

Research on Strategic Performance Evaluation of Mongolian State-Owned Mining Enterprises Based on the Integration of KPI and OKR

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Abstract: Given the two constraints of resource endowment and fluctuation in the external market, there are many kinds of strategic goals for Mongolian state-owned mining enterprises, such as resource utilisation, extraction efficiency, cost control and risk avoidance. The traditional performance appraisal tools have some defects in the mining industry; KPIs are too inflexible, and Balanced Scorecards and Management by Objectives do not consider the differences in resource endowment and uncontrollable production circumstances. In light of the combination of KPIs and OKRs, this paper will first explore the company's strategic goals, then examine how far the old system can be extended, and finally study the theoretical intersection of the two systems. Therefore, the two-track integrated evaluation system put forward here includes the extraction of indicators, embedding of OKRs, allocation of weights and arrangement of cycles, as well as analysis of the operating mechanisms for such systems, such as information transmission, performance feedback and flexible adjustment. Research has shown that KPIs are for maintaining the normal operation of things, and OKRs are used to achieve extraordinary results; together, they can achieve good results through complementary cycles and continuous adjustment of goals. The evaluation system should be connected to the outside world, change according to changes in the external environment, and be able to handle the high complexity and uncertainty of mining production.

Keywords: Integration of KPI and OKR, State-owned Mining Enterprises, Strategic Performance Evaluation, Construction of Evaluation System, Operational Mechanism, Mongolia

Introduction

State-owned mining enterprises are the main subjects undertaking the extraction of resources in the development of Mongolia's mining industry, and their performance management directly affects the efficiency of resource utilisation and sustainable development of the company. Mining production has the characteristics of capital intensity, long cycles and geological complexity. The aim of the company is due to its own reasons, and generally it includes using resources well, improving extraction efficiency, controlling costs, avoiding risks, etc. There are some deficiencies in the current assessment tools for the mining industry: the fixed targets of the key performance indicators do not consider geological conditions, the balanced scorecard does not have a dimension for resource endowment, and the negotiation space for management by objectives is limited by extraction circumstances. Together, KPIs and OKRs will be used to build a stable and flexible performance management system for the company; that is to say, KPIs will be employed to control daily operations, and OKRs will be used to drive new strategic development. The Foundation of the New Performance Appraisal is Complementary Cycles and Progressive Goal Alignment. The Mongolian state-owned mining enterprises are the subjects of this paper, and this paper will study the construction and operation of a dual-track integrated evaluation system for performance management of resource-dependent enterprises in the mining industry.

1. Logical Basis for the Evolution of Performance Evaluation Models in State-owned Mining Enterprises

1.1 Multi-dimensional Deconstruction of Strategic Objectives in Resource-dependent Enterprises

1.1.1 Goal Orientation of the Resource Utilisation and Extraction Efficiency Dimensions

The Goals of the Mongolian state-owned mining enterprises are determined by the physical conditions and distribution of mineral resources. Given that the exhaustibility of resource reserves has been considered, one of the enterprises' main goals is to add resource replacement capacity, and the basic indicators for monitoring the level of resource utilisation are the dynamic reserve replacement rate, mining recovery rate and ore dilution rate. Due to the geological complexity of mineral deposits, there are goals for extraction efficiency; therefore, how mechanized the mining is, how many driving feet are covered, and how high the recovery rate in mineral processing are all directly affect the economic value obtained per unit of extracted resources. There is a conflict between resource utilisation and extraction efficiency; if the extraction intensity is too high, the reserves will be depleted at a faster rate, and excessive conservatism will not spread the fixed costs sufficiently. Therefore, the company's strategy should be both economical and effective at the same time.

