T.C.
ISTANBUL GEDİK UNIVERSITY
INSTITUTE OF GRADUATE STUDIES

PROJECT MANAGEMENT IN OIL AND GAS INDUSTRY SECTOR "CASE STUDY FOR IRAQI OIL COMPANIES"

MASTER'S THESIS

Aveen M. ABDULWAHAAB

Engineering Management Master in English Program

JULY 2021

T.C.
ISTANBUL GEDİK UNIVERSITY
INSTITUTE OF GRADUATE STUDIES

PROJECT MANAGEMENT IN OIL AND GAS INDUSTRY SECTOR "CASE STUDY FOR IRAQI OIL COMPANIES"

MASTER'S THESIS

Aveen M. ABDULWAHAAB
(191281003)

Engineering Management Master in English Program

Thesis Advisor: Prof. Dr. Gözde ULUTAGAY

JULY 2021

T.C.
İSTANBUL GEDİK ÜNİVERSİTESİ
LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ MÜDÜRLÜĞÜ

Yüksek Lisans Tez Onay Belgesi

Enstitümüz, Engineering Management Department İngilizce Tezli Yüksek Lisans Programı (191281003) numaralı öğrencisi Aveen M. ABDULWAHAAB'ın "Project Management In Oil And Gas Industry Sector"Case Study For Iraqi Oil Companies" adlı tez çalışması Enstitümüz Yönetim Kurulunun 08.07.2021 tarihinde oluşturulan jüri tarafından *Oy Birliği* ile Yüksek Lisans tezi olarak *Kabul* edilmiştir.

Öğretim Üyesi Adı Soyadı

Tez Savunma Tarihi: 08/07/2021

1) Tez Danışmanı: Prof. Dr. Gözde ULUTAGAY

2) Jüri Üyesi: Dr. Öğr. Üyesi Ayşe Övgü KINAY

3) Jüri Üyesi: Dr. Öğr. Üyesi Alper VAHAPLAR

DECLARATION

I, Aveen M. ABDULWAHAAB, do hereby declare that this thesis titled as “Project Management in Oil and Gas Industry Sector"Case Study For Iraqi Oil Companies” is original work done by me for the award of the masters degree in the faculty of Engineering Management. I also declare that this thesis or any part of it has not been submitted and presented for any other degree or research paper in any other university or institution. (08/07/2021)

Aveen M. ABDULWAHAAB

DEDICATION

This research is the result of my fatigue and effort during my years of study, so it is a pleasure to dedicate it to people who are credited with being here today and completing what I started with, and they have my love and gratitude. I would like to dedicate this thesis to the one who always inspire and encourage me in every step along my life my lovely mother (Asmahan Ahmed).

To the person whose supports always give me the power and trust to go on my father "Baba habiby" (Mohammed Abdulwahaab Bajalan). I also dedicate this work to my closest friend, love of my life and husband (Hallow) thank you for believing in my abilities "As usual we started together and we'll finish it together".

To my dear sister and brother for my heart (Azheen , Rebeen). Definitely I will not forget my life's happiness my two little angles my daughters (Hanya ,Arveen) one of the most important reasons why I completed my master's degree is to set an example for you in life and to show you the importance of science to follow the path of science in the future. I love you all GOD bless you.

PREFACE

I would like to express the deepest gratitude to Gedik Universty for giving opportunities to foreign students wishing to complete their higher educations at this esteemed university. Special thanks and gratitude To my supervisor (Prof. Dr. Gözde ULUTAGAY) for their support, advice and guidance to complete this search with the required apprroach. My gratitude to all the respected professors who gave us courses during these semesters (Dr. Mert Tolon, Prof. Dr. Gözde ULUTAGAY, Dr. Aysam Akses, Dr. Korkmaz ULUCAY and Dr. Umut Hulusi INAN).

Inaddition I want to appreciation to my committee chair and committee members for their efforts and time. It is my gratitude to dedicate this work to (Asst. Prof. Dr. Ashty Mahdy Aaref) the Dean of Kirkuk Technical Institute for her supports prsonaly to me and to this work. I also want to thank (Mr. Noor-Aldeen F. Sulaiman) the Assistant Dean of Kirkuk Technical Institute for his supports, encouragement and effort. I dedicate this work with pleasure and love to my husband (Hallow) for helping me during writing this work with all of his computer applications knowledge.

TABLE OF CONTENT

Page

LIST OF ABBREVIATIONS

SIS	: Safety Instrumented Systems
ESD	: Emergency Shutdown
MOO	: Ministry of Oil
E&P	: Exploration and Production
MADM	: Multi-Attribute Choice Making
BWM	: Best-Worst Method
WASPAS	: Weighted Totaled Sum–Product Appraisal
ISD	: Inalienably more Secure Distribution
P.E.S.T.L.E	: Political, Economic, Social, Technological, Legal and Environmental
IEC	: International Electronical Commission
BSC	: Balanced Scorecard
E&P	: Exploration and Production
SEM	: Structural Equation Modelling
SLS	: Stage Least Square
IV	: Industrial Variable
TA	: Technology Assessment
R&D	: Research and Development

LIST OF TABLES

Page

LIST OF FIGURES

Page

PROJECT MANAGEMENT IN OIL AND GAS INDUSTRY SECTOR "CASE STUDY FOR IRAQI OIL COMPANIES"

ABSTRACT

Project managements of oil and gas industry involve development of robust system that is able to integrate many skill professionals to work smoothly and together in the said project fields. This process are challenged by the ground reality as project manager is still have to look in many other tasks such as costing (budgets), contractors relations, safety norms, office routines etc. in this study, questionnaire survey is being established in order to derive a reliable project management system in oil and gas companies that field under Ministry of Oil (MOO) in Iraq.

Keywords: *Management, Machine Learning, Reservoirs, Petrol Exploration, Piping Network*

PETROL VE GAZ ENDÜSTRISINDE PROJE YÖNETIMI: IRAK PETROL ŞIRKETLERI İÇIN ÖRNEK OLAY İNCELEMESI

ÖZET

Petrol ve gaz endüstrisindeki proje yönetimi, bahsedilen proje alanlarında sorunsuz ve toplu olarak çalışmak üzere birçok yetenekli profesyoneli entegre edebilen sağlam bir sistem geliştirmeyi içerir. Proje yöneticisi bu çalışmada maliyetlendirme (bütçeler), müteahhit ilişkileri, güvenlik standartları, ofis prosedürleri vb. gibi diğer birçok görevi hala göz önünde bulundurmak zorunda olduğundan, bu sürece temel gerçeklikten faydalanılır. Irak'ta Petrol Bakanlığı'na (MOO) bağlı olarak faaliyet gösteren petrol ve gaz şirketlerinde güvenilir bir proje yönetim sistemi ortaya çıkarmak için bir anket oluşturularak sonuçlar ve öneriler sunulmuştur.

Anahtar Kelimeler: *Yönetim, makine öğrenimi, rezervuarlar, petrol sondajı, boru hattı ağı*

1. INTRODUCTION

1.1 Overview

The demand for hydrocarbon energy worldwide has been increasing over the past few decades. At the same time, the industry of oil and gas is facing a shift towards conducting operations in non-conventional locations. Examples of such production environments are remote, poorly accessible, offshore/deep-water, and Arctic locations. In recent decades, the petroleum reserves in the Arctic have become more accessible due to the ice melting, which resulted in increased international attention to this region (Conley 2012).

Establishing facilities in these new environments and unpopulated areas is seen as beneficial for both businesses and societal welfare. On the other hand, these environments present considerable challenges to the oil and gas sector where operations are by default associated with potential hazards since they deal with flammable, toxic, and explosive substances, and therefore, pose risks to people, technological assets, environment, and companies' reputations. Complex process automation and IT systems are deployed to ensure the proper course of hazardous industrial facilities' operations. A part of this IT solution is referred to as Safety Instrumented Systems (SIS).

These systems act as protective barriers aiming either to prevent the occurrence of unwanted events or to mitigate the hazardous consequences. Among these systems, there are process shutdown systems which may isolate parts of the technology in semi-critical situations, emergency shutdown (ESD) systems which shut down the entire process in case an emergency condition which can quickly escalate to a critical situation, is identified, fire and gas systems which detect fire and high concentrations of hydrocarbon gases and notifies the personnel about it, pressure protection systems for pipelines, and potentially others (Devold, 2013).

Among these barriers, ESD systems are considered to be especially important as they provide the most substantial risk reduction among the preventive safety barriers

(Centre for Chemical Process Safety (CCPS) 2010). The typical form of implementing a technological solution in the oil and gas industry is as an engineering project. Any project consists of several key phases, as described in (Gruhn and Cheddie, 2006; Redutskiy 2017).

The management of oil and gas projects is hard enough sue to the permeated cases and however, robust management system developed is required for tacking the raised challenges. In order to so, it is important to be realized the challenges that management system and entire project could be faced in real life environments, which is the reason for establishing of this study.

1.2 Problem Formulation

Oil and gas industries are among vital resources in Middle East countries i.e. IRAQ where other industries such as agriculture and manufacturing are poorly performing. From the other hand, the demand of hydrocarbon energy has been widely expanded over last few years. Hence, hydrocarbon mining companies are forced to include remote and unmanaged locations for production expansion.

However, at many places around the world where hill stations and mountains environments are the earth overheating and ice melting are motivated the over mountains hydrocarbons mining. In other environments where water and seas are existed, offshore rather than conventional onshore hydrocarbons production is being established. Society as well as business men together are in benefit from expansion the mining areas into unemployed environments i.e. offshore and mountains. Accessibility of such area is from the main challenges in oil and gas sectors faced by every concerned operator/company.

The challenges can be related into two management concerns namely safety and cost. This is manifested where workplace is in remote and hazardous environments such as open desert, offshore and mountains. Dealing with flammable substances is insisting problem in such environments which threat workers safety. Being remote and none accessible by regular transportation system, it required adoption of individual facilities such as transportation, medical, and hospitality sectors.

All incorporating excessive cost over the project budget. Thus, initiation of such projects is budget oriented if other factors that related to human safety is overcome.

Knowing that advance safety and technological system adaptation is another budget challenging aspect.

1.3 Study Sample and Research Gap

Iraqi oil and gas industry represented by Ministry of Oil (MOO) is the national holder and owner of all hydrocarbon mining activates conducted on all provisions in Iraq. Process of oil exploration, extraction and mining are conducted by MOO as well as many oil companies such as Shell and Gazprom, etc. the working environments are mostly sandy, flat and open deserts propagated at the southern and middle provisions of country as well as regions at the northern provisions which are almost flat and rocky environments.

However, the high temperature in the summer (crossing the water boiling degree) and unclear safety protocols are the dominant problems. Problems are starting post project handover by the companies (during operation phases) and below Miscellaneous problems in the selected study sample can be enlisted below:

1. Resource management shortage: smart technology alike artificial intelligence is yet not been incorporated and conventional mining machinery are still in service, several failed trails are to be going through in order to reach the final reservoir location is mainly caused by leak of artificial intelligence technology and forecasting machines.
2. Leak of maintenance strategies and planning manifested in events alike breaking of drilling machine head, fire, etc. where operations stand halt until the fault clearing.
3. Leak of safety management systems and unclear safety protocol with poor knowledge of safety.

1.4 Study Hypothesis

Hypothesis 1: Safety is major concern of any project during designing phase and implementation phase; within petroleum projects, only instrumenting the staff with appropriate machinery must be enough for safety insurance.

Hypothesis 2: Within petroleum project where verity of professionals is working

together, safety training needs to be given for every group of workers base on their academic background and their position.

Hypothesis 3: Information technology tools and models if integrated with petroleum project, it may degrade the cost and budgets dedicated for the project.

Hypothesis 4: With existence of machines and computerized technology, human intervention is not required in many sections of petroleum projects.

Hypothesis 5: Petroleum project are mostly situated in remote and hazardous localities, this is good way for land utilization irrespective of high risks of lives.

Hypothesis 6: Results of conceptual project analysis must be depended prior to initiate the petroleum projects in order to ensure performance, profitability and safety.

