

The Multidimensional Data Model of Integrated Accounting Needed for Compiling Management Reports Based on Calculation EBITDA Indicator

Yatsenko Viktoria

Kherson National Technical University, 24, Beruslavske st., Kherson, 73008 Ukraine
Viktorijajacenko@rambler.ru

Abstract. Organization and method of assembly management report using a definition of EBITDA indicator (Earnings before interest and tax, amortization and depreciation) are considered on the practical example of Kherson river port's activity. The process of constructing a multidimensional model, that is necessary for determining EBITDA of integrated accounting using the program "IC: Accounting for Ukraine", and implementation of the model using PivotTable in MS Excel are represented. The range of possibilities to implement the process named "Data Mining" of the models is demonstrated. The management report, formed on the basis of multidimensional data model is used to determine the profitability of the business units, business processes and enterprises considering the organizational architecture of the entity.

Keywords: Multidimensional data model, EBITDA, Pivot table, Management Reporting.

Key Terms: KnowledgeManagementMethodology, Management, Model, ModelBasedSoftwareDevelopmentMethodology.

1 Introduction

The process of the evolutionary development of accounting and reporting in Ukraine has a long history of changes and qualitative transformations, first of all, resulting from the wish to timely provide the various groups of interested users with the reliable data. The accounting and financial reporting is considered by lots of people as a formally obligatory phenomenon approved and regulated by the state legislation. Actually, it is a fundamental basis of the de facto existing accounting and analytical system able to perform the primary functions of a business management.

The current realia of a business management require expanding the boundaries of the existing accounting and reporting systems by means of including the tasks of planning, control and performance measurement regarding the activities, business processes, business units, the company as a whole, and elaborating the strategy of operation and development. Additional "non-standard" for the accounting requests

from the information users and different vision of the functional tasks' development essentially enforces the formation of various types of accounting (financial, fiscal, management, strategic, etc.) and the methods of data interpretation in order to define the financial indicators such as (EBIT, EBITDA, ROA, TIER etc). One of the priority trends of the accounting development is creating the accounting and analytical system of a company that can provide all the necessary information to every level of management on a real-time basis. In this paper we present a variant of an integrated accounting data model on a company incomes and expenditures allowing you to create the management report items based on the indicator computation EBITDA, and which is in practice used at Kherson river port.

2 The System of Integrated Accounting

New approaches to shaping the views of the category "accounting" are based on the theory of the system: any system can be represented as a set of the inter-related and linked elements forming a certain unity and value. In addition, it is necessary to emphasize the impact of the system theory on understanding the accounting system as a multidimensional and complex informational space. Determination of the core system features is an important factor allowing seeing the accounting elements in a single accounting system. These features include: the ability to assess data to solve problems in the same monetary units; matching the economic resource cycle model, their origin, and business processes represented in the general Chart of accounts; actuality and retrospectiveness of the data obtained within the framework of accounting; legal (documentary) proofs of business transactions. The system approach to formation of the indicators to draw the various forms of reporting (financial, statistical, fiscal, management) makes it possible to assert of the establishment and operation of an integrated accounting system.

In recent years, the problem of integration of the accounting information has become particularly relevant for the scientists. A lot of them raise the issue of the necessity to get the information that allows separating the costs not only for the reproducing process as a whole, but also for all types of the core and service processes which is important to identify the most costly processes, develop measures to reduce the costs for their implementation [1].

The integrated accounting is the main element of the accounting and analytical business management and the basis for the accounting system functioning that allows you to transform information in order to draw various forms of reporting and identifying the indicators characterizing the degree of the approved plans implementation.

Analysis of the possibilities of the special-purpose programs of various decision support systems (DSS) available on the Ukrainian market confirms that the software products meet the requirements put forward by the modern company executives and enable to simulate any business processes with due consideration of the external and internal factors, and can automatically calculate the economically sound company's performance indicators. The main criteria for choosing the software for the Ukrainian companies is the minimum price, usability, compatibility with accounting programs usually on the 1C platform, and preferably not involving any IT experts.

3 The Multidimensional Data Model

Let us give consideration to the real-life experience of the Kherson river port on solving the tasks mentioned.

Evaluation of the performance of the Kherson river port is based on the EBITDA indicator, which, according to the foreign authors, is the key to determine the profitability, and is used all around the world [2].

The indicator EBITDA (Earnings before interest and tax, amortization and depreciation) means Earnings before interest, taxes, depreciation and amortization [3]. There are several algorithms for calculating EBITDA. The company in question uses the following order to calculate the analytic indicator, as adapted to the realities of its economic activity:

$$\text{EBITDA} = \text{NP} + \text{ITE} - \text{SIT} + \text{IE} - \text{EI} + \text{AA} - \text{DA}, \quad (1)$$

where NP - net profit, ITE - income tax expense, SIT - satisfied income tax, IE - interest expenses, EI - earned interest, AA - amortization of assets, DA - depreciation of assets.

