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Critical Factors Affecting the Quality Management System in Oil & Gas On-Shore Drilling Sector for In-Sourcing Drilling Model – (Concept Paper)

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ABSTRACT

The intention of this research is to define the critical variables which are affecting the overall quality management system and develop a sustainable quality management system (SQMS) for Oil and Gas sector, specifically for On-shore drilling operations, by which it will enhance the overall performance for the In-Sourcing drilling model. However, the intention of this paper (Part-1) is to demonstrate the road map of developing the conceptual framework which is driven from other different quality theoretical frameworks and models (where it was concluded after a comprehensive literature review that there is no fit for purpose QMS in a specific sector, instead companies depend on generic frameworks such as ISO: 9001, etc).

The concluded results are that conceptual framework consists of in-dependent variables which are (competency framework, preventive maintenance, management of change (MOC) and people recognition and dependent variable which is the overall performance by establishing a sustainable quality management system. The author used the Total Quality Management (TQM) model (focusing on three areas which are technology and digitalization assurance and lean) to study the effect of independent variable on the overall performance. In part 2, all the sampling and data analysis will be demonstrated to confirm the proposed conceptual framework as described in part1.

Keywords: ***QMS, ISO: 9001, TQM, APIQ2, Theoretical Framework and Conceptual Framework.***

1. INTRODUCTION

Oil and Gas industry is one of the most critical industries to which it contributes the most, in the economy of the majority of countries around the world. One of the sectors in oil and gas industry is the drilling and work over the sector, (Baker Hughes, 2017). There are more than 2000 drilling units in all over the world with an overall objective to produce Oil and Gas, (Baker Hughes, 2017).

The geographical distribution of these rigs can be classified into six regions by which North America has more than 54% of these rigs and then the Middle East comes at the second place with more than 19%.The rest of the rigs are allocated in Africa, Europe, South America and the Asia Pacific. Figure 1 below; demonstrate the number of rigs worldwide per region as of September 2017, (Baker Hughes, 2017).

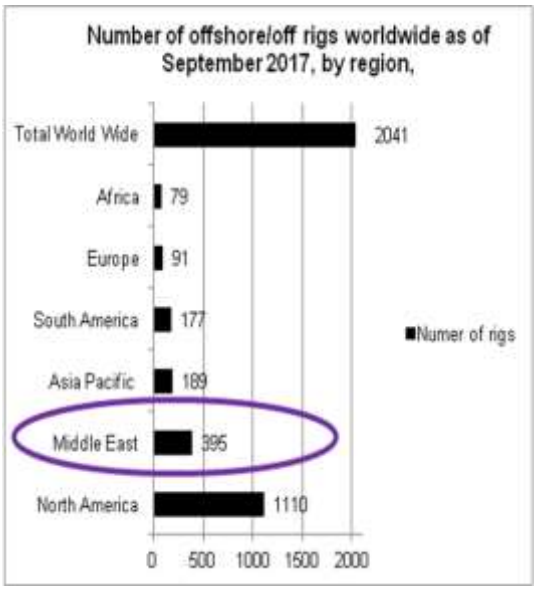

Figure 1: Rig Count per Region, (Backer Hughes 2017)

Drilling Rigs are mainly defined as massive structure hoisting equipment used to drill well bore which can be water wells, oil wells or natural gas wells with an overall objective to produce Oil and Gas. These drilling rigs can drill wells On-Shore where the drilling unit will be allocated on the land (Land drilling) or drill wells Off-Shore by which the rigs will be allocated on the sea (sea drilling), (IADC, 2017) as demonstrated in figures 2 and 3 respectively.

Figure 2: Off-Shore Drilling rig, (Company Y, 2016)

Figure 3: On-Shore Drilling rig, (Company X, 2017)

Drilling rigs are operated by hundreds of operators (also known as clients) across the world with a common operating model which is known as Out Sourcing, (IADC, 2016). The operator will be out sourcing the scope of work to professional drilling contractors to execute the drilling scope as defined in an agreed terms and conditions of a contract by which the contractor will be providing the drilling rig with its all accessories including personnel to operate it. In the other hand, the operator will be having the overall accountability of defining the scope and supervising the job which is executed by the contractors.

