

# Conceptual Model on the Influence of Environmental Awareness on the Effectiveness of Environmental Management System: Case Study of Oman Oil and Gas Operators

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## Abstract

This paper is intended to define the environmental awareness as a mediating variable that needs to be studied to ensure the effective implementation of the Environmental Management System. The model will look into the importance of environmental awareness at different level of an organization on improving the Environmental Management System and what are the identified factors to ensure its sustainability. Five (5) oil and gas operators in Oman will be chosen to examine the model. The organizations were selected based on different criteria; scope of activities, ISO 14001 certification and implementation and how large is the organization in terms of number of drilling units. The study will look into existing theoretical models examining the literature and address any areas to be improved. The outcome of this paper is a conceptual model that suggests how the existing Environmental Management System elements can be further improved by ensuring a comprehensive environmental awareness programs are implemented into those organizations.

**Keywords:** Environment awareness, Environment Management System, conceptual model, oil and gas.

## INTRODUCTION

Oman is one of the world's major oil producing countries in the Middle East with oil and natural gas extraction account for 51 percent of GDP; hence, it remains a crucial element to Oman's economy [1, 2]. The Ministry of Oil and Gas (MOG) has indicated that it aims an average oil production of 1 million barrels/day in 2017, while promising gas fields is being discovered (Khazan and Mabrook) with expected daily gas production of 1 bcf [1, 3].

The exploitation of oil and gas reserves is expanding, and has not always been without some adverse environmental impacts, as in Figure 1 [4]. Due to the nature of this activity; oil spills,

air emissions, waste generation, land degradation and water pollution have all been recorded at various times and places [4, 5, 6].

Awareness of the environmental issues has become an integral element of the strategic planning and processes of the oil and gas regulators in the last decades. Integration of development and environment approached in partnership with stakeholders is vital; the UNCED conference in Rio in 1992, one of the declaration captures was looking into the sustainability development as key enablers for development processes and shall not be in isolation from it [7].

In Oman, environmental awareness started at the very early stages [8], and the importance of saving the natural environment and understanding related environmental impacts from oil and gas operations and managing them is becoming one of the critical requirements of Oman environmental regulators [3, 9].



**Figure 1:** Typical environmental aspects for oil and gas operations

## ENVIRONMENT MANAGEMENT SYSTEM AND ISO 14001

ISO 14001 is an international standard that looks into the requirements to assure effective Environmental Management System into organizations [10]. The standard is considered as the most popular systems implemented in organizations [11]. The purpose of this standard is to provide organizations with a

structured framework to protect the environment and respond to changing environmental conditions in balance with socio-economic needs. In Oman, obtaining the ISO 14001 certification is a mandatory requirement and a compliance obligation by the authority by all oil and gas concessionaire [1, 3, 8]. The ISO 14001 sets out the criteria for an Environment Management System and aims to improve resource efficiency reduce waste, drive down costs and provide assurance to stakeholders that environmental impacts is being monitored and continually improved. All industries agrees in common that obtaining the Environmental Management System certification will provide guidelines to perform a continues improvement to its environmental performance, hence, assure legal compliance [12, 13, 14, 15, 16].

The study will capture the following research questions:

- What are the factors influencing the effectiveness of Environmental Management System implementation in oil and gas operators in Oman?
- What are the obstacles in the system that causes the issues to still persist?
- How can an effective and comprehensive environmental awareness package will help in improving the organizational Environmental Management System and consequently its performance?

### **Environment Management System and organizational improvements**

There have been several studies investigating the benefits and the sustainability factors of implementing the environmental management system into organizations as regards to its economic remuneration and cost requirements. Savovic et.al was looking into the impact of investing in environmental protection and improvements on regional sustainability and whether it could be largely justifiable and profitable [12]. They also looked into factors related to the cost-benefit of implementing such systems, and what are the stakeholder's requirements and needs that influences the sustainability process in the region. Maintenance of an Environment Management System can also be costly and time consuming (average annual cost of 40k USD). It was seen that the Environmental Management System process in addition to its cost, it can be an initiator of profits. Many researchers also remarked that investing in environmental protection and improvement, particularly Environment Management System implementation could be of a large benefit for regional organizations [17, 18, 19].

