

MODELING AND OPTIMIZING THE BUSINESS PROCESSES USING MICROSOFT OFFICE EXCEL

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ABSTRACT

Business process management is a management approach based on aligning all the company's activities along with the customers' needs and wishes. It is a method that promotes the company's efficiency, but in the same time leaves an open place to the innovation, flexibility and integration with other software applications. Business process modeling is trying to continuously improve the work processes within a company. Business process modeling helps the companies to be more efficient and more able to change than the companies that are based on a traditional hierarchical management.

Key words: modeling, simulation, optimization, business, Excel

1. THE IMPORTANCE OF MODELING WITHIN THE BUSINESS PROCESS MODELING

The business process modeling is the easiest, with the lowest risk and the highest rentability investment that a company can do, in order to become more efficient.

The key features of globalization which includes the services sector target high technology, capital investment, management and marketing performance.

The globalization of services, generated by using modern technology, has led to a quantitative growth but also a qualitative leap in the development of services.

According to the opinion of specialists, the globalization determines a strong increase of competition between business partners in services, for conquest of known market segments targeted by the offer and to conquer new segments.

Analyzing the business processes will review in detail, through discussions with the company's employees, the existing business processes. The interviews will be both direct and cross interviews. After a detailed analysis of the processes, the consultants will document and deliver the results.

After documenting the processes, the consultants will start to optimize them using the business process re-engineering techniques. This way, the analyzed company will become more efficient and will use the best processes at that moment.

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After optimizing the business processes, the deciders will ensure that there are indicators which are necessary to measure each process, so that the user will be able to improve the processes in the future, based on relevant performance indicators.

Advantages from the operational costs' point of view:

- Automatization – removing the manual work by automating the operations using the software applications
- Capturing the information – capturing the information from the process, in order to better understand the flow and streamline the process.
- Sequence – changing the sequence tasks with parallel tasks
- Disintermediation – removing the intermediates from the processes, this way to efficient the process.

Advantages:

- To become proactive
- To have roles and well defined responsibilities, to know who to contact in each situation, to improve the timing in taking decisions
- To remove the work overload
- To learn from experience
- To increase the quality of the products and services
- To align the business strategy with the offered services
- To measure our performances
- To be scalable

2. DATA MODELING IN EXCEL

The spreadsheets can be used not only to create tables, charts and simple calculations, but also to create complex mathematical models. Due to easiness which it can be used, many financial applications are being solved with the spreadsheet systems.

One of the most popular systems of this type is the software product **Microsoft Office Excel**. It can also be used other spreadsheets programs, e.g. *OpenOffice.org Calc*.

Unfortunately, even if Excel is a software with a very strong platform, which can be used to solve a large variety of financial issues, the most Excel users are using only its' base capacities.

In the modeling process of the financial decision, Microsoft Office Excel offers a range of financial functions, which can be found within Insert Menu.

Modeling and simulation are necessary when direct experimentation on a real system is not possible or desirable.

Simulation is a process through which a model of a real system is build and experiments are made with this model, in order to understand the system's behavior and/or evaluate different strategies for the analyzed system.

Table 1: Simulation and optimization menuiu



Currently, an increase of the simulation usage in different domains can be observed. This situation was favored by many factors:

- Increasing the number of simulation software tools
- Existence of some simulation packages for specific problems.
- The convenient prices that most of the available software packages can be bought.
- The simulation software packages do not, generally, require a particular technical expertise in order to be used.
- Current computer systems can provide large amounts of data necessary for the simulation experiments.

Data modeling tool with PowerPivot

PowerPivot is a software program in addition to Office Professional Plus Excel 2013 which can be used in order to perform strong data analysis and to create sophisticated data models. PowerPivot allows an Excel user to combine large data amounts from various sources, to quickly perform information analysis and to easily share details.

Both in Excel and Power Pivot, you can create a data model, a collection of tables with connections. The data model that you see in a spreadsheet from Excel is the same with the one that you see in PowerPivot window. All the data that you input in Excel are available in PowerPivot and vice versa.

The main difference between them is that you can create a data model much more sophisticated working in the PowerPivot window. Let's compare some activities.

Table 1: Activities from Excel with PowerPivot

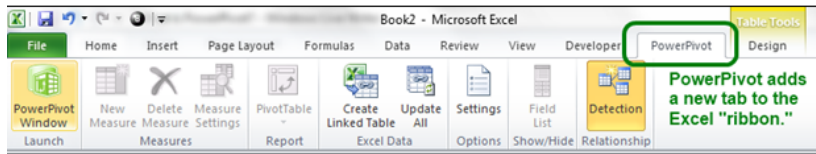
Activity	Excel	PowerPivot
Import data from other sources, such as big corporate databases, public data flows, spreadsheets and text files on the computer	Import all data from a data source.	Filter the data and rename the columns and tables during the import.
Create the tables	The tables can be on each spreadsheet from the workbook. The	The tables are organized in pages with individual sheets in PowerPivot window.