This operating model is the common model applied by the majority of leading international and even local companies in the oils and gas business all over the world such as British Patrolmen Company, Occidental Company, Aramco Company and many others all over the world. This confirms that outsourcing has become the major trend in oíl and gas sector over the past decade. More and more companies have turned to outsourcing as a way to grow while restraining payroll and overhead costs. These trends are most suited in the stable economic environment.

However, one of the major companies (operator) in oil and gas sector in the Middle East decided jointly with its shareholders to move from the concept of "Out sourcing" to "In souring" where the company itself has owned rigs including their own employees to execute the drilling operations. In other words, "In-Sourcing" drilling model is defined as a model where (operator or client) will be owning the drilling rigs including all personnel and will be executing the work without the need of having a contractor. Hence, the overall drilling activities risk will be retained by the operator rather than transferring it to the contractor, (Company X, 2012).

This shift is necessary as the declining oil price has a profound effect on the growth of this sector and any inflexible outsourcing contracts, which are the norm currently, will have a profound effect on performance. In this situation turning from outsourcing to insourcing plays an important role, especially when combined with internal knowledge; know how skills and expertise.
The authors believe that this concept paper will provide the frame on initial issues and the performance after this shift. The core issue of survival depends on a right decision been made and has this company made the right decision and can it be replicated by other companies in this sector after this trying period. The full fledge research by the authors, hopefully, give some answers to this pertinent and critical survival question.

2. "IN-SOURCING MODEL" PILLARS

Since 2012, "In souring" model became operational as a pilot in one of the oil and gas sector and the following figure 4 demonstrate the overall objectives of having such a model.

Figure 4: In Sourcing Model Objectives (Company X, 2012)

The four main pillars and objectives of "In sourcing" model are (Company x, 2012):

- Cost bench marking: where the "Out sourcing" model depends purely on contractors commercial submission. However, with "In-sourcing" model, the true operating cost will be experienced and the operator will have a better understanding of the breakdown of cost details. Furth more, the design of "In souring" model aims to be cheaper than the current model by 25%.Training: as the current model is purely operated by the contractor and operators graduates are missing the opportunity of hands on training (HOT) and having them physically engaged in operations and drilling activities. The objective is to improve the competency of operator drilling employees by having direct involvement in operating their own drilling equipment's and having ZERO incidents related to people competency.

- Technology: as the equipments which are provided by the contractors are conventional and the objective of the company is to move toward automation and up gradation through "In souring" model and to be a role model which will enhance the overall HSE and operational performance. On the other hand, operating cheaper than contractors by 25%.

- In country value (ICV): where the intention is to capitalize on ICV element in the country and transfer the technology including assembly and manufacturing of specific rig equipment in the country with an overall objective of 30% assembly of rigs equipment in the country.

Investments were made in building the "In sourcing" model and it is operating under a certain budget annually. This model is considered to be a pilot (trial) where it has been implemented by the operators in one specific field and the overall company vision is to capitalize on "In-Sourcing" model and to replicate across the other areas locally and then internationally by introducing the model globally to the other operators and joint ventures with an overall objective to improve the performance.

However, to ensure the sustainability of such a model, more improvements are required toward achieving the overall objectives which can be enhanced by having a specific QMS system which will enhance the overall efficiency, effectiveness and overall performance of the "In sourcing model".

The overall research questions can be summarized as follow:

1. Is the need to shift to in-sourcing drilling model justified in this organization? The authors intend to study cost to benefits of such a move.
2. What are the critical factors that may bolster such a move? The authors intend to identify factors in the particular niche area, drilling activities, of Oil and Gas industry.
3. What are the likely impacts on the performance of such move to the organization?

However, this paper will shade light on question 2, the critical factors which are affecting the overall performance of In-sourcing model through a conceptual model.

3. QUALITY MANAGEMENT SYSTEM LITERATURE REVIEW

Figure 5: QMS for drilling Mind mapping

It is recommended that before you start the literature review, to conduct mind mapping process or relevant tree approach on the subject so that it will support in streamlining the thoughts and building a structured specific flow for the overall research (GOPAL,2015) as demonstrated in figure 5 above.

There are lots of studies which were conducted in the quality management system by different sectors such as education, health, manufacturing, tourism, construction and etc. On the other hand, few studies were conducted in the oil and gas sector specifically for drilling activities.

Quality Definition

Philosophers define quality in many forms. For example, Quality is defined as a degree of excellence, (Plato, 347 BC) and in the sixth century B.C, (Lao Tzu) defined quality as perfection, the ideal without any defects, which must constantly strive.

