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Streamlining ERP Deployment in Nepal's Oil and Gas Industry: A Case Analysis

¹Dipa Adhikari, ²Bhanu Shrestha, ³Surendra Shrestha, ⁴Rajan Nepal

¹Assistant Manager, Department of Engineering, Projects and Information Technology, Nepal Oil Corporation Ltd., Manager, Nepal

²Professor, Dept. of Information Convergence System, Graduate School of Smart Convergence, Kwangwoon University, Seoul, Korea

³Dean, Faculty of Science, Health and Technology, Nepal Open University, Nepal

⁴Manager, Department of Engineering, Projects and Information Technology, Nepal Oil Corporation Ltd., Manager, Nepal

E-mail: dipa.adhikari@noc.org.np, bnu@kw.ac.kr, surendra.shrestha@nou.edu.np, rajan.nepal@noc.org.np

Abstract

Oil and gas industry is a unique sector with complex activities, long supply chains and strict rules for the business. It is important to use enterprise resource planning (ERP) systems to address these challenges as it helps in simplifying operations, improving efficiency and facilitating evidence-based decision making. Nonetheless, successful integration of ERP systems in this industry involves careful planning, customization and alignment with specific business processes including regulatory requirements. Several critical factors, such as strong change management, support of top managers and training that works have been identified in the study. Amongst the hurdles are employee resistance towards the changes, data migration complications and integration with existing systems. Nonetheless, NOCL's ERP implementation resulted in significant improvements in operating efficiency, better data visibility and compliance management. It also led to a decrease in financial reporting timeframes, more accurate inventory tracking and improved decision-making capabilities. The study provides useful insights on how to optimize oil and gas sector ERP implementations; key among them is practical advice including strengthening change management strategies, prioritizing data security and collaborating with ERP vendors. The research highlights the importance of tailoring ERP solutions to specific industry needs as well as emphasizes the strategic role of ongoing monitoring/feedback for future benefits sustainability.

Keywords: ERP implementation, oil and gas industry, supply chain management, operational efficiency, data-driven decision-making.

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Corresponding Author: surendra.shrestha@nou.edu.np, and bnu@kw.ac.kr

Tel:+82-2-940-8626

Dean, Nepal Open University, Nepal, and Professor, Dept. of Information Convergence System, Kwangwoon University, Korea

1. INTRODUCTION

The oil and gas sector's complicated operations, vast supply chains, and strict regulatory requirements make it an exceptional environment for implementing ERP systems. By merging various business processes, ERP systems improve efficiency of the organization, increase productivity and support decision-making based on data. Therefore, adaptable ERP systems are necessary in this industry to handle exploration, drilling production and distribution workflows. Wide-ranging supply chains require strong logistics and procurement modules for coordination purposes as well as smooth running of the system. In addition, there is a need for the implementation of an ERP system with comprehensive compliance tracking and reporting due to strict regulations. While this is true, successful deployment of ERP in this sector will require careful planning, customization and integration to address these specific operational or regulatory challenges.

Enterprise Resource Planning (ERP) systems are widely recognized for their potential to streamline complex operations, particularly in industries with intricate supply chains, such as oil and gas. The unique challenges of the oil and gas industry—ranging from regulatory compliance, extensive logistics, to high capital-intensive operations—necessitate a tailored approach to ERP deployment [1]. ERP systems integrate various business processes, providing real-time insights and enhancing decision-making capabilities [2]. Research has underscored the importance of aligning ERP systems with organizational goals and industry-specific requirements. Al-Mudimigh, Zairi, and Al-Mashari highlight that successful ERP implementations depend significantly on top management support, change management, and customization that fits the industry's needs [3]. The oil and gas sector's reliance on accurate data tracking and compliance management further emphasizes the need for a robust ERP solution tailored to address these sector-specific demands [2].

Researchers identified several factors influencing the successful implementation of ERP systems in the oil and gas industry. These include top management support, effective change management, alignment with business processes, and adequate training and support. Additionally, studies have highlighted the importance of customization and flexibility to accommodate the industry-specific requirements of oil and gas companies. Murray and Coffin examined factors contributing to successful ERP system implementations and emphasized the importance of executive support, understanding business processes, minimizing customization, treating ERP as a program, providing comprehensive education and training, maintaining realistic expectations, and setting achievable deadlines underscoring the critical role of strategic planning and organizational readiness in ERP success [4]. Mishra and Mishra highlight challenges faced in an ERP implementation, attributing issues to inadequate change management, employee perceptions, insufficient training, interface development, and cultural diversity. Despite improvements in certain areas post-SAP implementation, weaknesses persist. The study underscores the importance of aligning ERP processes with business needs and emphasizes that success relies on effective implementation strategies rather than the technology itself [5].

