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ACCOUNTANCY

ABSTRACT OF DOCTORAL THESIS

Developments and enhancements concerning management accounting and cost calculation in energy mining industry

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CONTENTS:

DEVELOPMENTS AND ENHANCEMENTS CONCERNING MANAGEMENT ACCOUNTING AND COST CALCULATION IN ENERGY MINING INDUSTRY

Key-words: management accounting, cost calculation, cost calculation methods, target cost, Activity - Based Costing, calculation method target - costing, ABC method, Balance Scorecard, performance, economic & financial indicators, revenues, expenditures, energy mining industry, financial constraints, optimal modeling, economic management, cost control, SWOT analysis, econometric models.

1. Motivation, timeliness and interest in research topic

The motivation for choosing this topic was the desire to identify ways to streamline the business entities in extractive mining of Romania, which is facing now a number of problems arising from lack of investment, and lack of effectiveness and efficiency. By developing a system to integrate the organizational objectives with the activities and costs, we want to study the impact of information obtained on efficient cost management, resource allocation and / or streamline processes.

From a theoretical perspective, this paper aims to bring more knowledge regarding the definition and analysis of management accounting methods and techniques and calculation of energy costs in mining industry in our country, proving the importance of their use and establishing a general framework of approaching the issue.

By applied perspective point of view, the results of the survey are intended to provide a clear answer to your questions about sizing and dynamic costs of mining industry, as well as those related to assessment of system-level performance, in terms of cost. Also, the relevance of the topic approached in this paper can be found in close connection with its potential future contribution over the development stage of knowledge of the approached field.

Because any research field needs to set its size of progress and to define their conceptual cues, the ***motivation and importance of this research*** is found between economic research priorities respectively re-assessment of management accounting concepts, cost calculation and performance in energy mining industry, which is not a static universe, it is a dynamic environment, whose main objective is adding value to.

Topic of this approach is motivated, firstly, by the fact that management accounting research methods applicable to energy mining industry must be placed in the contemporary economic, national and international context and, secondly, by the need for impetuous renewal and improvement of cost calculation in order to reflect realistic results achieved by energy mining industry closely related to the requirements of the stakeholders.

The significance of this scientific research can be justified at least by the following arguments:

- contributes to the development of the state of knowledge in the field of management accounting and cost calculation, with direct implications on the performance management at Oltenia Energy Complex level, respectively Pinoasa mine;
- contributes to the knowledge of the stages that have marked the evolution of conceptual management accounting and performance assessment;
- performs presentation and detailed analysis of the size, specific methods and techniques of management accounting and cost calculation, emphasizing the ABC method, by which the management accountants in energy mining can accurately appreciate the costs involved in operating activities and processing, specific to this industry;
- highlights the fact that in current economic and financial context, in the process of quantifying the impact of ABC method application, the processes of planning, budgeting and forecasting, designed to reduce decision-making and performance limits have a particular significance;
- performs an empirical research that has led to costs' direct and indirect identification and analysis, related to energy mining processes, as well as to allocation of indirect costs and calculation using the ABC method of lignite and ballast cost production, if talking about Pinoasa mine, within the Energetic Complex of Oltenia. Through empirical study we tried to stop over one of the economic research priorities, namely, finding those elements that best reflects the actual costs, and ultimately, building econometric models to characterize the energy mining industry from Romania.

Due to the complexity and social implications, the mining system in Romania generates, and to motivation outlined in previous paragraphs, we consider that the topic, ***"Developments and enhancements, concerning management accounting and costing in energy mining industry"*** is one ***of great interest*** and its approach requires practical experience, research work and perseverance.

2. Research context

Financial and economic crisis, whose effects still appear to make their presence felt, accelerated globalization and rapid technological development, entities' merger or partnership, the exponential growth of digital economy or entities borders suppression represents only a part of causes, that forced conversion of management accounting and cost calculation, in order to adapt theirs content to information requirements of entities, which are in a constant change.

Since the occurrence of management accounting has been referred only to calculation of cost of production, as time goes on, new information dimensions have been added, related to identifying ways to streamline the activities of cost reduction and budgetary control. "Management accounting has evolved historically, along with development of commodity production and market economy - competition. Since the market was the manufacturer's exclusively, due to shortages of goods demanded by consumers, so, of underproduction, the role of management accounting could have been summarized to full costs calculation, enabling the manufacturer to adjust his prices to the movement of costs. Over time, due to increased competition, as well as arrival of new management models, of technical progress, etc., there were changes in economic power position on the market, from producers to consumers and all these have influenced the development of management accounting systems oriented towards forecasting level and cost structure, and especially to their operative control".

Precisely for these reasons, the management accounting applicable to mining industry has experienced a number of development and enhancements, all of these being similar to those from manufacturing industry.

Within this industrial context, the production costs are the specific costs of commercially marketable products and include all costs related to the mining and processing. Within the context of this industry, production costs are the specific costs of commercially marketable products and include all costs related to the mining and processing. The fundamental issue, however, aims at dealing with various methods of management accounting applicable to energy mining industry, referring to optimal choice of cost centers, so that, they can be used in external reporting. There are a large number of possibilities regarding establishment of cost centers, but they vary greatly in size.

Mining energy is one of the pillars of national economies functioning and the world's economy, as a whole. The energy is the main strategic factor in global economic policies and economic development and the current concerns are focused on production streamlining, supply and consumption of energy, in order to ensure sustainable development

Due to the incident at Fukushima in 2011, there has been a 50% decrease of development programs for new nuclear plants until 2035, and the main result of this measure is share decrease of atomic energy by 90%. It is obvious that, in these conditions, the energy provision should be made by using coal reserves or through use of renewable energies. If for the production of renewable energy, the researches are still at an early stage, requiring large investments to achieve profitability, in case of energy obtaining by using the "black gold", only the action of streamlining activities is needed, in the context of an entire infrastructure necessary for coal extraction.

As for the year 2011, the global coal reserves were of 900 billion tons, 470 billion tons of coal (anthracite and hard coal) and 420 billion tons of inferior coal (lignite and brown coal). The estimated total reserves / existing global production report in 2011 means the opportunity to exploit these reserves and use them to provide energy for the next 145 years, and Europe is ranked as second provider, in terms of volume of coal available.

