COSTS AND MANAGEMENT DECISION-MAKING - THE THEORETICAL BASIS FOR THE EVALUATION OF MINERAL RESOURCES

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ABSTRACT: *The decision-making component holds a privileged position in the architecture, functionality, and performance of the management system of any organization. No other organizational element has such a pronounced managerial specificity and such a significant impact on all aspects of the organization's activities and results. Consequently, most authors in the field of management consider the decision to be the essential element of the management process and the specific instrument through which managers express themselves. Ultimately, the qualitative level of how an organization is managed is best reflected in the results achieved through the decisions formulated and implemented. The decision represents the "cornerstone" of management, its most dynamic expression, through which it fully manifests its functions. Probably no other economic category has such strong connotations and such a significant influence on the decision-making process as costs. In their various forms of expression, structured according to different criteria, costs most often represent the essential element underlying management decisions. The explanation for this importance is quite simple: cost best reflects, both quantitatively and especially qualitatively, the processes taking place within the enterprise. In order to achieve its economic objectives (profit maximization, value maximization), as well as to fulfill its social responsibilities (providing consumers with goods and/or services), the enterprise consumes resources, and costs represent one of the fundamental elements through which the efficiency of their consumption is expressed. The essence of this paper is to elucidate several decision-related aspects concerning costs within a particular category of decision problems in the mining sector: the use of the production factors capital and mineral deposit within existing mining perimeters.*

KEY WORDS: *cost, decision, decision substantiation, mining sector, mineral resources*.

JEL CLASSIFICATIONS: *D24, M11, L72, Q32.*

1. MANAGEMENT DECISION

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Numerous specialists, both Romanian and foreign, have attempted to define decision. The result has been a multitude of definitions, more or less simple, concise, or elaborate. The analysis of the viewpoints of different specialists and their correlation with practical decision-making data lead to the conclusion that a decision represents "the course of action chosen to be followed in order to achieve one or more objectives" (Nicolescu &Verboncu, 1995). This simple definition highlights the elements that a decision necessarily involves:

-the objective (set of objectives);

-the alternatives (courses of action) that may be followed in order to achieve the assumed objective (set of objectives);

-the choice or selection (the conscious process through which one of the previously identified alternatives is selected).

When a decision made by an individual does not influence other people, it is a so-called personal decision, whereas when the decision concerns the activity of a collectivity or organization, it is referred to as a management (managerial) decision. A management decision is "the result of a rational process through which, from several possible alternatives or solutions, the one that best corresponds to the proposed goal or objective of the organization is chosen" (Simionescu, 2002).

The management decision represents the main outcome of the management process. Even if, in terms of approach and problem-solving methods, personal decisions may sometimes resemble management decisions, there are distinctive elements specific to the latter that clearly differentiate them, namely:

-greater complexity and difficulty (a management decision always involves at least two persons: the decision-maker, who takes the decision, and the executor, who implements it or bears its consequences);

-in the formulation and implementation of the decision, the characteristics of groups or the organization, as well as the interests, training, motivation, and potential of those affected by the decision, must be taken into account (a management decision has direct influences at the level of groups or the organization, not only on a single individual);

-decision effects (a management decision always generates direct and/or indirect economic, technical, financial, human, and other effects at least at the level of a department or even at the level of the organization as a whole).

The importance of management decisions derives precisely from the effects they may generate. Clearly, within an organization, the entire managed system implements the commands received from the management system. If these commands (and the solutions that generated them) are sound, the overall result of the organization will be good; if the chosen solutions are mediocre, the results cannot exceed them in quality. However, the importance of management decisions may vary depending on the nature and type of the decision, the management level, the scope of application, the size of the affected system, the possible implications for the organization, etc.

In management practice, the management decision takes either the form of a decision act or a decision-making process. The decision act occurs in decision situations of low complexity or repetitive nature, when the variables involved are well known to

the decision-maker, and no additional information gathering and analysis are required. Decision acts (which are quantitatively predominant within organizations) take place over a very short period (seconds or minutes) and are based on the managers' experience and intuition. The decision-making process is specific to relatively complex decision situations, involves a relatively large time consumption (days, weeks, or even longer), requires the collection and analysis of a certain volume of information, and generally the consultation of several persons before the decision is formulated.

2. COSTS AND THE SUBSTANTIATION OF DECISIONS

Cost accounting oriented toward control and decision-making has become one of the basic components of the mechanism for the profitable management of the enterprise. Thus, a circular system of rules has been conceived to help the enterprise compete on the market under performance conditions, a system designated by the concept of "controlling" (Ristea et al., 2000).