1.1.2 Joint Demands of Cost Control and Risk Resilience

The third reason for the increase in prices of mineral products is that they are affected by changes in the world market. The combination of unit mining cost, mineral processing cost and period expense rate shows how well a company can maintain profitability in the face of price fluctuations. With the continuous operation of mining production and the unpredictable nature of underground conditions, people are now more risk-averse, and thus all three are regarded as important indicators of operational stability: the safety production cycle, the equipment operation integrity rate and the timeliness of emergency response to sudden geological events. There is a trade-off among the allocation of resources for cost control and risk aversion, and now one of the main problems in achieving the strategic goal is to determine the boundary for safety investment and cost reduction^[1].

1.2 Functional Boundaries and Applicable Limitations of Traditional Performance Appraisal Tools

1.2.1 The Indicator Rigidity Problem for Key Performance Indicators in the Mining Industry

The goal is to use quantitative indicators of the achievement of organisational goals to measure the results of various operations by mining enterprises, such as the quantity of extracted ore, quality of feed, etc. The reasons for the appearance of deposits in nature are also irregular. For the reasons stated above, due to changes in the geological structure and breaks in orebody continuity, the original goals have not been achieved. A fixed set of KPIs will not reflect changes in production due to geological factors, and thus the evaluation results will not show the actual efforts of the managers. The problem of index rigidity is that it is assumed that the organisational environment will be relatively stable under KPIs, but mining enterprises are constantly facing disturbances in the conditions for resource occurrence that are beyond their control.

1.2.2 Structural Limitations of the Balanced Scorecard and Management by Objectives

The four parts of the Balanced Scorecard are Finance, Customers, Internal Processes and Learning & Growth, but there are some structural problems in applying it to mining. Resource endowment is an external factor affecting mining enterprise performance but is not one of the assessment indicators. The difference in deposit grade and extraction difficulty is not the same, so they cannot be directly compared. Management by Objectives is based on setting goals through communication between managers and employees, but there are practical problems in the mining industry; extraction plans and production targets need to be in line with the actual conditions of resource distribution and cannot be freely negotiated. The main reason is that the two tools mentioned above do not consider how to deal with the impact of differences in resources and external circumstances on a company's performance.

1.3 Theoretical Common Ground and Collaborative Space for the Integration of KPI and OKR

1.3.1 Dual Management Logic: Seeking Both Stability and Flexibility

Key Performance Indicators (KPIs) and the Objectives and Key Results (OKR) method come from different management schools of thought, but both can help meet the performance evaluation needs of

mining enterprises. Key Performance Indicators (KPIs) are result-oriented indicators that have been standardised according to the norm and can be used to track the results of one's daily work and control costs. OKRs are the overall goals that need to be achieved in certain areas to obtain good results, so they are very suitable for strategic projects with new ideas, such as finding alternative sources of funds and improving operating efficiency by reducing costs. The two kinds of tools are combined because the operation of a company needs to maintain the stability of daily extraction and be able to respond to changes in resource conditions. Therefore, Stability and Flexibility are the two sides of the same coin in performance evaluation.

1.3.2 Integration Mechanism of Cycle Complementarity and Progressive Goal Alignment

The cooperative space of KPIs and OKRs is formed by using different evaluation periods and various levels of goal hierarchy. KPIs will be set at the end of each month or quarter based on changes in extraction work, and they can help control production and predict what will happen in the future. OKRs are linked to the progress of the main goals in a particular quarter or year, and they will include cross-period objectives that need to be achieved through accumulated efforts in various periods. KPIs provide the foundation for the logic of goal setting; they are the necessary conditions that need to be met in the development of basic resources, and OKRs offer an inspirational leap line to motivate the company to find new ways to improve efficiency under resource constraints. The first is to distinguish between the regular operation of the mining project and areas that need to be developed in an organized manner, and thus the two types of tools can be used together.

