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

Qian Liu[1*], Erkhembayar Tseveen[2]

[1]Hainan Vocational University of Science and Technology, Haikou, 571126, China
[2]Ikh Zasag University, National Engineering and Technology School，Ulaanbaatar city, Mongolia, 976, Mongolia
[*]Corresponding author: 18940023005@163.com

Abstract: *Subject to the dual constraints of resource endowment and external market fluctuations, Mongolian state-owned mining enterprises present a multidimensional structure of strategic objectives encompassing resource utilization, extraction efficiency, cost control, and risk resilience. Traditional performance evaluation tools exhibit limitations in the mining context: Key Performance Indicators (KPIs) face the problem of indicator rigidity, while the Balanced Scorecard and Management by Objectives struggle to accommodate resource endowment heterogeneity and uncontrollable production conditions. From the perspective of integrating KPIs and OKRs, this study begins with the deconstruction of strategic objectives, analyzes the applicable boundaries of traditional tools, and explores the theoretical common ground between the two types of tools. On this basis, the study constructs a dual-track integrated evaluation system that covers indicator extraction, OKR embedding, weight allocation, and cycle arrangement, and examines such operational mechanisms as information transfer, performance feedback, and flexible adaptation. The research shows that KPIs anchor the maintenance of routine performance, whereas OKRs carry strategic breakthroughs, and the two achieve synergistic operation through complementary cycles and progressive goal alignment. The evaluation system must establish functions of two-way transmission, dynamic calibration, and flexible adaptation to external fluctuations, so as to address the 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

In the development of Mongolia's mining industry, state-owned mining enterprises serve as the main entities responsible for resource extraction, and their performance management level directly affects resource utilization efficiency and corporate sustainable development. Mining production is characterized by capital intensity, long cycles, and geological complexity. The strategic objectives of these enterprises are endogenously shaped by resource endowment constraints and encompass multidimensional demands, including resource utilization, extraction efficiency, cost control, and risk resilience. Traditional evaluation tools reveal their functional boundaries in the mining context: the rigid assessment of Key Performance Indicators (KPIs) fails to accommodate geological contingency, the Balanced Scorecard does not incorporate the dimension of resource endowment, and the negotiation space of Management by Objectives is constrained by extraction conditions. The integration of KPIs and OKRs provides enterprises with an evaluation approach that balances stability and flexibility: KPIs anchor the maintenance of routine performance, while OKRs carry strategic breakthroughs. Complementary cycles and progressive goal alignment offer theoretical possibilities for performance evaluation innovation. This study focuses on Mongolian state-owned mining enterprises, exploring the construction and operational mechanisms of a dual-track integrated evaluation system, aiming to provide a performance management framework tailored to the industry characteristics for resource-dependent enterprises.

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

1.1 Multidimensional Deconstruction of Strategic Objectives in Resource-Dependent Enterprises

1.1.1 Goal Orientation of the Resource Utilization and Extraction Efficiency Dimensions

The strategic objectives of Mongolian state-owned mining enterprises are endogenous to the physical properties and occurrence conditions of mineral resources. The exhaustibility of resource reserves determines that these enterprises must incorporate resource replacement capacity into their core objective system, with the dynamic reserve replacement rate, mining recovery rate, and ore dilution rate constituting the basic indicators for measuring resource utilization levels. The geological complexity of mineral deposits gives rise to goal requirements in the extraction efficiency dimension, as the level of mining mechanization, the completion rate of driving footage, and the mineral processing recovery rate are directly linked to the economic value conversion capacity per unit of resource output. An inherent tension exists between resource utilization and extraction efficiency: increasing extraction intensity may accelerate reserve depletion, whereas excessive conservatism leads to insufficient dilution of fixed costs. Therefore, enterprise strategies must seek a balance between resource conservation and efficiency release.

1.1.2 Composite Demand for Cost Control and Risk Resilience

The attribute that mineral product prices are determined by the international market elevates cost control to an independent dimension of strategic objectives. The combined control level of unit mining cost, mineral processing cost, and period expense rate determines the ability of an enterprise to maintain its profitability floor amid price cycle fluctuations. The continuity of mining production and the uncertainty of underground conditions give rise to goal setting for risk resilience, with the safety production cycle, equipment operation integrity rate, and the timeliness of emergency response to sudden geological events constituting key measures for evaluating operational stability. A competitive relationship in resource allocation exists between cost control and risk resilience, and the boundary choice between safety investment and cost compression becomes a core trade-off proposition in the deconstruction of strategic objectives[1].

