

ERP Implementation in the Oil and Gas Sector: A Case Study in Sultanate of Oman

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Abstract: Oil and Gas industry in the Sultanate of Oman has a vital role in the economic growth of the country. At the same time, the role of Enterprise Resource Planning (ERP) systems in Oil and Gas sector cannot be denied. This research aims to study how the implementation of ERP system influences the efficiency and productivity of this sector. The qualitative and quantitative research were carried out to assess the influence of ERP system on this sector in the country. End-user feedback on the impact of using ERP has been analyzed in addition to the data collected from the literature. The study suggests that Oil and Gas industries should implement ERP system to boost its growth in all aspects.

Keywords: ERP Implementation; Oil and Gas Sector; Oman; SAP

I. INTRODUCTION

Oil and Gas sector plays a fantastic and dynamic role in Oman's economy. About half of the gross domestic products of Oman is maintained with oil and gas production. It not only depends on the sources or support of government but also on private organizations in Oman [1]. Oil and gas have remained the pushing force or the most sustainable element to the economy of Oman since 1967. Oman's oil market supports the economy which is eventually establishing the concept of modern Oman. Also, it is the backbone of highly developed infrastructure supporting massive projects like public education, medical services, and electrical utilities in the country. Low prices of oil may be pushing firms to improve their efficiency, to decrease their market base cost and their workforce. Also, Oman has reserves of natural gas which increases the economy quickly. The natural gas also plays a prominent role in expanding the vision of the country's ruler towards the industrial growth in the upcoming years [2].

ERP is a business process management software when being implemented in the organizations allows a firm or organization to use integrated applications. These integrated application helps to manage the business. ERP software is a modern and well-developed technique which is typically used by large organizations and industry especially having massive numbers of human resource workforce, as well as multiple functions, merged to facets operation. It also involves managing the sales, production planning, marketing and accounts in a single database and User-friendly interface. Usually, designed for customizing and analyze the data but on small sectors. ERP has the potential to optimize any system. This research focusses on how ERP system can affect the Oil

and Gas Sector of Oman and how it can be used to improve the efficiency and productivity of the sector.

II. LITERATURE REVIEW

Studies confirm that ERP is an efficient software platform to be utilized in the oil and gas sector to improve its efficiency. However, there are changes related to the big industries and organizations in the modern communication [3]. The utilization of this sophisticated software depends upon the need at large business organizations in Oman.

A. ERP implementation in the modern era

In modern days, some ERP systems are implemented by the organizations' own system and software. Many ERP applications have been implemented. However, there are gaps in the integration of technology in this industry, due to a market deficiency in Oman [4]. A few leading vendors including Oracle, Microsoft and SAP act as the key players in implementing of an ERP solution.

The studies made by Alok and his co-workers stress upon the role of ERP in Oil and gas sector in Oman [5]. The business environment has attracted the competition with the help of increasing the complex activities in business. It requires planning and decision making to promote integration and optimization of various business, in relevance to the system. The ERP implementation proves a new dimension in the oil and gas sector because this will help in the smooth transition of the system between the ERP application in Oil and gas sector in Oman and its effect on the economy.

Human resource and inventory are linked to the efficient software to control the critical activities in oil and gas sector [6]. There are some challenges in the ERP which can generate a load of information for the manufacturing companies. ERP consists of the integrated structure where the logistics and sales are a track with the organization activities. Bigger the sector, bigger the need of ERP system.

B. Oman's Oil and Gas sector

The oil and gas sector of Oman has been under the influence of the ERP systems. This system provides integration and optimization to the various business processes which are beneficial for the organization. ERP system has gained popularity in providing the accurate responses to resource management [7]. It helps to automate companies with the help

of client-server system. These systems are widely adopted in the form of a business model which affect the working of oil and gas industry in Oman [8]. The implementation of an ERP system remains a challenge for the timeline because it is a challenge to regulate the oil and gas sector regarding the business relationship.