After the 1970s, the definition of quality became more specific. Such as Quality is defined as excellence, value, conformance to specifications and meeting customer expectations, (Reeves, 1994). Another definition of quality is fitness for use, (Juran, 1974). As per (Garvin, 1987), quality is a multidimensional construct, as it has eight dimensions starting with performance, features, reliability, conformance, durability, serviceability, aesthetics and perceived quality. Some authors define quality as to develop, design, produce and service a quality product which is most economical, most useful by being specific to the organization nature of activities and always satisfactory to the customer, (Ishikawa, 1989).

However, some scholars concluded that there are five approached to define quality, (D. A.Garvin, 1989) which are Teanscendent definitions, Product-based definitions, user-based definitions, manufacturing-based definitions and Value-based definitions.

Teanscendent approach states that true quality cannot be defined precisely. However, it can be recognized via experience. In thus approach, quality is defined as "Means investment of the best skill and effort possible to produce the fine stand most admirable results possible. Quality is achieving or reaching or the highest standard as against being satisfied with the sloppy or fraudulent, (B.W., 1980).

Product-based approach defines quality as a precise and measurable variable. However, there is difference between the dimensions of manufactured products and service products by which, manufacturing dimensions are durability, serviceability, aesthetics, safety, and perceptions. On the other hand, service dimensions are timeline, completeness, courtesy, consistency, convenience, accuracy and responsiveness.

User-based approach states that quality is determined by the customer needs and willing to pay. By which, it shall be fir for purpose and use. On the other hand, Manufacturing based approach defines quality as the outcome of engineering and manufacturing practices or conformance to specifications.

Finally, Value based approach defines quality in terms of costs and prices by which the quality definition is price sensitive.

$$Quality = \frac{Value}{\Pr ice}$$

Equation 1: Quality Definition – Value Based

From the above literature review on Quality definition, the author conclude two main critical information, the first conclusion is that quality approach definition identification will depend on the workflow current phase which can be classified into four main categories which are market intelligence and research phase, product design phase, manufacturing based and execution and operating phase as demonstrated in figure 6 below. Hence, the value based definition will fit for In-sourcing model current phase.

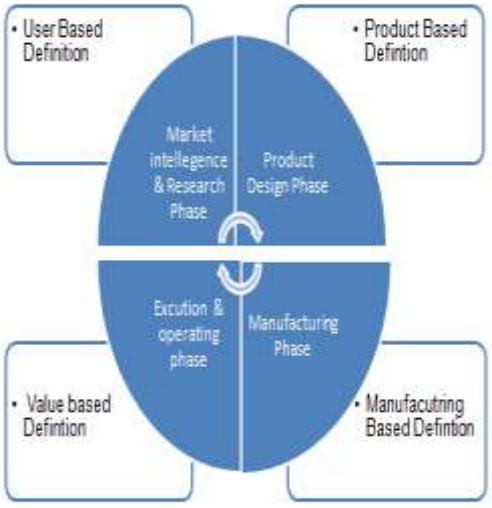

Figure 6: Quality Approach Depending on workflow process phase

The second conclusion is that the definition of quality started to move from generic terms to specific meaning by which recent scholars supported the specific definition of quality such as "J.M.JURNA" defined quality as fitness for purpose or use by which quality is compatible with the uses and characteristics and "Ph.B.CROSBY" defines quality as conformance to requirements and standards. In Summary, over the time, the quality definition can be presented graphically with regard to standards and time as demonstrated in figure 7 below.

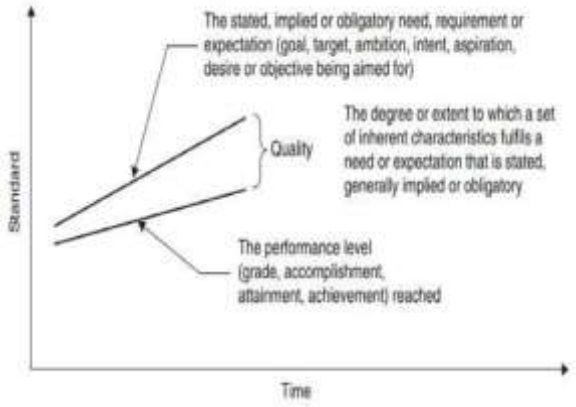

Figure 7: Quality Meaning, (D., 2007)

However, from this literature review, quality is widely used by practitioners and academics by which there is no agreed definition of it. In fact, different definitions of quality are appropriate under different circumstances, (Garvin, 1984; Reeves and Bednar, 1994; Seawright and Young, 1996; Beaumont and Sohal, 1999 and Ojasalo, 2006).