Within the management system, costs and analytical results represent the core that, through the concept of profitability, integrates the objectives programmatically set by the enterprise's decision-makers. Planned parameters are expressed as values chosen by management, while resulting parameters express how management has conducted the enterprise. Each planned parameter represents an objective of the enterprise as an economic system, and through control, the system's activity is permanently regulated in order to achieve these objectives. In the field of cost accounting, controlling does not aim only at monitoring the efficiency of performed activities by comparing planned and actual costs. Its scope also includes the rigorous substantiation of decisions based on costs. Thus, cost accounting has been oriented toward a wide range of managerial decisions.

By adopting many decisions, managers make comparisons, with cost being the most frequently used element. The generalization of this behavior has led to the tendency to compare enterprises with the same business profile based on their unit costs. In mining, these comparisons are particularly emphasized, unit costs becoming both the motive and the basis for substantiating decisions with multiple effects (economic, social, political), such as continuing operations in certain mining perimeters and closing others. In the energy-producing sector, unit costs have even become a fundamental element in shaping national strategy by focusing on the capitalization of certain energy sources.

Costs are present in the multitude of daily mini-decisions taken by managers at lower hierarchical levels, but they are especially important for strategic decisions adopted at top management level. The adoption of a particular strategy for the enterprise itself is based on analytical considerations imposed by economic and financial project evaluation methods, which cannot be conceived without costs. Resource allocations at enterprise level are based on estimated costs, as are asset replacements.

Costs underlie price formation and represent the determining element of enterprise profitability. Hence their importance in cost-volume-profit analyses and in decisions based on such analyses.

Costs are also important for the so-called special decisions faced by enterprise management: the make-or-buy decision, integration decisions, and the decision to accept orders at special prices.

As a final appreciation regarding the place of costs in the decision-making system, it must be emphasized that the very behavior of the enterprise in different market structures is based on knowledge of the shape of cost curves.

2.1. Costs as the result of the cost calculation process

Cost calculation constitutes "a set of mathematical operations, more or less complex, through which the identification, evaluation, grouping, division, and aggregation of expenditure elements and structures are carried out, resulting in the cost of the resource used, the cost of the activity location, the cost of the activity or process, and ultimately, the cost of the product and the cost of the period" (Ristea et al., 2000).

From a managerial perspective, the final result of cost calculation is cost, established as an aggregated magnitude expressed in monetary units, as the expression of all resources incorporated, through a certain sequence of technical procedures, into a material good produced or a service provided by the enterprise.

Depending on the perspective adopted, the object of cost calculation acquires certain particular meanings, namely: the collection and structuring, in a certain manner, of expenses and revenues in order to determine costs and analytical results of the enterprise (internal accounting perspective); the collection and sorting of information on historical costs in order to evaluate inventories and measure profit (financial accounting perspective); the determination and analysis of enterprise costs and results in a manner that facilitates planning, decision-making, and control processes (managerial accounting perspective).

Regardless of the approach, achieving the objective of cost calculation is possible only by taking into account the following elements: types of costs: expressing the nature of consumed resources; types of products and/or services: as cost objects; activity locations or processes carried out: as cost centers; time periods: as management periods; the overall outputs of the enterprise (production of the period, sold production, stored production, capitalized production): as the basis against which costs are assessed.

2.2. The importance of costs in the decision-making process

To truly highlight the importance of costs in general, and particularly the shape of the curves through which their functions are graphically represented, for the decision-making process, reference must be made to the content of the theory of the firm's behavior, which constitutes the core of microeconomics. "Microeconomics approaches and analyzes economic processes in a 'microscopic' manner. Its field of study is the behavior of individual economic agents … and the relationships between them in different markets and industries. … The purpose of the theory of the firm's behavior … is to provide models for analyzing the firm's decision-making process under different market structures" (Simionescu & Mangu, 1999).

In the theory of the firm's behavior, costs are addressed in a particular manner, favorable to their use in the decision-making process. First, the multitude of classification criteria is abandoned, retaining only three: the relationship with production volume (total costs, unit costs), behavior (fixed costs, variable costs), and time period (short-run costs, long-run costs). Second, regarding the time criterion, it should be specified that it does not operate with calendar intervals. The short run is considered the period during which at least one production factor remains unchanged, while the long run represents a period sufficiently extended for all input factors to be varied.

