

# A Review of Integrated Management System in the Offshore Oil and Gas Industry

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**Abstract** – This paper presents a review of the Integrated Management System (IMS) in the oil and gas industry. Literature reviews were carried out to identify the available current studies of IMS in the oil and gas industry. The majority of the papers on the IMS in the oil and gas industry focus on Integrated Health, Safety and Environmental Management System based on OHSAS 18001 and ISO 14001 requirements due to the involvement of highly risk activities. The IMS papers in the oil and gas industry are mainly on historical case studies on companies where actual experiences and best practices were shared. The evolution of the IMS can be seen from the elements being studied or shared. Earlier IMS papers focused on the development, strategies and benefits gained from IMS, whilst the recent ones focused on sustainability, social responsibility and risks. The scope of IMS however remains within the three most popular certifiable standards of ISO 9001, ISO 14001 and OHSAS 18001. Most of the IMS papers were presented in the oil and gas conferences and seminars by Oil & Gas Energy and Production (E&P) Companies. There is lack of IMS papers by Oil and Gas Marine Engineering, Procurement, Construction, and Installation (EPCI) Contractors. The IMS knowledge on the oil and gas companies' experience in developing and implementing the IMS is limited by the available review of literatures. It may not reflect the latest IMS implementation status of these companies. This paper reviews the integration of management systems on industrial basis (oil and gas industry), which the literature has not been covered widely. As there is lack of literatures on the IMS in Oil and Gas EPCI Marine Contractors, a survey questionnaire will be sent to the contractors that registered with International Marine Contractors Association (IMCA) and have been certified to more than one certification (ISO 9001, ISO 14001, OHSAS 18001 and others). The data from the survey will be analysed to identify the key aspects of IMS design and implementation in the Oil and Gas EPCI Marine Contractors. A case study will be conducted in one of the Oil and Gas Marine Contractors to design and implement the IMS framework suitable for the EPCI projects.

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**Keywords:** Integrated Management System, framework, oil and gas industry, EPCI, Marine Contractors.

## 1.0 INTRODUCTION

Globalization is a leading concept which has become the main factor in business life during the last few decades. Globalization leads to increased competition. In the oil and gas industry, the key factors affecting competition are oil and gas prices and demand, exploration and production costs, global production levels, alternative fuels and government (including environmental) regulations. Due to high oil and gas demand, more exploration and production (E&P) works take place, the Engineering, Procurement, Construction and Installation (EPCI) contracting environment is becoming “highly competitive” in the oil and gas industry. The increasing numbers of oil and gas EPCI Contractors in the last five years has contributed to intense competition to win the oil and gas contracts or tender offered by National and International Oil and Gas E&P Companies.

Most Oil and Gas E&P Companies have pre-requisite requirements for EPCI Contractors to participate in their tenders. One of the requirements is that only the contractor that have been certified to and/or implemented the ISO 9001 Quality Management System, ISO 14001 Environmental Management System (EMS) and OHSAS 18001 Safety Management System can participate in their tenders. Hence, most EPCI contractors now have certified to and/or implemented these three main standards in order to survive in the business.

Managing a multiple parallel management systems covering quality, environment, and safety is difficult particularly in ensuring their compliances at all times. Many organisations embarked into the Integrated Management System (IMS) due to “intolerable burden” in managing three separate system [1] operational resource constraints, similar intention but non-alignment with the way work is performed and implementation of the systems was not part of the work process [2]. Similar trend occurs in other industries regardless of size or sector due to the benefits gained from the integration [3] such as an innovative approach towards a sustainable performance excellence [4]. As there are benefits gained from the IMS as well as similarities to some of the requirements in Quality, Safety and Environmental Management Systems, a dominant current trend by contractors that have been certified by more than one certification is looking at how to integrate their certified Management Systems into one single system called IMS.

The demand by the organisations as the industry practitioners to integrate the Quality, Safety and EMS into a single merged standard is not favoured by International Organisation for Standardisation (ISO). The ISO is paying more attention on compatibility between management standards in order to bring about their alignment [5]. Hence, to date there is no ISO certifiable standard for IMS. Several countries such as UK, Spain, Australia, France, Belgium and Denmark have developed their own national guidelines in order to assist the industry practitioners in their effort to set up and implement the IMS for competitive advantage [6]. Even BSI (UK) in partnership with BSI Management Systems have produced a latest certifiable PAS 99:2012 specification which is a framework for implementing common requirements of management system standards or specifications in an integrated way.

