

Some Considerations Regarding the Application of Data Warehouse Solutions in Consultancy Companies

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Abstract This paper outlines some possible uses of data warehouse instruments in consultancy companies, particularly for the companies that provide consultancy services for potential beneficiaries of projects with non-reimbursable funds, the example dataset used in the paper refers to projects for public authorities in local communities of Romania.

Key words Consultancy, performance, customer service, data warehouse, analysis

DOI: 10.6007/IJARAFMS/v5-i4/1885

URL: <http://dx.doi.org/10.6007/IJARAFMS/v5-i4/1885>

1. Introduction

The access to non-reimbursable funds may prove a difficult procedure for any manager of an organization aiming to access such funds to develop a certain project. Regardless the type of program, there are several key issues that are to be considered when writing the proposal documents, which are further submitted for evaluation and enter in competition with similar proposals, presented by other organizations. In this respect, I would like to outline the following: the contents of the main document included in the proposal, (i.e. business plan or feasibility study), especially the argumentations offered, that is the way the proposal is written, the compliance with the selection criteria published in the call for projects, the coherence and correctness of other documents that are to be presented as support for the core document, and not to be considered of least importance, the deadlines. This is where the consulting company enters into role and offers the expertise of its employees, which are to collaborate with the beneficiary of the potential future project and its own team in the attempt to competitively enter the contest for funds, become eligible for financing, receive the money and implement the project.

2. Literature review

After gaining some expertise, the company can learn from its own historical data about the projects that were submitted with the help of the company. A data warehouse solution could help the company draw feasible and useful conclusions regarding its performances and further improving its own activity. The management of the consulting firm cannot always allow itself the luxury of making substantial changes to its core processes when the deadline for certain call for projects is approaching, and there are some members of the team, even if they are external collaborators, such as the engineers, whose expertise is invaluable and cannot be always readily replaced. Anghel (2012) develops the analysis of financial instruments. Anghelache and Anghel (2014) have outlined multiple facets and instruments of modeling in economy and finances. Data warehouse technologies and instruments were described by Manole (2007), Anica-Popa and Manole (2014), Popa *et al.* (2006). Sivakumar *et al.* (2012) offers a valuable reference for using SQL Server Analysis Services. Also, significant information on SQL Server instruments is available on MSDN official website.

3. Data warehouse design and implementation

The proposal for a data warehouse starts from the benefits for the decisional process in the consulting company and also from the good practice to have a software application that supports the administration of the projects developed by the company.

In this respect, the activity measures proposed are the number and value of the contracts, considering that the size of the project and the overall cost of the project submitted during the call does not necessarily puts an influence on the value of the contract, which depends also on the marketing policy towards a specific customer (a customer that signs more contracts for different projects, a customer with god history of commercial relationships with the company etc.). All projects analyzed at this stage are considered approved/financed.

The dimensions that can be taken into consideration are:

A. *The customers.* They are the core of the consulting business, as they pay the company for services, are likely to return in the event of success and can provide recommendations of company’s quality to other people, thus enlarging the customer base of the company.

B. *The employees.* The consulting company employs a team of consultants and each project team works under the supervision of a team leader. The results achieved by the team reflect upon the performance of the leader, therefore this analysis will focus on the leader as key employee in the activity.

C. *The project type.* This paper will focus on projects developed by public authorities from the rural area, projects aimed at building rehabilitation, enhancements of the road networks, implementation of better water supply and sewage networks in the villages etc.

D. *The time.* the date when the contract was signed will form the core of the time dimension proposed.

The data source for the proposed data warehouse is a relational database, which includes the necessary data for the measures and dimensions described above and can be used to trace the most important data of the project.

The principles for the data transformations, necessary in this case for the construction of the fact table and time dimensions were outlined by the author in a previous work (see Manole, 2007), and these principles were applied according to the proposed dimensions and measures. The physical model of the data warehouse was implemented into SQL Server 2014, both the data source (as a database) and the multidimensional data warehouse (in Analysis Services), together with the reports (in Reporting Service). Using the instruments provided by the Data Tools for Visual Studio extension, I have defined a data source, then a data source view, linked to the source database, the cube and then the reports.

From the data source, the analysis cube was then defined, following the structure previously presented, by applying the star schema template:

