

**PERFORMANCE MEASUREMENT SYSTEMS AND METRICS:  
A FRAMEWORK FOR MONITORING OIL OPERATIONS**

Adel Nouara  
Advanced Manufacturing and Enterprise  
Engineering  
Brunel University  
London  
Uxbridge, UB8 3PH, UK  
Adel.nouara@brunel.ac.uk

Dr Rebecca DeCoster  
Advanced Manufacturing and Enterprise  
Engineering  
Brunel University  
London  
Uxbridge, UB8 3PH, UK  
r.decoaster@brunel.ac.uk

**ABSTRACT**

Oil operations involve high levels of capital equipment and high capacity production processes for which performance measures can assist with monitoring production throughout the oil industry stages. The approach taken in this paper is to utilise the lifecycle approach of asset management as well as organisational resource factors in an integrative manner. This research will examine the use of performance measurement in both private and public oil companies with a focus on Developing Countries. National Oil companies are of national economic importance in Developing Countries.

Thus purpose of this paper is to develop a conceptual framework for performance measures of current and future oil operations and the associated asset management for field operations. The approach taken is to recognise the national context and strategic drivers and then to examine within this context the three areas of: Asset Management; Oil Operations (including Technology and Development; Management approaches; Partnerships) and Performance Outcomes.

**Keywords:** Performance Measurement, Performance Management, Asset Management.

**1 INTRODUCTION**

Kincaid (1994) signifies that to conduct correct appraisals and develop tactics for progression, performance management is highly important. According to Lebas (1995) performance management execution is highly important when the definition of improving performance is concerned as it helps in making strategies for decision making and focuses on a better future as well. Performance Measurement or better known as PM is continually been realised as a key mechanism regarding performance management considering it offers and incorporates the entire related information significant whilst undertaking decisions linked to the undertaking of handling a firm's performance Bititci et al. (1997).

The recent works collected on performance management by different researchers such as Flapper et al. (1996) and Bititci et al. (2005) have shown the growth from defining universal commendations on cultivating performance to articulating performance measurement (PM) structures and schemes as identified by Folan and Browne (2005), lastly towards the problems of executing as well as expending performance management systems to achieve optimal performance in the organisation.

This research aims to examine the changing drivers of oil operations in developing countries and their strategic importance and the associated evolution of operational performance and metrics for National Oil Companies (NOCs). Therefore the purpose of this paper is to develop a conceptual framework for performance measures of current and future oil operations and the associated asset management for field operations.

## **2 BACKGROUND TO PERFORMANCE MEASUREMENT AND MANAGEMENT**

According to different researchers such as Keegan et al. (1989), Kaplan and Norton (1992) and Neely (1998) the field of performance management has been very important when identifying performance management and its structures. Azzone et al. (1991) and Dumond (1994) identified the different applicable performance measures stating that the researches done in the past regarding performance management were different as it was expected that they would be performing feedback functions by giving the organisation important data regarding the firms business model. In today's time the researches conducted are different as they use the importance of performance management to measure the success of learning and innovation in an organisation and the level of applicability derived Kerssens-van Drongelen (1999). Furthermore performance measuring signifies the pointers of performance that could be implemented when making distinctions both internally or externally in an organisation Ho et al. (2000) considering they are a good identifier or comparison.

Performance measures can describe the performance purposes in a strong and calculable way Hitchcock (2002) and O'Sullivan et al. (2004). Key performance indicators (KPIs) were identified according to five chief standpoints; physical features of the project, funding and promotion, improvement and learning stakeholders, and project procedure Yuan et al. (2009). They also mention when the major KPIs are recognised, confirmed, and examined after that a sincere performance measurement will be possible. It was argued that credentials of key performance indicators and the implementation of performance measurement of focus on assessment and overall performance toward an organisation's mission Cable and Davis (2004). Consequently the resolution to adopt performance measurement underlies in the comprehension of the influences of the decision-making done by the management and its attainment and disaster in recommending conceivable enhancements Cable and Davis (2004).