1.2 Functional Boundaries and Applicable Limitations of Traditional Performance Evaluation Tools

1.2.1 Indicator Rigidity Dilemma of Key Performance Indicators in the Mining Context

The Key Performance Indicator (KPI) method translates corporate goals into quantitative assessment standards, and mining enterprises widely apply this method to evaluate routine activities such as extraction volume, feed grade, and unit cost. However, mining production is subject to natural fluctuations in deposit occurrence conditions. Unforeseeable factors, including geological structural changes and interruptions in orebody continuity, often cause the preset indicators to deviate from actual conditions. The rigid assessment of KPIs fails to accommodate the output fluctuations caused by geological contingency, and consequently, the evaluation results deviate from the actual effort level of managers. The indicator rigidity dilemma originates from the relative stability of the organizational environment presupposed by KPIs, whereas mining enterprises face continuous disturbances from resource occurrence conditions as an antecedent variable that is difficult to control artificially.

1.2.2 Structural Limitations of the Balanced Scorecard and Management by Objectives

The Balanced Scorecard constructs a performance evaluation framework from four dimensions—finance, customers, internal processes, and learning and growth—but it exhibits structural defects in mining applications. Resource endowment, as a natural determinant of mining enterprise performance, is not incorporated into the evaluation dimensions. Differences in deposit grade and varying extraction difficulty eliminate a fair benchmark for cross-enterprise performance comparison. Management by Objectives emphasizes the negotiation between superiors and subordinates to set goals, but it also faces applicability challenges in the mining context: extraction plans and output targets are subject to the rigid constraints of resource occurrence conditions, thereby limiting the space for negotiation objectively. The common limitation of these two tools lies in their inability to accommodate the shaping effect of resource endowment heterogeneity and uncontrollable production conditions—characteristics unique to resource-dependent enterprises—on performance.

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

1.3.1 Dual Management Logic Emphasizing Both Stability and Flexibility

Key Performance Indicators (KPIs) and the Objectives and Key Results (OKR) method originate from different management philosophies, but they present theoretical complementarity in meeting the performance evaluation needs of mining enterprises. KPIs are outcome-oriented assessments that emphasize indicator stability and comparability, making them suitable for monitoring and evaluating ongoing routine activities such as extraction efficiency, cost control, and safety records. OKRs are characterized by goal challenge and focus on phased breakthroughs in key results, making them suitable for strategic activities with innovative attributes, such as resource replacement exploration, the introduction of new processes, and cost-reduction initiatives. The integration of the two types of tools is based on the fact that enterprise operations require both the maintenance of daily extraction stability and adaptive adjustments to changes in resource conditions. Stability and flexibility thus constitute the two sides of the same coin in performance evaluation.

1.3.2 Integration Mechanism of Cycle Complementarity and Progressive Goal Alignment

The collaborative space between KPIs and OKRs is realized through the mismatched arrangement of evaluation cycles and the progressive hierarchy of goals. KPIs use monthly or quarterly cycles as evaluation units, which adapt to the continuous rhythm of extraction activities and ensure the controllability of production processes and the predictability of outcomes. OKRs adapt to quarterly or annual breakthrough cycles, carrying strategic tasks such as resource replacement and technological upgrading that require cross-period accumulation, thereby providing goal orientation for phased leaps. In terms of goal-setting logic, KPIs anchor the baseline that must be achieved, representing the guarantee requirements for basic resource development activities; OKRs represent the aspirational leap line, driving enterprises to seek new paths for efficiency improvement under resource constraints. The key to the integration mechanism lies in identifying the areas of routine performance maintenance and strategic breakthroughs in mining activities, thereby achieving a mismatched allocation and synergistic operation of the two types of tools.