Hypothesis 7: Good project management must allow diversity of professionals to work all together at same time in the project.

Hypothesis 8: Computerized project management is the key solution for all problems tackling within the petroleum projects.

1.5 Study Objectives

In order to overcome the above shortages which cause serious performance degradations, we intend designing robust and stable engineering management strategies with flexible features for tackling the maintenance and safety challenges in oil and gas projects. In order to do so, the following objectives are made:

1. To conduct a survey study in order to evaluate the challenges faced by the work personnel (professionals) including engineering crows, technicians, staff, etc.
2. To evaluate the technical challenges influencing the performance and overall quality of the oil and gas projects.
3. Optimization of project resources by eliminating the reasons of extra expenses in other word, adaptation of new technologies i.e. (artificial intelligence) for efforts and cost reduction of reservoirs exploration and digging.

4. To minimize the reasons behind life risks by implementation of safety norms inspired by international standards such as IEC 61511, IEC 61508 and ISO 45001.

1.6 Thesis Organization

This thesis report is consisting of seven chapters which are made to illustrate the petroleum (oil and gas) industry project management paradigm and challenges. Chapters' content is demonstrating as below:

Chapter One: entitled as "**Introduction**" is illustrating the overview of the study, problem statement and case study as well as the objectives.

Chapter Two: entitled as "**Literature Review**" illustrates the past researches about this study.

Chapter Three: entitled as "**Methodology**" illustrates the methods of survey formulation with data analysis. Also explains the study tools.

Chapter Four: entitled as "**Results Analysis**" demonstrating the outcomes of this study and discusses the survey responses.

Chapter Five: entitled as "**Hypothesis Test**" demonstrating the final decisions on the assumed hypothesis base on survey results analysis.

Chapter Six: entitled as "**Conclusion**" illustrates results discussion.

Chapter Seven: entitled as "**Recommendations**" for the future studies.

The final sections of this thesis are involved the references enlisting as well as the appendix respectively

2. LITERATURE REVIEW

At Masár, Hudáková, Šimák & Brezina (2019), these days endeavors are centered on effectively venture, which are overseen by extend supervisors. The venture must to fulfill essential ventures desires and setting extends goals. It is vital to recognize extend hazard within the arranging stage. Base on dangers, which are overseen by extend directors. Than directors may oversee ventures more effectively and utilize relief to prevent projects from falling flat. The most point of this paper is to depict the current state of extend chance evaluation in Visegrad Gather nations in transport segment, based on experimental inquire about, which was realized by creators in 2018/2019. This inquire about was centered on analyzed the current state of extend risk assessment in Europe, Asia, Africa and America. The most point of this commitment is to survey the current state of venture hazard administration of Visegrad four nations (V4) based on observational inquire about in transport segment.

At Meski, Belkadi & Laroche, (2019), the industry 4.0 worldview is right now one of the spaces that presents different problematic with tall challenges for investigate and fabricating specialists. Among the industry 4.0 subjects, computerized chain observing incorporates an incredible effect on the execution of the company. Without a doubt, less association of undertaking data frameworks and information sharing between commerce offices of the company can result on over costs and genuine delays with respect to the operational arranging. In fabricating companies, virtual obstructions can exist between the operational administration and the shop floor due to security, privacy, and interoperability issues. Consequently, feedbacks around the genuine exercises and occasions within the shop floor are not frequently exchanged to the choice making divisions (i.e. handle designing, upkeep, etc.). In this setting, this paper examines the potential of information organizing through a common store as an arrangement to bolster the progression of the full computerized chain.

At (Litvaj &Stancekova, 2015) this study about analyzing the ways of how innovation appraisal (TA) can be best coordinates within the management of R&D

both at the research facility and the approach level. The most objective is to show a conceptual system to arrange and assess the real and conceivable TA foundation in Europe. The paper comprises of three particular areas. In segment one, the concept and hone of TA are briefly presented with an accentuation on their genuine institutionalizations in Europe. Area two presents a conceptual system of R&D management at four levels: the R&D environment, the R&D institution, the R&D prepares, and the R&D extend. The relationship between TA and R&D administration is investigated for each of the four levels. At last, in area three the concept of and thought processes for TA coordinates inside the research facility work of researchers and engineers are displayed. The essential contention of this paper is that by advancing the integration of TA in R&D management hones, a noteworthy commitment can be made to (1) expanding the cost-efficiency of inquire about and (2) increment the social responsibility of researchers. The creators in this manner draw up a conceptual system for the advancement of R&D-integrated TA hones called Coordinates Innovation Evaluation (ITA). The modern contemplations incorporate meta program administration to adjust multi objectives; knowledge and partner integration to make complex ventures; back arranging and organizing as an basic fixing of materializing complex ventures; administration of extraordinary ventures; and unexpected chance administration.

At Huang, McCullagh & Black (2007) preparatory recommendations were put forward to quicken the commercial improvement of residential mainland shale oil and gas. The progressed advances, important information and wealthy encounter were presented, counting the assessment of topographical target region of the venture, quick long flat penetrating and completion, high-intensity breaking, and well dispersing optimization. In specific, the concept and intention of the full-life cycle administration of unusual asset ventures were analyzed. Its accentuation on early assessment and chance administration, and a profoundly competitive showcase environment have played a critical part in advancing mechanical development and administration advancement. In expansion, the low-cost sharing framework of industry-wide information and encounter and the administration mode were connected. These administration approaches are of extraordinary importance for reference in quickening the investigation and advancement of unusual assets.

At Seon& Choi, (2019) creators assess the causal impact of supporting long term cost chance on the debt-to-equity proportion of petroleum venture companies. In specific, they look at how such an impact contrasts between the upstream and downstream businesses, given that comparative with downstream endeavors; upstream ventures are uncovered to the price hazard to greatness more noteworthy. The IV/2SLS relapse comes about appear that supporting the long run cost hazard increments excessively the upstream project's obligation to-value extent relative to that of the downstream extend. This proposes that supporting the cost hazard is an critical way to extend lenders' subsidizing sum to the upstream oil (or gas) venture but not so much for a downstream oil (or gas) extend. It is additionally found the significant contrasts within the supporting probability between upstream and downstream ventures: (i) the upstream company is more likely to embrace the supporting contract; and (ii) the upstream company possessed by a support company with the littler oil introduction is more likely to embrace the supporting contract, while the inverse is the case for a downstream company. Taken together, the discoveries propose that between upstream and downstream oil (or gas) ventures, there are significant contrasts in both probability and impact of supporting the cost chance.

At Urton & Murray, (2021) the extend administration writing recognizes collaboration as being imperative to extend victory. In any case, clear direction on how collaboration can be created and kept up among key venture partners remains a crevice in this writing. In parallel, the natural administration writing has inspected collaboration for more than two decades in expansive, multi-disciplinary ventures. This investigate looked for to recognize openings for cross-disciplinary learning. Receiving a projects-as-practice approach, subjective interviews with specialists undertaking extend administration for complex, multidisciplinary natural ventures were utilized to create standardizing hypothesis with respect to methodologies for empowering effective collaboration in such settings. Discoveries highlight key contrasts in how collaboration is conceptualized inside the venture administration and natural administration areas and recognize openings (and boundaries) for cross-disciplinary learning. In expansion, clear techniques are displayed to direct professionals in how collaboration can be energized in hone.

At Aramayo, da Silveira & de-Almeida (2013), the objective of this ponder was to get an improved understanding of variables that impact Exploration and production (E&P) venture administration victory and corporate financial performance. The consider takes after auxiliary condition modeling (SEM) strategy to realize more noteworthy understanding of the perplexing organize of connections between factors included in E&P extend administration. A comprehensive hypothetical system was required to define the conceptual premise of inquire about. Perception of the genuine world and viable encounters were moreover imperative. To that conclusion, we conducted a case consider in a large Brazilian oil company. Field investigate was basic since of the lack of comparable thinks about within the oil and gas division. The show created may be a hypothetical develop known as a basic and estimation show (set of inactive factors, watched factors and theories, portrayed in a way chart). This demonstrates contributes essentially to the company since it could be a worldwide representation of the most components for moving forward E&P venture administration. Be that as it may, the discoveries ought to be deciphered with caution since alteration and approval of the hypothetical show were not performed.

At Asrilhant, Meadows & Dyson (2006); Yazdi, Komijan & Wanke (2020), this inquire about focuses on the determination of oil ventures by utilizing Multi-Attribute Choice Making (MADM) strategies in a questionable environment. Oil generation plays a significant part within the economy of Iran, a nation with numerous openings for inland oil investigation. In an unexpected way from other nations, be that as it may, oil makers in Iran confront a few limitations with regard to oil extraction since a few ranges are shared with other makers. Also, oil makers in Iran must too apportion rare physical, human, and financial assets among distinctive ventures. Wrong decision-making may not as it were surrender sub-optimal income era, but moreover antagonistically influence the national economy for these reasons, need oil ventures must watch a sequence of steps. Within the to begin with step, basic variables for selecting oil ventures are collected from past related ponders and specialists are met. These components are along these lines sifted utilizing the Delphi strategy.

The oil ventures are at that point positioned employing a comprehensive approach including novel elective MADM strategies. The best-worst method (BWM) may be a modern MADM stream that depends on pairwise comparison. It presents a few

unmistakable points of interest with regard to less computational steps and higher unfair control among choices. In an unexpected way from past inquire about, this paper couples BWM with Weighted Totaled Sum–Product Appraisal (WASPAS) to move forward.

Result affectability beneath dubious decision-making situations as modeled by Z-numbers. A strength cross-check against other MADM models is additionally displayed. Comes about show that quality has the most elevated need which generation innovation has the most reduced need among ten variables for oil extend determination, in this way reflecting the effect of US sanctions on oil generation in Iran. Administrative suggestions and future roads of inquire about are determined.

At Asrilhant & Meadows (2004), this article endeavors to extend understanding of best hone in decision-making in vital extend administration, as connected to the upstream oil and gas segment. It portrays what is implied by vital venture administration in that setting, traces the wide run of procedures that can be connected to overseeing key ventures, and investigates the components (or measurements) of the key venture administration handle, and the fittingness of procedures in encouraging key extend administration. It looks for to make strides administrative understanding of key venture administration, by proposing a set of multidisciplinary components surrounded by the adjusted scorecard's (BSC) basis, and exploring the degree to which procedures address the proposed set of components.

At Vincent (2020), like all dangerous establishments, inalienably more secure distribution (ISD) is one of the key apparatuses in seaward oil and gas ventures to play down dangers in seaward offices. As the life cycle of seaward offices is generally brief compared with inland partners and there are numerous ventures running each year, the potential is tall for raising inalienable security benchmarks and bringing down security dangers all through the seaward industry as ancient offices are staged out. This paper gives an outline of seaward offices and illustrations of usage of ISD. Great cases of ISD are various. Industry direction on ISD usage proliferates. However, the systematic execution of it within the industry is inconsistent. There are numerous reasons for variables which hinder the compelling, effective and steady usage of ISD in ventures. This paper depicts a few of them and proposes arrangement to address them. They incorporate:

a. The viable integration of ISD into danger administration frameworks with fitting dialect to lock in all disciplines in ventures.

b. The stages of assets to empower the venture to capture ISD measures which are as it were accessible amid early stages.

c. Application of fitting ISD objectives and ISD execution measurements at different stages.

d. The suitable utilize of measured hazard appraisal to bolster ISD.

At Guoxin, Kai & Deqin (2020), the Duvernay project in Canada was taken as an example to summarize the advanced technology and engineering management model of shale oil and gas development in North America. Preliminary suggestions were put forward to accelerate the commercial development of domestic continental shale oil and gas. The advanced technologies, valuable knowledge and rich experience were introduced, including the evaluation of geological target area of the project, rapid long horizontal drilling and completion, high-intensity fracturing, and well spacing optimization. In particular, the concept and connotation of the full-life cycle management of North American unconventional resource projects were analysed. Its emphasis on early evaluation and risk management, and a highly competitive market environment have played an important role in promoting technological innovation and management innovation. In addition, the low-cost sharing system of industry-wide knowledge and experience and the management mode were applied. These management approaches are of great significance for reference in accelerating the exploration and development of unconventional resources in China. China possesses abundant shale oil and gas resources, which are an important replacement to guarantee the national oil and gas energy supply. However, due to the late start and special geological characteristics and engineering difficulties in China, there is a large gap in technology level and management mode compared with North America. According to the advanced experience and enlightenment of the shale oil and gas development in North America, a preliminary proposal to accelerate the development of shale oil and gas in China was made.