Quality Evolution

The quality approached has significantly changed over the last four generations, (Burnet N, 1993). In the first generation where resources (manpower and materials) were cheap, products were over engineered to prevent failure. However, in the second generation where the material became expensive and manpower remain cheap; products were designed in a manner that meets the required specification without having extra safety margin which introduced the risk of increasing in failure probability. However, intense inspection and quality control were required to replace the large safety margin. In the third generation, where both the material and manpower became more expensive, understanding the cause of defect became very critical where the quality assurance was introduced. Finally, quality management is the current industry focus to eliminate potential defects at the design stage. The following figure 8 below demonstrates the quality evolution.

As stated above, the quality evolution started from over engineering to the current status which is focusing on the quality management system. In the other hand, as mentioned in the quality definition section, that the definition of quality moved from generic terms to very specific and fit for purpose meaning. Hence, the author confirms the need to have a specific fit for purpose quality management system related to on shore drilling activities specifically for the in-sourcing model to enhance the overall performance rather than depending on generic models.

Figure 8: Quality Evolution, (Burnet N, 1993)

Quality Management Models

Globally, there are many quality management models which are practiced all over the world by different industries. The adoption of a quality management system is a strategic decision for an organization that can help to improve its overall performance and provide a sound basis for sustainable development initiatives, Quality management system (QMS) is defined as a structured and formalized system that documents process, standards, roles and responsibilities for achieving quality policies and objectives.

By which the QMS will direct organizations activities to meet the customer and regulatory requirements and improve its overall effectiveness and efficiency continuously. Lots of literature and studies on the quality management system were conducted in different sectors such as education, construction, transportation, manufacturing, tourism, airlines and etc.

Majority of these studies were focusing on generic quality management system such as ISO9001 (Quality management system) and its implementations across different sectors as indicated earlier, (Archer, 2013); (Leong & Zakuan, 2014); (Sharma, 2005); (Willar, 2012); (Willar, 2012), (Alolayan, 2014) and (Ali, 2013).

Some of the common models which are used worldwide include but not limited to are total quality management (TQM), an international organization for standardization ISO: 9001 family, American Petroleum Institute, API Q1 and Q2, six sigma and many other models.

In this paper, a brief summary of what has been done in these models will be demonstrated including the major identified gaps by which what is required to be done will be translated to a conceptual model. The gaps identified will be addressed to have a fit for purpose model for oil and gas industry specifically for on shore drilling activities.

Till 2010, ISO 9001:2008 was one of the optimum models used in different industries including oil and gas. The oil and gas industry thought that ISO 9001:2008 was optimum to adopt its operations.

On the other hand, sophisticated and complex industries such as air space and air flight they have developed their own established quality system which matches with the nature of activities. Al though, some organizations in these industries are adopting ISO model as a minimum but they are having their own established model such as NASA.

In 2010 a catastrophic incident occurred in off-shore drilling operations in Gulf Mexico known as Macondo incident where the entire drilling rig got blown out as demonstrated in figure 9 below.

Furthermore, this resulted in the fatality of 11 people, another 17 people were injured and 210 million gallons of crude oil was lost where the operating company lost more than 6 billons of USD including the overall contamination of the environment (Berkeley, 2011).

Figure 9: Macondo Incident (Berkeley, 2010)

A detailed investigation took place where many findings and recommendations were concluded. However, there were main four themes recommended for the investigation conducted which can be summarized as technology, assurance, risk management and emergency contingency plan (Berkeley, 2011).

After this incident, the oil and gas industry realized the need of having a quality model which is risk based where it was not the case with ISO 9001:2008. Hence, experts started to brainstorm to develop a quality system which is fit for purpose with the drilling nature of activities.

Furthermore, different industries realized the need for a change as well. In fact, many Literature review which were conducted by different authors indicates that ISO9001 underlines too much the importance of documentation and varieties of procedures and does not give too many results relating firm's performance improvement as indicated by (Seddon J, 2000), (Wenger E,1998), (Hossein Bidgoli,1997), etc.