The existence of a large amount of coal reserves available on global and European levels raises a series of issues related to effective and sustainable management of these reserves, such as:

- The need for long-term planning of future coal ways of use, in order to be used over several generations;
- Achieving economic efficiency in terms of extractive activities profitability and recovery of the capital invested in mining by entrepreneurs;
- Using some profit shares, in order to develop research activities and development in mining area.

Across Europe, Romania is ranked on the 7th place in terms of production and consumption of lignite. Given the amount of coal available, it is obvious that this resource in the coming decades will be the basis of energy production in the European Union, a limiting factor of Member States' dependence on energy imports, and will reduce the vulnerability towards a energy crisis. According to statistics, over 90% of lignite production and 67% of hard coal

production in the European Union are being used to produce electricity and thermal energy in power stations.

Even if, due to the volume of mineral deposits, Romania has a long tradition in their exploitation, the mining units have a small and medium production, mining being practiced on a small scale. Also, due to lack of investment in modern technology, mining has negative effects for environment, requiring both, mines reequipping in order to increase production and compliance with existing environmental standards.

Repositioning the importance of energy mining, in energy production, as well as the significant reserves of coal in Romania were the first factor, that influenced the choice of this paper's topic - the issue of improving management accounting and cost calculation in this industry. Subsequently, by studying mining extractive activity of Oltenia Energy Complex S.A., I identified the mine with the highest cost of production of lignite - (Pinoasa mine) and I want, by applying the modern methods of management costs to find an answer for the questions about cost veracity and relevance, as well as to streamline the work of the mine on the basis of rational decisions based on the results of modern methods used.

3. Epistemological Positioning of research

Epistemological Positioning of research aimed determination of:

- the issue;
- the hypothesis;
- research methods;
- methods for validation of hypothesis.

The main research question was formulated as follows: *What are the possibilities for implementation, development and enhancement of the ABC method in management accounting and costing, used in the energy mining industry in Romania?*

From here implicitly emerged other questions:

1. To what extent the process of quantifying the impact of ABC method application in the context of planning, budgeting and forecasting aims to diminish the limits of decision-making and performance processes in energy mining industry?

2. What are the direct and indirect costs related to mining processes?

3. How can we streamline the process of indirect costs sharing?

4. How can the production cost of lignite & ballast be calculated by using the ABC method in case of Pinoasa mine, within the Oltenia Energy Complex.

5. What are the elements that best reflects the real costs specific for mining industry from Romania, in the context of a detailed analysis of Pinoasa mine within Oltenia Energy Complex structure?

Through highlighted issues, this thesis seeks the confirmation of the fact, that currently the economic entities actively involved in mining industry must approach the issue of energy costs in a manner specific to performance management, because sustainability of this activity can be provided only by indicating the social responsibility and environmental protection.

4. The research hypothesis

The hypotheses underlying the research were:

I1. State of knowledge and development of management accounting and cost calculation, with direct implications on performance management, have led to new approaches and implementation of cost calculation;

I2. Dimensions, specific methods and techniques of management accounting and cost calculation analysis reveals that new approaches of management accounting and cost calculation meet better managerial accounting needs in energy mining, who can properly asses the costs involved in operating activities and processing specific to this industry.

I3. Identification of the most suitable method of cost calculation in mining industry is an improvement of the cost system, in the context of planning, budgeting and forecasting, designed to diminish decision-making and performance limits.

Since the S. CEO S. A. uses traditional methods of management accounting and cost calculation, when calculating the unit cost of lignite, we concluded that the most relevant method for determining the unit cost of lignite is ABC method. Also, the case study demonstrated how the results of the ABC method may be used in decision making and implementation of strategies to increase profitability. Providing an example to company's managers on how this method can be implemented and used is another utility of the results.

5. The research methodology

The research methodology involves a number of methods and techniques adapted to objectives mentioned above. As shown in the previous paragraphs, the general structure of the thesis was developed in two directions:

I. Specialized literature study and current state of knowledge outlining in approached field and

II. Research itself or applied research, which has started from grounding objectives based on conclusions drawn from current state of research analysis in conjunction with detailed analysis of how the studied entity organizes and leads itself the management accounting and costing

To achieve the research documentation were consulted over 250 bibliographic material, formed mostly of books, articles and studies published in Romanian and international scientific literature as well as legal sources or sources available on specialized websites.

Documentary research has been the basis for applied research subsequently carried out and has offered the possibility of a very detailed analysis of available theoretical results and / or validation of a set of established assumptions.

The general methodology of the research was based on three general types of research, namely: basic research, applied research and empirical research. Unlike applied research, that seeks to find solutions capable to explain the theoretical models applied in basic research, the theoretical modelling of certain phenomena is aimed. The two main types of research are therefore in a complementary relationship. The third type of research - the empirical research, completes the conceptual field of research by statistical validation of assumptions made and the results obtained by other types of research.

In order to validate the results of the research the scientific reasoning was used based on which new ideas were generated contained in the conclusions of the research.

Regarding the types of scientific reasoning used, they were inductive and deductive reasoning. For identification of research hypotheses and of data selection required to perform research and to validate the research hypothesis, a deductive reasoning was applied. The same type of reasoning was used to identify the degree in which the hypothesis validation takes place, a validation based on logic inference.

From the theoretical point of view new results were generated using inductive reasoning, by means a series of rules were selected, on which they were based.

From another perspective, of research methods classification within the present thesis both, qualitative methods and quantitative methods were used. Regarding quantitative methods,

they were mathematical, statistical methods and econometric methods. A significant part of the case study was allocated to econometric tests of formulated hypotheses, which gives the results added value.

Highlighting the current state of knowledge in the field of management accounting and cost calculation was performed using the method of scientific documentation, which involved a stage of information on existing sources, data collection, study of identified sources and synthesizing the information provided, respectively assessing the summarized results, in order to perform a critical analysis of the current state of knowledge in approached field. The methods used in this phase were content analysis and comparative method. Performing empirical research was based on data and information provided by Oltenia Energy Complex S.A. (SCEOSA) and information obtained from discussions with this entity's staff.