The Environmental Management System interrelationship with the sustainability and sustainable development was also studied by Hyršlová and his team in 2007. They mapped the understanding of the sustainable development concept in Czech organizations and explained the Environment Management System significance in promoting business practices. Based on a survey conducted by them, 91% of the respondents believed that their organizations contributed to

the sustainability of the society, and pursuing of this concept in business practice is helped by Environment Management System implementation. He concluded that Environment Management System is worth implementation and it increases the enterprises profit [16].

From a scientific research and publications prospective, the global trend in conducting research related to Environmental Management System and ISO14001 improvements in organizations was investigated during the years of 2000 to 2016 [14]. The aim was to highlight the geographical and thematic trends of researchers publishing research related to Environment Management System and ISO 14001 with a view in developing a holistic and coordinated framework for the researchers, which can also be applied to facilitate the adoption of the Environmental Management System and ISO 14001 in developing and developed regions of the world. Results show a considerable increase in scientific publications; from 10 articles in 2000 to 58 articles in 2016. Three themes were identified from the analysis: socio-ecological (60 %), economic implications (25 %), and environmental aspects (15 %) which definitely aid in improvements in multiple environmental aspects of an organization [10].

The operational parameters required to systematically undertaking the essential elements of a sustainability management system, and the inter-relationship of those parameters, has been largely ignored. Furthermore, integration of sustainability assessment in the management models has been overlooked. Nawaz and Koç in 2017 reviewed the imperative elements of sustainability management in organizations implementing the Environment Management System and ISO 14001. Their research question was "what will be the sustainability management framework to ensure implementation and integration into organization's management framework?". The findings of the review study formed the basis of a newly proposed framework for sustainability management the highlights various components of existing management systems essential for managing sustainability [13].

From the other end, some of the researchers in the academic cadre looked at the Environment Management System cons, and found that this standard has also expected some criticism from different organizations and institutions, especially when it is not accompanied by significant improvements in organizational environmental performance. Kafel and Nowicki studied the implementation of Environmental Management systems after resignation of management standard certification. The aim of their study was to investigate the reasons on why organizations give up the management system certification as well as what happened with implemented management systems after resignation of its certification. High cost of certification and lack of positive externalities related to the certification found to be the main findings that causes the organizations to give up the certification of Environmental Management System and ISO 14001 [11]. The study found that most Polish organizations tend to have their own internal tailor-made system of managing the environmental aspects and related processes. Kafel and Nowicki concluded that, no matter what happen to

the Environmental Management System third party certification, the organization will still follow the internal Environmental Management System standard requirements.

Few researchers went deep dive and looked into the quality of implementing the Environment Management System into organizations and the uncertainties of environmental parameters using diffusion models. Main research question was: "What will be the future international diffusion of ISO 14001 certification based on analyzed data from ISO 14001?". The Marimón and his team study aimed to analyze the diffusion process of ISO 14001 standard, using data provided by the ISO organization itself using a diffusion model based on the logistic curve, to explain the growth of certifications. They found that it is obvious that the fundamental value of the certificate is not constant, but rather tends to decrease as the Environment Management System and ISO 14001 certifications does not prove to be a distinguishing factor for organizations when it comes to its environmental performance [20, 21]. Studies concluded that organizations in a trend of losing the importance of its Environmental Management System certification and hence to be discontinued. Organizations will tend to focus its attention on other improved models that is "fit-for-purpose" and closely matching their internal needs and requirements.

Based on the literature above, it could be clearly noticed that many organizations having the tendency in implementing the concepts of Environmental Management Systems, and they are keen into improving their environmental benefits and organizational profits. However, bulk number of organizations looking into having their own internal systems of managing the environmental aspects and related requirements. Few also recommended on having additional mediating variables that leads into an effective implementation of Environmental Management Systems and related standard requirements.

Vílchez in 2017 looked into the "dark side" of ISO 14001 (Environment Management System) and the symbolic environmental behavior at different organizations. His research aimed to study the relationship between the symbolic environmental behavior as a mediating variable and the adoption of ISO14001 in manufacturing facilities. Despite all the implemented independent variable in the ISO 14001, the symbolic environmental behavior played a key role in the environmental performance of an organization [22]. The results contribute to the previous literature that has studied the symbolic adoption of ISO 14001, indicating that the more symbolic the environmental behavior of an organization, the greater the likelihood of it in adopting Environmental Management System and ISO 14001 requirements [23, 24, 25, 26].