At Seon & Bongseok (2019), the causal impact of supporting the future value hazard on the obligation to-value proportion of oil and gas project organizations was assessed. Specifically, this examination is inspected how such an impact varies

between the upstream and downstream businesses, given that comparative with downstream undertakings; upstream ventures are presented to the value hazard to an extent more prominent. With an example of 230 advances made to oil and gas projects in 32 nations over the period 1997–2017, the examination has explored the determinants of the obligation to value the proportion of oil and gas project credits. To distinguish the causal impact of the venture organization's supporting choice that is endogenous, creators utilize the support organization's oil / gas hazard openness as the instrumental variable for the oil / gas project organization's supporting choice. Our IV/2SLS relapse results show that supporting the future cost hazard increments excessively the upstream undertaking's obligation to-value proportion comparative with that of the downstream task. This proposes that supporting the cost hazard is significant methods to expand moneylenders' financing add up to the upstream oil /gas project however less for a downstream oil/ gas project. Creators additionally track down the considerable contrasts in the supporting probability among upstream and downstream activities:

i. The upstream organization is bound to embrace the supporting agreement.

ii. The upstream organization claimed by a support organization with the more modest oil openness is bound to receive the supporting agreement, while the inverse is the situation for a downstream organization. Taken together, our discoveries recommend that among upstream and downstream oil / gas projects, there are generous contrasts in both probability and impact of supporting the value hazard.

At Choi & Kim (2018), creators researched how the oil and gas project organizations' choices to support the danger of future costs of oil and gas react to the progressions in the value instability of oil and gas, particularly the job of the openness of the support organization's stock re-visitations of the danger of oil and gas costs. With an example of (328) credits made to oil and gas advancement projects in 30 nations during (1996–2011) period, they track down that the oil/gas cost instability builds the oil/gas project organization's supporting probability, particularly undeniably for the case wherein the support organization's oil/gas openness is more modest. The discoveries recommend that the support organization's eagerness to decrease its openness to the danger of oil and gas costs improves the probability that the auxiliary venture organization will fence the danger of future costs of oil and gas.

At Aramayo, Silveira & de-Almeida, (2013), the objective of this study was to obtain a better understanding of factors that influence Exploration and Production (E&P) project management success and corporate financial performance. The study follows structural equation modelling (SEM) methodology to achieve greater understanding of the intricate network of relationships between variables involved in E&P project management. A comprehensive theoretical framework was needed to formulate the conceptual basis of research. Observation of the real world and practical experiences were also important. To that end, we conducted a case study in a large Brazilian oil company. Field research was essential because of the lack of similar studies in the oil and gas sector. The model developed is a theoretical construct known as a structural and measurement model (set of latent variables, observed variables and hypotheses, depicted in a path diagram). This model contributes significantly to the company because it is a global representation of the main factors for improving E&P project management. However, the findings should be interpreted with caution because adjustment and validation of the theoretical model were not performed.

At Tanaka (2014), the author published his research paper at 26th International Project Management Association World Congress in which he argued that the monodukuri industry, or broadly hard systems project industry, is being affected either positively or negatively by a variety of complexity categorized by P.E.S.T.L.E. (political, economic, social, technological, legal and environmental) factors and proposed a conceptual model of an enterprise viability system reinforced by meta program management. This paper is based on the author's continuing meta program management research and contextual analysis of the project industry, traces how the typical events discussed under each of the PESTLE factor categories have behaved thereafter to confirm the validity of impact descriptions, and presents a case analysis of current mega oil and gas development and complex infrastructure projects for dominant characteristics of project operations. Then new thoughts of project and program management in the space of complexity of the project industry are proposed as the first step to build a new management paradigm, which has been qualitatively induced by the cases under study and are deriving from existing research results on complex projects.

The new thoughts include Meta program management to balance multi objectives; knowledge and stakeholder integration to create complex projects; finance planning and structuring as an essential ingredient of materializing complex projects; management of extreme projects; and contingent risk management.

3. METHODOLOGY

3.1 Study Candidates

For validating the hypothesis made in this study, set of questionnaires have been made and shared with field experts in order together the required information from the real-life projects and understand the ground reality about the petroleum projects. However, study is enlightened by the opinions collected from the candidates. Total of forty five candidates were asked to participate this study. All the candidates are sharing the same profession as all are selected from different industries of renewable energy production as well as from research institutes. Those who are pursuing their higher education and experience on projects management have been invited to participate the study.

Total thirty-four questions are involved in this survey study and each candidate was asked to provide the answer of each question. By using Google forms are survey tool, questions are feed into form and link is generated. Thereafter, link of survey is share with each candidate and every question of the survey has made compulsory to answer. In other word, the questions were made in sequential order where the candidate cannot answer the next question before answering the preceding one. Candidates of the survey were selected carefully and shortlisted with help of colleagues' references. A list of forty-five primary candidate were drafted, therefore questionnaire link has shared with everyone by writing "Study Invitation Email" (As in Appendix 1).

After classification of the received responses, only thirty candidates were realized completing their task and successfully submitting their opinions. The candidates are selected as mixture of male and females. Ages and experiences of the participants were tried to be chosen where the maximum exports and qualified number of participants are solemnly shortlisted. Figure 3.1 demonstrates the gender wise distributions of the candidates those are participated in the survey study. Figure 3.1 revealing that eighteen candidates were males and rest twelve candidates were

females. Gender representation shows a little difference in the number of the males and the females participating the study.

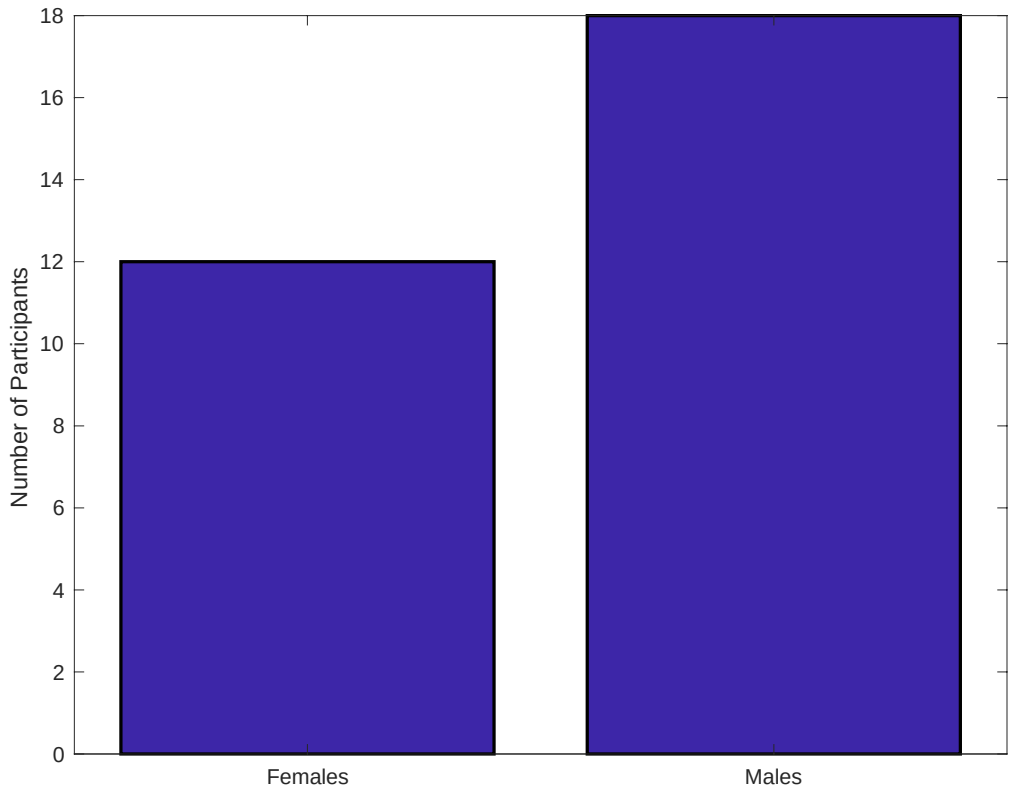

Figure 3.1: Gender Distribution Representation of the Candidates Participated In the Study

3.2 Biometrical Information

The first section of the survey was involved questions to reveal the back ground about the characters participated in the study. However, the biometrical data of the candidates were gathered through the first section of the survey involving the questions of the gender, age, field experience, specialization (type of profession), educational qualification and training (professional degree) if any. Figure 3.2 is demonstrating the age group of the candidates participated in the survey.

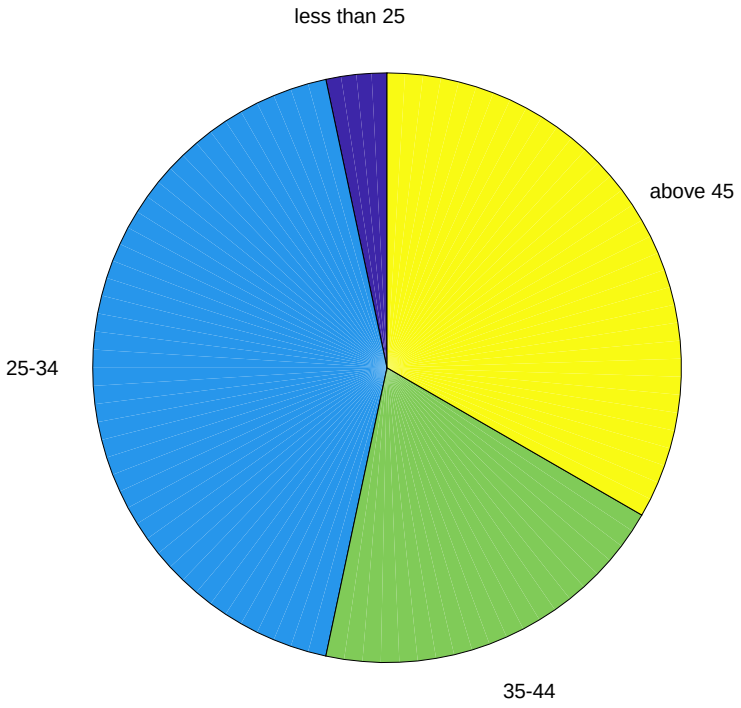

Figure 3.2: The Age Group of the Candidates Participated In the Survey

Figure 3.2 depicted four age groups namely 25-34 year old, 35-44 years old, less than 25 years old and above 45 years old. The majority of candidates participated the survey have been realized falling in to the middle age in the range of 25-34 year old. Only one candidate has been realized less than 25 years old.

From the other hand, the education qualification of each candidate was also required to be provided by each particular candidate while he/she responding the survey. However, three choices were situated in the survey form namely diploma, bachelor and master degree. The majority of candidates were realized having a bachelor degree and second higher number of candidates was seen with diploma degree. Rest candidates were classified as post graduated with master degree. Figure 3.3 demonstrates the education qualification degrees distribution for all the candidates participating the study.