Short-run cost functions are crucial for pricing and output decisions, while long-run cost functions serve development planning and investment policy substantiation. Finally, with regard to the level of detail, historical evolution, and correspondence with economic reality, cost issues are reflected in a traditional, a modern, and an engineering approach. The traditional approach is based on the so-called "U-shaped" unit cost curves, considering that there is only one economically efficient level for each capacity domain. The modern approach abandons the "U-shaped" unit cost curves and promotes the so-called "bathtub-shaped" curves, introducing the fundamental concept of capacity reserve. The engineering approach is somewhat simplified, supporting a technical, practical attempt to address cost issues.

3. PARTICULARITIES OF THE DECISION-MAKING PROCESS IN THE MINING SECTOR

The framework classification of geological reserves proposed by the United Nations summarizes the stages of the decision-making process associated with the capitalization of a mineral deposit. Practically, through the terminology, definitions, and rigor imposed, the analytical framework necessary to capture the particularities of the decision-making process in the mining sector is ensured.

The classification of geological reserves is based on information related to three types of evaluation: geological evaluation, feasibility evaluation, and evaluation of the degree of economic viability. Each of these evaluations corresponds to a stage or phase of the process of valorizing the deposit. The transition from one stage to another involves decision-making. The reconnaissance stage provides the first information regarding the possible existence of a concentration of useful mineral substances in a certain area of the Earth's crust. A first decision intervenes, establishing the areas in which research efforts will be intensified by moving to the prospecting stage. Using direct and/or indirect methods to determine quantities of useful mineral substances, the prospecting stage may provide the elements necessary to adopt a new decision, namely to elaborate a general exploration program. The information obtained at this stage is used to prepare an initial technical-economic documentation, the pre-feasibility study, which is used to substantiate the decision to move to the detailed exploration stage. Accurate knowledge of the geometric parameters, shape, structure, grades, and other characteristics of the deposit will allow the preparation of the main technical-economic documentation of the decision-making process, the feasibility study. This documentation underlies the major decision to commit the capital funds necessary for deposit development and the creation of the first production capacities.

Thus, bringing a deposit to the stage of exploiting its useful mineral reserves involves several major decisions. These are dynamic, long-term decisions, rigorously substantiated analytically, marking the transition from one stage of the mining project to another. Mining project development takes place progressively over time. Each stage must be validated to allow the transition to the next. The prospecting stage must be validated in the sense of promoting a more detailed geological research program (requiring additional investments) or temporarily or definitively stopping the project. Similarly, after an exploration program, a decision must follow: either to continue the project (with studies of industrial, market, and more detailed geological conditions) or to temporarily or definitively stop it. The final exploration stage must also be validated, either to continue the project (with mine opening works) or to postpone or abandon it. Although mining project stages appear successive, forming a linear cycle, this is a simplification. In reality, certain stages and studies begin even if some detailed elements are missing, these being completed in parallel with activities specific to another stage. Moreover, decisions taken at the end of certain stages influence project development and may have retroactive effects on previous stages. Not infrequently, mining projects experience significant interruptions of several years between phases. As a rule, this particular feature is due to changes in the economic conjuncture, yet it is by no means unrelated to the dynamics of the process of depletion of reserves of useful mineral substances with certain characteristics, in parallel with a certain dynamic of the demand for such mining products. It should be noted, however, that almost never does a mining project start from scratch, because, at the current stage of societal development, a sufficient knowledge of the mining potential of each country and of each geographical area has been attained.

The decisions involved in the development of mining projects are inherently unique in character. No two decision-making situations are identical, and the outcome of a decision that has already been adopted may provide the necessary framework for shaping a subsequent decision-making situation (provided that the project continues). However, the transition from one stage of the project to another requires additional capital investment. In practical terms, the decision to validate a given stage constitutes the justification for continuing the allocation of capital. The amounts required to be invested from one stage to the next increase progressively. The information related to the mineral deposit likewise becomes increasingly abundant and detailed, and the risks associated with investment are correspondingly reduced. Nevertheless, a situation will never be reached in which the states of nature are perfectly known and decisions are adopted under conditions of certainty (a mineral deposit becomes fully known with precision only when it has been completely exploited). The economic effects of a decision to suspend or abandon the project must also be emphasized. Mining projects are long-term capital investment projects. Practical experience in the development of mining projects shows that significant periods of time on the order of years (ten years or even more) elapse between the moment the development decision is made and the moment the first economic effects are obtained. Delays and interruptions adversely affect the overall economic efficiency of the project due to losses arising from the immobilization of invested capital (which may be substantial in the case of major capital investments extended over long periods of time). The situation of project abandonment

is even more economically unfavorable. Owing to the "sunk cost" nature of prior expenditures, the earlier efforts materialized in the knowledge acquisition and development of the deposit cease to have economic value. The decision-maker in mining projects must be aware that the achievement of economic effects and the recovery of the invested capital are contingent upon the full completion of the project. Any decision to abandon a project under development or to close an operating mining unit results in the (almost total) loss of the capital previously invested.