Darbo in 2010 investigated the interrelationship between health, environment quality and economic activity on organizational economic coverage and growth. He involved couple of mediating variable and examined the link between them. He examined the relationship between health indicators, environmental variables and economic development, and the consequences of this relationship on economic convergence for a large sample of rich and poor countries. Taking into account the positive effect of environment quality and

performance on economic growth of an organization, the speed of economical convergence tends to increase slightly. This shows that environmental quality (i.e. good health indicators, controlled environmental processes and performance) plays a considerable role in economic convergence process [15].

In the past two decades, many researchers and academics looked into understanding the elements of Environmental Management System with an attempt to improve the process, enhancing environmental behavior in each operation and identifying key success performance which leads to maximizing the profits [27]. Driven by both organizational and research interest, this has resulted in a number of phase models, and a range of theories. This paper proposes environmental awareness as one of the models that aids in improving the development of such environmental management systems. Improvement models are starting to have more attention by the management of different organizations [28]. Although comprehensive environmental performance assessments are still unavailable, however, the needs on such improvement models tend to be paid more attention to many. The paper presents these key elements, and draws conclusions on the contribution of environmental management models and performance evaluation systems.

### Environmental Management Systems theoretical models

In order to overcome the growing concerns on how to effectively manage environmental aspects in any organization, the Deming model was initially developed (Figure 2). The theory is based on four steps management process named as (PDCA) which stands for Plan-Do-Check-Act and aimed at the control and the continual improvement of products and processes, and it always look into improving systems including environmental management related [29].

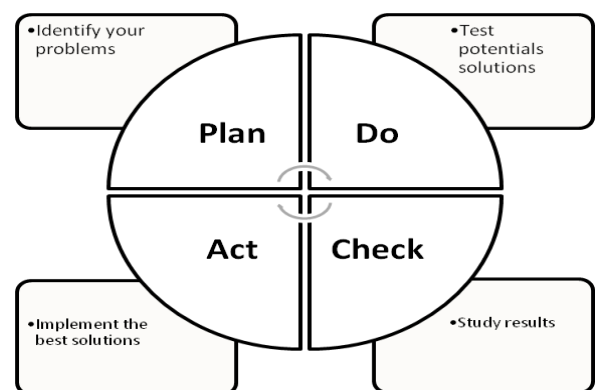
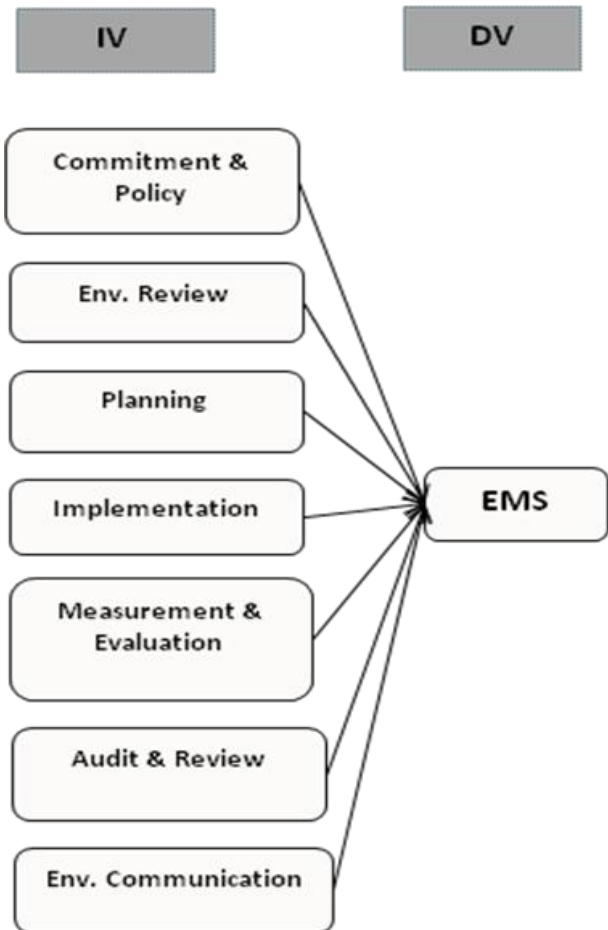