C. Low Budget for ERP

According to the studies, about ninety percent of the systems are regulated with the help of low budget for the ERP systems because the change is only about the industry and processes related to Oman business culture. There is some drawback in the implementation of a software system to the oil and gas sector of Oman. It can be related to the complex social issues which may form the solid bases of inefficiency in the organization [9]. The mutual adaption towards the information technology is essential for the ERP systems to be implemented in the social systems of Oman. This is a difficult point but should not be compromised because the oil and gas sector requires an infrastructure. In Oman due to similar environment condition ERP system has a restricted mode of application in the industry.

The researcher also made a strong point regarding the ERP practice and implementation in Oman. It changes the nature of project implementation and provides a reliable resource for the management to underline the common issues present for the ERP projects [10]. It affects the planning stage where a different type of instruments is practised under the same concepts of ERP systems.

D. Management Information System

ERP systems are categorized in the form of management information systems. These are sometimes perceived as complex programs to implement in the industry where the system selection and valuation have deemed different for the people. A significant implementation plan is made regarding the organizational outcomes and people which are related to the concerned with the department and role [11]. The ERP systems have brought a revolution in Oman due to the financial resources and reduction of risk from the Oil and Gas sector. However, there had been implementation difficulties for this sector in Oman. The obstacles which were present in ERP systems implementation was the technical problems and people barriers. The technical problems in Oman can be accounted towards the technological advancement and its integration with the ERP. The people also stand as the prominent barrier because during installation both issues are highlighted in the context of behavioural and organizational changes [12]. The change in the cost and risk also provide an opportunity for the competitors for a reliable place in technology investments.

E. Improving the Efficiency

The ERP system is related to improving the efficiency of the Oil and Gas sector in Oman. It will have related to the stakeholder's contribution in providing the flexibility for the

whole systems. The primary form is related to the company culture and strategy. If the Oman oil and gas companies are motivated towards the ERP activity, then it can form changes in the process through the enterprise-wide formation [9]. It helps to include more customers towards the existing workflow and data formats.

The evidence from the literature shows that ERP systems are vital to introduce the IT integrators in the oil and gas sector of Oman. It helps to change the efficiency of the oil and gas upstream operations where the drilling operations are connected in link with the operation of wells [8]. If the process is controlled with the help of software management, then the business decision making efficiency will improve, and this will regard the most prominent area for drilling.

The implementation of ERP system helps to provide efficiency to the sizeable expanding business. Oman Oil and Gas sector is also a part of the same chain which provides an increasing demand for development [5]. The supplies and the dispatch cannot be controlled with the help of conventional management, and there is a need to imply the ERP system in the business.

F. Lack of Motivation and Commitment

Literature confirms that ERP project is related to resource consuming activities and it demands motivation and commitment from all the sector of business. The first step is the initial phase of ERP. The package introduced in the SMART technique provides the process for the critical steps in an organization. The other step is related to the development of ERP packages in context with the project failures and risk of ERP systems.

According to the work of Maha and co-workers, there are different types of business related to the adoption of E-commerce [13]. Oman oil and gas area is also a similar example where the ERP system is proposed to provide improvement and efficiency.

The electronic network for buyers and vendors has been made effective with the help of ERP Systems. The method of incorporating the E-procurement network for the ERP based systems is the first step in initiating the real changes in business process. Now the second area is the ERP systems based on the E-procurement [12]. The business with a high volume of the transaction can become substantial for whole oil and gas sector because it will provide innovative features to expand the business.

G. Type of Barriers

In applying the ERP systems, there is a different kind of barriers present. The first barrier comes out in the form of high cost. The oil and gas sector should have remained prepared for the cost because this will be initial investment for improving the efficiency of the business, the setup cost pertains as the first barrier in applying ERP system to the Oman general business [4]. The competitive bidding and inadequate

technology infrastructure are also the supportive problems. This can stop the path of software to become a part of the industry, the immature business and lack of trust between the supply chain also one of the barriers, hence these problems should be tackled with more care and experience.

The price of oil has affected the exponential growth in GCC countries. The local population is relatively small, and it is also facing a shortage of technology and computer skills. Applying the ERP systems will only focus on increasing the development operation and provide computer related information regarding the business and corporate sector.

The implementation of ERP system is also related to the Oman vision 2020. This vision is a long-term plan made in relevance to the sustained oil reserves of the country. The country's future also depends on the economic stability and private sector corporation in development of industry related ERP systems [4].