Kherson river port maintains the financial accounting and prepares financial statements pursuant to the national Regulations (standards) of accounting (NP(S)A) and the International Financial Reporting Standards (IFRS) in parallel, which meets the requirements of the Law of Ukraine on Accounting and Financial Reporting [4]. It is clear that the definition of EBITDA is not possible on the basis of the financial accounting data without further transformation.

The process of accounting and financial reporting at the company in question is automated using "IC: Accounting for Ukraine". Necessary details of the accounting data in "IC Accounting for Ukraine" as the raw data to determine the resulting indicator EBITDA is achieved by constructing a hierarchy of the analytical accounting levels through the structured directories for storing objects that can be hierarchically classified according to selected features. Important for the determination of EBITDA and preparation of management reports is the organizational structure, under which one should understand a complex of the typical elements of accounting in general and some of its parts in particular. Given the category features and integrated accounting, to build a multidimensional data model of EBITDA determination, a basic scheme of the integrated accounting of income and expenses is used at the company in question on the "asterisk" principle (table 1).

Construction of the model takes into account the complex organizational architecture of the company as well as the details of its activity. The point at issue is that the business units of the company are strongly interrelated and also perform the maintenance functions of the company in general, therefore, it is important to separate the data relating to the internal business volume to prevent any result misrepresentation.

Table 1. The multidimensional organization model of the integrated accounting of the Kherson river port.

Characteristic	Period	Subject	Object	Area	Dimension		
Dimension of characteristics	Month	Business Unit (BU activity)	Impact on the result of activity (+/-)	Type of activity	Data unit		
Meaning of characteristics	Year	I half-year	I quarter	January	Elevator	Income	
				February			
				March			
		II quarter	Port	April	Complex fleet service Mechanization	Internal turnover	Operating Financial Another
				May			
				June			
	III quarter	July	Another	Internal turnover	Operating Financial Another	Result of dimension	
		August					
		September					
	II half-year	IV quarter	Sand	Costs	Operating Financial Another	Result of dimension	
			October				
			November				
		Non-core assets					
		December					

4 Implementation of the Model in Pivot Table MS Excel

The process of drawing a management report based on EBITDA for the Kherson river port is realized in the pivot Excel tables, "... one of the most convenient means applying the OLAP technology, the main purpose of which is to process information for analyzing and decision making. The advantage of OLAP is to create queries using flexible ad hoc approaches without involvement of the IT experts. The pivot tables

provide using of the multidimensional classifications, detail and integration of the data, identifying trends, patterns, forecasting, analysis, thus representing a weighty tool for operation of the accounting and analytical system of a multi-segment company in the real-time mode" [5].

Formation of items of the management statements based on the multidimensional data model of the integrated accounting and the algorithm for determining the EBITDA indicator in the pivot Excel tables are shown in Table 2,3.

Table 2. The management report items in the Pivot Tables in MS Excel of the Kherson river port.

Status	The management report items	Abbreviation
(=)	Total revenue	TR
(-)	Logistics costs	LC
(-)	Special engineering	SE
(=)	Present revenue	PR
(=)	Variable costs	VC
(=)	Marginal revenue	MR
(=)	Marginal revenue, %	MR, %
(-)	Material costs	MC
(-)	Energy	E
(-)	Insurance	I
(=)	Services of external organizations	SEO
(-)	Staff costs	SC
(-)	Depreciation	D
(-)	Change of residues unfinished goods and finished goods, corrections of balance residues	CBR
(-)	Operating taxes	OT
(=)	Fixed costs	FC
(=)	Total profit	TP
(+)	Other income	OI
(-)	Other costs	OC
(=)	Profit before taxes 1	TP1
(+)	Financial income	FI
(-)	Financial costs	FC
(=)	Profit before taxes 2	TP2
(-)	Income tax	IT
(=)	Net profit	NP
(=)	Net profit, %	NP, %

Table 3. The calculating algorithm of performance indicators of the management report in the Pivot Tables in MS Excel of the Kherson river port.