The approach of this research has iteratively used induction and deduction, within observation of the phenomena studied and conclusions drawn, the analysis being made both, from general to particular, and vice versa.

The research methodology used in carrying out the empirical study was based on quantitative research, which aimed the validation of the formulated research hypothesis and goals achievement, in order to demonstrate how the ABC method application may increase the performance using the information provided by it, in decision-making process.

In order to implement the ABC method were necessary data and information that were provided by various departments of SCEO S. A. Method application has been done in 2013.

We find relevant period of one year for results' validity, as thus, comparisons with budgeted amounts by entity can be performed.

As research methods there were used: direct observation, discussions with staff, data acquisition from official documents, mainly financial accounting and also other management reports, analysis and mathematical modelling.

6. General structure of the research

Research area demarcation has been generated by the following factors:

- the central theme of the thesis, namely development and enhancements concerning the management accounting and costing in mining industry;

- necessity of applying a particular accounting management method in order to assess the level of costs in the analyzed industry and to create a model to characterize it.

Therefore, the scope of the research was represented by energy industry from Romania, which has been studied in terms of how it can improve the management accounting and costing, based on the example of one of the largest energy complex namely in Oltenia Energy Complex SA.

The thesis has been structured in four research chapters and a summary chapter (general conclusions and research perspectives), where I have approached both, historical aspects and evolutionary concerning mining industry, a well as structural problems, effectiveness and economic performance, respectively the size and impact of conversion and reconversion of this industry - our country's core economy.

The main objective of this scientific approach was to analyze the possibilities for implementation, development and enhancement of the ABC method in management accounting and costing used in the mining industry in Romania. To this main objective are subscribed secondary objectives, we will present them in the following paragraphs.

Since running the research is guided by a set of objectives designed to relate the issue of energy costs in the mining industry in a scientific manner, the pursued ***secondary objectives*** aim to:

- O_1: An evolutionary analysis of the mining industry from Romania in order to highlight the importance and effects of an efficient specific costs management on performance;
- O_2: Theoretical foundations of management accounting role in increasing economic and financial performance of the entities from energy mining industry;
- O_3: Detailed analysis and theoretical foundation of the ABC method content and its development;
- O_4: Demonstration of practical valences of the ABC method, as well as econometric methods for assessing the intensity of the relationship between cost production and specific independent variables.

In turn, the secondary objective pursued within empirical study is supported by a number of ***operational targets***:

- O_{41}: ABC method implementation in the mining unit of Pinoasa;

- O_{42}: profitability analysis of extractive mining activities in terms of ABC method results;
- O_{43}: demonstration of the ABC method results and how these results can be used in decision making;
- O_{44}: providing a practical guide for implementing the ABC method and its integration into the available management accounting system, useful for managers in understanding the utility of the method;
- O_{45}: demonstrating how the econometric modelling may help to identification of available correlations between different cost categories.

This thesis seeks confirmation that currently, economic entities actively involved in mining industry must approach the issue of costs in a manner specific to performance management because sustainability of this activity can be provided only by indicating of social responsibility and environmental protection.

7. Synthetic content of the research

As mentioned, the thesis has been structured in four research chapters and a summary chapter (general conclusions and research perspectives), where we have approached both, historical aspects and evolutionary concerning mining industry, as well as structure issues, efficiency and economic performance, respectively the size and impact of conversion and reconversion of this industry - our country's core economy.

Chapter 1: *Epistemological Positioning of research in the context of influential factors development of energy mining industry evolution, nationally and internationally.*

Chapter 2: *General aspects and theoretical fundamentals regarding the management accounting role in increasing economic and financial performance of the entities from mining industry*

Chapter 3: *Theoretical approaches concerning the methods of management and cost calculation, activity-based (ABC method)*

Chapter 4: *Empirical Study on improvement of management accounting and cost calculation in mining industry by ABC Method application*

Chapter 5: *General conclusions. Research perspectives*

The first chapter of the scientific approach, "*Epistemological Positioning of research in the context of influential factors development of energy mining industry evolution, nationally and*

internationally", approaches the industrial activities in terms of evolution, chronology and development features, internationally and in our country.

One of the roles of this chapter is to place the research, epistemologically, namely to highlight the fact, that the significance of the extractive mining industry in energy production both nationally and globally, led to the formulation of this study, whose area concerns the development and deepening of the management accounting field and cost calculation in this industry. Concentration of a large number of mines in Oltenia and their management by a single entity - Oltenia Energy Complex Company, as well as quite different results obtained by these mines, in terms of lignite unit cost, has led us to choose Pinoasa mine as object of study, which has the highest value of lignite unit cost.

An explanation of this maximum values recorded at Pinoasa mine could be the very low volume of coal extracted and traditional methods used for determining the unit cost and a high degree of activity inefficiency of this mine due to lack of relevant information in making decisions concerning various aspects related to the streamline business.

From all modern methods of management accounting and cost calculation, we have stopped over the ABC method and its developments, considering it appropriate for mining industry, studying how this method can be applied, as well as studying how the information provided by this method can help to streamline activity and to increase profitability by following a decision-making process based on relevant information.

It is also highlighted the role of the mining industry in national economies, but also the realities and perspectives of this field, as outlined in the context of national strategy objectives of the mining sector.

Priorities and requirements of conversion and industrial reconversion measures' implementation, financial constraints specific to mining industry and management accounting field emergence are some of the key issues, affecting mining industry in our country.

Mining may have a successful role in generating indirect jobs in the supply chain. Such activity has a multiplication effect, which can often be very high. To an employee of a mining company corresponds usually three or four employees from other economic sector. In poor regions, where mining activity is dominant, indirect employment effects can be particularly significant.

From the literature review we have concluded that there is no economic study group - either within the World Bank nor the International Monetary Fund - which systematically capture the crucial role of extraction and mining production in economies of every country in the world.

A deeper understanding of the various components of mining industry in terms of production value, may help to illustrate the main types of benefits, this sector can generate, but also may identify how these benefits can be attracted, respectively policy options designed to ensure local economic growth in the context of mining activities.