H. General Review of the technique

ERP analysis is fundamentally dependent on the sharing of databases where the organization have made rules and regulations for the requirement. The companies in Oman need to integrate the technology regarding the management and information systems.

The implementation of ERP models is related to the integration and optimization of the business processes to improve the efficiency of the oil and gas sector [13]. The primary barrier was the technology implementation, and this was resolved with classified ERP models. ERP system is designed to study the effect towards the end to end users, and this is the recommended solution to achieve the business goals. Fig. 1 illustrates the proposed model/framework that could be adopted when considering ERP implementation within Oil and Gas sector.

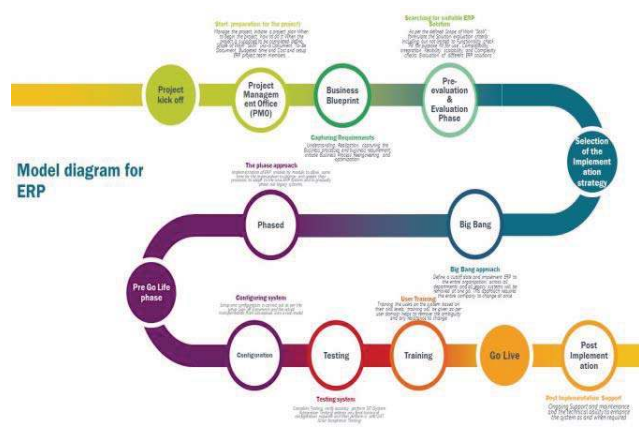


Fig. 1. Proposed ERP System implementation model /framework diagram

The implementation of the information system is a bit complex, and it also depends on the sector scope and size [10].

Oil and gas sector size in Oman can be understood from the economic levels. Most of the earnings are related to the oil and gas sector where success rate and results are related to the implementation.

I. Software System

There is another point regarding the ERP system because the main change is related with replication of old software as compared to the new systems [4]. The old software for Oman companies is not working for the required results, and the introduction of ERP sources has got the addition of different groups in the market. The vendors who provide the facilities are also prominent for most of the organization depending on the market size and structure.

The proposed system can be implemented in large sectors of Oman. It is an advantage which can aid the overall volume of Oman oil and gas production. The organization which are connected with oil and gas industry have higher values than the other organizations of different business, therefore, ERP systems are the best possible solution for the companies. It can increase the demand for ERP system as the products are readily available from the market [10]. The local industries and utilities also focus on product to regulate their production. It demands the role of ERP because the consumer has increased their circle of activity. The government and organization require it.

The introduction of ERP in the oil and gas market have causes which should be explained to increase the performance level of the system. Now the bigger circle of production would require the planning of Enterprise in the relation with the resources present [3]. The need for ERP has also exceeded because of the initiation of more significant projects about the oil and gas extractions. The companies tend to expand the nature of the services to a higher level.

III. RESEARCH METHODOLOGY

The qualitative and quantitative research methodologies [14] are used to assess the influence of ERP system in the Oil and Gas sector of Oman and how this system is influencing the efficiency of oil and gas sector of Oman. The literature review of the implementation of ERP system has provided data regarding the challenges of ERP system and the impact of ERP system on the efficiency of the organizations. This data is utilized for the formulation of questions that are used for the survey. A questionnaire is designed to get the feedback from people about the impact of implementation of the ERP system in oil and gas sector. The survey is conducted with the help of a questionnaire.

A. Data Collection and Sampling

1) Sample composition

The survey is conducted among four big oil and gas companies of Oman. These companies include Petroleum Development Oman (PDO), Oman Oil Refineries and Petroleum Industries

Company (ORPIC), Oman Oil Company Exploration & Production LLC (OOCEP), Abraj Energy Services (AES) and Oman Gas Company (OGC). Electronic versions of the questionnaire are used for the survey. The size of the sample is 200 that targets oil and gas sector of Oman. The managers and IT experts of oil and gas sectors of Oman were included in this sample. The responses of 200 respondent from the Oil and Gas companies of Oman are recorded in electronic versions for the analysis.