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

2.1 Extraction and Hierarchical Decomposition of Key Indicators Under Strategic Guidance

2.1.1 Identification of Key Performance Areas Based on the Entire Resource Development Process

The strategic objectives of Mongolian state-owned mining enterprises need to be transformed into measurable evaluation scales through key performance indicators. The resource development process covers geological exploration, mine construction, ore extraction, mineral processing, and mine closure and reclamation, with each link exhibiting heterogeneity in performance contribution. The exploration link focuses on the reserve upgrade conversion rate and the input-output efficiency of exploration. The construction link pays attention to the completion rate of shaft and tunnel engineering and the investment intensity per unit of capacity. The extraction link takes the recovery rate, the dilution rate, and the mining loss rate as its core indicators. The mineral processing link emphasizes the mineral processing recovery rate and the stability of concentrate grade. The principle of full-process coverage avoids one-sided evaluation. Extraction and mineral processing, as the links of direct value conversion, occupy a foundational position, while exploration and reclamation reflect the goal orientation of resource replacement and sustainable development.

2.1.2 Target Transmission Mechanism of Organizational Levels and Functional Units

The transmission of key performance indicators from corporate strategy to the operational level relies on a hierarchical decomposition mechanism. The heterogeneity of orebody occurrence conditions determines that different mining units have production condition differences, so the indicator decomposition must accommodate objective differences rather than imposing forced uniformity. Mine-level performance indicators take unit full cost, ore grade compliance rate, and safety production duration as their core, and when decomposed downward to excavation and extraction teams, they are transformed into operational indicators such as the completion rate of driving footage, the unit consumption of explosives, and the roof management pass rate. The concentrator’s indicators take concentrate output and recovery rate as their core, and when decomposed downward to production shifts, they are transformed into process indicators such as grinding fineness, the reagent addition pass

rate, and the equipment operation rate. The essence of hierarchical decomposition is to translate strategic objectives into behavioral variables that different management levels can directly influence, while maintaining the logical consistency of vertical indicators[2].

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

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

The strategic breakthrough needs of Mongolian state-owned mining enterprises are primarily concentrated in the areas of resource replacement and production capacity succession. Resource reserves are continuously depleted as mining progresses, and the exploration and discovery of new reserves constitute the fundamental support for the survival of an enterprise. The embedding of the OKR model in this scenario takes the resource replacement rate as its objective, with the key results set as the completed footage of drilling in the detailed exploration area, the scale of newly added controlled reserves, and the breakthrough milestone of low-grade ore utilization technology. Production capacity succession involves the transition of mining levels and the construction of new mining areas, with the objective set as the commissioning timeline of the new mining area, and the key results decomposed 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 objectives of such OKRs have a phased breakthrough attribute, and the evaluation focus shifts from outcome assessment to the achievement of process milestones.

2.2.2 Goal Decomposition in Cost Reduction, Efficiency Improvement, and Technology Upgrade Scenarios

The fact that mineral product prices are determined by the international market makes cost control a core capability for enterprises to respond to cyclical fluctuations. The OKR design in the area of cost reduction and efficiency improvement takes the reduction range of unit cost as its objective, and the key results are decomposed into the decline rate of unit consumption in the extraction process, the validation of alternative reagent schemes in mineral processing, and the reduction amount of outsourced procurement costs. The technology upgrade scenario focuses on the optimization of mining methods and the improvement of mineral processing techniques, with the objective set as the reduction of the mining loss rate or the increase range of the mineral processing recovery rate, and the key results corresponding to the completion of industrial trials of new processes, the determination of equipment renewal selection, and the achievement of operator training standards. The embedding of OKRs requires identifying the feasible space for technological improvement, ensuring that the key results are verifiable and the milestone nodes are traceable.

2.3 Structural Arrangement of Indicator Weight Allocation and Evaluation Cycles

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

The weight allocation between KPIs and OKRs depends on the mining stage in which the enterprise operates and the shift in its strategic focus. During the stable production period, extraction efficiency and cost control serve as the core, with KPIs occupying the dominant weight, while OKRs focus on strategic tasks such as resource replacement and technology reserves. During the capacity expansion period or a period of tight resource replacement, the weight of OKRs increases correspondingly to guide resources toward breakthrough tasks. The weight allocation needs to consider the strength of the correlation between each indicator and the strategic objectives, the degree of controllability, and data availability, and it should be dynamically reassessed with annual strategic planning adjustments or changes in external market conditions. Differences in mineral types also affect the weight configuration, as the value chain characteristics of different minerals determine the relative importance of cost control and technological improvement.