Karlsson and Flink's investigate the ERP implementation challenges within procurement and supply chain processes, focusing on Maersk Drilling and have emphasized the transformative potential of ERP systems in streamlining processes, enhancing transparency, and facilitating cross-functional collaboration; findings underscore the significance of clear communication, designated change agents, and robust master data management in navigating the complexities of ERP adoption within the oil and gas supply chain [6]. Sumbal and Tsui explore the interrelationship between big data and knowledge management (KM) in the oil and gas sector and have revealed that while the sector has long worked with data, the term "big data" has gained prominence due to technological advancements and the challenges include effectively utilizing data for knowledge discovery and value creation [7]. Jafari and Nair explore the impact of ERP system implementation on the efficiency and productivity of the oil and gas sector in Oman. Through qualitative and quantitative research, they highlight the benefits of ERP systems in improving resource management, operational efficiency, and profitability. Despite challenges such as technological complexity and organizational resistance, they recommend ERP adoption to enhance growth in the sector. It underscores the importance of selecting appropriate ERP technology and formulating effective mitigation plans to address implementation challenges and maximize benefits [8].

2. METHODOLOGY

The research was carried out through a case study method in order to get to the core in investigating the issues, strategies, and outcomes of Enterprise Resource Planning (ERP) implementation at Nepal Oil Corporation Limited (NOCL). Data was obtained from document analysis and semi-structured interviews with key stakeholders, including project managers, IT staff, departmental heads, and end users. It primarily aimed at eliciting information on how the decisions to adopt the ERP system were made, the challenges encountered, and key lessons learned during the period of the implementation. Interview findings were further supplemented by project planning documentation, progress reports, and meeting minutes. The reiterated themes and patterns revealed critical insights into strategies and critical success factors specific to NOCL's ERP implementation. Therefore, the data was then subjected to a thematic analysis. A comparison with other case studies on oil and gas gave general findings of the similarities and differences in the ERP deployment under settings with resemblance. All ethical considerations were followed to the letter, from obtaining informed consent from all participants to the anonymization of transcripts to ensure that the information contained remained confidential. Such measures would maintain the integrity of the study while showing respect for participant privacy. The study, therefore, incorporated strong methodologies for dealing with potential limitations, such as those related to generalizability and biases. Device techniques included: member verification, which implied that participants were given the papers to review for exactness; data triangulation, typically done to cross-verify data coming more than one way; and upholding a detailed audit trail to increase the reliability and credibility of the study. The research design incorporated a comprehensive review of the ERP project at NOCL. The findings added value in the context of the industry and also contributed to the discourses associated with the implementation of ERPs in similar sectors [9].

3. RESULTS AND DISCUSSION

The variation in resource utilization rates before and after the implementation of ERP system at NOCL is shown in Figure 1. The implementation of the ERP system faced several key challenges, particularly resistance to change from employees, as reported by 70% of respondents.