2) Primary Data sources

The questionnaire is the primary data source for this research. For designing of the questionnaire, an industry visit to Petroleum Development Oman was conducted to support the information gained through the literature review of ERP implementation. The industry visit helped in the development of a practical understanding of the issues and challenges faced during the implementation of the ERP system. Moreover, the industry visit has given insight into various parameters that determine the impact of the ERP system on the efficiency of Petroleum Development Oman. The questionnaire is drafted with the help of literature review and observations made during the industry visit. The responses of questionnaires have constituted the primary data for research [15].

3) Secondary data sources

The secondary sources of data include the information from websites, journal articles and reviews of IT experts, reviews of oil and gas industry experts, and reviews of academia about the influence of ERP system on the efficiency of the oil and gas sector of Oman. The annual reports of three of the selected oil and gas companies are accessed, to analyze the influence of ERP system on the performance of oil and gas companies. The annual reports of these companies have provided qualitative and quantitative data for the research [16].

B. Data analysis techniques

Two fundamental techniques of data analysis are employed to organize, inspect and model the primary and secondary data. The data is analyzed by both quantitative and qualitative data analysis for the deduction of reliable results of the study. The results obtained through data analysis has formed the base of the conclusion of this research. In this research, the primary data consists of quantitative data and secondary data comprised of qualitative data. The quantitative data analysis technique is used for the analysis of primary data, and the qualitative data analysis technique is used for the analysis of secondary data [17].

1) Quantitative data analysis

The responses of the questionnaires are tabulated in two different formats. The first format contains frequency distribution of data. The second format contains percentage distribution of the survey responses. The tabulation of data in frequency and percentage distribution formats has helped in the inspection and interpretation of the primary data. Moreover, the primary data is plotted to make it easy for

interpretation. To simplify the process of analysis, SPSS is used as a tool for the quantitative analysis of primary data [18].

2) Qualitative data analysis

There are three steps for the qualitative analysis of secondary data. In the first step, data is divided into different categories to increase the subjectivity of qualitative data. This practice has helped in the quantification of non-quantifiable data. Different parameters are identified in each category increase the objectivity of data. Each category of secondary data is assigned a specific code to make it more interpretable. Max QDA software is used for this purpose. In the second qualitative data analysis, the theme of different categories is identified by critically analyzing each category. Next, the patterns are observed in different categories and the relationships are developed between different factors [19]. The relationship between various parameters is recorded.

The relationships and patterns are tabulated to make them more interpretable. Finally, the summary of organized data is compiled for the critical analysis. The compiled qualitative data is comprehensively and critically analyzed, and its relationship is developed with the quantitative data. The trends and patterns of quantitative and qualitative data are compared to make sure deductions. The comparison of these two different types of data has helped in the development of linkage of the findings with the objectives of the research. The differences and similarities between quantitative and qualitative data are observed, and the relationship between the two makes decisions.

The analysis of quantitative and qualitative data by employing different techniques and soft-wares has converted the raw data into an external format. The critical analysis skills are employed to deduce the useful findings of the research. Finally, the accurate conclusions are made by findings that meet the objectives of the study and imply productive recommendations for the future research.

IV. RESEARCH SURVEY FINDINGS AND ANALYSIS

The questionnaire designed for the survey of the impact of the ERP system in the oil and gas sector of Oman consists of sixteen questions (Fig. 2). These questions investigate the integration of the ERP system with the existing system of the oil and gas companies. These questions asked for the opinions of the participants of this research about the influence of the ERP system on the operational performance and efficiency of oil and gas sector of Oman. The questionnaire takes the responses from the participants in the form of affirmation or negation of the statement of the corresponding question. The questionnaire also provides the option to add the opinion other than the affirmation or negation of the statement.

The analysis of data depicts that approximately 67 percent of the participants believe that advancement in technology has significantly influenced the oil and gas sector of Oman and ERP system is beneficial for the oil and gas sector of Oman.