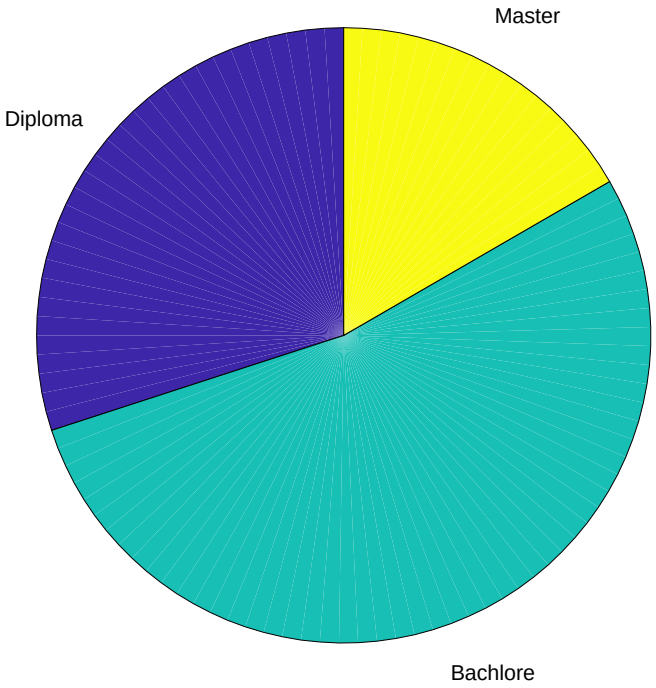

Figure 3.3: Educational Qualification Degrees Distribution For The Candidates Participated The Study.

The survey study concerned to involve those who are most export in the field of problem and hence, the deep specialization of the professional scope of the candidate was also acquired in the survey. The specialization alike ‘piping network’ 'bore well management, 'Project Management', 'Maintenance' and 'Computer Programming’ was made as options for the survey question. Figure 3.4 demonstrates the response distribution of this question.

The responses of the field experience and qualification were realized and the top the greatest numbers of the candidates were realized having experience in 'bore well management’ whereas second top number of the candidates were having experience in the piping network, project management and computer programming. The lesser number of candidates were into maintenance profession.

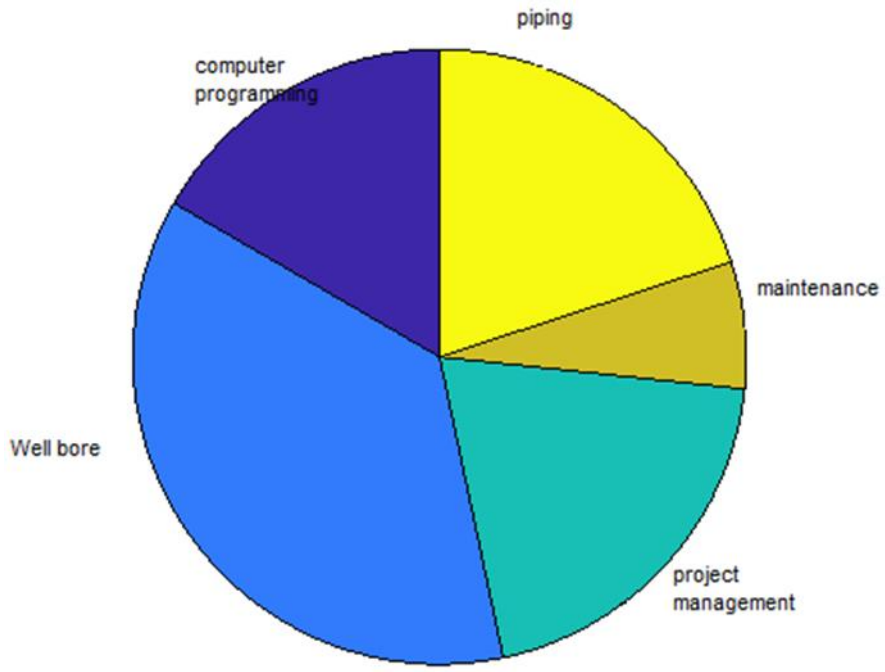

Figure 3.4: Professional Experience and Specialization of the Candidates Participated in the Study

It was interested for finding out whither the candidates are having any other training or professional degrees related to the field of profession or not. Therefore, another question was made in the survey stating that if the candidates are undergoing with any type of field related training or professional courses (degrees). The survey results revealed that most of the candidates are with no extra professional courses and around ten percent of the total candidates are realized granted such training.

Figure 3.5 demonstrates the professional courses granting status among the candidates participated this study.

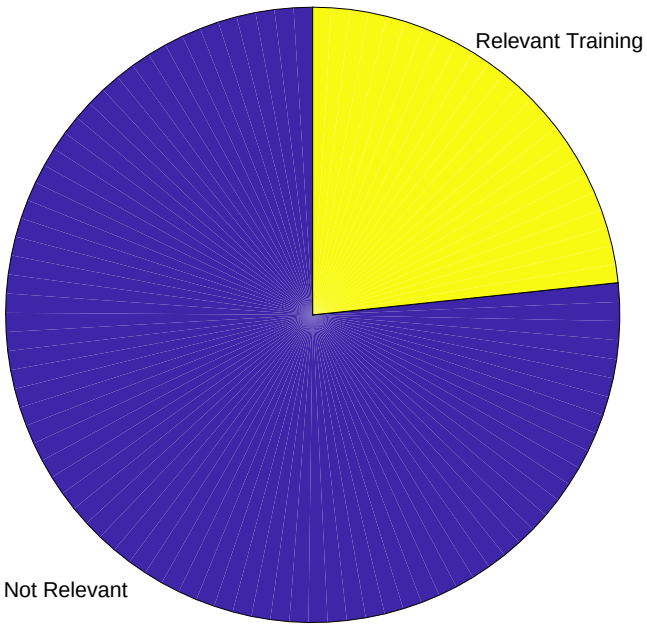

Figure 3.5: Professional Courses Granting Status Among The Candidates Participated This Study

Eventually, the biometrical survey is terminated by enquiring the total experiencing years of each candidate in the field of profession. The options situated in the survey were fallen in the following categories: 'less than 6 years', '7 to 12 years', '13 to 20 years' and 'more than 21'. However, the responses were revealed that most of the candidates are with very long experience in the field of profession (more than 20 years). The second top populations of the candidates were realized with number of experience years among 7 to 12 years. Only two candidates were fallen in the category of 13 to 20 years where the rest candidates were juniors with experience less than six years. Figure 3.6 demonstrates candidate’s distribution amongst the years of experience.

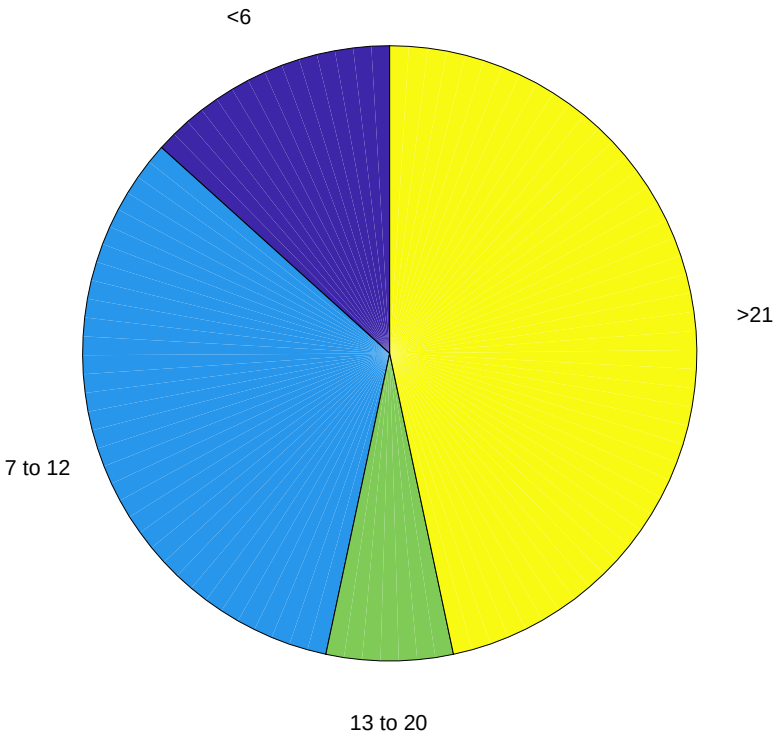

Figure 3.6: Candidates Distribution Amongst the Years of Experience

3.3 Survey Structure

In order to understand the impact of each factor made the methodology on the successes of petroleum projects, a survey of thirty-four questions is made. The questioners in the survey are covered the research goal as in multiple categories i.e. petroleum projects management tools, factors influencing the petroleum project management and quality of management.

Thirty-four questions are made in order to cover the objectives of the study; however, each question is set to be answered by one of five options namely: neutral, strongly agree, strongly disagree, agree and disagree. Each candidate is supposed to select one of the answers by hitting the answer reflecting his/her opinion.

3.4 Delphi Method

Delphi method is kind of statistical approach that relies on surveys to collect the information form the experts and attempts reaching a consensus about particular facts (Negra, Holmstrøm & Jensen 2007). By receiving the information from the field experts, data is to be generated accordingly and used in the analysis. This method is performed through several steps as in hereinafter:

a. Establishment of the survey: By designing the questionnaires that covering the research problem or the dispute. The number of the questions lying on the survey is depending on the size of the problem and scope of solutions Nguyen, Almasabi & Mitra (2018);

b. Nguyen & Mitra (2018), Survey questions might be targeting knowledge inquiry and gaining popular with some hidden or confusing facts.

c. Study candidates are termed to the bodies that are willingly participating the survey study and providing their opinions and knowledge. The number of candidates to be selected carefully according to particular conditions and requirements (Jiang & Singh, 2011).

d. Feedbacks/ Responses: It terms to the set of answers provided by the candidates for the survey questions. Answers might take the forms presented on Table 3.1.

e. Qualifications: Candidates selected should be qualified with proper academic qualifications as well as enough field experiments (Lopes & Borges, 2015).

f. The age of each candidate should be within the boundary limit which is important to ensure the reliability of the survey.

g. Sharing the Survey is another step in Delphi method where the survey questions are to be spreading amongst the candidates by means of Fax, Emails, Posts, Personal (face to face) interviews, Telephonic interviews, Web Forms (links to be shared), social medias, etc. (Dobakhshari & Firuzabad, 2009).

h. By providing their responses, experts are being anticipated to reflect their personal experiences from the ground fields (The IEEE reliability test system, 1996). The responses might be carefully made where the candidates (experts) are to make their feedback after melting their practical experience and their educational (academic) qualification so that more reliable responses are ensured.

i. Coding of the responses: responses that provided by the candidates is usually in form of text data or alphabetical-numerical combination (Guoxin, Kai & Deqin 2020). Preprocessing is required prior to any analysis; this stage of

preprocessing may involve conversion of data into numerical form that is compatible with analyses tools.

Table 3.1: Coding of the Responses According to Delphi Method

No.	Answer/ Feedback	Value (weight)
1	If response is “male”	1
2	If response is “female”	0
3	If response is “less than 25”	1
4	If response is “25-34”	2
5	If response is “35-44”	3
6	If response is “above 45”	4
7	If response is “Dip”	1
8	If response is “Br”	2
9	If response is “MSc”	3
10	If response is “Piping network”	1
11	If response is “'Bore well management”	2
12	If response is “Project Management”	3
13	If response is “Maintenance”	4
14	If response is “Computer programming”	5
15	If response is “>21”	4
16	If response is “13 to 20”	3
17	If response is “7 to 12”	2
18	If response is “<6”	1
19	If response is “nothing”	0
20	If response is “neutral”	0
21	If response is “strongly agree”	2
22	If response is “strongly disagree”	-2
23	If response is “agree”	1
24	If response is “disagree”	-1

a) Scoring approach: The most of the surveys using Delphi method are enabling the score based analysis to be done over the data in order to understand the

impact of each question on the hypothesis. Utmost of surveys adopting the method of Delphi are using standardized feedbacks or responses such as: neutral, strongly agree, strongly disagree, agree and disagree.

b) Scores imply assigning a number for each response from the type mentioned in point (g), those scores are numerical values according to the Table 3.1. As scores are allotted for each response (feedback), the mean of each question response is to be performed. Delphi model can be demonstrated in the Figure 3.7.