2. Construction of a Performance Evaluation System Based on Dual-Track Integration

2.1 Extraction and Hierarchical Decomposition of Key Indicators in Line with Strategy

2.1.1 Identification of Key Performance Areas According to the Whole Resource Development Process

The goals of the Mongolian state-owned mining enterprises should be turned into measurable indicators for performance evaluation according to the main performance indices. The links in the resource development process are geological exploration, mine construction, ore extraction, mineral processing and mine closure and reclamation, and they have different performance contributions. Exploration Link is the reserve upgrade conversion rate and the input-output efficiency of exploration. Construction links are defined by the completion rate of shaft and tunnel engineering and the investment intensity per unit of capacity. The three main indices of the extraction link are the recovery ratio, dilution ratio and mining loss rate. The mineral processing link shows the recovery rate of minerals and the stability of concentrate grade. The Rule of Full-Process Coverage is not biased. Extraction and mineral processing are links in the chain of direct value creation and thus form the foundation; exploration and reclamation aim to replace resources and achieve sustainable development.

2.1.2 Target Transmission Mechanism of Organizational Levels and Functional Units

A hierarchy of division is used to pass down the main figures of the company's strategy to the operating units. Due to the varied conditions of orebody occurrence, the various mining units have different production environments; therefore, the decomposition of the indicator should consider these objective differences and not be forced into uniformity. The first indices of mine-level performance are unit full cost, ore grade compliance rate and safety production duration; breaking these down further to the level of the excavation and extraction team, these become operational indicators such as the completion rate of driving footage, unit consumption of explosives and roof management pass rate. The indices of the concentrator are based on the output and recovery rate of concentrate, and these can be further divided into process indicators, such as changes in production, grinding fineness, rate of reagent addition, equipment operation rate, etc. The purpose of hierarchical decomposition is to change the goals of top management into measurable indicators at all levels of the organisation and to keep track of the reasons for this link.

2.2 Embedding Path of Objectives and Key Results in the Mining Operation Context

2.2.1 OKR Design for the Areas of Resource Replacement and Production Capacity Succession

The first two problems that need to be addressed by the Mongolian state-owned mining enterprises are resource replacement and inheritance of production capacity. As mining progresses, the reserves of

resources are constantly being depleted; thus, new explorations and discoveries of reserves must be made to support the long-term operation of the company. The goal of applying the OKR model in this case is to increase the speed of resource replacement, and the main results have been set as the completion of drilling in the detailed exploration area, the scale of newly added controlled reserves, and the breakthrough milestone for low-grade ore utilisation technology. Production capacity succession refers to the progression of mining levels and the construction of new mining areas, with the goal of achieving the commissioning time of the new mining area, and the key results are broken down into the remaining engineering volume of shaft and tunnel work, the progress of equipment installation and commissioning, and the time required to reach the standard in trial production. The goals of such OKRs are in the form of phased breakthroughs, and the focus of evaluation is on achieving the steps in the process rather than the final results.

2.2.2 Goal Decomposition in the Context of Cost Reduction, Efficiency Improvement and Technological Upgrade

As the price of mineral products is determined by the international market, changes in that market abroad are also a cause of fluctuations in our market. The objective of the OKR Design for the area of cost reduction and efficiency improvement is to lower unit costs, and the main results have been set as the decrease rate of unit consumption in the extraction process, validation of alternative reagent schemes in mineral processing, and the reduction amount of outsourced procurement costs. The Technology upgrade scenario is to optimise mining methods and improve mineral processing technology to reduce the mining loss rate or increase the range of recovery for mineral processing; the main results have been the completion of industrial trials for new processes, the selection of equipment for renewal, and the achievement of operator training standards. The embedding of OKRs should point out a realistic field for the development of technology, and it should be possible to verify the key results and track the milestone nodes.

2.3 Structure of Indicator Weight Allocation and Evaluation Cycle

2.3.1 Principles of Weight Allocation and Dynamic Adjustment of Dual-Track Indicators

The proportion of weight given to KPIs and OKRs will change according to the stage of development of the company and shifts in its strategic direction. The aim of the stable-production stage is to increase extraction efficiency and reduce costs; thus, KPIs will be used to track the progress of these goals, and OKRs will be employed to achieve the strategy of resource replacement and technology fund accumulation. During the period of capacity expansion or when replacement resources are scarce, the weight of OKRs will be increased to focus resources on the main task. The weight of each indicator should be determined by its correlation with the goals of the company, the degree of controllability, availability of data, etc.; at the same time, this weight should be periodically adjusted in light of changes in the annual plan and external market conditions. Different types of minerals have different weights and various value chains, so the emphasis will be on cost control and technological innovation to different extents.