They believe that ERP can remove all flaws of the resource management system of an organization. The acceleration in technology advancement has introduced many software and hardware applications that can reduce the operational cost for the organizations. The oil and gas sector of Oman makes a significant contribution to the country's economy. The incorporation of advanced technology in the oil and gas industries has improved the efficiency and reduced the operational cost. Others responded that the ERP system is not beneficial for the oil and gas sector as the implementation of ERP will complicate the existing systems of the oil and gas industries. However, most of the participants believe that the issues in the implementation of the ERP system can be mitigated and the desired outcome of this system can be achieved in shorter time. The literature review of the efficiency of the ERP system implies that the ERP system can improve the resource planning, but it cannot absolutely remove the flaws in resource management system. The complexity of resource planning depends on the size of the organization. If the organization is large with complex infrastructure, there is a high probability that the ERP system will perform at maximum efficiency. In the small organizations, the ERP system has the greater capability to minimize the weaknesses of resource management system.

of new and existing projects. It seems that all participants agree that oil and gas sector of Oman should upgrade the database approach and implement the ERP system to optimize their resource planning, as this sector demands efficient planning of resources to improve the performance. All are convinced that most of the companies operating in oil and gas sector are aware of the ERP system. The competitive environment in the oil and gas industry of Oman has forced the companies to seek approaches that can improve positioning and give them a competitive advantage over their competitors. Many oil and gas companies of Oman are aware of the significance of the ERP system. Moreover, all of the respondents recognize that the ERP system can help in the growth of oil and gas sector of Oman. Majority of the participants think that the implementation of this system is economical for this sector. The employment of ERP system is economical for the oil and gas sector owing to its minimal expenses and maximum output. However, they all confirm that the employee satisfaction is crucial for the successful implementation of the ERP system. It is crucial to overcoming the internal resistance for the complete absorption of change in the organizational structure and culture. The will of employees is significant for the integration of the ERP system with the existing organizational mechanisms. All of the respondents believe that the ERP is not a simple method to be implemented.

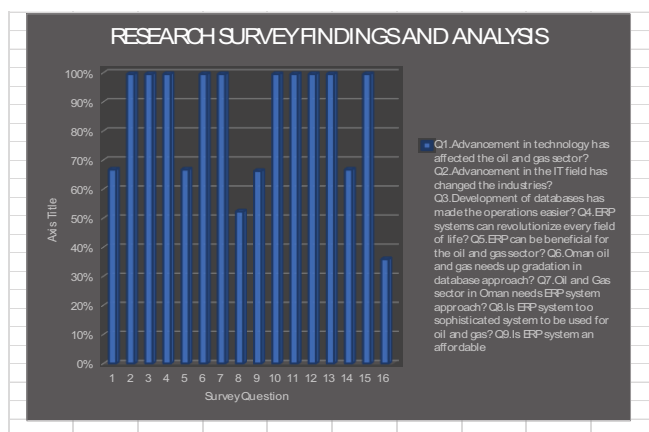


Fig. 2. Survey Findings and Analysis Chart

All participants in this survey believed that the information technology has changed the industries and has transformed the mechanisms of industries. The IT has introduced a paradigm shift in the operations of many industries and accelerated the operational efficiency of many industries. Information technology has facilitated the effective management of all activities in the industries. They believe that the development of databases has reduced the complexity of many operations and have minimized the cost and time of operations. Moreover, facilitated the management of huge data that is required for the day-to-day activities of the companies. Majority think's that the ERP has revolutionized every industry. All industries demand efficient resource planning to optimize its resources and to improve its performance. The ERP system helps the organizations in meeting their goals and objectives by facilitates the organization for the smooth implementation

Approximately 52 percent of the participants of the survey responded that the ERP system is too sophisticated to be used for the oil and gas industries. About 66 percent of the respondents of the survey believe that the ERP system is an affordable option for the oil and gas sector. The oil and gas sector of Oman has enough capability to bear the expenses of the implementation of ERP system. There is a greater probability of higher rate of return in the implementation of the ERP system. On the other hand, about 64 percent of the participants think that the ERP system is not the answer to all the problems related to resource handling in the oil and gas industry of Oman. The ERP system can only assist the resource management. It can only minimize the problems related to resource planning. The strategies of the oil and gas companies can maximize the efficiency of resource handling. The ERP system can only complement the functioning of the resource management.