2.3.2 Differentiated Setting and Connection Mechanism of Evaluation Cycles

KPIs and OKRs exhibit structural differences in evaluation cycles, and a connection mechanism is required to achieve coordinated operation. KPIs adapt to the continuous production characteristics of the mining industry, using monthly or quarterly cycles as evaluation units to reflect real-time changes in extraction efficiency and cost control, thereby providing a basis for production scheduling and process correction. OKRs adapt to the phased characteristics of strategic tasks, using quarterly or annual cycles to focus on the achievement of key result milestones and avoid short-term fluctuations interfering with the advancement of long-term goals. The cycle connection is reflected in the fact that

quarterly OKR evaluation results can serve as inputs for the strategic task dimension in annual KPIs, and the sustained performance of monthly KPIs can verify the feasibility of OKR settings. The staggered arrangement enables daily operational monitoring and strategic breakthrough management to complement each other, forming a complete evaluation rhythm.

3. Operational Mechanism of the Performance Evaluation System

3.1 Information Transfer Channels Under the Multi-Participation of Evaluation Subjects

3.1.1 Two-Way Information Transmission Between the Mine-Level Management and Functional Departments

The performance evaluation of Mongolian state-owned mining enterprises relies on information coordination among multiple hierarchical subjects. The mine-level management, as the formulator of strategic objectives, transmits downward the annual KPI benchmarks and quarterly OKR challenge goals, thereby forming a top-down instruction flow. While receiving the target instructions, functional departments such as production technology, safety and environmental protection, and equipment and power assume the responsibility of collecting field information and providing upward feedback, including objective factors such as changes in mining conditions, equipment operation status, and geological anomalies. The two-way transmission mechanism enables the management to reasonably adjust the KPI benchmarks based on the feedback from functional departments regarding grade fluctuations and changes in mining difficulty, thus preventing the indicators from deviating from actual production conditions. The information transfer relies on monthly production analysis meetings and quarterly strategic review meetings, forming a communication rhythm that combines periodic and trigger-based approaches, thereby ensuring information symmetry between the upper and lower levels[3].

3.1.2 Cross-Unit Horizontal Information Sharing and Benchmarking Mechanism

A sequential production connection exists between the mining unit and the mineral processing unit, and horizontal information sharing constitutes the fundamental support for the operation of the evaluation system. The mining unit must transmit changes in ore grade and ore properties to the mineral processing unit in a timely manner, so that the latter can adjust the grinding fineness and the reagent regime, thereby ensuring the stability of the mineral processing recovery rate. The driving efficiency and unit consumption indicators of different excavation and extraction teams are shared through an internal benchmarking mechanism, which identifies optimal operating parameters and management methods and promotes the diffusion of tacit knowledge within the organization. Horizontal information transfer is based on the intrinsic linkages of the production process and the common pursuit of performance improvement. Its efficiency depends on the coverage of the enterprise information system and the uniformity of data standards, and it directly affects 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 Execution

The performance feedback mechanism runs through the entire mining production process, and it identifies strategic execution deviations through attribution analysis of phased evaluation results. After the monthly KPI evaluation is completed, the differences between the actual ore output, feed grade, and unit cost and the planned values need to be distinguished between controllable factors and uncontrollable factors. Uncontrollable factors, such as changes in geological conditions and sudden equipment failures, trigger dynamic calibration of the mining plan, which adjusts subsequent operation arrangements and resource allocation. Controllable factors, such as inadequate management execution, are transformed into management improvement requirements for the responsible unit. Process feedback moves the evaluation forward from end-of-period assessment to in-period adjustment, allowing intervention before deviations accumulate to an irreversible point. The quarterly OKR review also performs a corrective function: when key results fail to reach milestones, the review reassesses the intensity of resource input and the feasibility of the technical path, determining whether to increase efforts or adjust the objectives.

