DATA GOVERNANCE IN OIL AND GAS INDUSTRY: AN EMPIRICAL STUDY OF CPC CORPORATION, TAIWAN

Huei-Chu Liao, TamKang University, +886-2-26215656, rubyliao@mail.tku.edu.tw

Sheng-Yuan Lan, CPC Corporation, Taiwan, +886-2-87898989, 444715@cpc.com.tw

Jhe-Ming Yang, CPC Corporation, Taiwan, +886-2-87898989, 632058@cpc.com.tw

Shu-Chuan Lin, CPC Corporation, Taiwan, +886-2-87898989, 009041@cpc.com.tw

# Overview

In the critical era marked by the rapid advancement of information technologies such as AI and big data, and the imperative transformation of the energy sector, the application of data in decision-making and the optimization of operational processes through AI and other advanced technologies are of paramount importance. These factors significantly influence whether energy companies can remain profitable amidst the currents of energy transition. In the journey of digital transformation, data governance emerges as a crucial step. However, upon investigation, it is found that the investment in this area within the oil and gas industry lags behind other industries. CPC Corporation, Taiwan (CPC) has leveraged modern data technologies and automated Extract, Transform, Load (ETL) techniques to consolidate its data infrastructure. This paper explores CPC's approach in integrating a diverse array of data sources into a unified data warehouse. Through the application of advanced methodologies, the corporation has effectively streamlined its data processing pipeline, facilitating the seamless fusion of various data types. This encompasses operational data from refinery processes, crucial for enhancing supply chain management, along with Internet of Things (IoT) stream data, sales transaction data, energy consumption data across different sectors, and comprehensive market analysis data including trends, forecasts, and competitive insights. The integration strategy also extends to unstructured data, such as images and documents, and detailed logistics information on the transportation and distribution of products, thereby augmenting the richness of the data ecosystem. By amalgamating these diverse data sources, CPC has not only boosted its analytical prowess but also fortified its decision-making framework, enabling a proactive and adaptable stance towards the complex challenges and prospects within the energy domain. This empirical analysis underscores CPC’s dedication to technological innovation and strategic foresight, illustrating the tangible benefits of its data integration initiative.

# Methods

In this paper, we proposed a data flow architecture and data integration strategy, which is detailed, highlighting the sophisticated techniques and technologies used to unify a broad spectrum of operational data into a comprehensive data warehouse. Central to this approach was the utilization of automated ETL processes, which facilitated the efficient and reliable consolidation of data from diverse sources. Leveraging Application Programming Interfaces (APIs), the company achieved seamless data ingestion, ensuring a continuous flow of operational data. A key innovation in this paper was the adoption of a hybrid cloud and on-premises storage solution, which addressed critical needs for scalability and security while providing the flexibility to manage sensitive data in compliance with industry regulations. Moreover, the establishment of a data lake architecture played a pivotal role in this integration process. Unlike traditional data warehouses, the data lake enabled CPC to store raw data in its native format until needed, offering unparalleled flexibility in data processing and analysis.

# Results

The initiative has markedly enhanced the efficiency of supply chain management, enabling a more agile adaptation to changes in supply and demand. By incorporating real-time data streams, it has fostered the establishment of proactive maintenance schedules for exploration and refining equipment, thereby reducing downtime and prolonging the durability of essential infrastructure. Moreover, the creation of a unified data warehouse offers a holistic perspective of the energy market, empowering CPC to fine-tune its production strategies dynamically. This strategic optimization not only reduces waste but also ensures more effective resource allocation, thereby enhancing the company's sustainability and diminishing operational expenses.

# Conclusions

This infrastructure has revolutionized CPC's operations, enabling enhanced efficiency, agility in responding to market fluctuations, optimized supply chain management, and proactive maintenance. In the volatile and complex landscape of the oil and gas sector, characterized by fluctuating prices and high operational risks, such agility is not just beneficial but crucial. As the industry shifts towards sustainability, the insights provided by a unified data warehouse become indispensable in optimizing operations, reducing environmental impact, and guiding strategic investments in renewable resources. In essence, CPC's adoption of a unified data warehouse underscores the strategic imperative for the oil and gas industry to embrace data integration technologies, highlighting the transformational impact on operational excellence, strategic agility, and competitive advantage in a rapidly evolving market.

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