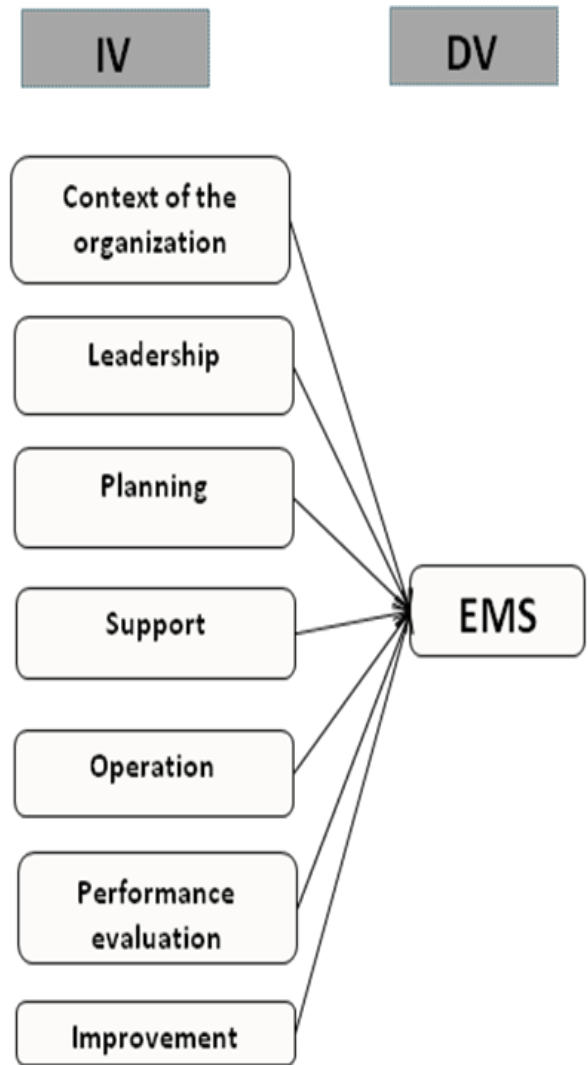
Figure 2: The Deming Model (PDCA) [29].

The world's first Environmental Management System standard was published in 1992 by BSI Group with as a reference number of BS 7750, see Figure 3. The standard was published as a step towards providing answers to the trending unease about environmental protection and pollution prevention [30]. BS 7750 provided the structure and the theoretical framework for the initiation and development of

ISO 14000 series in 1996, with ISO members and committees representation from the international communities. As of 2018, there are more than 300,000 certifications to ISO 14001 in 171 countries around the world [31]. ISO 14001 sets out the criteria for an Environmental Management System and sets up a framework that a company or organization can follow and provide assurance to company's internal and/or external stakeholders that environmental impacts is being monitored and improved, Figure 4Figure 1. The standard can be used by any organization regardless of its activity [31].



**Figure 3:** BS 7750 and environmental management model [30].



**Figure 4:** ISO14001 elements of Environmental Management System (EMS) [31].

The EU Eco-Management and Audit Scheme (EMAS) is another management system tool developed by the European Commission for organizations to basically evaluate, monitor and improve their environmental performance. EMAS is also available for any organization aiming to improve their environmental performance via mitigating and preventing pollution and protecting the environment from the potential impacts of their activities [32]. Since 2001, the ISO 14001 standard requirement has been a key element of EMAS, and provided un complicated process via only listing an organizational requirements and strategic policies and ensures implementation through adequate monitoring and verification top down the organization, see Figure 5 [32].

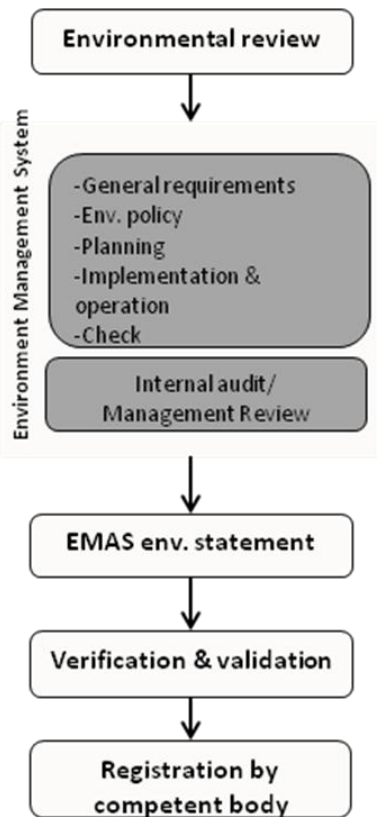


Figure 5: EMAS Model, EU-EMAS [32].