2.3.2 Differentiated Setting and Connection Mechanism of Evaluation Cycles

KPIs and OKRs have different evaluation periods, so a link will be added to have them work together. With the continuous development of the mining industry, its KPIs have also changed; now they are used to track fluctuations in extraction efficiency and cost control every month or quarter to help adjust production plans and address problems in a timely manner. OKRs are a set of goals that need to be achieved in a certain period, usually three months or a year; by reaching these goals, the company can keep its long-term direction. Cycle connection is shown by the fact that the results of the quarterly OKR evaluation can be used as the basis for the strategic task component of the annual KPIs, and continuous performance of monthly KPIs can confirm the achievability of OKRs. Staggered Arrangement can be employed to observe the daily progress of the project and regularly hold meetings to discuss any problems.

3. Operational Mechanism of the Performance Evaluation System

3.1 Information Transfer Channels in the Multi-participation of Evaluation Subjects

3.1.1 Two-way Information Transmission between the Mine-level Management and Functional Departments

Performance assessment of Mongolian state-owned mining enterprises is based on information coordination at all levels of the government. The mine's management will issue the general direction in the form of annual KPI standards and quarterly OKR challenge goals, and then distribute them throughout the organisation. In addition to obtaining the target instructions, the departments at the forefront of work, such as Production Technology, Safety and Environmental Protection, Equipment and Power, need to collect field data on external factors, changes in mining conditions, equipment operation status, geological abnormalities, etc., and report this information upwards. A two-way communication channel will be set up to adjust the KPI norm based on the feedback from the relevant department regarding changes in grade and mining difficulty, so that the indicators are in line with the actual production conditions. Organise monthly production analysis meetings and quarterly strategy review meetings to spread information, establish regular and timely communication, and ensure information symmetry at all levels of the organisation^[3].

3.1.2 Cross-unit Horizontal Information Sharing and Benchmarking Mechanism

The mining unit and the mineral processing unit are in a production chain and generate a large amount of data that can be used as the basis for building an evaluation system. The mining unit should promptly inform the mineral processing unit of any changes in ore grade and ore properties so that, based on this information, the latter can adjust the fineness of grinding and the kind of chemical reagents to keep the recovery rate of mineral products stable. Spread the drive efficiency and unit consumption data of all excavation and extraction teams across the company through an internal benchmarking system to find good operating conditions and management models, and then spread this tacit knowledge throughout the organisation. Horizontal transfer of information is based on the natural links in the production process and the common goal of performance improvement. The efficiency of this depends on the coverage of the enterprise information system and the uniformity of data standards, and it will directly affect the fairness of KPI evaluation and the rationality of OKR setting.

3.2 Corrective Function of Performance Feedback on Strategic Execution Deviation

3.2.1 Process Feedback and Dynamic Calibration of Mining Plan Implementation

The performance feedback mechanism covers all links in the mining production process, and based on attribution analysis of the results from phased evaluations, we can determine whether there have been any deviations in the implementation of strategy. After carrying out the monthly KPI evaluation, one should separate the reasons for the deviation in actual ore output, feed grade and unit cost from the plan into controllable and uncontrollable factors. For the reasons mentioned above, due to changes in the ground conditions or sudden equipment failures, the mining plan and other operating plans will need to be revised accordingly. The reason is poor execution of management; therefore, we will issue improvement requirements for the responsible department. Process feedback helps to solve problems early in the process so that they do not become serious issues later. Quarterly OKR reviews will be held to identify problems, and if the key results do not meet the goals, these reviews will determine how much effort and resources have been used, whether adjustments are needed in the technical plan or goals, etc.