The second chapter of the approach, "*General aspects and theoretical fundamentals regarding the management accounting role in increasing economic and financial performance of the entities from mining industry"* approaches performance from a financial, economic, social and environmental point of view making a direct connectivity with cost control as the core element of management system of efficiency and effectiveness.

Knowledge of such information is necessary in decision making and in monitoring process of the decisions execution. That is why one of the most important functions of specialists in management accounting field is working closely with managers in order to prepare accurate and relevant information for making management decisions generating performance and effectiveness.

Unfortunately, cultural and institutional differences between national accounting systems underlie various practices, reducing the comparability of financial statements between entities and therefore financial performance for investors.

No wonder, users of financial statements - both analysts, as well as shareholders, creditors, managers, tax authorities, economists - prefer an accounting database - measuring value, rather than value creation.

Performance is not synonymous with financial results of entities, because its measure can be determined by comparison with the results achieved by other entities, or in relation to suggested operational objectives.

But it is clear that performance' measure is correlated with profitability, effectiveness, efficiency and productivity, context where a one-dimensional analysis of it is not possible. In turn, economic profitability is driven by efficiency and effectiveness. Efficiency takes into account results maximization and resources minimizing used within the activities, but we can talk about efficiency when the results are set forth and their achievement requires a minimum amount of resources or resources previously established.

Regarding the social performance of an economic entity, we could not find in the specialized consulted literature a clear and specific definition of it, but only concerns about various social aspects: contribution to the Community development where it operates, compliance with sustainable development etc. It rather tries to define social responsibility of the

entity. That is why we believe that economic entities that are distinguished by a better social performance can achieve a sustainable financial performance.

Environmental performance represents "measurable results of the environmental management system, related to the economic entity's control over its environmental aspects, based on policy, general and specific environmental objectives implications". Getting by an economic entity, of environmental performance is of great importance and in the context of positive effects it may have, respectively a good environmental performance on the entity's financial results expressed through various measures (e.g. toxic emissions) positively influence the rates of financial return.

Industrialization and globalization have subsequently induced the idea that the information provided by financial accounting (overall annual result) is not enough. When making decision in order to improve the performance of economic entities, we needed much more detailed information that may be obtained by using management accounting, under the support of information system which takes into account the specificity of activity of each economic unit.

Chapter three of the initiated scientific approach "*Theoretical approaches concerning the methods of management and cost calculation, activity-based (ABC method)"* approaches *from* theoretical and practical point of view, the activity-based cost method (ABC). Through a comparative analysis between ABC method and traditional methods of cost allocation, the external and internal factors influence over decision of this method adoption is highlighted.

ABC method methodology implementation highlights the fact that it provides detailed information on the size of the added value of activities performed by entities, of costs associated with these activities, as well as of activities cost inductors. Thus, the manager’s benefit of an important tool of cost reduction by designing some products or processes that may require fewer resources and processes, being thus ensured an efficiency increase. The same result quantified in efficiency increasing may be achieved by eliminating those activities that do not provide an added value to clients or by improving of processes coordination related to suppliers or customers.

Due to the allocation and calculation of all direct and indirect costs, the ABC method is the one that has the greatest ability to asses the goods / services profitability in relation with their customers.

Once the costs of each product have been identified the profitability can be calculated as a difference between the selling price and their value, which gives a clear picture on the correlations between the entity's and the customer's expenditures or on offered added value.

Applying the ABC method should be seen as a continuous process which includes both, cost analysis and removal from their structure of activities which does not contribute to the added value growth and which has as a result a high level of entities' operational efficiency achievement.

The fourth chapter "*Empirical Study on improvement of management accounting and cost calculation in mining industry by ABC Method* application attempts to provide an example methodology for implementing the ABC method in a mine in order to identify whether ABC method results bring added value for accounting information concerning cost relevance or production cost structure.

Comparative cost structure calculated by two methods - traditional and ABC method, not only confirms the results of other studies performed in the field of management accounting and cost calculation but also attempted to validate the hypothesis according to which the ABC method allows a more even distribution of costs related to activities. It is noted that the largest differences occurs in case of staff expenditures and other operating expenses.

Based on the analysis results obtained due to case study, we consider appropriate to keep the current system of cost calculation and gradual implementation of the ABC method, at departmental level in case of administrative area or at mining points level, so as to avoid interruption of information costs flow, until the current system will be completely replaced by the new system.

Due to the complexity of the entity under review, the successful implementation of the ABC method can not be done without the implementation of a entity's resource planning (ERP) allowing integration of all available departments and functions within the entity in a single computer system, that can meet the information needs of all departments.

Following the completion of the research there are two categories of conclusions - conclusions arising from the theoretical study and conclusions related to empirical study. Both conclusions are related to the main research directions, namely, the conceptual research and estimative research. The conceptual research pursued the foundation from the theoretical point of view of improving ways of the management accounting and cost calculation using a concentrically approach of available concepts and theories, from general to particular. The estimative research also had two components - on the one hand demonstration of ways in which an ABC system can be built and implemented, as well as econometric approach of quantification of available link between production cost and independent variables that can influence it.

As generic overview of both, ABC method and its development (ABM method, ABB, ABP) we may consider, that these methods primarily refers to management of organizational and behavior change and after that to cost calculation technique.

Therefore, it is important for economic entities to focus more on how to use the information provided by these two methods and less on the details of how to define and build information systems specific to these methods. An essential element for entities which adopt these methods is to obtain information as quickly as possible (which is possible by avoiding the design of an information system highly detailed), because invariably, at the early use of methods, be it employees or managers, they experience an innovation element which may seem shocking at first instance. Therefore, it is very important that the team responsible for design and implementation of methods must consider the impact of information obtained by application of the methods over stakeholders. Goods or services we were thought to be profitable, may prove unprofitable, activities or departments apparently previously effective may prove ineffective, etc.

Recent years have been marked by a visible increase in understanding that ABC method provides information that can be integrated into a large number of applications and decisions. In most cases, the information provided by ABC method allow processes' production streamlining and of those decision making, there being often situations where they have allowed the drafting of decision that could not been taken before.