3.2.2 Connection Between Outcome Feedback and the Incentive and Constraint Mechanism

The outcome feedback of performance evaluation, through its connection with the incentive and constraint mechanism, forms a long-term regulation of organizational behavior. The annual comprehensive score of KPIs and the completion status of OKRs jointly determine the performance-based pay coefficient of the mine-level management team, and they also link the evaluation results to the allocation of resource budgets for the following year. High-performing units receive budget flexibility and investment priority, while low-performing units face pressure from cost compression and investment tightening. The transmission effect of incentives and constraints is also reflected in implicit evaluations such as organizational reputation and internal status, thereby generating intrinsic motivation for performance improvement. The effectiveness of outcome feedback depends on the seriousness and consistency of applying the evaluation results, and it is also necessary to reasonably reflect the differences in objective conditions of mining production in the evaluation, avoiding the treatment of resource endowment differences as equivalent to management performance differences.

3.3 Flexible Adaptation Between External Market Fluctuations and Internal Evaluation Standards

3.3.1 Dynamic Adjustment of KPI Benchmarks in Response to Mineral Product Price Cycles

As price takers in the international market, Mongolian state-owned mining enterprises face continuous impacts from external fluctuations, and internal evaluation standards need to establish a flexible adaptation mechanism. During a downward cycle of mineral product prices, the profit margin of an enterprise narrows, and maintaining the original cost control indicators may cause the evaluation standards to become detached from reality. At this time, the enterprise needs to initiate dynamic adjustments of KPI benchmarks by appropriately relaxing the unit cost assessment or adjusting the weight allocation between output and cost, shifting the evaluation focus toward cash flow maintenance and inventory control. During an upward price cycle, the enterprise correspondingly tightens the cost indicators to guide itself toward maximizing benefits. The trigger condition for benchmark adjustment is set as the magnitude and duration of price fluctuations, which prevents frequent adjustments due to short-term volatility, maintains the alignment of evaluation standards with the external environment, and keeps management pressure within a reasonable range.

3.3.2 Elastic Range of OKR Objectives Under External Uncertainty

OKR setting has a challenging nature, but when external market fluctuations are severe or major changes occur in geological conditions, the preset objectives may lose their basis for achievement. To address such uncertainty, OKR objectives need to have a preset elastic range that distinguishes between two levels: the baseline objective and the challenge objective. The baseline objective represents the level that should be achieved under normal conditions and is linked to resource allocation budgets. The challenge objective represents the leap that requires extraordinary efforts to achieve and is associated with excess incentives. When external prices plummet or a major geological anomaly occurs, the enterprise activates the objective adjustment mechanism within the elastic range, temporarily setting aside the challenge objective and focusing on achieving the baseline objective. The establishment of an elastic range acknowledges that the uncertainty and geological unpredictability faced by mining enterprises are objective realities. The evaluation system needs to have the capacity to accommodate unexpected shocks while clearly defining the boundaries of operation to prevent the objectives from becoming empty.

Conclusion

This study begins with the multidimensional deconstruction of the strategic objectives of Mongolian state-owned mining enterprises, revealing the intrinsic relationships and trade-offs among resource utilization, extraction efficiency, cost control, and risk resilience. Traditional evaluation tools exhibit limitations in the mining context: the rigid assessment of KPIs fails to accommodate geological contingency, while the Balanced Scorecard and Management by Objectives do not address the shaping effect of resource endowment heterogeneity. KPIs and OKRs demonstrate theoretical complementarity in the dimensions of stability and flexibility, with cycle mismatch and progressive goal alignment constituting their collaborative space. The construction of an integrated system requires identifying performance areas based on the entire process and achieving goal transmission through hierarchical decomposition. Scenarios such as resource replacement and cost reduction and efficiency improvement

provide embedding paths for OKRs, while weight allocation and evaluation cycles are dynamically adjusted according to the shift in strategic focus. The operational mechanism relies on two-way information transmission, horizontal benchmarking, feedback correction, and flexible adaptation to external fluctuations. This study reveals the applicable logic of integrating KPIs and OKRs in mining performance evaluation. Future research may explore differentiated designs for different mineral types and digital-enabled pathways.

References

[1] Zhou Shuyan. Optimization Design of Performance Management System for Company A. 2024. Nanjing University of Posts and Telecommunications, MA thesis.
[2] Ren Fangli. Research on Optimization of Employee Performance Management in Company A Based on KPI and OKR. 2025. Guizhou University, MA thesis.
[3] Liu Chunjia, and Zhong Wei. "Integration of KPI and OKR: Building Collaborative and Efficient Performance Management." Human Resources, no.24 (2024): 53-55.