EMAS and ISO14001 are both setting up the framework of Environmental Management System, however, EMAS can be distinguished from ISO 14001 by the following; EMAS basically focuses on the external communication strategies by publishing annual environmental statement reports by which it documents the organizational related environmental activities and environmental performance reports and KPIs that need to be validated externally. EMAS also emphasizing on employees involvement in environmental performance of a particular organization and always providing commitments towards environmental improvements via creative and innovative ways of stakeholders engagement and continuous improvement of related environmental performance measures [32].

Internationally, there are many environmental theoretical models which are implemented all over the world by different organizations with a common interest of enhancing the organizational environmental performance, environmental protection and pollution prevention. Many organizations voluntarily constructed their own in-house and Environmental Management Systems with an attempt that it is more suitable and fit-for-purpose and matching its specific operations same as in Oil and Gas industry. Comparisons of environmental impacts between different organizations is becoming as an issue, therefore, The ISO 14001 standard was developed in order to ensure consistent process of planning, defining the key roles and responsibilities, common standards and procedures, implementation of the identified environmental objectives, follow up and monitoring and continual improvement.

In this paper, the only intention is to briefly summarize what has been done in these theoretical models and its implementation by oil and gas operators in Oman, share the experience and what are the challenges faced. The paper will demonstrate the proposed conceptual model by understanding the identified gaps in the theoretical models of Environmental Management Systems implemented and translates the suggestion into a mediating variables that might enhance the process of environmental performance improvement by Oil and Gas operators in Oman.

### Environment Management System implementation by Oil and Gas operators in Oman

Oil and gas operators in Oman have been facing increasing pressure from various stakeholders; i.e. regulatory bodies, shareholders and the community in general in order to improve their environmental performance. Managing environmental aspects of oil and gas activities is becoming more challenging, due to the fluctuating market oil price, stringent regulations and shareholder requirement for continuous production, profitability without compromising the safety of people and harm to environment and assets. As an example, company Alpha (due to confidentiality of data) has an Environmental Management System in place for more than a decade, with a very structured system in place including but not limited to; environmental policy, strategic environmental objectives and targets, related environmental specifications and procedures that manages different environmental aspects and structured monitoring and auditing programs at all level. Following the standard requirement of Environmental Management System and ISO14001 audit criteria, a number of findings are raised every year despite the comprehensive system in place. Particularly, company alpha receive an average of 300 findings raised from different environmental aspects and at different audit levels. As per the company's internal Environmental Management System, 50-60% of those findings were raised and identified as a gap in the element of implementation and operation (Figure 6). This is raising a concern on how effective is the Environment Management System in raising the awareness among employees key personnel and operators on the importance of complying to the implementation and operation requirements of system.