ABC method does nothing more than to process current data in the balance sheet, reorganizing them on activities and processes, but preserving the total amount of incomes and expenditures and providing a different view over them. The key point in understanding the ABC method is to understand the behaviour of costs and their variation in relation to other factors. Also, a specific method's element that differs from traditional methods of cost allocation is that it allows the activities description by using some grammatical conventions consisting of a verb, an adjective and a noun (e.g. it processes customer complaints). This gives a great flexibility and a very high precision in modifying, eliminating or activities improving.

Value of production cost obtained by ABC method application in all completed studies is lower than the cost value calculated by applying traditional methods because it reflects the real costs distributed in a more rational manner.

Also, ABC method allows an impact assessment of the total costs value of activities borne on profitability, the effects of activities over goods being easily identifiable.

Within the empirical study context we can conclude that although the information on the unit cost of lignite seem attractive of 34.71 USD / ton compared to the unit cost of lignite

determined by traditional accounting methods of 84.87 USD / ton - we must take into account that a part of ballast is dump, which means it is necessary to determine a distribution coefficient of the total costs of the dump ballast and which is added to the total cost of lignite production. Based on information provided by the entity's staff, the amount of marketed ballast is about 30%, which means that 70% of the ballast cost must be attributed to lignite.

Assuming a recovery of 30% of the ballast, the unit cost of coal is calculated by ABC method USD 67.77 per tone, 20% lower than the unit cost of lignite calculated by using traditional methods of management accounting.

Another useful information would be that concerning the cost ballast, that is 2.95 USD / tone, a critical information in case there is sought an extension of its trading activity.

As the company produces only two products that can be sold it is obvious that the two are related production costs, the growth of volume ballast sale (synonymous with quantity dump decrease) involves the lowering of the cost of production of lignite. The first information on the possibility to streamline the activity in terms of income growth is therefore increasing ballast traded volumes and finding technological solutions to meet the requirements imposed by Environmental Protection Agency, regarding dumper activities and environmental preservation.

Since lignite is the main product obtained from the activity of the Pinoasa Mine we will analyze the differences between the information provided by the results offered by the ABC method and the results obtained by using traditional methods practiced by the entity.

The comparative structure of the costs calculated at Pinoasa Mine using the two methods – traditional and ABC – confirms the other results of the studies made in the field of management accounting and cost calculation, which tried to validate the hypothesis that ABC method provides a more even distribution of the costs related to the activities. It can be noticed that the biggest differences occur with the personnel expenses and other exploitation expenses.

A second part of the case study followed the analysis of relationship between cost production and a number of independent variables, such as lignite production volume, extracted ballast volume, amount of investment, the value of fixed assets or salary expenses. For this purpose it was used the econometric modelling through simple linear regression. Following testing of six econometric modelling, the direct link between the dependent chosen variables and the independent variables, confirming the previously laid down hypotheses has been demonstrated.

The model presented within empirical study is viable, which means there is a direct relationship between the dependent and independent variable. Thus it is confirmed,

econometrically the direct link and high correlation between all independent variables (production volume, investment value, direct salaries, the amount of ballast extracted or the machinery value) and independent variable - production cost.

In the last chapter "*General Conclusions. Research perspectives*", I presented synthetically the research conclusions, personal contributions, limitations and research perspectives.

With a view to formulate recommendations in order to improve the activity of the studied entity from management accounting and cost calculation perspective, we considered relevant to mention the available difficulties in design stage of the ABC method implementation and which refers to way of defining the activities inductors and costs, optimal data required volume determination, data collection, formulation of long-term goals or staff motivation to reduce resistance to change.

Based on the analysis results of the case study, we consider appropriate to keep the current system of cost calculation and the gradual implementation of the ABC method, at departmental level in case of administrative area or mining points, so as to avoid interruption of the information flow about costs, until the current system will be completely replaced by the new system.

Given the complexity of entity's activity under review, the successful implementation of the ABC method can not be done without implementing an ERP system to integrate all available departments and functions within the entity in a single computer system that could meet the information needs of all departments.

The suggested model has had an **average** degree of data entry detail into the ABC method system, and the necessity to add to the initial model different quantities or different types of information will arise in future. Therefore, it is necessary to periodically review the way the method was developed and continuous updating of data and information needs.

8. Conclusions, personal contributions, research's limitations and perspectives

Following completion of the research there are **two categories of conclusions** - conclusions arising from theoretical study and conclusions related to empirical study. Both conclusions are related to main research directions, namely, conceptual research and estimative research. The conceptual research pursued foundation from the theoretical point of view of

improving ways of the management accounting and cost calculation using a concentric approach of available concepts and theories, from general to particular. The estimative research also had two components - on the one hand demonstration of ways the ABC system can be built and implemented, as well as quantitative econometric approach of the link quantification between cost of production and different independent variables that can influence it.

A generic overview of both, ABC method and its development (ABM method, ABB, ABP), we may assume that these methods primarily refers to the management of organizational change and behavioural change and then to cost calculation technique. Therefore it is important for economic entities to focus more on how to use the information provided by these two methods and less on the details of how to define and build information systems specific to these methods. An essential element for entities which adopt these methods is to obtain information as quickly as possible (which is possible by avoiding the design of an information system highly detailed) because invariably, at the early use of methods, be it employees or managers, they experience an innovative element that might seem shocking at first instance. Therefore, it is very important the team responsible for design and implementation of methods to consider the impact of information obtained by application of the methods over stakeholders. Goods or services which were thought to be profitable may prove to be unprofitable activities or departments apparently previously effective may prove ineffective etc.

Recent years have been marked by a visible growth of understanding the fact that ABC method provides information that can be integrated into a large number of applications and decisions. In most cases, the information provided by ABC method allows the streamlining of production processes and decision making and there are often situations they have allowed development of some decision that have not been taken before.

