisions Machine. We can see a view of the SQL package in Figure 2.

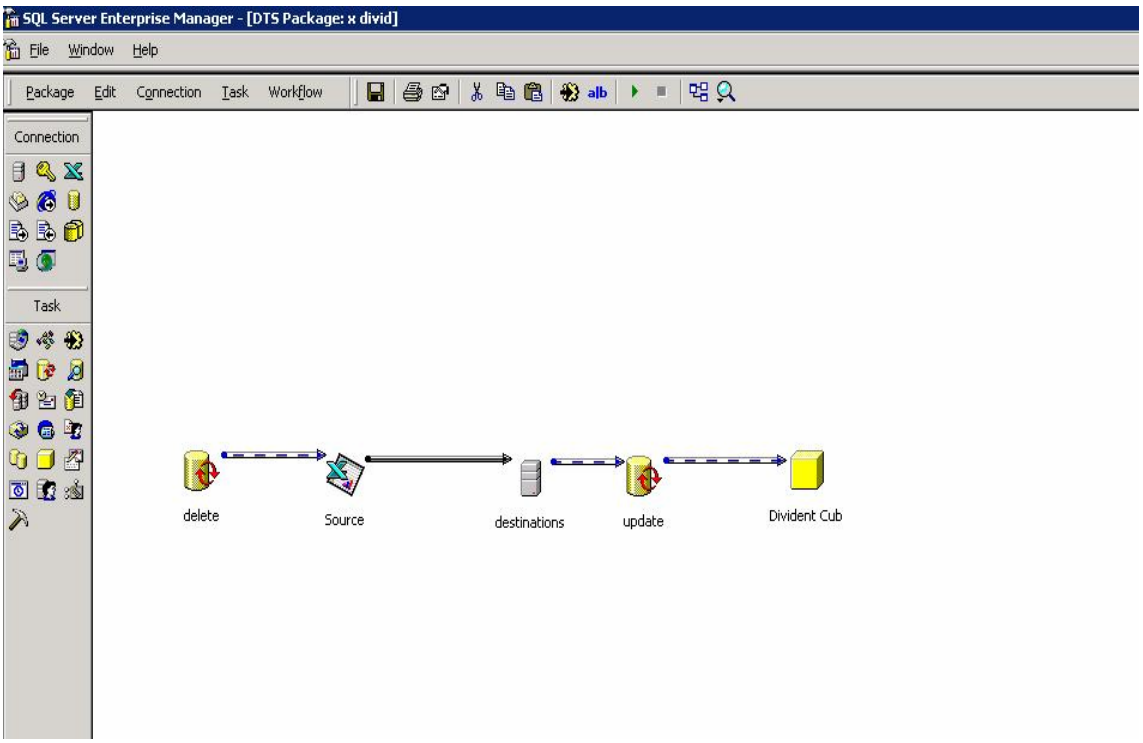


Figure 2. The SQL package

In this case the SQL table has the following structure:

```
CREATE  TABLE  tDividends
(
        SIMBOL CHAR(4),
        COMPANY_NAME  VARCHAR (100),
        DIVIDENT_VALUE DECIMAL (18,7),
        YEAR   int
)
```

Where:

SIMBOL – a code of the company (3 or 4 characters)

COMPANY_NAME – The name of the company registered to The National Trade Register Office.

DIVIDENT_VALUE – The brut value of the dividend per action that is paid by the company.

YEAR – The year for which the brut value of the dividend per action was paid. When the SQL package is processed the **tDividends** table will contain all the companies that emitted dividends between 1996 and 2006. At the end of the package there is an **Analysis Services Processing Task** object that automatically process the data from the table **tDividends**.