As the available IMS specification and guidelines developed by countries are general and not sector specific as well as no ISO certifiable standard for IMS, the Oil and Gas EPCI Marine Contractor that intend to integrate their certified management systems are facing a lot of problems due to lack of knowledge and availability of specific frameworks on what should be the suitable strategies to implement it according to their business processes. [7-9] have

stressed the needs of providing a suitable strategies and "how-to" methodology in assisting the companies to implement IMS specific to their industries or sectors. In order to developing an IMS Framework for the EPCI business process of the Oil and Gas Marine Contractor, it is important to explore the current status of IMS generally in the oil and gas industry and specifically in the oil and gas marine contractor.

## 2.0 OVERVIEW OF OIL AND GAS INDUSTRY

The oil and gas industry consists of two major sectors i.e. upstream and downstream as pictorially depicted in Fig. 1. The upstream, exploration and production is the process of finding oil and gas resources, developing and producing it. Whereas downstream are activities after the production phase and through the point of sale which includes refining and the commercial side of the business such as delivering to gas stations and consumers. The oil and gas marine contractors are involved in every facet of the upstream construction, except the actual commissioning, drilling and first oil production upstream as shown in Fig. 2.



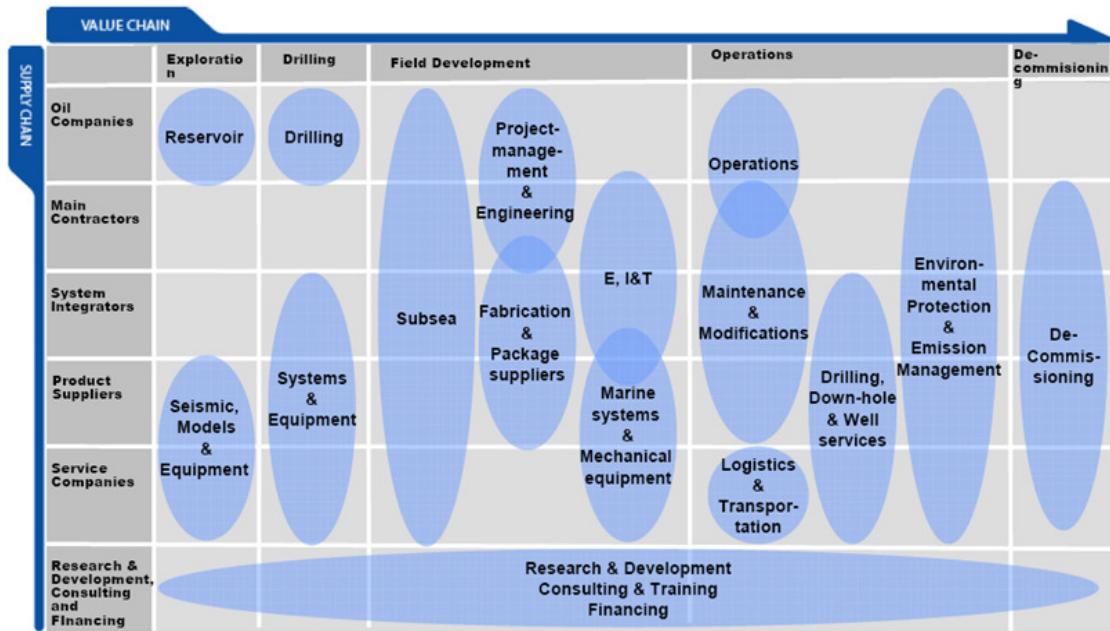
**Figure 1:** Upstream and downstream segments in the oil and gas industry [10]