3.2.2 Linkage of Outcome Feedback with the Incentive and Constraint Mechanism

Based on the results of the performance appraisal, modifications will be made to the incentive and constraint system to guide the direction of the organisation in the long run. The overall score of KPIs and the completion status of OKRs will jointly determine the performance-based pay coefficient for the mine-level management team, and based on the results of this evaluation, resource budget allocation for the following year will also be decided. The high-performing unit will receive a larger budget and be allowed more freedom in investment; the low-performing unit will have to reduce costs and cut back on investment. Another way to motivate people is to change their perception of the company's reputation and internal environment indirectly, thus encouraging them to improve on their own initiative. The effectiveness of outcome feedback depends on how seriously and consistently the evaluation results are put into practice, and it is also necessary to reasonably consider the different objective conditions of

mining production in the evaluation, avoiding treating differences in resource endowments as if they were differences in management performance.

3.3 Adjustment of External Market Fluctuations and Internal Assessment Norms

3.3.1 Dynamic Adjustment of KPI Benchmarks in Response to Price Fluctuations of Mineral Products

Mongolian state-owned mining enterprises are price-takers in the international market, so they will be affected by changes in the external environment and need to adjust their internal cost standards accordingly. When the price of mineral products declines, the company's profit margin will be lower; thus, the same cost-control indicators will no longer show the true situation at the company. At this time, the company should adjust the KPI targets dynamically, lower the benchmark for unit cost assessment, change the weight given to output and cost, and shift the focus of evaluation towards maintaining cash flow and controlling inventory. As prices have risen recently, we have cut some of our expenses to boost profits accordingly. Decide when to change the reference price based on the size and scale of the price adjustment, avoid frequent revisions due to short-term fluctuations, stay informed about changes in the external environment at the time of assessment, and keep the pressure on management reasonable.

3.3.2 Elastic Range of OKR Objectives Under External Uncertainty

It is difficult to set OKRs, but if there are considerable fluctuations in the external market or significant changes in geological conditions, the original goals may no longer be realistic. Given the uncertainty, the OKR goals will have an initial wide range and be divided into two levels: the base goal and the extended goal. The bottom line goal is the expected result of normal operations, and it will be used to allocate funds for resources. The goal of the challenge is high, so it will require more effort, and thus higher rewards will be given. If there is a considerable decrease in the external price or serious geological problems, the company will employ the objective adjustment mechanism in the elastic range to temporarily postpone the difficult objective and focus on achieving the baseline objective. An elastic range will be set according to the actual conditions of the mining enterprise, such as uncertainty and geological irregularities. The evaluation system should be able to handle the unexpected, and at the same time, set clear operating boundaries so as not to lose sight of the purpose of the evaluation.

Conclusion

First, the different strategic goals of Mongolian state-owned mining enterprises will be introduced, and then the problems of linkage and trade-offs among resource utilisation, extraction efficiency, cost control and risk resistance will be discussed. Traditional indicators of performance in mining have some deficiencies; that is, they do not take into account the geological conditions, and the Balanced Scorecard and Management by Objectives also fail to consider the impact of heterogeneous resource endowment. In theory, KPIs and OKRs have different levels of stability and flexibility, and together they can solve the problems of cycle mismatch and progressive goal alignment. Based on the performance factors at all times in the construction of the integrated system, set hierarchical goals and spread them throughout the organisation. Scenarios for resource replacement and cost reduction and efficiency improvement can offer embedding paths for OKRs, and then, based on shifts in the focus of strategy, the weights of evaluation and observation periods can be changed dynamically. The other two will be conducted: the second is two-way information exchange, and the third is cross-industry benchmarking. A way to combine KPIs and OKRs in the evaluation of mining operations is put forward here. Different Designs will be developed for the various minerals and Digital Pathways in the future.

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