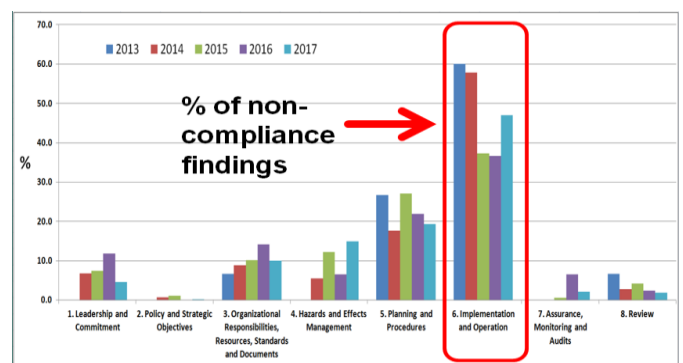


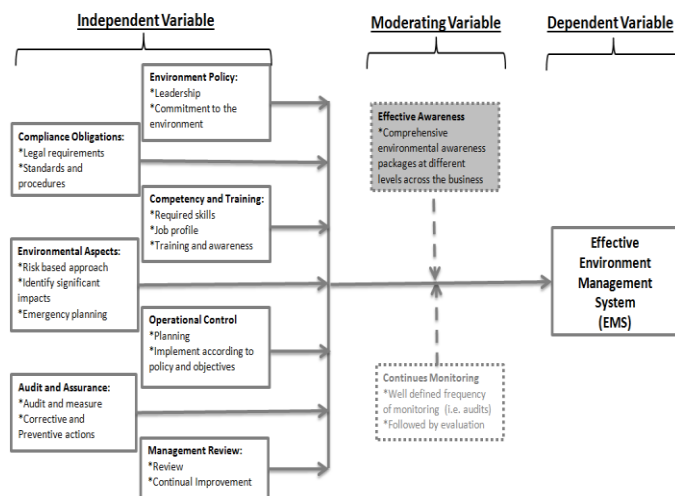
Figure 6: Environmental Non-Compliance findings as per the Environment Management System

Such challenges cannot be controlled nor monitored without having a structured, yet effective process of Environment Management System. Hence, there is a need to develop a structured Environmental Management System, fitting the requirements of oil and gas operators, maximizing its benefits, meeting the legal requirements, and become as an important factor in terms of overall corporate image and market competitiveness.

To put the above example in this paper's context, although all of the key oil and gas operators in Oman obtained the Environment Management System certifications (i.e. ISO14001), however, issues of non-compliance still persist. As demonstrated above, evidences shows areas of non-compliance in the organization's Environmental Management System, particularly in the implementation and operation as a key element. The intended objectives of obtaining the Environment Management System and ISO14001 certification was not achieved yielding to direct impacts on business performance and reputation due to non-compliance. Hence, there is a need to conduct a detailed study to investigate the reasoning and identify any success factors influencing the effectiveness of implementing environment management system to help key oil and gas operators in Oman (in this paper we are proposing environmental awareness at all levels in the organization). This might have a potential impact in reducing or minimizing the concerns on the effectiveness of the environmental management system to control its environmental risks and what are the factors contributing to its sustainability.

### Environmental awareness as a conceptual model in improving Environmental Management System

As elaborated above, there is a need to investigate and deep dive into the factors influencing the effectiveness of the environmental management system in Oman oil and gas operators and defines environmental awareness as a one of the critical moderating variables (Figure 7).



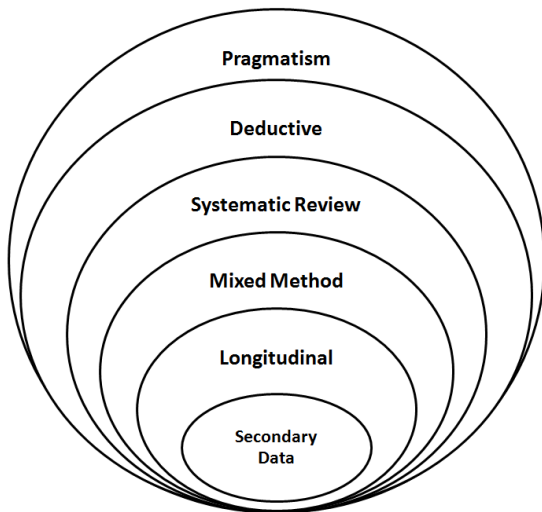
**Figure 7:** Comprehensive environmental awareness as a moderating variable for an effective Environmental Management System

Number of researches looked into the Environment Management System as a beneficial tool that increases the organizational profits and enhances its reputation, yet some other organizations not as what will show based on the literature later in this paper. Many researchers also explicitly studied the Environmental Management System independent variables such as compliance obligations, environmental aspects, and impacts, associated risks, environmental policy, planning and implementation as a system; however, staff awareness on the requirements of Environmental Management System was under looked. The bulk of the paper involves an explanation of the importance of the environmental awareness as a mediating variable conceptual model affecting the implementation of the dynamic process of the Environmental Management System and how it will assist in overcoming related issues to ensure its sustainability and to achieve its intended outcomes.