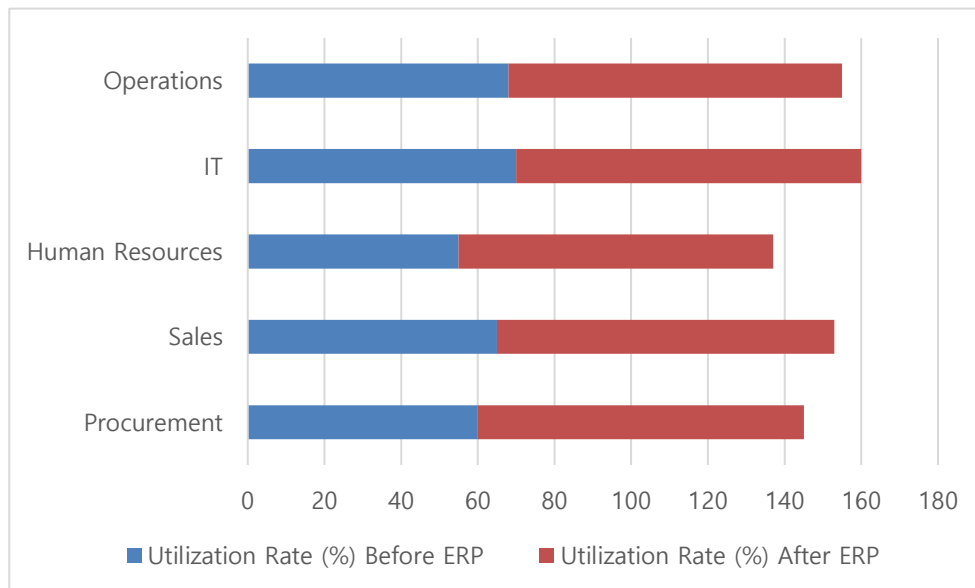


Figure 1. Resource Utilization Rates before and after implementation of ERP System

This resistance largely stemmed from the employees' comfort with traditional manual processes and their apprehension about shifting to an automated system. Employee reluctance is often rooted in a fear of job

insecurity, concerns about increased workloads, or anxiety over mastering new technology. In this case, the resistance was exacerbated by the absence of a robust change management strategy early on, which could have helped address concerns and facilitate a smoother transition. The change from long-standing, familiar processes to an entirely new and automated system disrupted established workflows and routines, creating anxiety among employees and leading to pushback against the ERP initiative.

Data migration emerged as another significant challenge, with 60% of participants identifying it as a critical issue. The process of transferring data from legacy systems into the new ERP system is often a complex and error-prone task. Legacy systems typically store vast amounts of data in varying formats, making the extraction, cleaning, and transformation of data for ERP integration difficult. Additionally, data inconsistencies, outdated information, and the lack of standardization further compounded the difficulties during migration. The complexity of ensuring that data was accurately transferred without loss or corruption posed a substantial risk to the success of the ERP implementation [10].

Regulatory compliance was another key area of concern, highlighted by 40% of respondents. The oil and gas industry is governed by stringent regulatory requirements that dictate how data is handled, reported, and stored. Ensuring that the ERP system was fully compliant with industry-specific regulations was essential but also challenging. Compliance issues included aligning the ERP system with local and international standards, maintaining accurate records, and generating reports that met regulatory expectations. Failure to meet these regulatory requirements could result in legal consequences, fines, or operational setbacks, making this a crucial aspect of the ERP deployment. Table 1 shows the Significant Findings on ERP System Implementation Challenges and Success Factors and System downtime(hours) over a period of two years is depicted in Figure 2.

Table 1. Significant Findings on ERP System Implementation Challenges and Success Factors

Aspect	Percentage of Respondents	Details/Impact
Resistance to Change	70%	Significant resistance from employees due to their familiarity with manual processes and apprehension about transitioning to an automated system.
Data Migration Issues	60%	Difficulties in transferring data from legacy systems to the new ERP system, creating significant migration challenges.
Integration Challenges	50%	Issues with integrating the ERP system with existing software and systems, crucial for ensuring system coherence and functionality.
Operational Efficiency Improvement	50% significant improvement, 35% general improvement	50% of respondents noted a significant improvement in operational efficiency, while 35% observed general improvements, demonstrating the ERP system's impact.
Financial Reporting Time	-	Reduction in financial reporting time from 20 days pre-ERP to 12 days post-ERP, marking a 40% improvement and demonstrating enhanced reporting efficiency.