## **3 CONCEPTUAL FRAMEWORK CONCEPTUAL**

When discussing performance indicators, there are factors influencing the nature of both public and private organisations in content to their facilities. These performance indicators are essential when identifying the evaluation of facilities for the coordination of the organisations goals and missions with its performance and hence help organisations to easily identify and manage their goals Cable and Davis (2004) and Cripps (1998).

### **3.1 Creating Value in Oil and Gas**

The oil and gas sector is creating value by linking various factors in the oil industry, starting from the resource base to production, processing, transportation, and finally to the market. Resource base is nature's gift, however, transforming this into reserves and production needs investment and effort. The production link in the value chain is connected to field recovery factors and production costs, both of which have technical and managerial dimensions and the same for the processing and transport stages of the chain Stevens (2008). Most of the time the market value of oil (crude or petroleum products) and gas is assumed to be outside the control of National oil companies (NOCs). Generally NOCs are operating with control over costs and efficiency, therefore they directly create value.

### **3.2 Performance Measurement and Analysis**

Hoque and James (2000) argue that about a resiliently constructive relationship amongst performance measurement processes and their financial enactment as a result of the study conducted by them regarding the implementation of non-financial processes maintained by contexts such as the BSC. Perera et al. (1997) however signified that there is a negative association amongst using non-financial measures and financial performance. Furthermore, Ittner et al. (2003) also studied the same idea which related to the practice of measurement association methods like those of the BSC and hence signified that there was no connexion amid these techniques of BSC and economic performance. Henceforth, Franco-Santos (2007) identifies the association amid using the non-financial methods in decision-making rewards as well as the financial enactment of the firm therefore reporting that

although the association existed, it wasn't applicable by being negative. Type of users have highly influence on the selection of performance measures, different users as managers, supervisors and customers need different measures for different purposes Lebas (1995).

### 3.3 Proposed Framework for Monitoring Oil Operations

The approach taken is to recognise the national context and strategic drivers and then to examine within this context the three areas of: Asset management; Oil operations (including technology and development; management approaches; partnerships) and Performance outcomes.

Figure 1 represents a conceptual model based on the extent literature which will underpin this research. The model comprises two parts: firstly asset management and its effect on oil operations. Mitchell and Carlson (2001) described the term asset management as “a tactical, cohesive set of ample procedures (financial, management, engineering, operating and maintenance) to gain greatest lifetime effectiveness, utilisation and return from physical assets (production and operating equipment and structures)”. When talking about physical asset management it can be seen that in the process industry this predominantly fixated on maintenance management models Amadi-Echendu (2004). Secondly oil operations and their factors affecting the performance of NOCs. Table 1 summarizes the key literature that includes theoretical and empirical support of the second part of the framework.