## 3.0 INTEGRATED MANAGEMENT SYSTEM

### 3.1 What is an Integrated Management System?

Skip a line space of 24 pts to start a new section. The Integrated means combined where all the internal management practices are put into one coherent system and not as separate components. Alignment, compatibility, co-ordination, deployment and combination are some of the terms being used to define IMS. Resolution and understanding is required even when considering the meaning of IMS and ways to accomplish it [5,11]. For systems to be an integral part of the Company's Management System there have to be linkages so that the boundaries between processes are seamless [12]. According to the CQI [13] "*An IMS is a management system which integrates all components of a business into one coherent system so as to enable the achievement of its purpose and mission*". According to BSI [3], "*an integrated management system is a management system that integrates all of an*

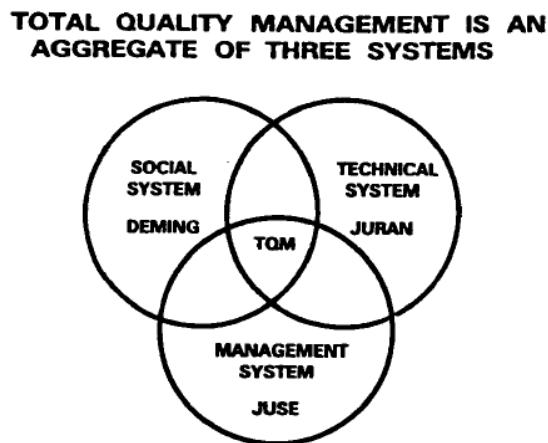
*organization's systems and processes into one complete framework, enabling an organization to work as a single unit with unified objectives".*



**Figure 2:** Upstream value and supply chain in the oil and gas industry [10]

### 3.2 History and Evolution of Integrated Management System in the Oil and Gas Industry

Total Quality Management (TQM) is very popular in the 1990s that used TQM to relate to the word "Management System" as shown in Fig. 3.



**Figure 3:** Optimizing upstream processes through Total Quality Management [14].

One of the earliest studies which use the word “Integrated Management System” in the oil and gas industry was presented by Alderman [1] at the Second International Conference on Health, Safety & Environment in Oil & Gas Exploration & Production held in Jakarta, Indonesia, 25-27 January 1994. There were several papers related to IMS presented in the following years. Although some of these literatures did not directly stated “Integrated Management System”, it represents a unified management system such as Downey [15] mentioned about the development of E&P Forum Health, Safety and Environmental Management System (HSE-MS) Guidelines which describe in one document an IMS based on the current best practice in the exploration and production industry, Clement [16] elaborated on the Business Integration of Safety, Health and Environmental Management, De Jong [17] suggested the Evolution from Safety Management System (SMS) to Health, Safety and Environmental (HSE) IMS by incorporating Health Aspects into the HSE Management System, Wills [18] suggested the Use of IMSs Assessments for Continuous Improvement of HSE Programs, Fonseca [19] mentioned about Health, Safety and Environment IMS in Amazonia.

Amaral [20] shared his experience in the implementation of an Integrated Environment, Quality, Health and Safety Management System in the Brazilian Oil Industry, [21] made a study of HSE-Management System in Action, Madkour [22] introduced the Operating Company's HSE Management System (Guidelines, Practices & Results), Tess [23] presented a case study on the Implementation and Integration of a Safety Management System within an ISO 14000 and ISO 9000 Certified Facility, Abernathy and Knode [2] shared his experience in creation of an IMS in the oil and gas company, Beyk and Paradas [24] looked into Quality, Health, Safety And Environment Synergy By Creating Alliances Between Oil and Service Companies In Integrated Projects, Sohani and Haugnaess [25] developed Contractor Management System By Integration Into The Safety Management System, Tramier [26] looked at the future overview of Health, Safety, Environmental Management, Robson and Parsons [27] explored the benefits and challenges of an ISO-Registered Management System in Atlantic Eastern Canada, Nouri [28] made the comparison of Environmental Performance in the Health, Safety, Environmental and Quality (HSEQ) Management System for the International and Iranian Oil and Gas General Contractors, Narayanan [12] proposed for IMS- Implementing HSEQ into the Project from Beginning to the End, Roy [29] looked into Integrated Quality, Occupational Health, Safety and Environment Management System in Oil and Natural Gas Corporation (ONGC) – A Pursuit of Excellence, Unnikrishnan and Rajab [30] proposed an Integrating Systems Approach in Accident & Incident Investigations, Lopez [4] shared about An Innovative Approach Towards a Sustainable Performance Excellence in Qatar by Integrated Implementation of a Management System, Faso [31] showed the set up and implementation of an IMS in Petrobel, Wadi [32] suggested an Integrated Approach to Managing HSE Requirements at Oil and Gas Facilities, Galinetto [33] shared the HSE IMS: A Framework Supporting Global Challenges And Sustainable Business Governance, Campbell [34] suggested to keep the HSE Management System, Wild and Middleton [35] suggested to integrating Social Responsibility into Management Systems to Mitigate Risks.

