

A mathematical model for strategic and tactical planning of the oil & gas upstream supply chain after a merger

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Abstract

The oil and gas (O&G) industry have complex supply chains across the various processes involved in extracting, refining, and distributing oil and gas. The supply chain involves multiple locations (wellheads, production facilities, and refineries) and many companies supplying the material and equipment required at these locations as well as support services such as project and contract management and logistics. Moreover, lower oil prices are reducing the operating margins of the Oil and Gas companies forcing them to review their organizations and supply chains to improve efficiencies and reduce cost. This can be achieved not only through vertical integration but also through a horizontal merger between two or more companies. Therefore, strategic and tactical planning and optimization of the main activities in the O&G is challenging and continue to attract researchers and practitioners.

In this study, we present a novel mathematical model for strategic and tactical planning of the upstream O&G supply chain. The O&G supply chain is composed of production areas for oil and gas, processing plants, and demand terminals (tank farms for oil and downstream gas processing). The proposed model assists decision-makers in studying how to manage the O&G supply chain after a merger. The model introduces a framework for the evaluation of advantages associated with horizontal mergers through supply chain network integration and optimization.

A case study based on real data from the UAE is provided to show the applicability of the model. Besides, a sensitivity analysis related to the volatility of oil and gas prices is conducted to derive managerial insights. The initial results show that merger decisions and related costs (shared services and logistics cost) have an impact on how to meet the demand, minimizing costs, and maximizing revenue. Finally, experimentation of the proposed model for two scenarios pre- and post-horizontal mergers is presented for the quantification of potential gains associated with the merger.

Keywords

Supply chain, Oil and Gas, Optimization, Strategic and tactical planning, and Merger.

Biographies

Abdalla Rashid Masoud Alnaqbi is Senior Vice President Umm Shaif, Lower Zakum, and Nasr Business Unit, reporting directly to ADNOC Offshore CEO ADNOC OFFSHORE. He joined ADMA-OPCO in 2000 as a Junior Electronics Engineer and was integrated into the position in 2002 and since then worked in various positions such as Control Engineer, Control & Electrical Maintenance Section Leader, Site Maintenance Team Leader, Vice President–HSEQ, and VP Umm Shaif Field. He holds a BSc in Electrical Engineering (Control & Electronics) from UAE University and a Master's Degree in Mechatronics Engineering from the American University of Sharjah. He is a Ph.D. candidate in Engineering Management & Innovation at the University of Sharjah and Ph.D. in Engineering from École de Technologie supérieure, Montreal, Canada.

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Amin Chaabane is an Associate Professor at the Systems Engineering Department at Ecole de Technologie Supérieure (ÉTS), Montreal, Canada, where he also heads the Supply Chain Research Laboratory and teaches Operations and Logistics. His main research interests are in the design of sustainable supply chains and the design and improvement of integrated business processes for complex systems with interest in manufacturing and distribution. He received his Ph.D. from ÉTS in 2011 and a Master of Science degree in Management Science (Logistics and Systems) from Conservatoire Nationale des Arts et Métiers (CNAM-Paris), in 2004.