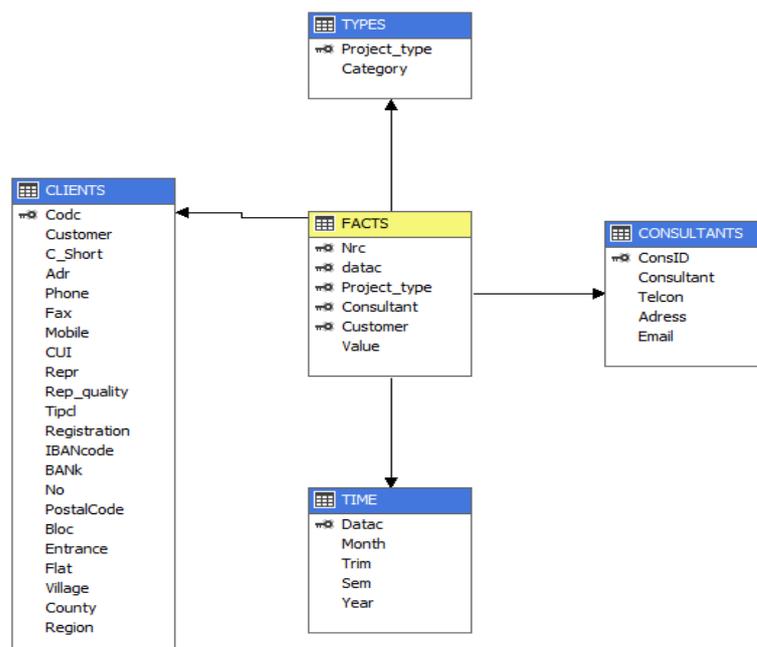


Figure 1. Analysis cube, as shown in Data Tools for Visual Studio

From this model, several types of reports can be drawn, and thus several type of information can be achieved.

A primary report can provide the overall performance of consultants, both in terms of number of projects and value of contracts achieved for the company. The structure of the report can be represented as the following figure states (the codes of the consultants are represented as column headings, above the measures:

	1		4		5		6		8		9	
	FACTS Count	Value	FACTS Count	Value	FACTS Count	Value	FACTS Count	Value	FACTS Count	Value	FACTS Count	Value
Infrastructure	17	224,400.00	7	90,500.00	8	153,325.00			2	69,500.00	4	95,400.00
Services	8	151,250.00	10	261,800.00	5	79,100.00	3	13,500.00			2	31,800.00

Figure 2. Performance of consultants, without drilldown as shown in Data Tools for Visual Studio

The same report, being set with the drill down enabled, will provide the user more detailed information based on the row heading attributes, which form a parent-child relationship:

		1		4		5		6		8		9	
		FACTS Count	Value	FACTS Count	Value	FACTS Count	Value	FACTS Count	Value	FACTS Count	Value	FACTS Count	Value
Infrastructure	Land works	4	38,000.00			2	49,750.00						
	Road infrastructure	7	157,000.00	2	66,000.00	6	103,575.00			2	69,500.00	4	95,400.00
	Social/ cultural infrastructure	6	29,400.00	5	24,500.00								
Services	Public administration services							3	13,500.00				
	Public services	8	151,250.00	10	261,800.00	5	79,100.00					2	31,800.00

Figure 3. Performance of consultants, with drilldown as shown in Data Tools for Visual Studio

Another type of report will take into account the geographical distribution of the projects won by the company. In this respect, the geographical dimension was defined, included into the clients dimension; this solution allows the compliance with the star schema.

		NORTH-WEST				SOUTH				SOUTH-EAST			
		BISTRITA-NĂȘĂUD		MARAMURES		CĂLĂRAȘI		GIURGIU		BUZĂU		TULCEA	
		FACTS Count	Value	FACTS Count	Value	FACTS Count	Value	FACTS Count	Value	FACTS Count	Value	FACTS Count	Value
Infrastructure	Land works	1	26250	1	23500							4	38000
	Road infrastructure	3	43900	2	54875		44400			5	125300	9	223000
	Social/cultural infrastructure											11	53900
Services	Public administration services							3	13500				
	Public services	1	39500					10	232050	5	46400	9	206000

Figure 4. Projects gained, per region/county/category/type as shown in Data Tools for Visual Studio

The type of reports presented in figure 4 gives to the management, apart from the factual data, an insight on the “fields” where company expertise could be capitalized. These spots are represented by the empty cells in the report. The company should act, during future calls for project, to extend its portfolio of customers in the areas not covered yet, corroborated with the number of projects won. Furthermore, as the skills of the employees-consultants were measured in the report drawn in figure 3, the best of them could be further tasked with bringing new clients and develop successful projects for them. The number of projects that were accepted during the national or regional calls would plead for the professionalism and commitment of the company in developing quality services for clients.

Furthermore, the company could be interested in the econometric correlation between the two activity measures. This link would show the effect of each new contract signed on the incomes of the company, apart from the traditional marginal value approach. The time series provided by the data source allows the study of monthly data for the two measures and the application of econometric instruments for a simple regression, where the number of projects is the independent variable and the value of contracts is the resultant parameter.