ABC method does nothing more than to process current data in the balance sheet, reorganizing them in activities and processes but preserving the total amount of income and expenditure and providing a different view over them. The key point in understanding the ABC method system is to understand the behaviour of costs and how they vary in relation to other factors. Also, a specific element of the method that differs from the traditional methods of cost allocation is that it allows the description of activities using grammatical conventions consisting of a verb, an adjective and a noun (e.g. processes customer complaints). This fact gives great flexibility and a very high precision in modifying, eliminating or activities improving.

The emergence of the ABC method system was supported by growth of problems generated by traditional cost calculation systems respectively incompleteness of the information

provided or providing distorted information. Using average values as a basis for cost allocation is one of the method's peculiarities that differ from traditional methods, which enables it a wide application within economic entities. Even if our whole approach aims to highlight advantages of the method ABC, we shall not, however, deny that the traditional simplistic allocation based on production volume for example can provide adequate information when the entity has few production lines, when there are distribution channels, customer requirements and homogeneous customers when administrative, distribution and sales costs are low or when the margin of profit is very high. Unfortunately, a growing number of small companies are in this situation which leads us to say that ABC method should not be regarded as an eccentricity or an element of modernity, but as a necessity.

Empirical studies performed in this research attempted to provide an example of methodology for ABC method implementing for a mine in order to identify whether ABC method results bring an added value to accounting information concerning costs relevance or production cost ingredient.

We believe that the ABC method application offers a new vision over the production cost structure, as well as extra information that may contribute to the improvement of entity's activity.

Traditional systems cost production formulas are based on direct costs allocation on the products which creates a distortion of accounting information, as there is not always a relevant connection between the allocated cost behaviour and sharing base value used. Also, to ease the calculations, often are being used very little sharing basis. ABC method brings a new element in the cost allocation system using business and cost inductors that allow a more relevant allocation in terms of reflecting the peculiarities of the production process and its component activities.

It is not new that center point of the decision making process in the area of accounting (and not only) is the information system that should provide quality information, respectively to meet the criteria of relevance and detail regarding the costs typology.

Activities area requiring decisions drafting is large ranging all areas of an entity, such as identifying ways to enable greater efficiency of processes, finding the optimum product life cycle, identification ways of capitalization activities, improving customer relations and users of accounting information, financial and economic analysis, employee motivation etc. It was demonstrated that performance management can not be done without existence of information systems to assist entities to continue their work efficiently and effectively subject to the existence of an economy in perpetual transformation and subjected to broad categories of risks.

At the same time, an optimal costs management must be designed so as to be perfectly adapted to the entities specific and must to start from strategic and organizational goals, while targeting costs specificity, as well as relations and link dynamics between costs and other economic magnitudes.

Value of production cost obtained by ABC method application in all completed studies is less than the cost value calculated by applying traditional methods because it reflects the real costs distributed in a more rational manner.

Also, ABC method allows impact assessment the total cost of the activities carries on profitability, the activities effects over goods being easily identifiable.

Within the empirical study context we can conclude that although the information on lignite unit cost seem attractive 34.71 USD / ton compared to lignite unit cost determined by traditional accounting methods of 84.87 USD / t, we must bear in mind that a part of ballast is dump, which means that it is necessary to determine a coefficient of total dump ballast costs distribution and plus total cost of lignite production. Based on information provided by the entity's staff, the amount of ballast marketed is about 30%, which means that 70% of the ballast cost must be attributed to lignite.

Assuming a recovery of 30% of the ballast, unit coal cost calculated by ABC method USD is 67.77 per tone, 20% lower than the unit cost of lignite calculated by using traditional methods of management accounting.

Another useful information would be the ballast cost, that is 2.95 USD / tone a critical information in case it is sought to extend its trading activity.

As the company produces only two products that may be sold it is obvious the two production costs will be correlated with the growth of ballast volume sale (synonymous with lowering of dump quantity) involving lignite lowering cost production. The first information on the possibility of business efficiency from the income growth perspective is thus increasing ballast traded volumes and finding some technological solutions to meet the requirements of Environmental Protection Agency, regarding dump activities and environmental preservation.

Since lignite is the main product obtained from the activity of the Pinoasa Mine we will analyze the differences between the information provided by the results offered by the ABC method and the results obtained by using traditional methods practiced by the entity.

The comparative structure of the costs calculated at Pinoasa Mine using the two methods – traditional and ABC – confirms the other results of the studies made in the field of management accounting and cost calculation, which tried to validate the hypothesis that ABC method provides

a more even distribution of the costs related to the activities. It can be noticed that the biggest differences occur with the personnel expenses and other exploitation expenses.

The results of the case study refer also to the importance of the success factors related to the implementation of this method, of which we mention allocated financial and human resources, offered managerial support or the clear definition of the connection between performance and employee motivation.

An important category of information generated by using ABC method is the identification of those activities which have low costs or very high costs. Thus, the managers have an important tool for decision making when finding the cause which led to those values of the costs, which furthermore support the presence or the lack of efficiency and efficacy.

The information offered by the results obtained by using ABC method can be used in many areas which target the increase of efficiency and profitability, for example decisions for externalization of the activities, decisions for decreasing the costs, decisions for introducing in the flux production of a new product or stopping the production of the unprofitable products, decisions for setting the budget, decisions related to the parts of integrated management etc.

We think that the comparison between the values of the production cost calculated using two methods is relevant for the understanding of the benefits of using the ABC method, quantified by the additional information it provides. Even though the use of this method is not easy and involves a large intake of human and material resources, the entities can decide its use, for example, only for certain products or departments.

Probably one of the most important benefits offered by the ABC method is the improvement of the weak points of the traditional systems of calculation of the production costs, because it is a reliable indicator for the topicality of the obtained costs due to its focus on the actual behaviour of the costs.

The second part of the case study contains the analysis of the connection between the production cost and a number of independent variables, for example the volume of the lignite production, the volume of the extracted ballast, the value of investments, the value of the fixed assets or salary expenses. To this end econometric modelling by simple linear regression was used. Following testing of six econometric models the direct connection between dependent variable and chosen independent variables was demonstrated, which confirms the prior established hypotheses.