The Cub has the following properties:

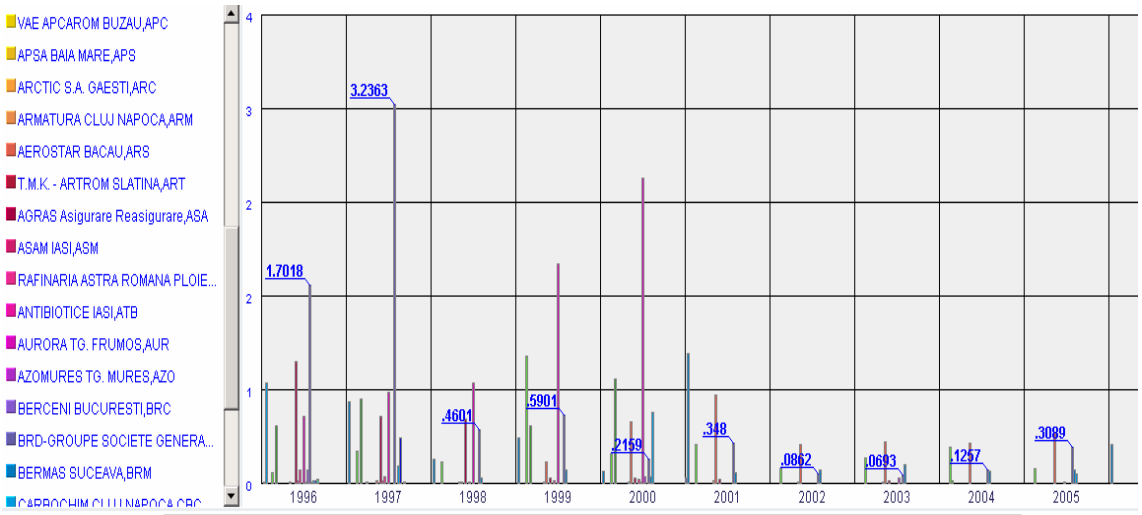
1. **dimensions**: **Symbol** (contain all the codes of the companies which pay dividends to the shareholders), **Company Name** (contain all the names of the companies which pay dividends to the shareholders), **Year** (All the years between 1996 and 2005);
2. **measures**: **Dividend Value** (Value of dividend in eq. Ron), **Max** (maximum value of the dividend in eq. Ron for a company for all years), **Min** (minimum value of the dividend in eq. Ron for a company for all years), **Count (**used to count the company that paid the dividends**).**

5. Front End Component

The decision makers connect to the Web Based Decision Support System using an Internet Explorer Browser. The authentication with the system is made using a user name and password, or at the operating system level, for the decision makers that are using an Intranet user account to connect their PC. The decision makers with special rights can view all the information from all departments. There can be restrictions for certain information at department level or for particular decision makers.

In the next section the decision maker chooses the **Dividend** Option of the Web Based Decision Support System.

The result of this action is shown, below, in the Figure 3



Sim...	Company Name	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
ARM	ARMATURA CLUJ NAPOCA	.021	.0081	.0135	.016	.016	.023	.014	.014	.007		
ARS	AEROSTAR BACAU	.0014	.0325	.0217	.1902	.5344	.756	.3348	.355	.35	.44	.87
ART	T.M.K. - ARTROM SLATINA	.009	.0008									
ASA	AGRAS Asigurare Reasigurare	1.0446	.5772	.5556	.0507	.049	.0369		.0268			
ASM	ASAM IASI	.0306	.0278	.0036								
ASP	RAFINARIA ASTRA ROMANA PLOIESTI	.1206	.0578	.0172	.0337	.0389	.002					
ATB	ANTIBIOTICE IASI	.0052	.006	.0056		.0201	.0061	.0085	.0109		.0148	
AUR	AURORA TG. FRUMOS	.5784	.7851	.8597	1.8771	2.6059						
AZO	AZOMURES TG. MURES	.0115	.0021			.065			.0523			
BRC	BERCENI BUCURESTI	.1201		.0017								
BRD	BRD-GROUPE SOCIETE GENERALE BUCURESTI	1.7018	3.2363	.4601	.5901	.2159	.348	.0862	.0693	.1257	.3089	
BRM	BERMAS SUCEAVA	.0141	.0094	.0495	.1143	.0598	.095	.1187	.1615	.1125	.1256	.14
CBC	CARBOCHIM CLUJ NAPOCA	.0283	.1545			.6151					.0848	
CER	CERCON ARIESUL	.0342	.3904									
CHI	C.H. INTERCONTINENTAL	.0399										
CIP	CIPROM S.A. PLOIESTI	.0054	.0138		.0099							

Figure 3. The Dividend Option of the system

By using the system, the decision maker can easily see the following information:

There are two companies ARS – AEROSTAR BACAU and BRM-BERMAS SUCEAVA, which have paid the dividends to the shareholders for the all 11 years.