The earlier studies focused on the development, strategies and benefits gained from the IMS implementation by Clement [16], Alderman and Donegani [1], Amaral [20], whilst the recent studies included the elements of sustainability, social responsibility and risks into their IMS by Lopez [4], Galinetto [33], Wild and Middleton [35]. However, the scope of IMS remains

within the three most popular certifiable standards of ISO 9001, ISO 14001 and OHSAS 18001.

### **3.3 Scope of the Integrated Management System in the Oil and Gas Industry**

There is no specific mention of what constitutes an IMS or what should be the components of IMS. CQI [13] stated that “*Anything which has an effect on business results must be part of the management system. Therefore, an IMS should integrate all currently formalised systems focusing on quality, health and safety, environment, personnel, finance, security etc*”. Alderman and Donegani [1] suggested for an integrated approach that incorporates Safety, Environment and Quality requirements within a single, unified management system. Narayanan [12] suggested four possible degree of Integration of the Management Systems in the Oil and Gas Companies; i) Safety and Environment, ii) Safety and Quality, iii) Quality and Environment, iv) Quality, Safety and Environment.

Most of the papers by the Oil and Gas Companies used the popular management system standards i.e. ISO 9001 for Quality Management System, ISO 14001 for EMS and OHSAS 18001 for Occupational Health and Safety Management System when integrating the management system [2, 4, 20, 28, 29]. However, the majority of the papers presented in the oil and gas industry focus on IMS for Health, Safety and Environment [15, 17, 18, 19, 26, 34, 36]. This is in line with the fact that the oil and gas industry involve a highly risk activities, thus most study in oil and gas industry focuses thoroughly on health, safety and environment, recognizing that field development and production poses major challenges. The degree and scope of IMS in the oil and gas industry is summarized in Table 1.

**Table 1:** IMS scope

Management System	Research Paper
Quality and Safety	Narayanan [12]
Quality and Environment	Narayanan [12]
Safety and Environment	Narayanan [12]
Quality, Safety and Environment	Alderman and Donegani [1], Tess [23], Narayanan [12]
Quality, Occupational Health, Safety and Environment	Amaral [20], Aberrnathy and Knode [2], Nouri [28], Roy [29], Lopez [4], Sohani and Haugnaess [25]
Health, Safety and Environment	Downey [15], De Jong [17], Wills [18], Fonseca and Filho [19], Tramier [26], Prewitt [36], Campbell [34]

### **3.4 Oil and Gas Companies embarking into the Integrated Management System?**

Figures The oil and gas companies embark into the IMS due to many reasons but similarity of the reasons could be observed. Alderman and Donegani [1] stated that the oil and gas industry is facing a number of quality, safety and environmental requirements imposed by the Regulators, Organisation and Industry Standards. Many oil and gas companies who are

having “intolerable burden” in managing all these three requirements due to numerous audits and noncompliance actions are looking into integrating the requirements into one single system.

Halliburton Management System (HMS) started the IMS initiatives in late 1995 due to three problems faced on separate quality and HSE management systems which are operational resource constraints, similar intention but non-alignment with the way work is performed and implementation of the systems was not part of the work process Albernathy and Knod [2]. Rockwell Automations motivation for implementing management systems began with customer pressure to adopt the quality standard - ISO 9000 in the early 1990s. In consideration of experience gained from the ISO 9000 initiative and with the creation of the internationally recognized EMS Standard ISO 14001 in 1996, Rockwell Automation saw an opportunity to use the ISO 14001 certification by Tess [23].