The model presented in the empirical study is valid, which means that there is a direct connection between the dependent and the independent variable. This confirms econometrically,

as well, the direct connection and the large correlation between all the independent variables (the volume of the production, the value of the investments, the direct salaries, the quantity of the extracted ballast or the value of the machinery) and the independent variable, the production cost.

We think that the depth and the level of particularization of both types of research – theoretical and practical – confer the work an ***innovative value.*** The novelty concerning the issues of development and deepening of the management accounting and the cost calculation consisted of the actual use of the ABC method within the pale of an entity pertaining to the mining industry, which holds a unique specificity. Furthermore, the work proves a technical and economical interdisciplinary approach of the selected industry, by using theoretical and practical tools pertaining to mathematics, statistics or to the science found at the borderline between these – econometrics.

The innovative character of the present research work resides within the synopsizing of the general frame of the management accounting and the cost calculation, which substantiates the necessity of application of modern methods of calculation of costs in the mining industry, and the demonstration of the practical ways of conceiving of an ABC management system and its integration in the system of management accounting present within the entity, object of the empirical study. Moreover, the econometric analysis performed is an example of analysis of the interdependency between the production costs and various other categories of costs, and the mathematical methods of analysis and prognostication of the evolution of the analyzed costs, offer economists an useful tool in the pursue of decreasing the impact of the potential risks, which could affect the energy mining industry.

Personal contribution, within the pale of this scientific research work can be justified by the following arguments, which include, but are not limited to:

- contributes to the development of the level of knowledge in the field of management accounting and production costs, having direct implication in the performance management of the Energy Complex Oltenia and Pinoasa Querry, respectively;
- contributes to the acknowledgement of the steps which marked the conceptual evolution of the of the management accounting and performance evaluation;
- contains the presentation and detailed analysis of the of the dimensions, methods and techniques specific for the management accounting and cost calculation, emphasizing the ABC method, by which the accountants from the energy mining industry can precisely

evaluate the costs implied by the activity of exploitation and processing, specific for this industry;

- it highlights the fact that, in the present economical and financial context, in the process of quantifying the impact generated by the application of the ABC method, the processes of planning, budget setting and prognostication have hold major importance, and are meant to decrease the limits of the decisional process and performance;
- it makes an empirical research which led to the identification and analysis of the direct and indirect expenses related to the processes of the energy mining industry, and the distribution of the indirect expenses and the calculation of the production cost of the lignite and ballast by application of the ABC method, within the Pinoasa Querry from the Energy Complex Oltenia, as well. Through the empirical study we tried to deal with one of the priorities of the economical research, namely finding of those elements which reflect best the real costs and in the end, to build the econometrical models for characterization of energy mining industry in Romania.

A detailed analysis of the mining industry in Romania was also performed, by formulating a future direction of development. The synopsizing of the most important results and phrasing of the conclusions, made possible the defining of the objectives and hypotheses of the research and the delineation of its architecture, as well.

In this scientific pursue we limited ourselves on dealing with some specific problems. The present work represents a starting point for future research, which should focus on aspects not covered in this work, in order to deepen the knowledge in this field.

Starting from this research work, we will continue the empirical research by extending it to domains of activity and, afterwards, we will start a comparative study. Furthermore, we intend to perform a complex research regarding the applicability of the ABC method within all the economical entities performing in the energy mining industry n Romania.

The development of the integrated technologies which permit the sharing of the information generated by the ABC method to all employees operation a computer, is one of the most important success factors in the understanding of the benefits of the ABC method and the process of organizational learning, which will permit the expanding of the area of utilization of the information offered to the maximum number of departments. Furthermore, the informatics technologies permit the development from the project stage to the program stage. Thus, one of the main directions of future research is finding modalities of developing an informatics program, specific for the method, which would permit the integration of the data from the financial

accounting and those from production activity, the final result being standardized reports, graphs, simulations or the development of new applications.

The integration of the obtained data from the application of the ABC method in the resident informatics systems must take place at three levels: financial, operational and technological. Furthermore, following research must be performed by a team including people working in the field of information technology, who could assure the existence of the basic elements of the business intelligence (BI) systems, namely the modeling of the business, collection, distribution and storage of data and also the tools of multi-dimensional accessing of information (OLAP, n-dimensional cube etc.)

Another future direction of research is the study of the way in which, after implementation of the ABC method and the familiarization of the personnel with it, it is possible to move to the next step of management accounting, in which methods ABB and ABP could be implemented, of which direct result consist of the preview of the costs and also the Balance Scorecard (BS) method which targets the strategic management and the management of the organizational transformation.

9. Thesis' contents

INTRODUCTION

Chapter 1
THE EPISTEMOLOGICAL INTEGRATION OF THE RESEARCH IN THE CONTEXT OF MANIFESTATION OF THE FACTORS OF INFLUENCE OF THE EVOLUTION OF THE ENERGY MINING INDUSTRY AT NATIONAL AND INTERNATIONAL LEVEL

1.1. The issues approached and the interests of the research theme
- 1.1.1. The context of research
- 1.1.2. The object and area of research
- 1.1.3. The objectives and hypotheses of research
- 1.1.4. The methodology of research

1.2. The evolution of the industrial activities. The chronology and characteristics of the development of the mining industry in Romania

1.3. The role of the energy mining industry in the national economies
- 1.3.1. The benefits of the mining industry at national and international level
- 1.3.2. Realities and perspectives regarding the energy mining industry in Romania
- 1.3.3. The objectives of the strategy of mining sector. Priorities and conditions in the implementation process

1.4. Financial constraints specific for energy mining industry and the emergence of management accounting

1.5. The mathematical and econometrical substantiation of economical management and optimal modulation in mining industry

Chapter 2
GENERAL ASPECTS AND THEORETICAL SUBSTANTIATIONS REGARDING THE ROLE OF MANAGEMENT ACCOUNTING IN THE INCREASE OF THE ECONOMICAL AND FINANCIAL PERFORMANCE OF THE ECONOMICAL ENTITIES OF THE ENERGY MINING INDUSTRY