	spreadsheets can contain more tables.	
Edit data within a table.	You can edit values in individual cells from a table.	You cannot edit in individual cells.
Create connections between tables.	In Connections dialog tab.	In See Chart or in Create Connections dialog tab
Create the calculation	Use the Excel formulas	Write complex formulas using the expressions language Data Analysis Expressions (DAX).
Create hierarchies		Define the Hierarchies to be used every where, in a workbook, including Power View.
Create the KPIs		Create KPIs to be used in PivotTable and Power View reports.
Create the Perspectives		Create the Perspectives in order to limit the number of columns and tables that the users of the workbook can see.
Create Pivot Table and Pivot Chart reports.	Create PivotTable reports in Excel.	Click the PivotTable button from the PowerPivot window. More about creating the Pivot Table and PivotChart reports from PowerPivot
Improving a model for Power View.	Create a database model.	Make improvements, such as identifying the default fields, the images and unique values.
Using the Visual Basic property for Applications (VBA)	Use VBA in Excel.	Do not use VBA in PowerPivot window.
Group the data.	Group the data in a PivotTable report in Excel.	Use DAX in calculated columns and calculated fields.

The data you are working in Excel and Power Pivot window are stored in an analytical database within the Excel workbook, and a strong local engine uploads, interrogates and updates the data from that database. Because the data are in Excel, these are immediate available in the PowerPivot, PivotChart, Power View reports and other features from Excel, that you use to aggregate and interact with data. The presentation and interactivity of all data are provided by Excel 2013; and data and Excel presentation items are included in the same file of the workbook. PowerPivot accepts files with a maximum 2 GO size and allows you to work with data until 4 GO size memory.

The workbooks that you modify with PowerPivot can be shared with other people in all the ways you share other files. However, you obtain more advantages by publishing the workbook in a SharePoint environment which has the Excel Services application enabled. On the SharePoint server, the Excel Services application processes and restores the data in a browser window where other persons can analyze them.

Table 2: Power pivot



In SharePoint2013, you can add PowerPivot for SharePoint 2013, in order to get extra assistance for collaboration and management of documents, including the PowerPivot Gallery, PowerPivot management dashboard from Central Administration, scheduled refresh of data and the ability to use a published workbook as external data source from its location in SharePoint.

Despite the general opinion, Microsoft Excel is designed for general purpose calculation, achieving charts and statistical operations, not having limited applicability only to financial accounting field.

Due to inclusion in Microsoft Office package, this software application is installed on most computers running one of the Windows version.

It is recommended to make calculations and charts in Microsoft Excel, because it has all the advantages of using the combined components of Microsoft Office Application: efficiency, easy transfer of information between documents by copying, setting some connections between the original copy, incorporation of new data by copying the existing information or insert through some objects.

In the next pages, it will attempt a brief description of this software application, by describing the main functions and how these can be used, in order to make complex mathematical calculations.

Data analysis tool by simulation with scenarios

In any institution from the tourism domain, at the economic activities level, there are one or many indicators, which by their value, determine the values of one or many other indicators. Solving in Excel such situations is made through a **model**, where indicators that influences, represents the **independent variables**, and the influenced ones are **dependent variables**, also named **objective functions**.

In a model it can be studied the variation of one or more dependent variables, based on one or two independent variables. A range of values are assigned to Independent variables, indicating a possible evolution **scenario** such as "**if the value of independent variable is ... the value of function is...**". Scenario's results are obtained in an Excel table.

If it indicates a single independent variable, it says that the table is with one entry and in this case it can be studied through a simple script the variation of multiple dependent variables (objective function).

If it indicates two independent variables, it says that the table is with two entries in this case can follow the evolution of a single objective function. In this case, the scenarios management is used (Scenario Manager ...) from Microsoft Office Excel.

If more than two independent variables are necessary, or it is desired an optimal value of the objective function, or restrictions are applied on the variance, it is used the **Solver** utility from Excel.

The scenarios are used when it is necessary to study variation of the values of two objective functions (dependent variables), depending on the variable value of a single indicator that influences them (independent variables). Depending on the values of the independent variable, the objective functions will have different values.

Case study

A hotel rents rooms on a unit cost $c = 215$ and a room profit for $p = 75$. The total cost per number of rooms $x = 100$ is $C = c * x$, and the total profit is $P = p * xs$, where $s = 0.9$ is the exponent of the profit decrease with increasing the number of rooms (due to the need to provide more tourist places).

Goal: study the variation of C (total cost) and P (total profit) in relation to the number of rooms, respectively 25, 50, 75 and 100.

