



# Performance evaluation of outsourcing decision using a BSC and Fuzzy AHP approach: A case of the Indian coal mining organization



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## ARTICLE INFO

### Keywords:

Outsourcing  
Performance evaluation  
Balanced Scorecard (BSC)  
Fuzzy Analytic Hierarchy Process (FAHP)  
Coal mining

## ABSTRACT

Mineral and mining sectors are always of a great concern to any nation due to its major contribution to the economy. In India, the demand for coal is continuously on rise due to its ever increasing need from the growing power sectors and steel industries. In spite of the large coal reserves, India has to import coal from overseas sources to address the perpetual demand-supply gap. In order to reduce the dependence on imported coal, to ensure an affordable price to the domestic customers as well as to achieve operational efficiency, the state-owned coal mining organization of India have now started taking initiatives to outsource some of the operational activities involving private agencies. To realize the success of outsourcing, it is indispensable to consider it as part of the corporate decision. Such decision essentially considers all possible attributes of strategy planning for performance improvement. The study focuses on the development of an effective performance evaluation framework based on Balanced Scorecard (BSC) and Fuzzy Analytic Hierarchy Process (FAHP) to analyze the suitability of organization's strategic decision of outsourcing in alignment with the organizational performance for the Indian coal mining organization. BSC administers strategic elements of decision making in assessing the performance of the firm whereas FAHP, on the other hand, is applied to determine the relative importance weight of criteria in regard to organizational objectives taking into consideration the vagueness and ambiguity of information as characteristics of decision-making problems. The findings of the present study establish the proposed framework as an analytical tool in strategy formulation and provide rationale guidance to management with regard to performance improvement.

## 1. Introduction

Mineral and mining sectors are the major contributors to the economic development of a country as they act as a primary source of raw materials to a wide range of industries. The Indian coal mining industry plays a significant role in terms of meeting the escalating demand for coal from the growing power sectors and steel industries. In spite of India being ranked fourth in the total coal reserve and third largest coal producing country in the world, a steady growth of demand-supply gap has been witnessed over the years. The continuously increasing demand has compelled the Indian coal mining organization to import coal from overseas sources. However, the import of coal is associated with several risks including global spot price movements, fluctuations in foreign currency exchange rate, and issues related to changes in laws and taxation in exporting countries. On the other hand, development of new domestic mines requires significant capital investment, higher operating costs, and maintenance of high level of spares. The resulting implication of all these factors is a

substantial increase in the price of coal that is made available to the domestic customers (ICC, 2013). Simultaneously, it has been observed that private agencies have delivered competitive advantage to captive mines through the deployment of high capacity equipment and application of their expertise in modern exploration technologies. Moreover, private agencies are equipped with the state-of-the-art mining methods and planning skills that have led to efficient execution (ICC, 2013). As a result, the state-owned coal mining organization has now started taking initiatives involving the private agencies. This has the purpose of increasing the efficiency of the mining operation, lowering the operational cost while minimizing the wastes and increasing the sustainability of mining operation (Khanna, 2013).

For mining industries, non-core business processes have been the primary candidates for outsourcing (Kumar and Kumar, 2004). However, mining industries are recently outsourcing activities in regard to financial management, marketing, environmental management, employee management, and activities related to corporate social responsibilities (Sivakumar et al., 2015). According to Indian Chamber

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of Commerce Report (2013), overburden removal and logistics are the areas where outsourcing was practiced initially that has extended to core areas like exploration (ICC, 2013). Such endeavor has improved the quality of geological information that in turn minimizes the failure rates in target achievement and assists to derive better financial returns. Activities that are critical to the coal mining organization include identification of coal reserves, exploration of new mine sites, design, implementation, and optimization of operational activities for extraction of coal. Engaging third party service provider for coal reserve identification and exploration of new mine projects substantiates it to be one of the strategic action plans to achieve the projected target (CIL, 2015).

While outsourcing has been an established corporate strategy worldwide to achieve competitive advantage, however, such a business decision is associated with some inherent risks that can jeopardize future business survival. Outsourcing, which is popularly known as a cost effective tool often becomes expensive due to undesirable transaction cost (Quinn, 1999). Other disadvantages of outsourcing include the unavailability of the vendor on a full-time basis, leakage of confidential information, cost escalation, and risk sharing (Stacey et al., 1999). There are instances where the Indian coal mining organization has reported dissatisfied results while delegated outsourcing jobs to the private agencies (NCL, 2015; SECL, 2015).

So, to realize the success of outsourcing, it is indispensable to consider it as part of the corporate decision. Such decision essentially considers all possible attributes of strategy planning for performance improvement. Integrating outsourcing within the strategic decision to achieve competitive advantage requires evaluating and monitoring of one's own internal performance. The study focuses on the development of an effective performance evaluation framework to analyze the suitability of organization's strategic decision of outsourcing in alignment with the organizational performance for the Indian coal mining organization. In particular, the study captures the influence of outsourcing decision on organizational performance.