Hence, it was concluded by different scholars that many organizations from different sectors are moving and walking away from a generic quality system such as ISO: 9001 to more specific owned quality systems where such companies have proven that such generic system is not effective nor efficient, (Piotr Kafel, 2014).

In 2013, a specific quality management system known as American Petroleum Institute API Q2 was developed by which it considered to be the first quality management system specifically for the oil and gas industry. However, it was driven by off-shore drilling activities and a reaction to the Macondo incident, (API, 2013). Similarly, the other industries realized the need to have a quality system which is specific to their nature of activities. In other words, "fit for purpose" quality models.

All above, created pressure on ISO by which ISO realized the need to change their model and adopt the risk based approach where it has released the new version of ISO in 2015 (ISO 9001:2015). Figure 10 below demonstrate a road map on the quality management system starting from TQM in the 1940s to ISO 9001 in 2015.

Currently, it is very clear that the industries are heading toward specific quality management system models rather than generic models where the risks techniques are tackled and mitigations are built into the overall system. Industries started moving from reactive models with generic variables to proactive models with more specific leading variables such as the manufacturing industry where API Q1 was specifically developed for this sector.

Figure 10: Quality Management System Excellence History – Road Map.

TQM Model

Total Quality Management (TQM) describes a management approach to long term success through customer satisfaction. In a TQM effort, all members of an organization participate in improving the process, products, services and the culture in which they work. This approach involves all employees in continual improvement. It uses strategy, data and effective communication to integrate the quality discipline in to the culture and activities of the organization, (Philip.B, 1999).

This model consists of the following independent variables as highlighted in figure 11.

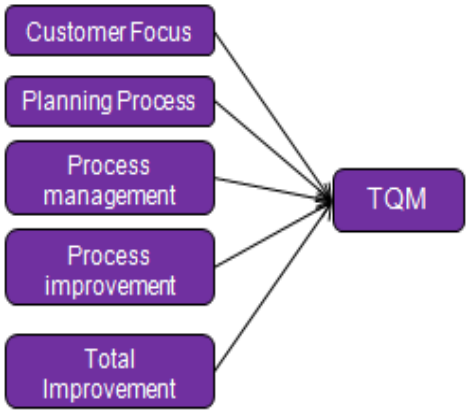

Figure 11: TQM Model

From above figure, it is obvious that the strength of this model is to overall customer satisfaction and continual improvement initiatives. As the intention is to replicate the quality culture at all levels of the organization.

API Q2 Model
Which consist of the following variables as demonstrated in figure 12 below:
API Q2 model is risked based approach and it is the only model which is developed for oil and gas specifications). However, it doesn't tackle certain critical elements such as the technology nor competency frame work.

It still did not reach the maturity level as the model is under revision (API, 2016).

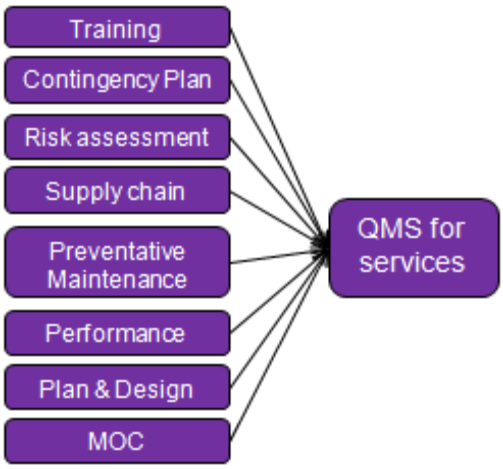

Figure 12: API Q2 Model

However, API Q2 model is risked based approach and it is the only model so far which is developed and designed for oil and gas specifications.

ISO 9001:2015 Model
The details of this model have been described above. However, this model consists of the following independent variables as highlighted in figure 13 below.