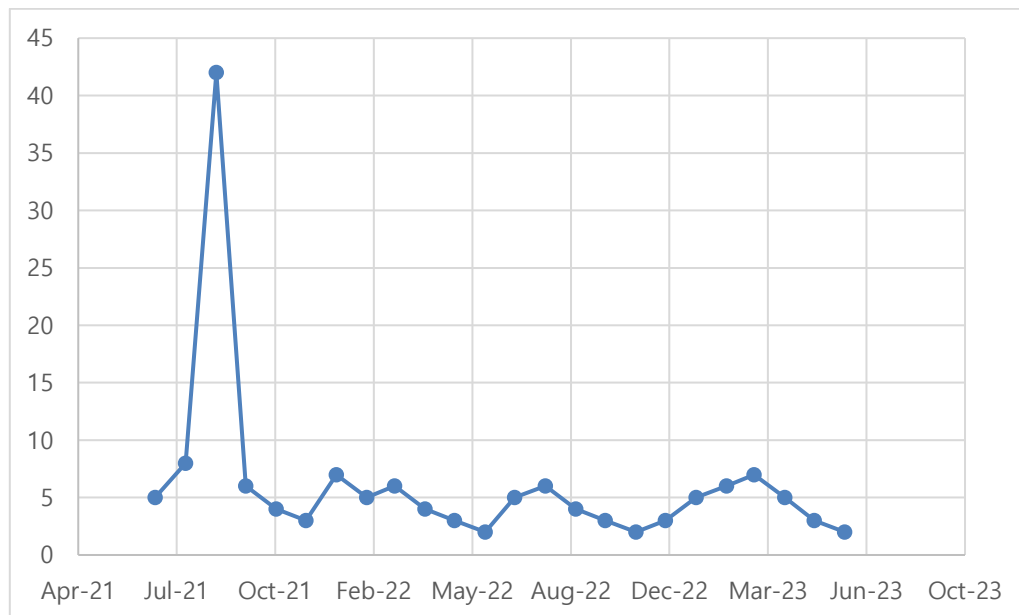


Figure 2. System downtime(hours) over a period of two years

Limited IT infrastructure and resources, particularly in remote locations, were identified by 30% of participants as a notable challenge. The oil and gas industry often operates in geographically dispersed and remote areas where reliable IT infrastructure is lacking. Implementing an ERP system in such environments requires overcoming issues related to connectivity, hardware limitations, and the availability of skilled IT personnel. Inadequate infrastructure can lead to system outages, delays in data processing, and reduced system performance, which can hinder the overall effectiveness of the ERP system. Despite these challenges, the training and change management programs were perceived positively by most participants. Approximately 40% rated these programs as very effective, while 45% considered them effective. The positive response indicates that the majority of employees felt adequately prepared and supported during the transition. Effective training programs are crucial for equipping employees with the necessary skills and knowledge to use the new ERP system efficiently. In this case, the training initiatives likely played a key role in mitigating resistance to change by building employee confidence and competence in the new system. The ERP system's impact on operational efficiency was significant, with 50% of respondents noting a marked improvement and 35% observing general improvements. The system's ability to streamline processes, reduce redundancies, and provide real-time data contributed to these efficiency gains. Only a small percentage of respondents (10%) reported slight improvements, and an even smaller fraction (5%) saw no change. These results suggest that the ERP implementation had a broadly positive impact on the organization's overall efficiency [11].

Improved data visibility and decision-making capabilities were also significant outcomes of the ERP implementation. Approximately 45% of participants reported significant improvements in these areas, and 40% reported moderate improvements. Enhanced data visibility allows managers and decision-makers to access accurate and up-to-date information, facilitating informed decisions that drive better business outcomes. The ERP system's ability to centralize data and provide real-time insights was a key factor in improving decision-making processes. Regarding system integration, 30% of respondents rated it as very good, and 40% rated it as good. These ratings indicate that, while integration posed initial challenges, the final outcome was largely positive. However, 20% of respondents remained neutral, and 10% rated the integration as poor, suggesting that there were still some unresolved issues or areas for improvement. The project experienced a slight delay, with the initial implementation timeline extending from 36 months to 42 months due to unforeseen challenges. Despite this, the ERP system achieved notable results. The time required for financial reporting was reduced

from 20 days pre-ERP to 12 days post-ERP, representing a 40% improvement. Inventory management accuracy also improved significantly, rising from 70% to 91%, a 30% enhancement. The decision-making process became 25% faster, reducing the time from 10 days to 7.5 days. Additionally, forecasting accuracy saw a 20% improvement, increasing from 75% to 90% [12].