The performance evaluation framework deployed in this study is an integrated framework comprising of the Balanced Scorecard (BSC) and Fuzzy Analytic Hierarchy Process (FAHP). BSC administers strategic elements of decision making in evaluating the performance of the firm. BSC approach is applied in terms of a hierarchical structure with its four perspectives (financial, customer, internal operations, and company learning and growth) along with the performance indicators corresponding to each of the perspectives (Wang et al., 2012). FAHP, on the other hand, is a multi-criteria decision-making tool that helps in determining the relative importance weight of criteria in regard to organizational objectives taking into consideration the vagueness and ambiguity of information as characteristics of decision-making problems (Huang et al., 2008). The objective of the study is to present an integrated performance evaluation framework based on BSC along with FAHP that helps in determining the relative importance of the BSC perspectives and its indicators through the linguistic judgment of decision makers. Furthermore, in view of the fuzzy (imprecise) nature of information, sensitivity analysis has been carried out taking into account the level of uncertainty and confidence of decision makers for prioritizing the BSC perspectives and their corresponding attributes. The novelty of the study is three-fold. First, the study captures the unexplored attributes within the BSC perspectives responsible for performance evaluation particularly for a coal mining organization. Second, is the development of a performance evaluation framework characterized by quantitative and qualitative judgements of decision makers. Third, is that the entire framework has been designed and evaluated using Microsoft Excel® 2010 platform which is another distinct feature of the proposed approach in comparison to the adoption of any other costly software.

## 2. Review of literature

The extant literature cites several performance measurement frameworks for measuring the performance of an organization. The present study discusses some of the prominent performance measurement frameworks from the existing literature.

### 2.1. A review of existing performance measurement frameworks

Purbey et al. (2007) and Anderson and Mcadam (2004) discuss a number of different performance measurement frameworks for evaluating the performance of an organization. The most popular performance measurement frameworks discussed in the study are balanced performance measurement matrix, performance measures for time-based competition, performance pyramid system, balanced scorecard framework, Brown's input, processes, outputs and outcomes framework, performance prism, Du Pont's pyramid of financial ratios, and Skandia AFS navigator.

Keegan et al. (1989) posit the balanced performance measurement matrix that considers cost as well as non-cost measures in the framework; however, the matrix does not clearly portray the links between the different dimensions of business performance. The performance pyramid system was developed by Judson (1990) is a hierarchical framework considering business performance measure with the business process view at different levels of the organization (Neely and Bourne, 2000). The time-based performance evaluation framework known as performance measures for the time-based competition was proposed by Azzone et al. (1991) which considers time as a strategy in responding to the changing environment in achieving competitive advantage. The framework reflects the efficiency (internal configuration) and effectiveness (external configuration) dimensions of performance measure within the organization (Anderson and Mcadam, 2004). Skandia AFS (1994), a Sweden financial service company developed Skandia navigator, measures intellectual capital as a management instrument. A notable feature of this model is that it considers intangible assets that are linked to guide benchmark dimensions Brown's (1996). input, processes, outputs, and outcomes framework is based on the significant difference between input, processes, outputs, and outcomes measures such that there is a cause-effect relationship where one influences the other (Brown, 1996). The performance prism is another performance measurement tool that comprises of five interrelated perspectives. They are stakeholder satisfaction, strategies, processes, capabilities, and stakeholder contribution. The prism is considered as a balanced framework that includes internal and external measures, financial and non-financial measures as well as measures efficiency and effectiveness as measures of organizational performance (Neely et al., 2001; Neely and Bourne, 2000). Du Pont's pyramid of financial ratios refers to a hierarchical structure that links a variety of financial ratios to return on investment at different organization levels, however, a number of shortcomings of the framework were outlined in the extant literature (Kennerley and Neely, 2002).

Kaplan and Norton (1992) introduced Balanced Scorecard (BSC) which is a comprehensive and multi-dimensional view of looking at the performance of the organization through the four perspectives as financial, customer, internal, and company learning and growth. The extant literature exemplifies BSC to be the most prominent management tool for evaluating the performance of a firm. According to Neely et al. (2001), the strength of the framework lies in the integration of different modules of organizational performance within a comprehensive framework. Another notable feature of this framework is that it explicitly links the different dimensions of the performance measure with the organizational strategy (Neely, 2002; Anthony and Govindarajan, 1998). state that it is a management tool that assists in focusing on organization, enhancing communication and integration, framing organizational objectives, and further facilitates in providing feedback on strategy. In particular, the framework measures

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