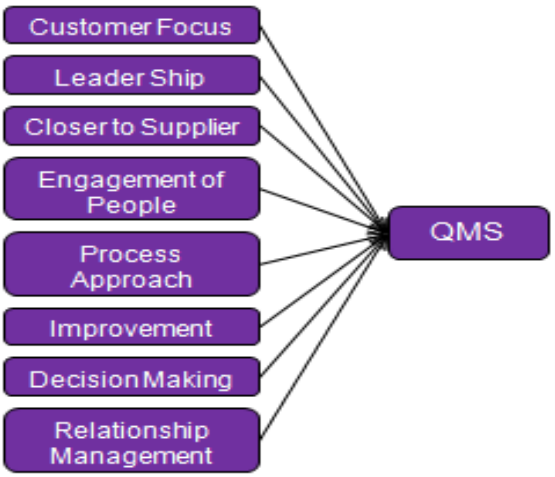

Figure 13: ISO 9001:2015 Model

Six Sigma Concepts

This concept can be divided into two categories (Joseph, 2005) and both of them are for continual improvement. If the model is new, then the concept will consist of the following variables as demonstrated in figure 14 below known as DMADV.

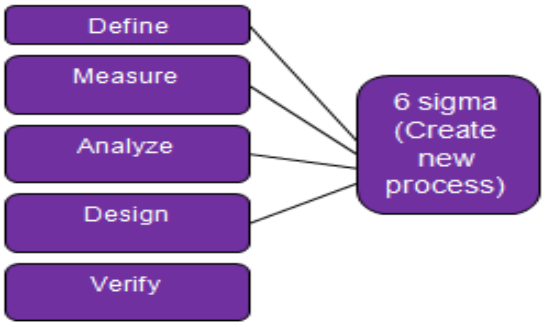

Figure 14: Six Sigma for New Model

If the intention is to improve and existing business model, then the following six sigma model is used as demonstrated in below figure 15 which is known as DMAIC

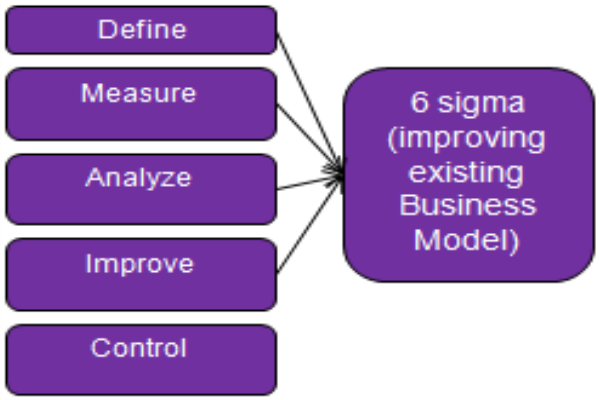

Figure 15: Six Sigma for existing model

4. METHODOLOGY AND CONCEPTUAL FRAMEWORK

From the previous oil and gas incidents and the gaps identified in the current quality models as stated in previous sections. The conceptual model is developed specifically for oil and gas industry related to on-shore (land) drilling activities. All the identified gaps from the previous models and the common themes in land drilling activities were investigated and an integrated model has developed accordingly. Furthermore, in oil and gas industry, there are certain specific areas of focus by which if it is improved and sustained, the overall performance will be enhanced such as Health Safety and Environment (HSE), Non-Productive timing (NPT), simplicity, efficiency, and compliance, (OPAL,2017).

The author took all of the above in consideration and linked with the overall in-sourcing model objectives to conclude a fit for purpose quality management system (QMS) related to its nature of activities by which the overall performance will be sustained.

The independent variables of interest are identified as (Competency framework, Preventive Maintenance, Management of Change (MOC), Technology & Innovation, People recognition, Assurance and LEAN) which all cumulatively affect the overall dependent variable defined as Performance. This is reflected in Quality Management System (QMS).

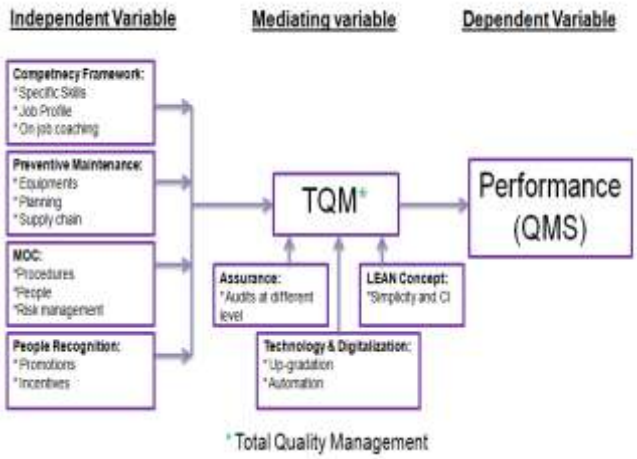

Figure 16: Conceptual Model

Many authors believe a multidimensional definition in the context of a system that is skewed towards the TQM is appropriate for the research, (Rodney.Mc, 2001) and (Alan.B, 2001). By which the TQM model has been used in other different industries such as education, manufacturing, and construction.