Indicators	Abbreviation	Algorithm for calculating
Total revenue	TR	<i>SUM</i> (TR_ cargo fleet; TR_ transportation fleet ports; TR_ cargo handling; TR_ comprehensive fleet maintenance; TR_ rental income; TR_ industrial activities; TR_ non-core activity; TR_ other income)
Present revenue	PR	<i>SUM</i> (TR; LC; SE)
Variable costs	VC	<i>SUM</i> (v_ fuel; v_ material costs; v_ port charges; v_ energy; v_ taxes)
Marginal revenue	MR	<i>SUM</i> (PR; VC)
Marginal revenue, %	MR, %	<i>IF</i> (TR=0;0;MR/PR)
Services of external organizations	SEO	<i>SUM</i> (f_ assignment; f_ repair; f_ rent; f_ connection; f_ other costs)
Fixed costs	FC	<i>SUM</i> (f_ material costs; f_ energy, f_ insurance; f_ services of external organizations; f_ staff costs; f_ depreciation; f_ corrections of balance residues; f_ operating taxes)
Total profit	TP	<i>SUM</i> (MR; FC)
Profit before taxes 1	TP1	<i>SUM</i> (TP;OI;OC)
Profit before taxes 2	TP2	<i>SUM</i> (TP1;FI;FC)
Net profit	NP	<i>SUM</i> (TP2; IT)
Net profit, %	NP,%	<i>IF</i> (PR =0;0; NP / PR)
EBITDA		<i>SUM</i> (NP; IT; FC; FI ; D)

5 Capabilities of the Model

A management report implemented in the pivot tables represents the data as to several informational slices - forming a subset of a multidimensional amount of data corresponding to one or more elements of measurement. For example, selecting a subset of values of the company's fixed costs over certain time, as a structural unit in general, and those of a business unit in particular, highlighting the internal business volume (fig. 1).

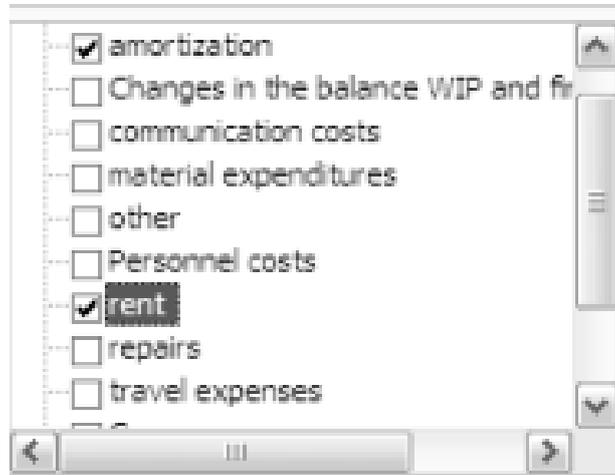


Fig. 1. Detailed fixed costs of the Kherson river port.

The model can not only be used for determining EBITDA and making a management reporting form, but can be a basis for implementation of the process of "Data Mining". Therewith, the spectrum of the problem solving by methods of Data Mining can be broad enough, from the sales revenue classification by types and business units to feasibility of a business unit in view of the internal business volume (fig. 2).

The screenshot shows an Excel spreadsheet with a dialog box open. The dialog box contains a list of values with checkboxes, including 85,5, 145,3, 181,8, 244,0, 823,8, 1 519,6, 2 499,7, 2 854,7, and 7 527,3. The spreadsheet table below is as follows:

	indicator	sum	internal	fleet	internal	ports	I quarter
11	Total revenue	2 854,7	397,3	1 078,3			
12	TR_cargo fleet:						
13	TR_transportation fleet ports;	244,0	244,0	244,0			
14	TR_cargo handling;	181,8		181,8			
15	TR_comprehensive fleet maintenance;	145,3	145,3				
16	TR_rental income;						
17	TR_industrial activities;	1 519,6		567,0			
18	TR_non-core activity;	823,8		85,0			
19	TR_other income	85,5	8,0				

Fig. 2. Detailed total revenue by origin and business-units including internal turnover.

6 Conclusion

Analysis of practical experience in the construction and operation of management accounting at the company in question, the reporting procedure for management and the algorithm for determining EBITDA are indicative of using the accounting system for the absorption - costing system which is focused on the owners (investors) requests regarding the effectiveness of the funds invested.

Organization of accounting using "1C Accounting for Ukraine" allows representing accounting as an information system in the form of a multidimensional data model to achieve a number of results, namely the creation of a single integrated accounting system, which meets both, "standard and non-standard" user requests; bridges the gap between the formation of actual financial and management accounting data; summarizes data for the preparation of management reporting forms with a given level of detail.

Use of the Pivot Tables in MS Excel provide for the appearance of new aspects of actual data usage, introduction of new connections between the data of financial and management accounting, which in turn does not lead to reconstruction of the whole accounting model and accounting database in general. In the pivot tables there are tools of data analysis allowing for the intellectual assessment, that is to summarize, group, delete unnecessary data, or increase the reliability by establishing links and accuracy of calculations. Good design of the tables can significantly facilitate the laborious process of making the management reporting forms and analyzing the company's activities.

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