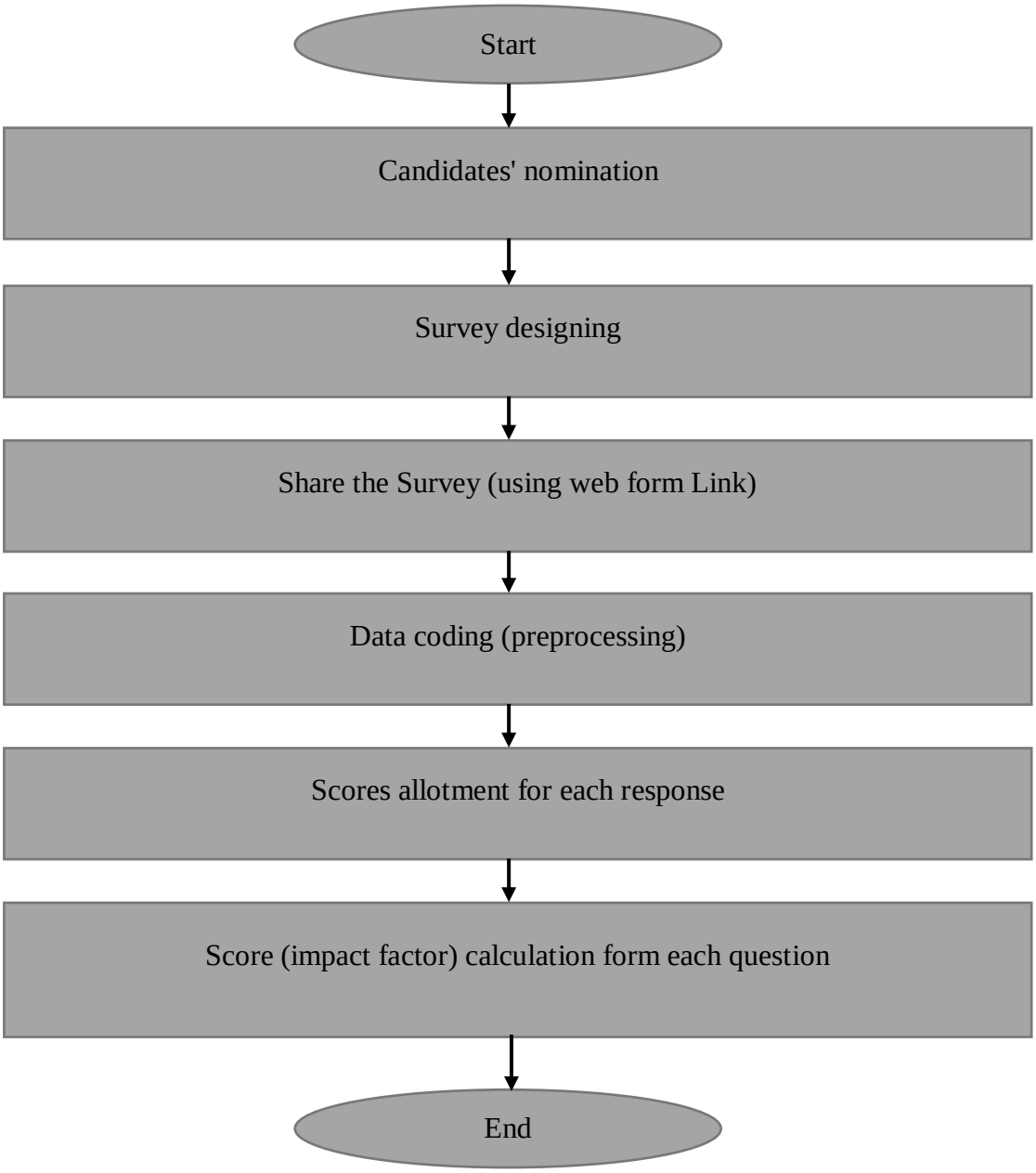

Figure 3.7: Delphi Method Flow Diagram Presents the Process of the Method

3.5 Hypothesis Formulation

With help of Delphi method, a set of survey questions containing of thirty-four equations is made covering the petroleum projects from several concerns namely:

Hypothesis 1: Safety is major concern of any project during designing phase and implementation phase; within petroleum projects, only instrumenting the staff with appropriate machinery must be enough for safety insurance.

Hypothesis 2: Within petroleum project where verity of professionals is working together, safety training need to be given for every group of workers base on their academic background and their position.

Hypothesis 3: Information technology tools and models if integrated with petroleum project, it may degrade the cost and budgets dedicated for the project.

Hypothesis 4: With existence of machines and computerized technology, human intervention is not required in many sections of petroleum projects.

Hypothesis 5: Petroleum project are mostly situated in remote and hazardous localities, this is good way for land utilization irrespective of high risks of lives.

Hypothesis 6: Results of conceptual project analysis must be depended prior to initiate the petroleum projects in order to ensure performance, profitability and safety.

Hypothesis 7: Good project management must allow diversity of professionals to work all together at same time in the project.

Hypothesis 8: Computerized project management is the key solution for all problems tackling within the petroleum projects.

The survey is designed to inquire the biological information at the beginning where every candidate is being asked about his gender, age, academic qualifications, field and practical specialization, number of years candidate spends in this profession and whither the candidate is received any kind of extra courses and education degrees apart from his/her basic academic qualification. From the other hand, the rest twenty eight questions of the survey have been designed for inquiring the information regarding the points listed above. However, the questions are labeled from Q1

through Q28 and each of those questions is representing a factor or disruptive fact that is vital for the success of petroleum project success.

The questions are given in the appendix 1, hence, each of those questions is serving the hypothesis made in the preceding chapter and to be compulsory to be answered by each candidate by choosing one of the following options: neutral, strongly agree, strongly disagree, agree and disagree. The reason behind keeping those choices is to provide flexibility for the candidates for sharing their opinions in level of five scores so-to-say; candidate can admit the given fact or reject the given fact throughout selecting one of five levels of agreement.

3.6 Research Sample

All of the questions of this survey are listed in web form (Google) and shared with forty-five field experts; the method of selecting those experts (sample) is made for fulfillment of the following conditions:

a) All study candidates those being shortlisted to participate the study must in age between twenty to fifty years old.

b) All study candidates those being shortlisted to participate the study must in fulfilling the condition of mandatory academic graduation.

c) All study candidates those being shortlisted to participate the study must have field experience in petroleum projects, bore exploration, maintenance engineering, etc.

d) All study candidates those being shortlisted to participate the study must be combination of males and females and must be including research scholars.

e) All candidates must submit their response within one month (considering the busy routine for many). So-far responses are not received within a week, a reminder email or text message is to be shared with the particular candidate for reminding him about the same.

After shortlisting the available primary candidates only forty-five candidate have got accepted according to the sample collection criteria mentioned above. Hence, questioners list is shared by the email addresses as well as through a short message text on the mobile number of the candidate. Thereafter, responses arrived only from

thirty candidates. Figure 3.8 is demonstrating the process of samples collection in this study.

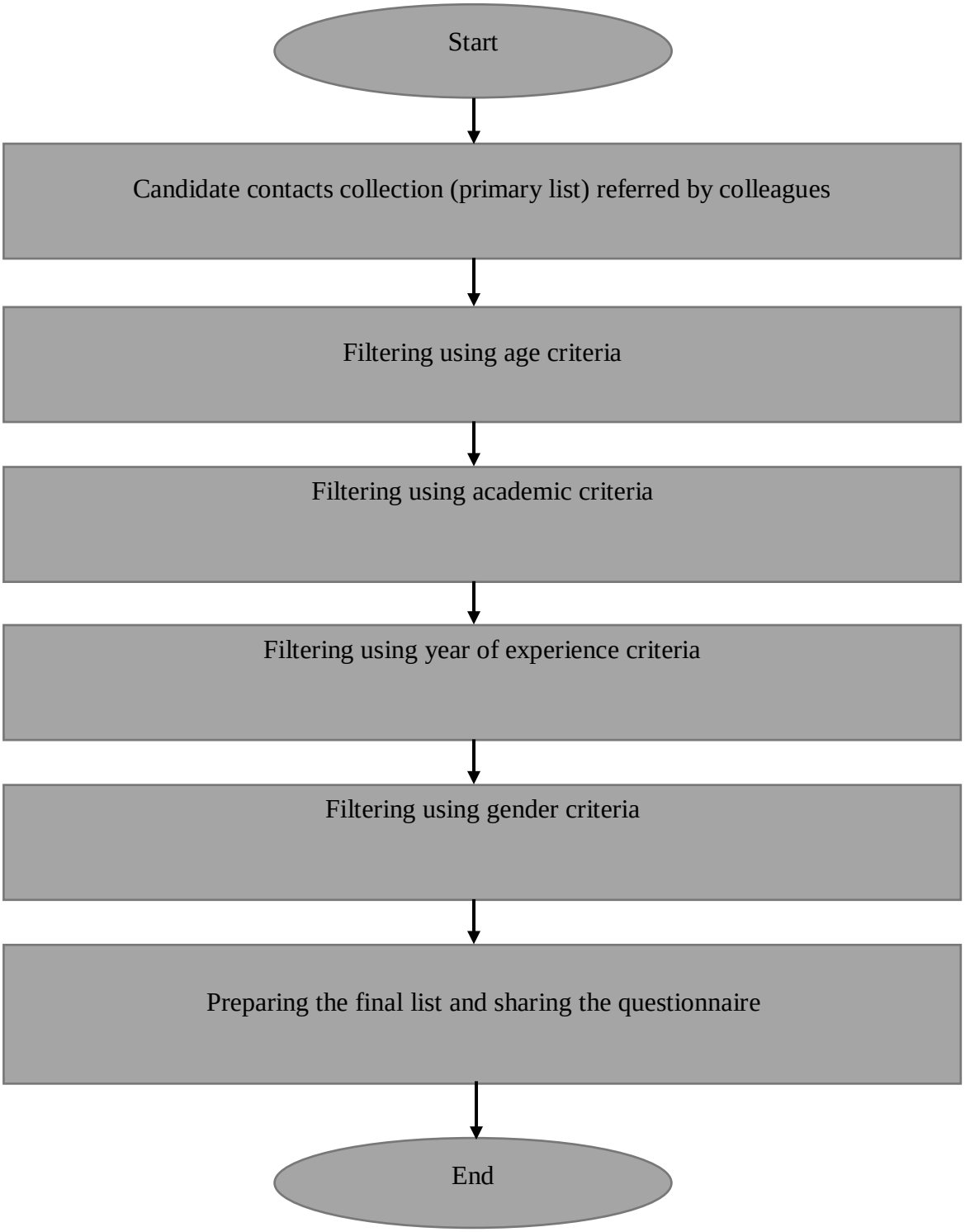

Figure 3.8: Demonstrating of the Process of Samples Collection in This Study

4. RESULTS ANALYSES

The data that received from the candidates are being converted according to criteria of Table 4.1 hence every response is converted into score. In order to analyze the response of each question, candidate agreement (consensus) is being analyzed as per the hereinafter points.

4.1 Neutral Responses

The received responses are included number of neutral responses those terms to candidate rejection to give his opinion for the mentioned fact. Neutral response might reveal that candidate is no popular with the given fact hence he/she cannot give opinion on the same. The scoring value allotted for this kind of response is made to be “zero” which implies that candidate opinion on the given fact has no weight of impact. The given twenty-eight questions are being analyzed and hence the following data is yielded (Figure 4.1).

Considering the total number of candidates, each question is being answered for thirty times that corresponds to the total number of candidates. The number of “neutral” responses on each question is demonstrated in Figure 4.1.