This paper attempts review the literature that that covers the critical factors influencing the effectiveness of implementing Environment Management System for key oil and gas producers around the globe taking into account the persisting issues. It will also explore and obtain information on the relationship between Environmental Management System implementation and environmental performance improvements via having a comprehensive environmental awareness packages at different levels of the organizations. The paper will catalog the moderating sustainability factors in Environmental Management System that will assist in enhancing the environmental performance of oil and gas producers in Oman.

### RESEARCH METHODOLOGY

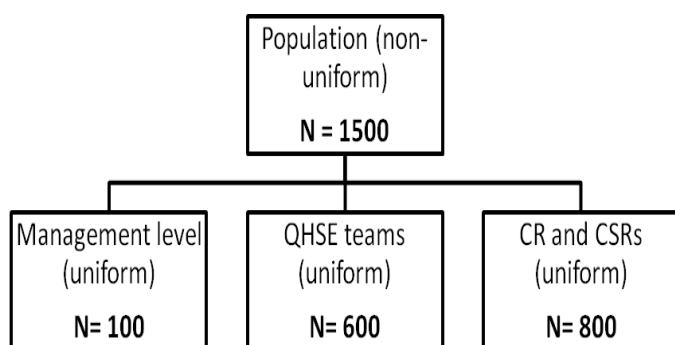
The research design can be summarized in below research onion (Figure 8). The proposed research has a “pragmatism” philosophy, as there will be no single point of view can ever give the entire improvement in the Environment Management System and that there may be multiple realities or opinions [33]. The research approach is “deductive”, as it intended to move from the generic variables, analyze and study its relationship towards a specific model of effective Environment Management System, which is “environmental awareness” as a mediating variable. The research is based on systematic review as a strategy, the review will be supported by surveys examine the patterns of assessing the effectiveness of Environment Management System. The research is analytical in nature (analysis of available facts to make critical evaluations) and it is mainly quantitative using questionnaires, supported by clarification interviews. Data collection is longitudinal (i.e. will be collected repeatedly at different time over an extended period). Data collection and technique will be secondary data. Data on Environment Management System implementation on various oil and gas operators are present. Existing data will be used to build on the model and come up with parameters and conclusions to ensure effective implementation of the Environment Management System across relevant organizations.



**Figure 8:** The design of the research (Research Onion)

The research will cover four (4) listed key oil and gas operators in Oman during the period of the study. The sample size is selected for the purpose of having a margin of error 5% and 95% confidence for the study to have a better external validity for the findings [34]. Sample size needed from the selected population is 371 (using the online sample size calculator). This sample size is selected at 95% certainty and a 5% margin of error from total population of 11,120 staff from the four listed oil and gas operators in Oman as identified above.

Documentation review will be carried out to revisit the concept of Environmental Management System and obtain required data. The review shall be supported by surveys, which will be carried out using a designed questionnaire; however, interviews will be conducted to ensure that questions are clearly understood. Random Sampling technique of a cluster based sampling shall be implemented to ensure staff at different levels will all have equal chances to be selected (Figure 9). Statistical Package for the Social Science (SPSS) tool is used to test data validity and reliability [34].



**Figure 9:** Cluster sampling of a non-uniform attributes population [34].

## CONCLUSION

Majority of research articles concluded that Environment Management System generated profits and improvements in the sustainability of an organization. Despite contributing to the profitability of an organization, many organizations in the trend of losing the importance of its Environment Management System certification due to extra costs and yet issues of non-compliance persist. Many organizations are diverting their attention on other standards or models which probably might be more effective in achieving the intended outcomes of the Environmental Management System. On other hand, many studies focused on the implementation of Environment Management System on different organization, yet very few studied in depth the effectiveness of such systems. In contrast with some other organizations, information on the oil and gas industry’s experience with, and perception of the effectiveness of Environment Management System and ISO 14001 is somewhat limited.

This research will define the obstacles to the effective implementation of Environment Management System across oil and gas operators in Oman for better management of environmental impacts, hence, compliance to legal requirements. The study will also contribute to the body of knowledge by broadening the areas for continues improvements in the Environment Management System to be considered and replicated by related cross firms. Establishing sustainability mediating variables such as (comprehensive environmental awareness across the business) for the oil and gas operators will provide them with a guide on how to suitably manage their environmental impacts, and ensure sustainability.

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