4. OUTCOMES ACHIEVED

Nepal Oil Corporation Limited initiated the process of implementing an ERP system for its modernization and efficiency enhancement and had a set of transformative results. In this case, it provided more scope for better collaboration and communication across the organization by consolidating different departments on a single platform. Part of this workforce, due to integration, could be channeled into other areas because of the streamlining of workflows and the automation of recurrent tasks, which reduced manual labor and minimized errors, enhancing resource allocation. With these, some cost savings were realized, along with a more efficient operational framework for NOCL. A noteworthy benefit realized from the ERP implementation was that it provided a centralized data repository. This centralization provided NOCL real-time access to crucial information for better decision-making at all levels. Updated, accurate data triggered proper trend analysis and forecasting, hence also supporting strategic planning. Additionally, reporting capabilities of the system enabled NOCL to generate individual views, which could help arrive at better operational decisions.

Another critical achievement has been ensuring that the system complies with the set regulatory and industry standards. The ERP system automated compliance tracking and embedded important controls within processes, thus reducing the risk of non-compliance. This improved NOCL's adherence to regulations while bringing in transparency and accountability through enhanced audit trails and comprehensive documentation. In addition, this provided integration with external partners like suppliers, distributors, and government agencies. This increased the efficiency of the supply chain at NOCL by facilitating the speed of procurement and distribution processes. Enhanced ability to coordinate with partners resulted in a more responsive and agile supply chain and aligned its operations with the market demand better. Financially, there were many gains from the ERP implementation through process streamlining and elimination of non-value-added expenses. Inventory management improved in carrying costs; methods of procurement became more defined to eliminate waste and add value. These operational improvements had a direct impact on financial performance and demonstrated a strong return on investment for the ERP system. Overall, the implementation of the ERP system at NOCL has been one of the many successful cases of digital transformation in the oil and gas sector. The new system did not only make actual changes to the internal processes but also acted as a base for long-term growth by synchronizing technology with strategic objectives, meeting compliance, and improving overall operational efficiency.

5. RECOMMENDATIONS

Based on the case study findings, the following recommendations are offered for optimizing ERP implementation in the oil and gas industry:

- 1) . Develop a comprehensive change management strategy to address employee resistance and facilitate organizational transition.
- 2). Prioritize data security and compliance measures to mitigate risks associated with sensitive information.
- 3) Invest in robust IT infrastructure and resources to support the implementation and maintenance of ERP systems.
- 4). Foster collaboration between internal stakeholders and external partners, including ERP vendors and consultants, to customize the system according to industry-specific requirements.
- 5) Continuously monitor and evaluate the ERP system's performance to identify areas for improvement and optimization.

6. CONCLUSIONS

Nepal NOCL has become capable of maximizing its operational efficiency and competitiveness with the help of technological support. Top management support, close coordination with the ERP vendors, and clear importance given to data security were some of the points that have been considered very important in order to address the obstacles in ERP implementation and to accomplish the primary objectives of this organization. The investments NOCL is making in advanced data center and infrastructure modernization are a clear demonstration of its commitment to digitally transforming and modernizing its operations. The data path and channels were also duly confirmed, adapted for even easy integration with its existing processes, thus proving NOCL's responsive capabilities to change within markets, and to regulations, which only underlines its visions and leadership efforts around innovation and operational excellence. This is further optimized in the oil and gas industry in the implantation of ERP through a few targeted strategies, though these achievements have been made with the ERP implantation. For example, developing employee training programs increases system proficiency and comfort throughout the organization. If workers can make maximum use of the features that the system presents, then only the benefits of the ERP platform will be best harnessed. Continual monitoring will therefore need to be in place, with timely feedback of probable issues. This proactive approach will always hold reliability and performance of the systems under check.

Another feature on which improvement could be done is the integration of added analytics and real-time data processing capacity. Those will provide deeper visibility into operations for more informed and strategic decision processes. With such an evolution of industry, it increasingly becomes important to be agile in data treatment and analysis to maintain a competitive edge. This makes it important to invest in scalable ERP solutions that align with new technological trends to drive long-term growth. The next step of extension across all departments and the integration of ERP software deep into the core operating procedures will only serve to enhance efficiency and operational cohesion. It is by focusing on these strategies that NOCL, together with other companies in the oil and gas sector, continues to derive optimum performances from its ERP systems. This leads not only to increased operational effectiveness but also enables them to meet industry demands capably and to respond in an agile way to a world of change. This, combined with the ongoing evolution of ERP platforms and dedication to continuous improvement, places NOCL at the forefront of digital transformation for the sector. Such endeavors will ultimately drive future growth and maintain competitiveness in this ever-increasingly complex and dynamic market.

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