Hence, the conceptual model demonstrates the use of the TQM approach by which the authors believe multidimensional definition in the context of a system that is skewed toward the
TQM is appropriate to study the influence of in sourcing factors which have been identified above on the overall Performance as demonstrated in figure 16 below.

This conceptual model is designed in a way that addresses the need, gaps and area of improvements in Oil and gas sector specifically for On-Shore drilling activities with regard to the quality management system.

Furthermore, the intention of this model is to change the mindset and to change the culture of being re-active to pro-active by introducing more leading independent variables in the quality management system model. The objective is to prevent and not to have another Gulf Mexico incident to realize that our model is not fit for the nature of our activities.

The design of the research shall clearly describe the structure plan of how the research questions will be answered including the justification of methods selected as stated by Saunders, Lewis, and Thornhill (2009).

In this paper, the author will provide a high level summary of the identified 7 critical factors as stated in the conceptual model:

Competency Framework

Drilling activities are challenging. Especially when changing from a common model of out souring to in souring model by which competency of the people who are involved is one of the critical items which will have the overall effect on the performance.

The author believes that a clear and structured competency framework will support uplifting the people skills. (Lucia and Lepsinger, 1999) offer this definition of a competency as a cluster of related knowledge, skills, and attitudes that affects a major part of one's

job (a role or responsibility), that correlates with performance on the job, that can be measured against well-accepted standards, and that can be improved via training and development."

So, from the definition above, competency integrates between skills and knowledge by which they can be improved having a positive impact on the performance. The author will focus on specific skills required and on job coaching for in sourcing model.

Preventative Maintenance

Preventive maintenance system is critical to sustaining the overall performance. It is considered to be one of the key requirements in oil and gas industry and recent quality models such as (API Q2, 2013). A structured preventative maintenance will support an organization to minimize its nonproductive timing (NPT).

The author will focus on the supply chain process and critical equipment's as the majority of NPT are equipment's related (Company X, 15).

Management of Change (MOC)

As highlighted, drilling activities encounter lots of risks. However, Management of change is required to provide assurance that when changes are introduced, new risks are not unknowingly incurred, or the prevailing risk profile is not adversely changed without appropriate mitigation and controls.

The management of change concept is still missing from different quality models as highlighted in the literature review section. On the other hand, many companies limit this concept to changes which are only related to equipment (Company X, 2016). Management of change shall not be limited to change in equipment only. In fact, the author will cover organizational (People related) and procedural changes as well by which if mitigations will cover the three defined area, it will prevent any unnecessarily nonproductive timing which will enhance the overall performance. Furthermore, this process will support Insourcing model to establish a structured risk management.

The risk management will be under this element by which the risk either (actual or potential) associated with drilling activities will be identified and explored.

Technology and Digitalization

Technology is another element which was not really popular in quality models. However, the Macondo incident which occurred in 2013 concluded the need to have the technology to improve the overall health, safety and environment (HSE) and operational performance. Technology can start from the manufacturing phase as stated by (API Q1, 2013) to the execution phase.

The author will explore this element more focusing on automation, up-gradation and its influence on the overall performance.

Assurance

Many oil and gas companies are having assurance system to enhance the overall performance especially when it comes to health, safety, and environment (HSE) area. However, the assurance system differs from one company to the other depending on the population and overall volume of the activities (MOG, 14).

The author concluded from a review of assurance systems implemented by different oil and gas companies such as (Company Y and Company Z) that to have a structured assurance system, it shall be implemented across by all levels. However, the author will investigate the different levels of required assurance in In-sourcing model as demonstrated in figure 17 below. Level 1 will be conducted by the Insourcing corporate and it will be focusing on the overall system implementation. Level 2 audit will be conducted by in-sourcing management to confirm the compliance to the specific focused area and level 3 will be conducted at site unit supervisors by which a detailed check will be used for task verifications.

Figure 17: Assurance system

People Recognition
One of the challenges in oil and gas industry is the sustainability of good performance. By which people play a big role in such achievement. Hence, people recognition and incentive models will be investigated.