Major decisions concerning the transition from one stage to another in a mining project are influenced by a wide range of risk factors. These may be of a geological nature (unconfirmed reserves and/or grades), technical nature (availability and adequacy of existing technologies), economic nature (price volatility and market instability), and, not least, political nature (the relationships established among the stakeholders responsible for the initiation, development, and operation of mining projects). The documentation forming the basis for decision-making (geological reports, pre-feasibility studies, feasibility studies, and operational reports) relies on progressively more detailed information, corresponding to successive stages of increasingly advanced knowledge of the deposit. The decision-making criteria gradually shift from predominantly technical considerations toward economic and/or social ones. A level of knowledge deemed sufficient regarding the volume of mineralization and its characteristics is ultimately replaced by the fundamental criterion of the efficiency of the invested capital.

4. CONCLUSIONS

Management decision, as the main attribute of the management process, is the result of a rational process through which, from a multitude of alternatives, the one that best corresponds to the proposed objective of the organization is chosen. The substantiation of the decision-making process involves the use of a wide range of information concerning the organization's activity. Among these, information related to costs occupies a distinct position. Costs best reflect, quantitatively, but especially qualitatively, the processes within the organization.

Costs are present in the substantiation process of the multitude of daily mini-decisions taken by managers at lower hierarchical levels, and their importance becomes crucial in substantiating decisions adopted at top management level. The development of strategies and the allocation of resources in every organization require cost considerations. The practice of price setting according to the mark-up rule (cost plus a profit margin) is widespread at the enterprise level. Cost-volume-profit analyses are crucial in decisions regarding production expansion. Integration decisions or decisions to accept orders at special prices require the use of the informational quality of costs. Even decisions concerning the behavior of the enterprise within the market structure in which it operates cannot be conceived without the use of cost-related information.

Cost calculation oriented toward control and decision-making has become one of the fundamental components of the mechanism for the profitable management of the enterprise. A system of rules (based on costs) has even been conceived that enables the enterprise to compete on the market under performance conditions, a system designated by the concept of "controlling." Cost calculation, as the process through which the

identification, evaluation, grouping, division, and aggregation of expenditure elements and structures are carried out, in order to obtain the cost of the resource used, the cost of the activity location, the cost of the activity or process as a whole, respectively the cost of the product or the period, requires a clear distinction between two notions that are very often attributed the same meaning: expenses and costs. The complete definition of the notion of "expenses" can only be achieved within an integrative process, with four main coordinates: the generating element, the place of occurrence, the cost bearer, and the reference period. By contrast, the main characteristics that ensure the individualization of the notion of "cost" are: resource consumption, the link with outputs, and monetary valuation. The distinction between expenses and costs, observed in relation to the connection between financial accounting and management accounting, can be nuanced in four different ways: from the perspective of belonging to one of the two branches of accounting, from the perspective of differences in nature, from the perspective of the method of monetary valuation, and from the perspective of the reference period. All these nuances allow for a hierarchical structuring of the relationship between expenses and costs, materialized at the level of cost calculation domains: by types of costs, by cost bearers, by cost centers.

In the particular case of the mining enterprise, several questions may be formulated regarding the elements in the definition of the notion of cost, namely: With what resources does it operate? What resources does it acquire from the market? How does it procure these resources? What expenses are generated by the acquisition of resources? What does it consume in order to obtain goods? What costs are "born" once resources are consumed? Is the term "resource consumption" adequate to define the costs of the mining enterprise?

The answers to such questions are capable of illustrating a number of particularities of mining activities, which cannot be ignored in the cost calculation process. Due to complexity and the need to ensure proper substantiation, managerial decision-making may require taking into consideration costs other than accounting costs (produced by calculations). Thus, a new approach has developed, in which the concepts of opportunity cost, implicit cost, relevant cost, influenced cost, and sunk cost prevail.

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