Table 3: Example of a hotel rental rooms

B11			fx: =B\$4*B\$2*B5			
	A	B	C	D	E	F
1	INDICATORS	DATA				
2	Daily rental rooms, x	100				
3	Cost/room, c	215				
4	Profit/room, p	75				
5	Size exponent of profit, s	0.9				
6						
7	SCENARIO (TABLE WITH AN ENTRY - x)					
8	OBJECTIVE					
9	Daily rental room, x		25	50	75	100
10	Total cost, C	21500	5375	10750	16125	21500
11	Total profit, P	4732	1359	2536	3653	4732

Table 4: Data table

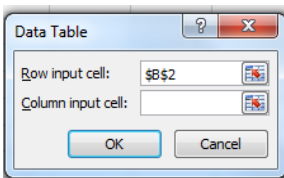
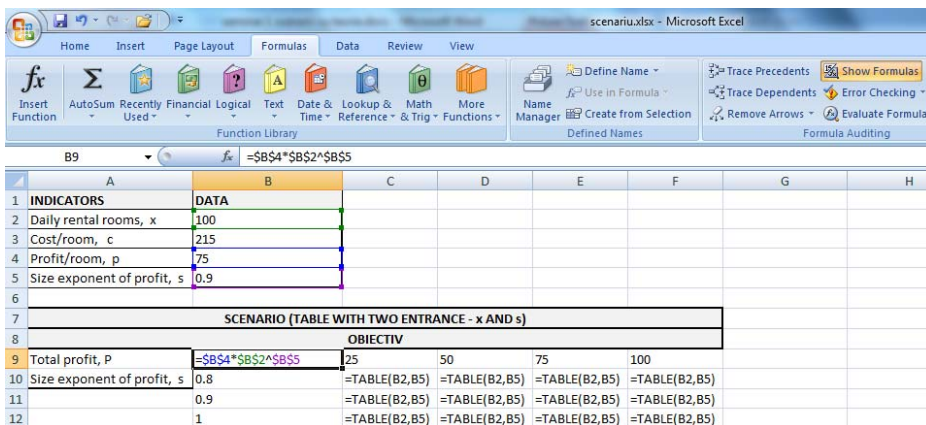


Table 5: Size exponent of profit calculations

	A	B	C	D	E	F
1	INDICATORS	DATA				
2	Daily rental rooms, x	100				
3	Cost/room, c	215				
4	Profit/room, p	75				
5	Size exponent of profit, s	0.9				
6						
7	SCENARIO (TABLE WITH TWO ENTRANCE - x AND s)					
8	OBJECTIV					
9	Total profit, P	4732	25	50	75	100
10	Size exponent of profit, s	0.8	985	1715	2372	2986
11		0.9	1359	2536	3653	4732
12		1.0	1875	3750	5625	7500

Table 6: Show formulas for the case study



	A	B	C	D	E	F	G	H
1	INDICATORS	DATA						
2	Daily rental rooms, x	100						
3	Cost/room, c	215						
4	Profit/room, p	75						
5	Size exponent of profit, s	0.9						
6								
7	SCENARIO (TABLE WITH TWO ENTRANCE - x AND s)							
8	OBJECTIV							
9	Total profit, P	=B\$4*B\$2*B\$5	25	50	75	100		
10	Size exponent of profit, s	0.8	=TABLE(B2,B5)	=TABLE(B2,B5)	=TABLE(B2,B5)	=TABLE(B2,B5)		
11		0.9	=TABLE(B2,B5)	=TABLE(B2,B5)	=TABLE(B2,B5)	=TABLE(B2,B5)		
12		1	=TABLE(B2,B5)	=TABLE(B2,B5)	=TABLE(B2,B5)	=TABLE(B2,B5)		

Monte Carlo Modeling Method

The Monte Carlo simulation method is more and more applied in business domain, in order to investigate the stochastic problems or risk conditions, when the same course of action might have more consequences, whose probability can be estimated.

The variables whose values are not known with certainty, but can be described by probability distributions are called stochastic or probabilistic variables. In the simulation, to mimic the variability of such variables it is necessary to generate its possible values based on the probability distribution.

The probabilities have an important role in modeling the situation, where stochastic sizes are involved. During simulation, the knowledge regarding probabilities is necessary both in the construction phase of the simulation model, as in the analysis phase of the simulation results.

The probabilities can be obtained in several ways. The simplest way is the subjective method, through which the experts estimate on a scale from 0 to 1, the probability that a certain event to take place. Another method is the objective one or the method based on *relative frequencies* which are using the historical data or gained by direct measurement of the values of a stochastic size.

3. CONCLUSIONS

In conclusion, modeling and simulation using Microsoft Office Excel can contribute to understand and improve a real system. Although a system can be extremely complex, it is good to attempt to create a model as simple as possible. This is obtained both by defining the boundaries of the analyzed system, so that only the essential features in terms of analysis's objective, and by defining some simplifying assumptions.

The model can be improved by redefining the limits and relaxing the assumptions. On the other hand, if you try to include in the model all the factors and relationships, the model might become too complicated to be solved. That's why it is necessary to make a compromise between the necessity to build a simple and easy model and the necessity to get through the model a reasonable and plausible representation of the real problem.

The simplest model is the deterministic one, because it makes the assumption that all the model's data are reliable. In some cases, this type of model is very valuable. In addition, by applying the sensitivity analysis some simplifying assumptions that underlying these models can relax and can better understand and explain the results of the resolution.

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