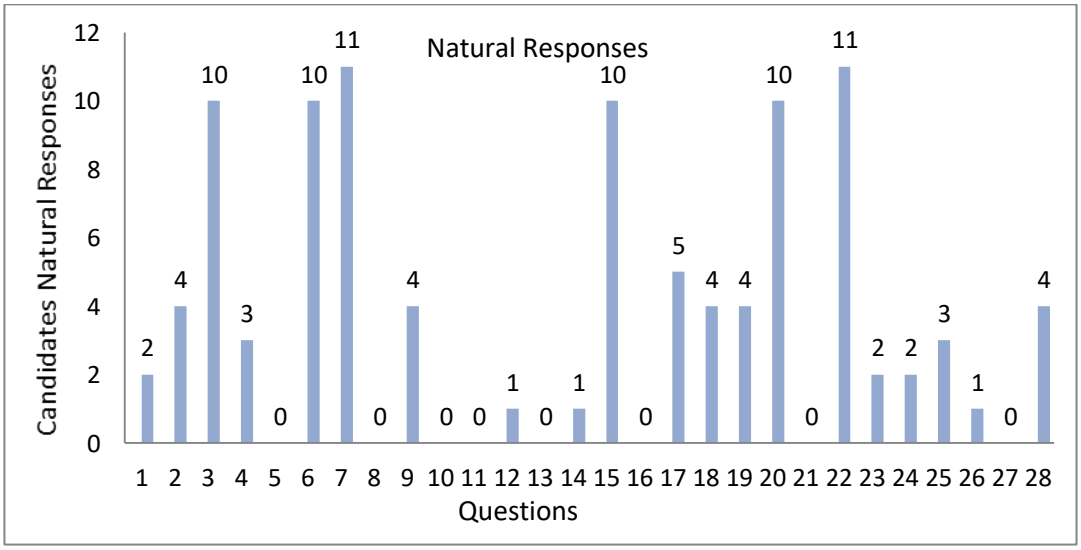

Figure 4.1: The Results of "Neutral" Responses for Each Question

4.2 Strongly Agreed Responses

The top score for each question (fact) could be made by the candidates by selecting strongly agree option on the survey form. Strongly agree may reflect that candidate is fully (100 %) agreed with the fact or question. That kind of consensus can be made as the candidate reveal that fact given in the question is correct and completely agreed without any doubt by the candidate. The results of strongly agreed opinions for each question are demonstrated on Figure 4.2.

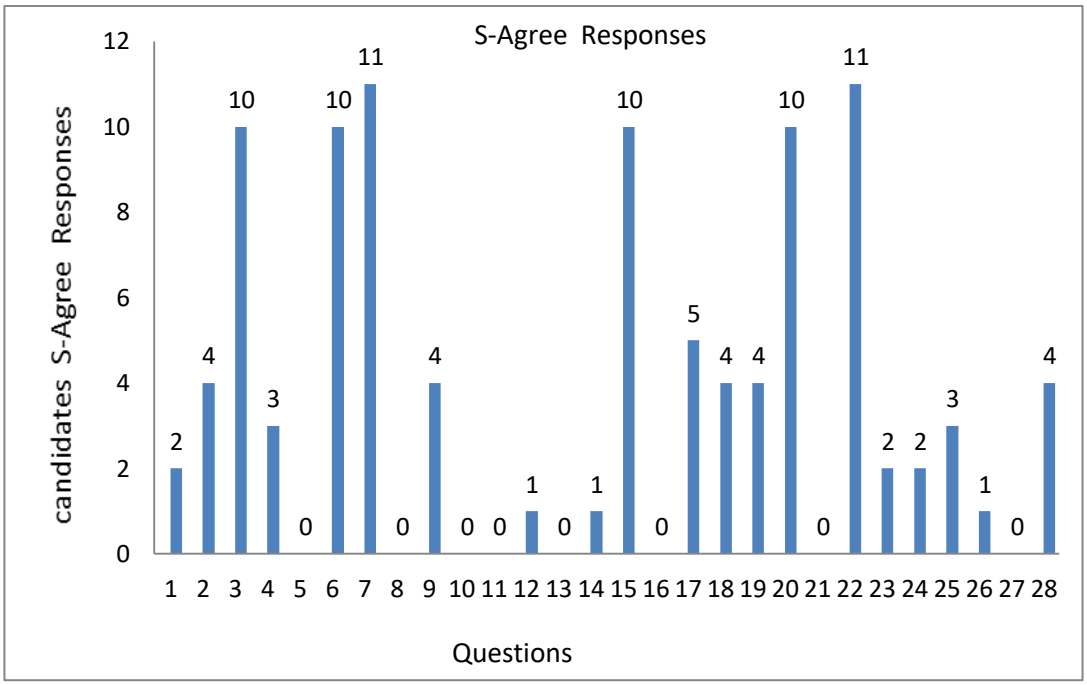

Figure 4.2: The Results of Strongly Agreed Opinions for Each Question

4.3 Strongly Disagreed Responses

The least score for each question (fact) could be made by the candidates by selecting strongly disagree option on the survey form. Strongly disagree may reflect that candidate is fully (100 %) disagreed with the fact or question. That kind of consensus can be made as the candidate reveal that fact given in the question is wrong and completely rejected without any doubt by the candidate. The results of strongly disagreed opinions for each question are demonstrated on Figure 4.3.

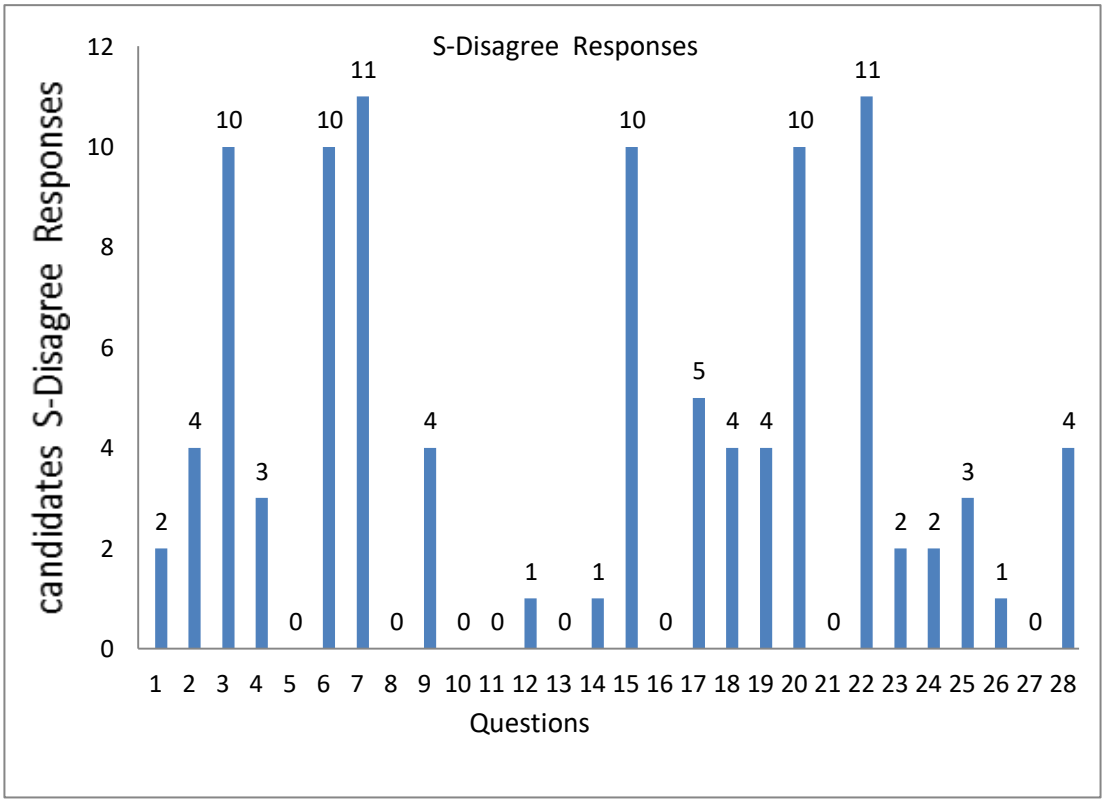

Figure 4.3: The Results of Strongly Disagreed Opinions for Each Question

4.4 Agreed Responses

Agree option in the survey is reflecting that candidate is merely agreeing with the given fact without fully satisfied on the content. The motivations behind selecting such option in the responses could be that candidate knew that given fact is correct but he/she might not have the complete information or knowledge about the same, hence this option is made to reflect the opinion of such candidates. All the agreed responses in each question are demonstrated in Figure 4.4.

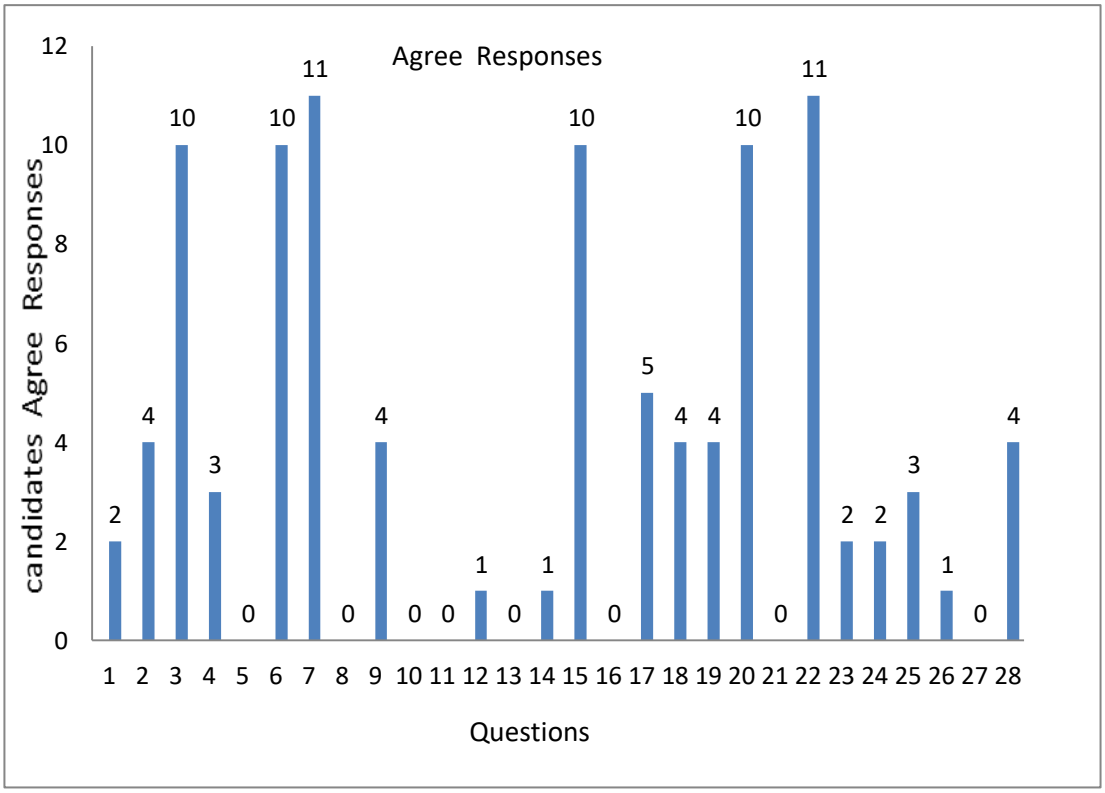

Figure 4.4: All the Agreed Responses in Each Question

4.5 Disagreed Responses

Disagree option in the survey is reflecting that candidate is merely disagreeing with the given fact without fully satisfied on the content. The motivations behind selecting such option in the responses could be that candidate knew that given fact is incorrect but he/she might not have the complete information or knowledge about the same, hence this option is made to reflect the opinion of such candidates. All the disagreed responses in each question are demonstrated in Figure 4.5.