The analysis of the annual reports of Petroleum Development Oman depicts that the implementation of the ERP system has increased the productivity and the profitability of the company. The annual reports of two other selected oil and gas companies show that these companies have experienced a reduction in the production cost and improvement in the operational efficiency. The analysis of journal articles and the perspectives of different scholars and IT experts depicted that the ERP system is beneficial for the large organizations. The reviews of experts show that the implementation of the ERP system in the oil and gas sector of Oman will positively influence the efficiency of this sector.

V. DISCUSSION

The importance of ERP systems in Oil and Gas sector of Oman cannot be denied. This industry has been an attraction from the future vision of Oman. The main thought for integrating the small and medium industries under one platform was to enable the companies in Oman to have a competitive edge over the human resource development part. The sources in Oman are linked with the private organization which have added towards the role of improving efficiency for market cost and workforce. This change is related to the Sultanate industrial growth forecasted for the next five to ten years.

The primary objective of the study was to affect the oil and gas sector and steps which can increase the efficiency of the system [6]. If there is a need for productivity in the oil and gas sector, ERP should be implemented under the business context. It affects the banking operating because the technology and services in Oman are closely linked with the oil and gas sector.

ERP software are the modern tools which control and manage the operations regarding the efforts of the industry as well as the human resource workforce [5]. It is potentially viable as the research shows that in implementing the ERP there are some potential challenges and difficulties. These can only be removed with the help of professional knowledge and business standpoint. The projects which have been spotted in Oman have a higher nature of responsibility which can only be controlled with the help of ERP initiative.

The research carried out in the form of quantitative and qualitative analysis were used to calculate data regarding the ERP systems. It involved collecting Data form journal articles and website. The main point was to learn standard techniques regarding ERP and provide a comparison between the technologies available in the market [6]. The importance of ERP systems was also investigated with the help of quantitative method of research. In this portion surveys and questionnaires were carried out to find the information about Oman companies and their counterparts. This main advantage was related to the business improvement and aligning the changes in the culture of Oman.

VI. CONCLUSION

The resource planning is a significant constituent of an organization's strategy. The efficient management of resources is crucial for the companies that are operating in the turbulent environment of oil and gas industry of Oman. The employment of the ERP system increases the operational efficiency of the organizations. This research studies how the implementation of the ERP system in the oil and gas sector of Oman influences the efficiency and productivity of this sector. The literature review is conducted on the ERP system to explore the efficiency of this system for the resource handling and to identify the challenges during the implementation. The primary data for this study is collected with the help of survey

that included the participants from four different oil and gas companies of Oman. The secondary data was collected from the journal articles and the reviews of industry experts about the impact of ERP system on the organizational performance.

The qualitative and quantitative data analysis techniques are employed for the interpretation of primary and secondary data. The analysis of primary data shows that the managers and IT experts of the five oil and gas companies of Oman encourage the implementation of the ERP system in the oil and gas industry of Oman. They viewed ERP system as of extreme importance for the efficiency of oil and gas companies. The analysis of secondary data shows that the implementation of the ERP system has improved the profitability of oil and gas companies of Oman. The findings of this study suggest that the oil and gas sector should implement the ERP system to boost its growth.

VII. RECOMMENDATIONS

During the study, it has been found that the implementation of the ERP system is a complicated process. The selection of technology for the ERP is a challenging task as no universal model can satisfy the demands of every organization. Moreover, it is challenging to make the ERP system compatible with the organizational structure. However, these challenges can be reduced by formulating an appropriate mitigation plan. This research can be further extended by comprehensively studying the challenges faced by the Petroleum Development of Oman during the implementation of the ERP system. By analyzing those challenges, the mitigation plan for minimizing the challenges could be proposed for other oil and gas companies that are seeking the implementation of the ERP system.

The mitigation plan of PDO for the implementation of the ERP system can be analyzed to assess its performance. The robust strategies from the mitigation plan of PDO can be adopted, and the weak strategies can be improved. An efficient model can be developed for the oil and gas companies that support the successful implementation of the ERP system. A model can be developed for the evaluation of the ERP implementation plan and the assessment of the mitigation plan. Comprehensive research could be conducted on the efficiency of the mitigation plans adopted by different organizations for the implementation of the ERP system.

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