The dataset can be generated by using a T-SQL clause of the following form:

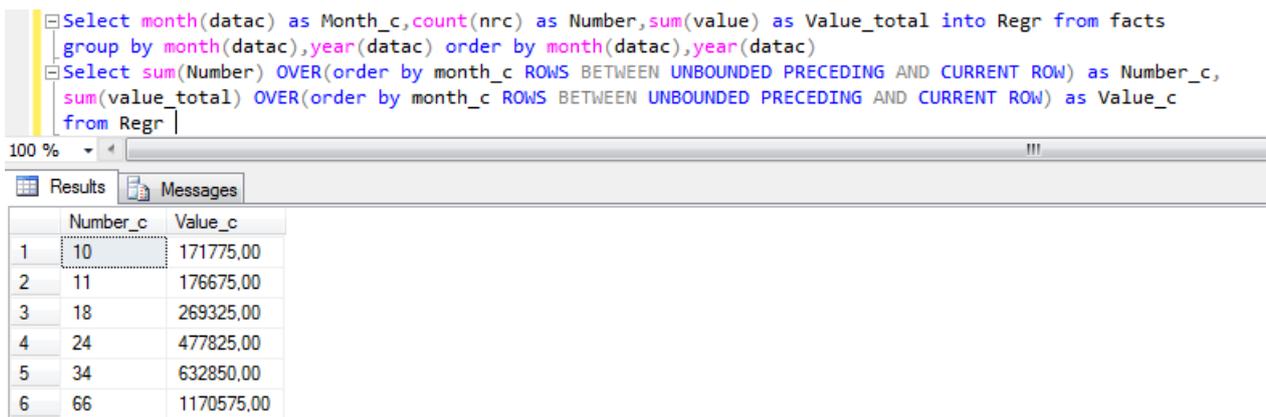


Figure 5. Calculating running sum for value and number of contracts, as extracted from SQL Server Management Studio

The application of the regression on the sample data above can be made by adding the corresponding temporary table to the data source view of the analysis project on which cube in figure 1 is based. The operation can be automatized for general use, regardless the number and frequency of contracts added to the source database, by dropping and re-creating the table or by defining a key on a time-related attribute and verifying the data via a NOT IN or similar criteria, which imposes a rigorous timetable for updating the table.

The result of linear regression applied to the sample presented in figure 5 is detailed in the figure below:

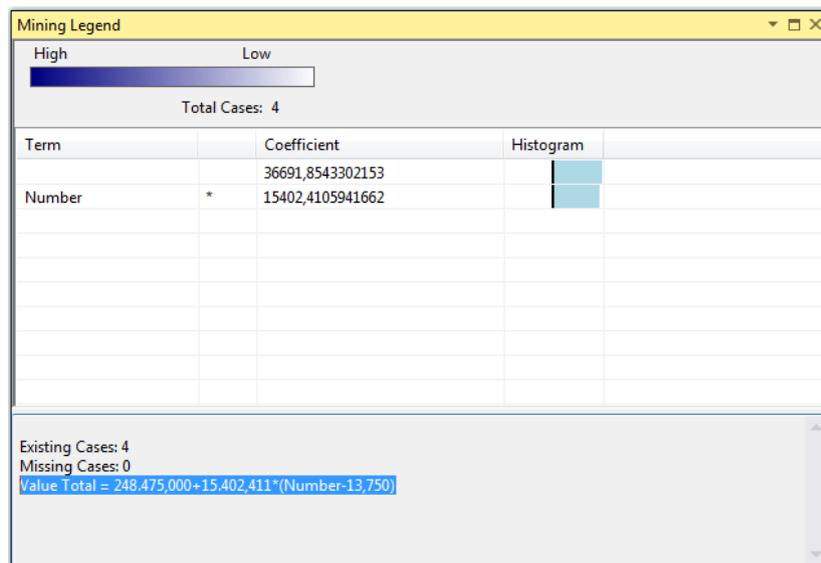


Figure 6. Regression model for the link between the number of contracts and total value of incomes from contracts

4. Conclusions. Future research interests

The multidimensional data instruments proposed in this paper allow the management of a consultancy company some proper tools for analyzing its portfolio of successfully implemented projects, to draw valuable information for future decisions related to market development, market expansion and customer services improvement. Also, the synthetic values aggregated across relevant dimensions can be added to the “business card” of the company during future negotiations with potential beneficiaries, whose attention might be drawn by the proven successes of the consultancy teams.

Given the business model of the consulting company, it would be of utmost importance to have also an instrument to measure the efficiency of the projects. The dimensional model presented in Figure 1 can be expanded, based on the criteria of shared dimensions, to include attributes for the project characteristics; one of the most important is the Internal Rate of Return. According to the call for projects guides (for example see <http://files.finantare.ro/2015/pndr-ghid-submasura-7.2-agricultura-infrastructura.pdf>, in Romanian language), this value should be computed both from the financial and economic viewpoints of the cost-benefit analysis. This rate is influenced by many factors, such as the number of beneficiaries, their age/demographic structure, the surface of the terrain affected by the works, maintenance costs, including labor force for maintenance etc. One section of the cost-benefit analysis demands the analysis of sensitivity for some factors. By generalizing this operation, the financial and economic IR rates could be provided with multiple regression models, able to help the project team in making decisions on some aspects of the project. Thus, a future preoccupation of the author will be the physical implementation of this component and the study on how regression method could be used to optimize the design of the project, while achieving maximum of points during the evaluation process.

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