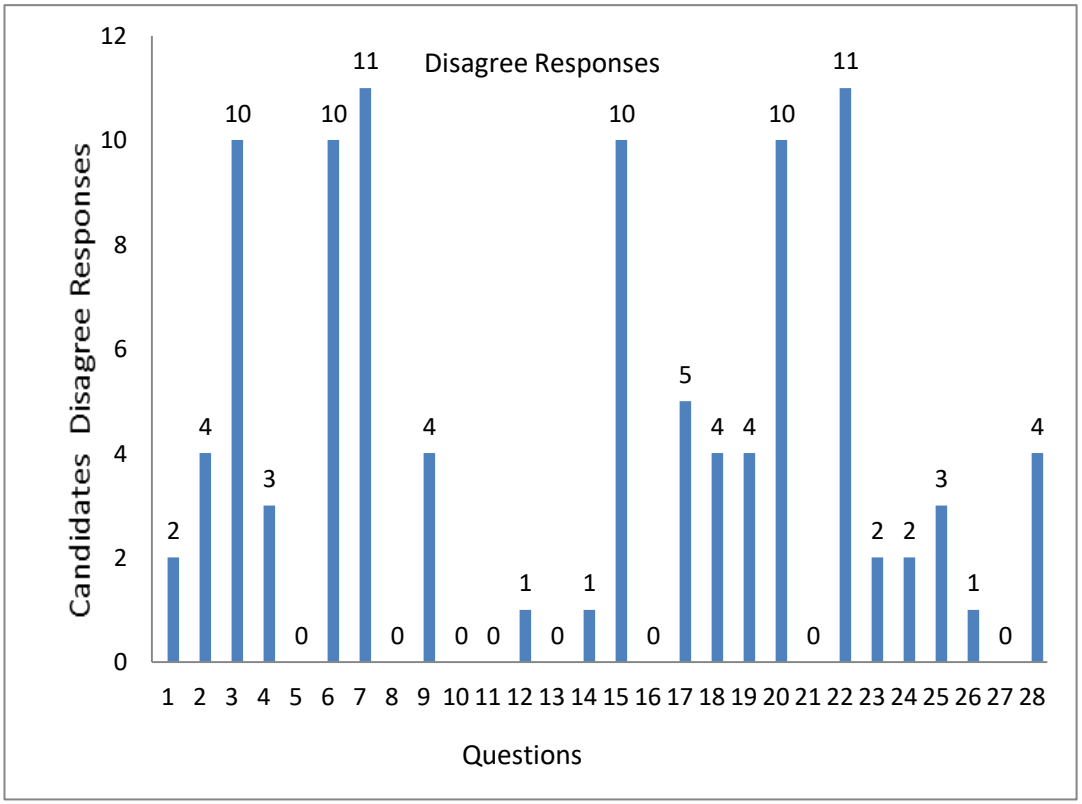

Figure 4.5: All the Disagreed Responses in Each Question.

4.6 Responses Interpretation

The data obtained from each candidate are made in single sheet that called dataset sheet, each question is being seen individually where each question being answered for thirty times (as thirty candidates are participated the survey). However, the responses data is being classified into five classes namely: neutral, strongly agreed, strongly disagreed, agreed and disagreed. Each class of these is contained with the total number of responses of its type for each question. Table 4.1 demonstrates the classes of the responses.

Table 4.1: The Responses Classes of the Candidate for Each Question in the Survey

Question Number	Neutral	S-Agree	S-Disagree	Agree	Disagree
1	4	9	0	15	2
2	1	11	4	10	4
3	3	1	2	14	10
4	12	1	0	14	3
5	5	7	0	18	0
6	1	7	3	9	10

Table 4.1: (Continued) The Responses Classes of the Candidate for Each Question in the Survey

7	**5**	**1**	**2**	**11**	**11**
8	2	13	0	15	0
9	5	8	0	13	4
10	1	9	0	20	0
11	1	9	0	20	0
12	1	14	0	14	1
13	2	20	0	8	0
14	3	6	1	19	1
15	10	0	3	7	10
16	2	11	0	17	0
17	9	4	0	12	5
18	12	0	2	12	4
19	9	5	0	12	4
20	4	4	2	10	10
21	6	6	0	18	0
22	6	2	2	9	11
23	4	2	4	18	2
24	9	4	0	15	2
25	9	3	0	15	3
26	2	10	0	17	1
27	5	8	0	17	0
28	5	3	0	18	4

The interpretation of the results that realized from the Table 4.1 can be made as below:

4.7 Neutral Questions

Questions of Q4, Q15, Q17, Q18, Q19, Q24 and Q25 are seen with maximum number of neutral responses as the boundary value of the comparison is decided to be NINE. The majority of the candidates were neutral to respond the following questions:

(Q4) Establishment of oil and gas projects at remote and unemployed locations is beneficial for business owners as well as workers.

Interpretation: working in remote areas is encountering plenty of challenges; most of that is limitation of transportation means also none availability of medical resources (project need to be equipped with hospitals and medical staff). However, benefit of that might be good enough for business owners but it is difficult for the staff in general. Also for business owners the working over harsh environments in encountering plenty of challenges that impact the profitability and performance. Therefore, this question got majority of neutral responses.

(Q15) Knowing that oil and gas project is consisting of multiple departments looking after various engineering concerns such as drilling, soil and rocks geological study, mechanical engineering, electrical engineering, IT department, etc. All of the departments must be available in the site for 24 x 7 in order to tackle any upcoming problem.

Interpretation: turbulence and confliction of the responsibilities from those departments are the main drawback. Being working together need strong coordination levels and strict management, however, it is not easy for all to work together and being available all the time therefore this question got majority of neutral responses.

(17) Knowing the fact mentioned in first phrase of Q. 15, the diversity of professionals in the oil and gas projects one of the cost hike reasons due to extra management payload.

Interpretation: diversity is a natural requirement and from the basis of establishment of such projects, thus being all together is must and essential irrespective of the cost. Cost is important factor for projects hence trade-off between the both vital parameters is taking pace thus this question got majority of neutral responses.

(18) All the departments in gas and oil project must be aware about each other work nature by getting the training of each other work and responsibilities in order to ensure the corporation between the experiments diversity.

Interpretation: basically it is not easy for each of staff to know about other responsibility and job profile, that is because the diversity in the experience such as petroleum engineer and civil engineer. From the other hand, people hired for

petroleum project must be aware of such again we are in front of trade of (compromising) option where most of candidates responded with neutral.

(19) Adaptation of heretical management system involves clustering the workers into technical related clusters and every cluster owns cluster manager is not always suitable especially during emergency phases.

Interpretation: working in large projects such as petroleum, the heretical management model is outstanding and widely used where different groups and clusters will be managing to work together. However, emergency phase is a turbulent and roles might be changed accordingly; thus; this question might be seen answered by more than option such as agree and neutral. Due to the conflicting nature of the question neutral response is major response.

(24) In order to find the oil reservoir, drilling must be done for soil and geological analysis. However, the same is guarantee existence of oil reservoirs and can be depended for drilling work initiation.

Interpretation: the forecasting technologies are evolved technologies and methods in the context of searching of oil reservoir. *However, this question has got neutral responses on the border line (only nine responses out of thirty are observed from the survey).*

(25) Machine learning and data technology can replace the soil and geological analysis and save the cost.

Interpretation: Small scaled petroleum projects are not really suitable for machine learning tools due to limitation of data, however, this question has been answered with neutral by only nine candidates out of thirty which implies that neutral answer is not agreeing or disagreeing with the content of question and might be answered by the candidates who are not popular with the mentioned facts.

4.8 Strongly Agreed Questions

It was observed that the questions Q1, Q2, Q8, Q10, Q11, Q12, Q13, Q16 and Q26 have been answered with strongly agree. However, the interpretation of the mentioned questions and the reason behind the responses will be as following:

Q1. Working in harsh environments such as desert, offshore and hill stations is required extensive training for all workers including engineers and staffs as well as other crow members (all evenly) in terms of survival knowledge.

Interpretation: The fact given in this question is correct and being answered by only nine responses out of thirty (on boundary limit) since there are many other considerations are participating in the safety roles apart from the position and academic profile.

Q2. engineering crow is educated in safety technologies is not compulsory to be undergo survival training before working in remote and harsh environments.

Interpretation: this fact is not totally correct, skills of safety and upgradable and changing with time as more requirements might be raised. However, engineering cow can led the training and being always updatable of the stat of the art. Eleven out of thirty responses were realized given strongly agreed on this question which can be interpreted as the question sequence is second where candidate might not reviewed the further question where he/she can meet another facts and impacts.

Q8. Safety Instrumented Systems (SIS) is one IT tools for prevention a hazardous consequence in gas and oil projects.

Interpretation: good positive responses were seen on this part of survey as thirteen candidates are strongly agreed with the fact given in this question. The fact is correct as all the IT tools and modules are made to tackle the challenges in quick and less efforts way.

Q10. Instrumenting workers with special dress i.e. sensors integrated suite is vital for early prediction of fault (unwanted event).

Interpretation: the equation has got nine responses of this type with good consensus of the fact given by the question. However, other professional rather than the technical and computer specialist might not popular with the mechanical structure of the sensor networks. However, the fact is being supported with high weighted response.

Q11. Knowing that works are not always available at the site especially at areas where bulky machines are installed. Depending on human sense to solve the technical problems at gas and oil fields is always worthier than other alternatives.

Interpretation: The equation has got nine responses of this type with good consensus of the fact given by the question. However, other professional rather than those in petroleum specialist might not popular with the mechanical structure of the site problems. However, the fact is being supported with high weighted response.

Q12. exploration and production companies (E&P) must be initiating the gas and oil projects by using conceptual design with general information about the project is gathered including risks factors and barriers analysis.

Interpretation: *The equation has got fourteen responses of this type with good consensus of the fact given by the question. However, the fact given in the question is well supported by both high weighted responses as well as good number of supports.*

Q13. Safety requirements specifications (SRS) phase is to be mandatory made before execution of gas and oil project.

Interpretation: The equation has got twenty responses of this type with good consensus of the fact given by the question. However, one of the best (biggest) responses with higher weight was allotted for this question which agreed strongly with the given fact. The given fact is popular and known by most of the individuals as well.

Q16. Knowing the fact mentioned in first phrase of Q. 15, the diversity of professionals in the oil and gas projects enforces a coordination problem.

Interpretation: The equation has got eleven responses of this type with good consensus of the fact given by the question. However, other professional rather than the petroleum engineers and projects managers might not popular with the environmental and structure of work load of the petroleum sites. However, the fact is being supported with high weighted response.

Q26. The robust engineering management in gas and oil projects involves conceptual frame work prior to the project establishment that done by the beneficiary side i.e. MOO before hiring the third party contractors for execution of project.

Interpretation: The equation has got ten responses of this type with good consensus of the fact given by the question. Other professional rather than the petroleum engineers and projects managers might not popular with the environmental and

structure of work load of the petroleum sites. However, the fact is being supported with high weighted response.

4.9 Strongly Disagreed Questions

In this section of responses, it was realized that no question has been answered with the boundary limit of nine responses of the same type (strongly disagreed). However, it was realized that ZERO disagree is more popular in the responses which is given to the following questions:

1. Working in harsh environments such as desert, offshore and hill stations is required extensive training for all workers including engineers and staffs as well as other crow members (all evenly) in terms of survival knowledge.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

4. Establishment of oil and gas projects at remote and unemployed locations is beneficial for business owners as well as workers.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

5. Hazardous environment such as deserts are creating challenges for the investors in gas and oil projects due to highly risk of lives.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

8. Safety Instrumented Systems (SIS) is one IT tools for prevention a hazardous consequence in gas and oil projects.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

9. As a management action, emergency shutdown (ESD) which is used for shutting down entire process can be dispensed in case of miner fires and other events where human intervention might only initiated for tackling the event.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

10. Instrumenting workers with special dress i.e. sensors integrated suite is vital for early prediction of fault (unwanted event).

Interpretation: This question is realized with ZERO Strongly Disagree Response.