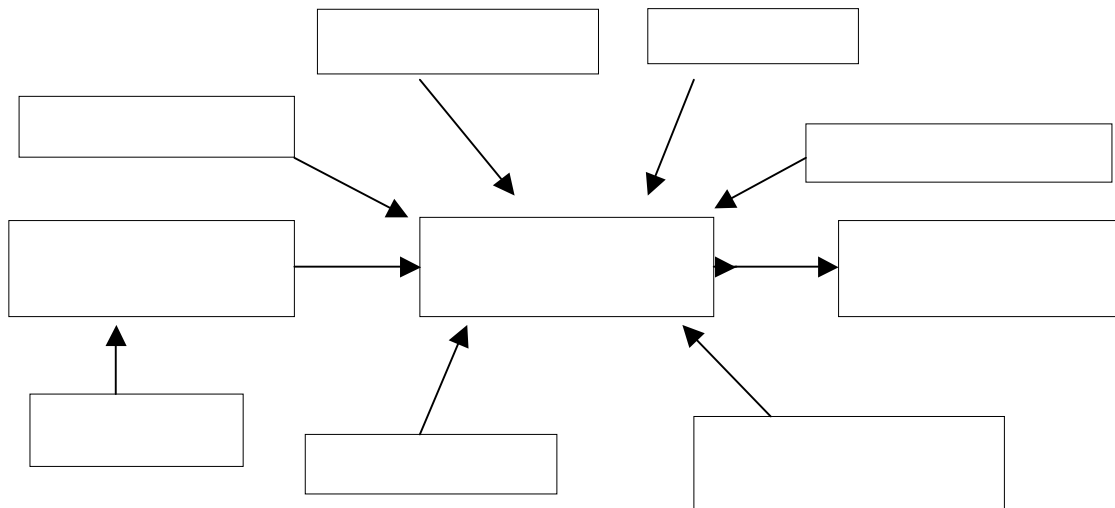


Figure 1: Proposed conceptual research model .

Table 1: Literature map of the research framework concerning oil operations.

Performance metrics	Cite
NOCs objectives	Mommer (2002) , Boué (2003), Victor (2007), PESD (2006), Energy policy (2009),CEE (2007) and Stevens (2008).
Production growth	Stevens (2008), CEE (2007), Energy policy (2009) and Victor (2007).
Reserves growth	Stevens (2008), CEE (2007), Energy policy (2009) and Victor (2007).
Exploration success rate	CEE (2007), Stevens (2008) and Energy policy (2009).
Technology	Stevens (2008), CEE (2007), Al-Naimi (2004), Zanoan (2002), Alleyne (1980), PESD (2006) and Energy policy (2009).
Partnership	Stevens (2008) and PESD (2006).

## 4 STUDY DESIGN

A large number of studies were designed to undertake the assessment of effect of performance management inventiveness on the real performance of a firm but many studies conducted in recent times have controversial results to this statement Neely (2005). Several of these for instance are presenting the constructive influence of the BSC on performance. The approach for this study will be a cross functional questionnaire survey within oil companies to identify current practices and their

impact on performance management. The intention is to interview key personal's with expertise in oil operations primarily NOCs in Middle East.

National Oil Companies are firms that were initiated after the 1950's by the government for the public sector. National oil companies (NOCs) are highly important as they control the oil reserves that supply the entire world's necessity for liquefied fuel. Furthermore In various countries around the world the most important sector on which the economy depends is the oil sector and is considered vital for economic development Stevens (2008).

National oil companies (NOCs) dominate almost 77% of the worlds extracted oil reserves which account to more than eleven hundred billion barrels. These excavated resources are within the control of the NOCs without any participation by the IOCs. Furthermore the foreign international oil companies now have control over less than ten per cent of these oil reserves Jaffe (2007). In terms of oil reserves, 9 out of the top 10 international companies are NOCs, and with respect to natural gas reserves, all the top ten global companies are NOCs .These NOCs are principally resident in developing countries. Also In terms of world oil production NOCs are in the top 20 oil producing companies in the world Jaffe (2007).

In addition to the hydrocarbons sector, NOCs have an impact on most of the energy services such as electric supply as they are often seen as states within a state because they are large suppliers of state revenues and are commonly in the top of the most attractive firms for employees in the country.

Although many IOCs claim their abilities of supplying technology, capital and access to markets, many governments have not allowed them to access the hydrocarbon resources therefore, NOCs have often found it difficult of involving in partnerships with outside firms in addition, most of the NOCs find it more difficult to operate outside their home market. In terms of utilising the reserves IOCs demonstrate that their efficiency is higher than NOCs,International Oil companies are better at least 33% more than NOC's when shifting oil reserves into utilisable output Victor (2007).

#### **4 CONCLUSION**

It is significant to understand the national oil companies performance in order to know their role and impact on energy sector. This work is aimed at developing a research framework that understands the impact of Asset management and operations on firm's performance. At this early stage of the research, our work lacks the validation of tools and the data required to draw conclusions on such relationships, which will be the succeeding phase of this research. At the current stage, we look forward to receiving criticism and feedback that will help us improve our understanding on how to best achieve this research's aims.

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