There are some companies like ALR -ALRO SLATINA, BRD-GROUPE SOCIETE GENERALE BUCURESTI, which have paid the dividends to the shareholders in 10 from the 11 years.

In 1997 BRD paid the grand dividend of 3.2363.

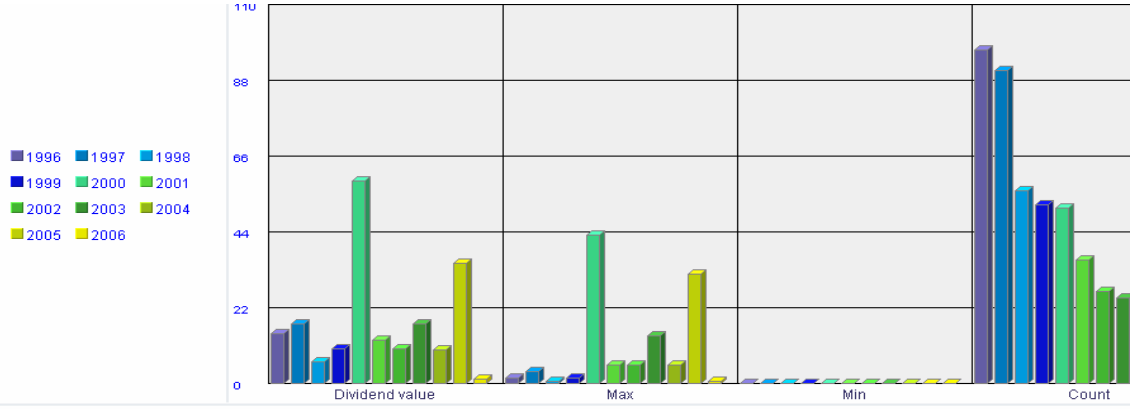
In 2006 only 4 companies (ARM, ARS, BRM and AER) paid dividends.

1996 was the year with the biggest number of companies that paid dividends. The number is 97 (see Figure 4)

2000 was the lucky year for the shareholders. They had more money from dividends.

In 1997 and 1998 the smallest paid dividend was 0.003.

These notes are very important for a financial decision maker, since based on this information he can choose to buy more and more shares of a company. Of course, there is a risk. It is possible that next year for example the company will not go so well. But in every business there is a risk.



Year	Dividend value	Max	Min	Count
1996	14.6354	1.7018	.0007	97
1997	17.5294	3.7694	.0003	91
1998	6.293	.8597	.0003	56
1999	10.3541	1.8771	.0005	52
2000	58.8505	43.0948	.0019	51
2001	12.6217	5.3867	.0008	36
2002	10.1746	5.6261	.0014	27
2003	17.5689	13.9589	.0027	25
2004	9.9307	5.4081	.0041	22
2005	35.0744	31.75	.0032	20
2006	1.3606	.87	.0179	4

Figure 4. Other view of the Dividend system option

6. Conclusions

Many organizations have been making serious efforts to analyze a large set of project proposals (Radulescu, Radulescu , 2000) in order to choose project portfolios that maximize the performance, meet the resource constraints and minimize the risk. The model of Web Based Decision Support System presented in this paper is intended to assist financial managers to choose the best solution, in the decision process of buying shares from the analyzed companies. Through the Web interface the proposed system can present graphical information to a multitude of users and it can be easily integrated with an expert system or artificial intelligence system (AI). It may be aimed at business executives or some other group of knowledge workers.

The main benefits of the proposed architecture are:

- Once the data is arrived, the cubs are automatically calculated and the decision makers will have a better speed performance in viewing the information;
- The interface of the system is very easy to use and very intuitive for the decision maker.
- All the information is stored in a single place (the SQL Server Database);
- Any decision maker can use a simple browser (Internet Explorer) to see the financial reports;
- You may access the system from virtually any Internet location if you have the right user name and password.
- The database choice and the software choice are independent of each other.

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[URL 2] http://www.uky.edu/BusinessEconomics/dssakba/instmat.htm#Detailed%20Course %20 Notes (latest date found: March 2007)

[URL 3] http://www.intelistock.ro/ (latest date found: March 2007)

[URL 4] http://www.alphafinance.ro/index.php (latest date found: March 2007)

[URL 5] http://www.bvb.ro (latest date found: March 2007)