2.1. Approaches of performance from financial, economical, social and environmental point of view

2.2. The importance of the management accounting in the performance management

2.3. The control of costs – central element for performance improvement

2.4. Theoretical approaches of management accounting from application in energy mining industry point of view
- 2.4.1. The conceptual framework of management accounting
- 2.4.2. Advantages and limits of the utilization of various methods and techniques of management accounting

2.5. The critical analysis of the mode of organization of management accounting and cost calculation in energy mining industry - S.W.O.T. Analysis

Chapter 3
THEORETICAL APPROACHES REGARDING THE METHODS OF MANAGEMENT AND COST CALCULATION BASED ON ACTIVITIES (ABC METHOD)

3.1. The background of the emergence and development of the ABC method

10. Curriculum vitae

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Curriculum vitae Europass	
Personal information	
Name / Surname	**Ioana Dorin**
Address	2 Maria Lataretu Street, Tg – Jiu, Gorj
Phone	0737437150
Fax(s)	
E-mail(s)	doris.ioana@yahoo.com
Nationality	Romanian
Birth date	09.10.1978
Sex	Male
Professional experience	
Time period	**07.12.2012 - present**
Occupation or position held	**Chief of Department Internal Control**
Activities and main responsibilities	Ensuring the compliance with legal provisions, regulations, methodological rules and provisions of the company leadership regarding the protection of heritage and information protection, goods and valuables of any kind, the use of material goods, preparation and circulation of documents, preventing and detecting deficiencies and fraud.
Name and address of the employer	**Energy Complex Oltenia Ltd.**
Type of activity and sector of activity	**Energy sector**
Time period	**18.06 – 06.12.2012**
Occupation or position held	Economist
Activities and main responsibilities	Various economical analyses, programs and strategies of administration in the field of electric energy production in economic plan
Name and address of the employer	**Energy Complex Oltenia Ltd.**– Strategy Development Division/ Development Direction
Type of activity and sector of activity	**Energy Sector**
Time period	**2003 -18.06. 2012**
Occupation or position held	Economist
Activities and main	Accounting, substantiation, preparation and analysis of the level of achievement of

responsibilities	the revenue and expenditure budget, correlation of the economic indicators, balances, graphs and cost analysis.
Name and address of the employer	E.C. Roşia (S.N.L.O. TG –JIU)
Type of activity and sector of activity	Coal extraction from the surface quarries
Education and training	
Qualification / Obtained diploma	***Bachelor's Degree*** in Economics ***Master's Degree*** in Finances and Public European Governance ***PhD*** in Accounting
Main studied subjects/professional competences obtained	Licensed economist, vast knowledge of financial situations analysis
Name and type of the last educational institution/ training provider	***"1 Decembrie 1918" University Alba Iulia*** Doctoral School – Accounting
Level of national and international classification	National
Education and military training	S. M. A. - M. A. P. n. - Officer
Skills and personal competences	
Native language	Romanian
Foreign languages	

Auto evaluation		**Understanding**		**Speaking**		
European level(*)		Listening	Reading	Spoken interaction	Spoken production	
English		Good	Good	Good	Good	

Social competences and skills	• good competence for communication and cooperation; • very good teamwork competency following working in teams; • adaptability in solving the economical processes in which I am involved;
Organizational competences and skills	- ability to coordinate and administrate professional activities and projects; - highly developed organizational skills;
Computer competences and skills	- good command of computer operating practices and great adaptability when operating any informatics program; - good command of Microsoft Office programs (Word™, Excel™ and PowerPoint™); - good command of Internet Explorer.
Teaching activity	

	According to the PhD status – University teaching activity
Additional information	**Participation to various professional training courses:** • Legal requirements in the field of Antifraud and Anticorruption; • Evaluation of the stage of organization, functioning and procedural of the activity related to internal control in the unities of M.E. **OTHER SPECIALIZATIONS AND CLASSIFICATIONS:** • Judicial Expert • Expert Evaluator • Trainer economical field **MEMBERSHIP IN PROFESSIONAL AND SCIENTIFIC SOCIETIES** - C.E.C.C.A.R. GORJ (2007 - present) - Romanian Association of Trainers (2012 – present)
Driving licence	**B**

11. List of published works

Some of the aspects presented in the doctoral thesis were capitalized by elaboration of papers published and presented at national and international conferences.

Selected list of publications:

Publication title	Name, Surname of author (s)	**Internationally indexed journals**	**Year of publication**
Realities and perspectives concerning Mining Energy sector in Romania	Ioana D., Diaconescu C.,Topor D	http://hrmars.com/hrmars_papers/Realities_and_Perspectives_concerning_Mining_Energy_Sector_in_Romania / International Journal of Academic Research in Business and Social Sciences / August 2014, Vol. 4, No. 8/ISSN: 2222-6990	**2014**
The role of mining in national economies	Ioana D., Diaconescu C.,Topor D	http://hrmars.com/hrmars_papers/Article_16_The_Role_of_Mining_in_National_Economies / International Journal of Academic Research in Accounting, Finance and Management Sciences / July 2014, Vol. 4, pp 155-160 E-ISSN: 2225-8329	**2014**
Appraisals concerning the advantages and disadvantages of the ABC method application in mining industry..	Ioana D., Diaconescu C.	International Conference „*Accounting and Auditing Perspectives*" (AAP 2014), to be held at the Faculty of Economics and Business Administration of Timisoara, on October 16 – 18	**2014**
The influence of internal and external factors on ABC method decision	Ioana D., Diaconescu C.	Hyperion Economic Journal	**2014**
The influence of ABC cost calculation method on economic entities performance	Ioana D., Diaconescu C.	University Athenaeum, in the Conference volume Contemporary crisis – risks and challenges, May 23-24, Bucharest	**2014**
The role of cost	Topor I.D., Ioana D.,	ICMEA Alba Iulia	**2011**

information in decision-making. case study,	Puțan A.		
The beginning of the auditing process of financial situations case study,	Ioana D., Udrițioiu A., Burdea R.	ICMEA Alba Iulia	**2011**
The Romanian administration under the impress of the European Commission	Ioana D.	ECO-TREND 6th EDITION 2009	**2009**

TOTAL NUMBER *Papers published in internationally indexed journals and scientific works presented at national and international conferences journals* = **8**