The implementation of an integrated Environment, Quality, Health and Safety Management Systems (EQHS) in an organisation is a rational and efficient manner of increasing performance and optimising resources in the management of these functions Amaral [20]. Schlumberger Oilfield Services hires various contractors or third party suppliers to help their operations. The need to manage them in a structured and systematic way has made them to consider the Contractor Management System which is based on the model recommended by Oil and Gas Producers (OGP) Forum Sohani and Haugnaess [25]. ONGC acquire simultaneous certifications for QHSE as they believe it will result in a substantial saving in time, effort and money, Roy [29]. Lopez [4] stated that the Organisation that have a mature management systems with strong leadership and bottom up approach tend to use the IMS approach as an innovative approach towards a sustainable performance excellence.

### **3.5 Oil and Gas Companies’ Approach and Experiences on the Integration of the Management Systems**

Narayanan [12] suggested three best approach to implement IMS depending on the current situation of the organization. Conversion – for organization that only have QMS, build by adding the necessary processes to cater for HSE and other standard requirements; Merging Systems – for organization that have more than one system and Systems engineering approach – design a top down system to fulfil a specific objectives, one coherent system which serves as business needs and does not tie the organization to a particular standard. Narayanan [12] suggested that to ensure effective design and implementation of IMS is done, the Company has to define the Business Model and Primary Functions; Analyse business processes using flowcharts, standard and failure mode analysis techniques; Formulate operational policies which will govern the process and their inter-linkages; develop internal business procedures to control each business process which define who does what and here, when and how; implement the new and improved practices, if required identify optimum documentation needs by linkage to the control procedures and document the system

ONGC synergised the requirements of the standards with the activities of the organization. Instead of engaging consultants for the development of the IMS, they decided to use the in-house experts as past experiences has proved that use of personnel from within the organization having exposure to different functions and knowledge of the standards are better placed in creating the required synergy of the system. The success of the project was dependent on developing an effective road map and implementing all activities in a time bound manner. The most challenging job was the development of QHSE documents based on

the model documents which addressed the requirements of the standards as applicable to the basic functions of the Organisation. The QHSE team took up the role of sensitizing the top and middle management about the QHSEMS, its core elements and their responsibilities within the system. They also formed the Steering Committee who interpreted the model documents and explanation of the same to the relevant officials. Their practical ways was identifying QHSE issues within their establishments and translating the model documents in context of their establishment. The local units developed their own documents; the same were examined and vetted by QHSE before approval and issuance, Roy [29]. Table 2 shows the summary of other Oil and Gas Companies and their approaches for the IMS.

**Table 2:** Company's approaches for IMS

Research Paper	Company	Approach
Amaral [20]	Petrobras, Brazil	Set up a Working Group to study the integration of management systems inside the company. The working group was split into 3 sub-groups to deal with Integrated EQHS Policy, Guidelines for Integrated auditing and guidelines to prepare a manual of IMS. Implement all management systems at the same time
Tess [23]	Rockwell, Automation, USA	Started with Quality Management System, followed by EMS and then Safety Management System, The next step was aligning all three management systems quality, safety, and environmental and perform one internal audit.
Albernathy and Knode [2]	Halliburton	Started with separate Quality and HSE Management before the creation of Halliburton Management System (HMS) which is an IMS that provides a structure covering HSE and Quality within the framework of each activity.
Fonseca and Filho [19]	Petrobras	Started with Integrated Environmental and Health Management System due to the nature of their projects which are in the Amazonia areas. It was followed by integrating the Safety Management into the H&E Management System and became HSE Management System
Sohani and Haugnaess [25]	Schlumberger	Consider the Contractor Management System which is based on the model recommended by Oil and Gas Producers (OGP) Forum.