Many studies show the impact of people recognition on overall performance such as (Thompson and Neary 2004). The author will validate the influence of recognition and motivation in the in-sourcing model.

LEAN
Lean is defined as a systematic method for waste removal or minimization within a manufacturing system without sacrificing productivity. LEAN concept became popular and practiced in different sectors all over the world.

The author believes the need to spread the lean culture in oil and gas sector by which it has been proven by many other studies that it will support the overall performance by which the focus will be on simplicity and continual improvement.

An example to support the author point is a study which was conducted in 2009 by which it was proven the need of integrating lean into a quality management system will enhance the overall performance by Hadica Hagarek implemented in the medical device industry.

Total Quality Management (TQM)
TQM can be defined as a management philosophy including certain methods and tools by which it enhances the overall productivity and quality in an organization. This concept intends to achieve the continuous improvement through the commitment and ownership of all its employees, furthermore, TQM focuses on ensuring all resources in the organization are utilized to meet and satisfy its customer requirements both internal and external using different techniques and tools. Many studies confirmed the effect of TQM in improving the overall organization performance in different sectors.

This has been studied by (George.S, 2004) by which he confirmed that TQM has a positive impact on an organization performance. Also, (Gharakhani. D, 2013) stated that TQM helps the organization achieve and maintain success over the long term. The author will use this approach to study the influence of In-sourcing factors upon its performance.

The TQM is a theoretical model, having inputs from practitioners, theoreticians, and academics. Different variables have been studied in different organizational structures and found to have produced superior results. In this study, the authors have identified a couple of relevant variables in TQM analysis for this organization.

The author will validate these factors by conducting specific surveys including questioner and interviews by which the data will be reviewed and translated in to a conclusion and future recommendations.

5. CONCLUSION
Quality management system effectiveness is very critical in enhancing the overall organizational performance. Hence, it is very important to have "FIT FOR PURPOSE" system. This article is conceptual and the independent variables which are affecting the overall quality System have been identified specifically for oil and gas drilling sector. Part 2 of this paper will have the detailed analysis of each independent variable and it's rational. Below figure 18 demonstrate research overall future plan.

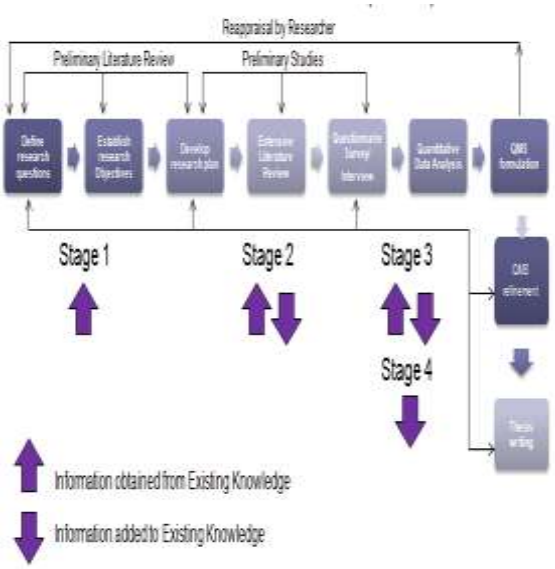

Figure 18: Research Overall Plan

Majority of studies which were conducted with regard to QMS before 2010, were commonly depending on a generic quality system such as ISO family as highlighted in L.R. The basis of ISO is driven from manufacturing Industry and it was not a risk based approach design till 2015, (ISO,1987).

Sophisticated industries such as Air space (NASA), Air flight, they are having their own QMS system specific to the nature of their activities. Many Literature review indicates that quality management system underlines too much the importance of documentation and varieties of procedures and does not give too many results relating firm's performance improvement, (Seddon J, 2000), (Wenger E, 1998), (Hossein Bidgoli, 1997), etc.

Many other industries are walking away from ISO as it has been proven not to be effective. Instead, companies are losing money, (Piotr Kafel, 2014). After the Gulf Mexico catastrophic incident which occurred in 2010, the oil & gas industry decided to develop a more specific quality system where APIQ2 was developed as the first quality management system specification for oil & Gas Industry for off-shore activities, (API, 2013).

Based on literature review, many theoretical frameworks on the quality system are having similar independent variables and very few are risked approach based where they mainly focus on policy, procedures, and documentations without considering specific risk management, assurance, simplicity, technology and LEAN.

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