### 3.6 Integrated Management System Model in the Oil and Gas Industry

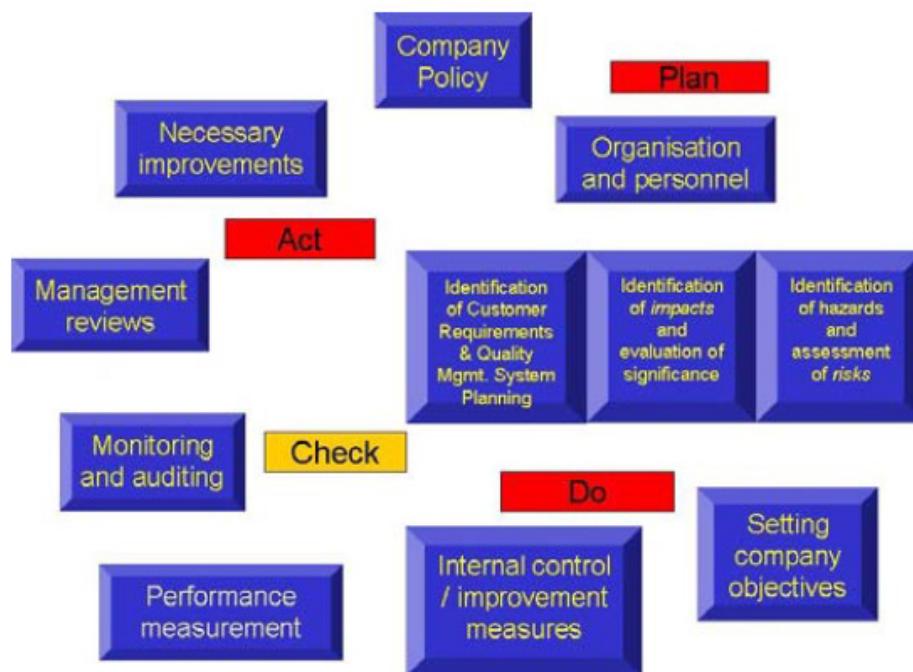
There were few established IMS models proposed and used by the Oil and Gas Companies as published in the literature. The basic IMS Model consists of five major components: (i) Policy, (ii) Planning, (iii) Implementation and Operation, (iv) Checking and Corrective Action and (v) Management Review, Roy [29]. The IMS documentation consists of QHSE Management Manual, Common Procedure Manual, Environmental Procedure Manuals, Safety Procedure Manual, Operational Control Procedures, Legal Register, Year Planners and Records showing evidence of having complied with the requirements of the standards, Roy [29].

Albernathy and Knod [2] highlighted that the IMS Model must be built around the way work is conducted; use a standards/process systems approach, based on ISO 9000, ISO 14001, and E&P Forum; Maintain feel and look of the E&P forum model because the European operations had successfully implemented that system, they were established, and

they were experienced; focus the organization on performance while maintaining compliance. Thus the Halliburton Management System (HMS) was designed based on Halliburton core business processes with the process-oriented management system that recognizes and links to its interdependent support functions, including Quality and HSE. Halliburton Management System Process maps developed at the global level allow modification to incorporate local practices. Local modifications may be made for unique geographical, geological, or business needs.

Narayanan [12] suggested similar model as Tramier [26] to use the PDCA Elements to identify areas that can be integrated and map the common management areas against ISO 29001, ISO 14001 and OHSAS 18001 as in Fig. 4.

### IMS PDCA



**Figure 4:** IMS plan–do–check–act (PDCA) [12]

Sohani and Haugnaess [25] discussed the key elements of the Contractor Management System as applied within the Safety Management System on Schlumberger sites including the step-by-step process flow and the various management tools as shown in Fig. 5.

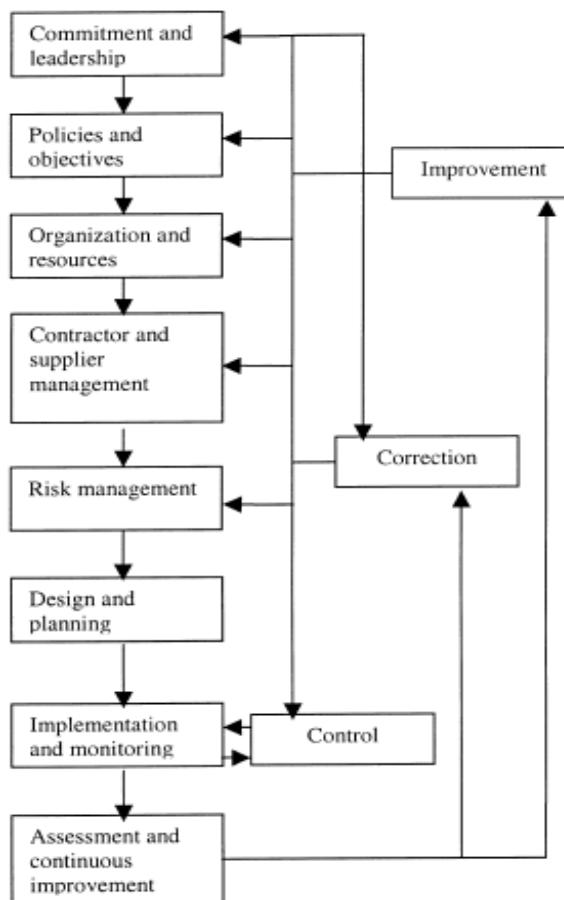
## 4.0 DISCUSSION

The majority of the papers on the IMS in the Oil and Gas Industry focus on IMS for Health, Safety and Environment Downey [15, 17-19, 26, 34, 36 ]. This is in line with the fact that the oil and gas industry involve a highly risk activities, thus most study in oil and gas

industry focuses thoroughly on health, safety and environment, recognizing that field development and production poses major challenges.

Quality is a word notably absent from many oil and gas company discussions. However, the Deepwater Horizon incident that occurs in April 2010 due to quality aspects which resulted in 11 deaths of crewmen and tremendous oil spill in Gulf of Mexico (the worst in the US oil spill), trigger concern from management system experts that not only HSE management system is the utmost important but the quality management system is equally important, Coles [37]. Hence, it is about time that a more comprehensive IMS is developed to be compatible with the specific company business processes for effectiveness and efficiencies.

The researches on IMS related to the oil and gas industry are mainly on historical case studies on organisation where actual experiences and best practices were shared. Most of the researches on IMS encompass all the industries and not segregated into specific industries where the researches are on empirical studies such as survey questionnaire were sent to many organisations on country basis. More than 90% of the papers on IMS presented in the oil and gas conferences and seminars were from Oil and Gas Companies and focus on Energy and Production business processes.



**Figure 5:** Contractor HSEQ Management System [25]

There is lack of IMS papers that represent the Oil and Gas Contractors in particular from the EPCI business process perspective. The reasons for lack of researches on the IMS in Oil and Gas Contractors is due to the nature of the projects which are short term where their project personnel are employed based on contracts as per project duration and their focus is only on complying with oil and gas company's contractual requirements to deliver the projects on time and within budget. There is limited time for them to study on improving the business processes or developing the IMS as it is not required by contract although it is an important part of the Oil and Gas Marine Contractor internal initiatives for process efficiencies.

## **5.0 CONCLUSION**

The research papers on IMS for oil and gas industry is limited and covers less than ten per cent of the overall research papers being reviewed. Majority of the IMS studies on the oil and gas industry are conference papers presented in the oil and gas forum where industry practitioners mostly from oil and gas companies shared their experiences in the IMS. There is lack of studies on the IMS for the EPCI business process by the oil and gas contractor.

## **6.0 FURTHER STUDY**

There is lack of literatures on the IMS for Oil and Gas EPCI Marine Contractors, hence a study will be pursued further to assess the status of IMS strategies and implementation employed by the Oil and Gas EPCI Marine Contractors. A survey questionnaire will be sent to the contractors that registered with International Marine Contractors Association (IMCA) and have been certified to more than one certification (ISO 9001, ISO 14001, OHSAS 18001 and others). The data from the survey will be analysed to identify the key aspects of IMS strategies and implementation in the Oil and Gas EPCI Marine Contractors.

The majority of the papers on the IMS in the oil and gas industry are on historical case studies of the companies. This reflects the uniqueness and need of the IMS research to be specific at organisation level. Therefore, a case study will be conducted in one of the Oil and Gas Marine Contractors to design and implement the IMS framework suitable for the EPCI projects. The IMS framework will then be validated by the focus group selected from the Oil and Gas EPCI Marine Contractors.

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