11. Knowing that works are not always available at the site especially at areas where bulky machines are installed. Depending on human sense to solve the technical problems at gas and oil fields is always worthier than other alternatives.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

12. exploration and production companies (E&P) must be initiating the gas and oil projects by using conceptual design with general information about the project is gathered including risks factors and barriers analysis.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

13. Safety requirements specifications (SRS) phase is to be mandatory made before execution of gas and oil project.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

16. Knowing the fact mentioned in first phrase of Q. 15, the diversity of professionals in the oil and gas projects enforces a coordination problem.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

17. Knowing the fact mentioned in first phrase of Q. 15, the diversity of professionals in the oil and gas projects one of the cost hike reasons due to extra management payload.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

19. Adaptation of heretical management system involves clustering the workers into technical related clusters and every cluster is owning cluster manager is not always suitable especially during emergency phases.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

21. Computer vision based management system including predicting the faults and site problems using the big data processing technology is vital for cost reduction in gas and oil projects.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

24. In order to find the oil reservoir, drilling must be done for soil and geological analysis. However, the same is guarantee existence of oil reservoirs and can be depended for drilling work initiation.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

25. Machine learning and data technology can replace the soil and geological analysis and save the cost.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

26. The robust engineering management in gas and oil projects involves conceptual frame work prior to the project establishment that done by the beneficiary side i.e. MOO before hiring the third party contractors for execution of project.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

27. In project management system adopted by gas and oil company, national safety code/protocol is more than enough for better safety performance.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

28. Standards alike IEC 61511, IEC 61508 and ISO 45001 may provide more specific safety management system according the size and type of project revenue and the resources availability.

Interpretation: This question is realized with ZERO Strongly Disagree Response.

4.10 Agreed Questions

The following question i.e. Q13and Q15 are realized below boundary in terms of number of responses with this response (AGREE). However, all the rest questions are realized with above boundary and have a good number of responses. The mentioned below boundary response questions are as in hereinafter.

Q13. Safety requirements specifications (SRS) phase is to be mandatory made before execution of gas and oil project.

Interpretation: This question got eight responses of agree out of thirty responses.

Q15. Knowing that oil and gas project is consisting of multiple departments looking after various engineering concerns such as drilling, soil and rocks geological study, mechanical engineering, electrical engineering, IT department, etc. all of the departments must be available in the site for 24 x 7 in order to tackle any upcoming problem.

Interpretation: This question got seven responses of agree out of thirty responses.

4.11 Disagreed Questions

The majority of the questions have got below boundary number of response (Disagree), the questions are Q1, Q2, Q4, Q5, Q8. Q9, Q10, Q11, Q12, Q13, Q14, Q16, Q17, Q18, Q19, Q21, Q23, Q24, Q25, Q26, Q27, Q28. The number of disagree responses given for each question respectively are: two, four, three, zero, zero, four, zero, zero, one, zero, one, zero, five, four, four, zero, two, two, three, one, zero and four.

5. HYPOTHESİS TEST

Considering the Delphi model for analyzing the response of this questionnaire, the impact factor of each question can be calculated using the Delphi prototype. Hence, for each question in this survey, the maximum score that can be given in the best cases is TWO which stands for (strongly agree) response. Considering that question is being answered by thirty candidates, the total scores at the best circumstances can be sixty scores (if all candidates voted with strongly agree). However, the impact factor can be calculated using mean of the scores given for each question.

$$m = \frac{\sum_{Q=1}^{28} S(Q)}{2 \times 30} \times 100$$

(2) 2x30

Where S is standing for the score of question Q and 28 is the total number of the questions, the scale factor (2) stands for maximum score that could be allotted for any of the questions in the survey. According to the above logic, each question has got its own impact factor which is demonstrated in the Figure 5.1 below.

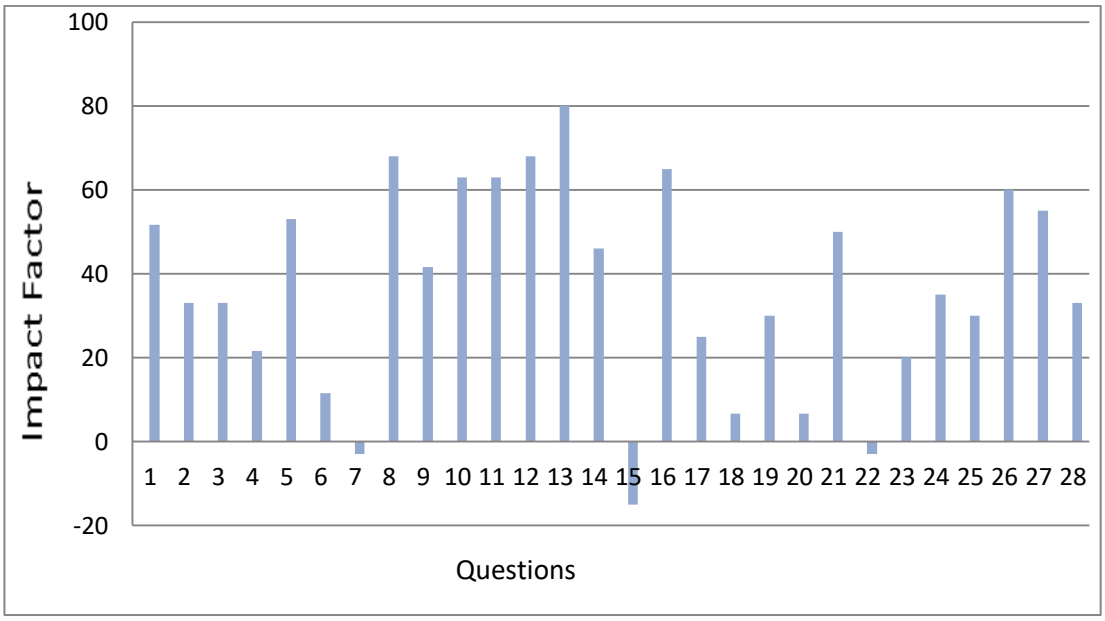

Figure 5.1: Impact Factor Calculated For Each Question in the Survey

Accordingly, Table 5.1 demonstrates the level of correlation between the given hypothesis and the survey outcomes.

Table 5.1: Hypothesis Test Acceptance Status According To the Survey Outcomes

Remark	Hypothesis	Acceptance status
Hypothesis 1	Safety is major concern of any project during designing phase and implementation phase; within petroleum projects, only instrumenting the staff with appropriate machinery must be enough for safety insurance.	Rejected
Hypothesis 2	Within petroleum project where verity of professionals is working together, safety training needs to be given for every group of workers base on their academic background and their position.	Accepted
Hypothesis 3	Information technology tools and models if integrated with petroleum project, it may degrade the cost and budgets dedicated for the project.	Rejected
Hypothesis 4	With existence of machines and computerized technology, human intervention is not required in many sections of petroleum projects.	Rejected
Hypothesis 5	Petroleum project are mostly situated in remote and hazardous localities, this is good way for land utilization irrespective of high risks of lives.	Accepted
Hypothesis 6	Results of conceptual project analysis must be depended prior to initiate the petroleum projects in order to ensure performance, profitability and safety.	Accepted
Hypothesis 7	Good project management must allow diversity of professionals to work all together at same time in the project.	Rejected
Hypothesis 8	Computerized project management is the key solution for all problems tackling within the petroleum projects.	Accepted

The impact factor of the survey questions can be illustrated in Table 5.2:

Table 5.2: The Impact Factor Details for Each Question in the Survey Study

Question Number	Impact Factor	Question Number	Impact Factor	Question Number	Impact Factor
Q1	51.6666667	Q11	63.3333333	Q21	50
Q2	33.3333333	Q12	68.3333333	Q22	-3.3333333
Q3	3.33333333	Q13	80	Q23	20
Q4	21.6666667	Q14	46.6666667	Q24	35
Q5	53.3333333	Q15	-15	Q25	30
Q6	11.6666667	Q16	65	Q26	60
Q7	-3.3333333	Q17	25	Q27	55
Q8	68.3333333	Q18	6.66666667	Q28	33.3333333
Q9	41.6666667	Q19	30		
Q10	63.3333333	Q20	6.66666667		

6. CONCLUSION

Challenges faced within petroleum industry are associated with different process including the production, exploration and maintenance. All are linked with the management protocol and project planning. The uncertainty of working environments which makes the ordinary resources and planning in the project unreliable for productivity continuation. Therefore, survey based study is made here for highlighting the impacts of different management protocols, resources and roles in petroleum projects so that the stated challenges can be tackled. Study is imitated by forming the following hypothesis:

Hypothesis 1: Safety is major concern of any project during designing phase and implementation phase; within petroleum projects, only instrumenting the staff with appropriate machinery must be enough for safety insurance.

Hypothesis 2: within petroleum project where verity of professionals is working together, safety training needs to be given for every group of workers base on their academic background and their position.

Hypothesis 3: Information technology tools and models if integrated with petroleum project, it may degrade the cost and budgets dedicated for the project.

Hypothesis 4: with existence of machines and computerized technology, human intervention is not required in many sections of petroleum projects.

Hypothesis 5: Petroleum project are mostly situated in remote and hazardous localities, this is good way for land utilization irrespective of high risks of lives.

Hypothesis 6: Results of conceptual project analysis must be depended prior to initiate the petroleum projects in order to ensure performance, profitability and safety.

Hypothesis 7: Good project management must allow diversity of professionals to work all together at same time in the project.

Hypothesis 8: Computerized project management is the key solution for all problems tackling within the petroleum projects.

Thereafter, survey approach is made for testing the above hypothesizes; a questionnaire consisting of thirty-four questions that covers and designed in accordance with the aforementioned hypothesizes is being shared with forty-five candidates. The received data is observed as thirty candidates have responded for the survey. The data collected form only thirty candidates who are responded to the said survey are analyzed for finding the correlation between the hypothesizes and the real-life wind projects. Delphi method is used for the analyzing and hence the impact factor is being calculated for each question. The consensus level of each question is being reflected by the impact factor.

The impact factor is varying from minus 100 to plus 100 where the questions have score maximum of 80 and least score of -15. The median value of the impact factor is set chosen to be 50 and hence, the questions of 50 and above have been selected for the correlation process.

Question 8 stated “Safety Instrumented Systems (SIS) is one IT tools for prevention a hazardous consequence in gas and oil projects”, question 13 which states “safety requirements specifications (SRS) phase is to be mandatory made before execution of gas and oil project”, and question 10 which states “instrumenting workers with special dress i.e. sensors integrated suite is vital for early prediction of fault (unwanted event).” Have got maximum impact factor of 60 to 80 score. The same is correlated with hypothesizes 1, 5 and 6.

From the other hand, the question 1 which states “1. Working in harsh environments such as desert, offshore and hill stations is required extensive training for all workers including engineers and staffs as well as other crow members (all evenly) in terms of survival knowledge.” has also got acceptable impact factor score which supports the hypothesis 2.

Question 3 “working in deep canal where various types of poisonous gases such as NOx and CO will require instrumenting the workers with safety masks only.” And question 7 “adaptation of complex information technology (IT) systems in engineering project management of gas and oil projects is encountering extra cost

that degrade the budgeting performance." Have got very low responding score which confuter hypothesis 3.

Hypothesis 4 is rejected since the question 9 "As a management action, emergency shutdown (ESD) which is used for shutting down entire process can be dispensed in case of miner fires and other events where human intervention might only initiated for tackling the event." Has got low impact factor and supports hypothesis 4.

Hypothesis 7 is rejected since the responses of Q15 "Knowing that oil and gas project is consisting of multiple departments looking after various engineering concerns such as drilling, soil and rocks geological study, mechanical engineering, electrical engineering, IT department, etc. all of the departments must be available in the site for 24 x 7 in order to tackle any upcoming problem." That got low agreement score that disagree with (all professionals always availability).

And Q16 "knowing the fact mentioned in first phrase of Q. 15, the diversity of professionals in the oil and gas projects enforces a coordination problem." Got good score that disagree with diversity.

Hypothesis 8 is accepted since the question 21 "computer vision based management system including predicting the faults and site problems using the big data processing technology is vital for cost reduction in gas and oil projects." Has got good scores in favour of the hypothesis content.

7. RECOMMENDATİONS

Efficient project management are vital for petroleum project success, a survey approach was made in order to evaluate different parameters influences on the project management performance in the petroleum industry and according to the achieved results, the following recommendations can be made.

According to question 27 “In project management system adopted by gas and oil company, national safety code/protocol is more than enough for better safety performance.” Which reflect the candidates' satisfaction with the so called national code adaptation for management safety; which got high score in the survey.

And according to question 28 “ standards alike IEC 61511, IEC 61508 and ISO 45001 may provide more specific safety management system according the size and type of project revenue and the resources availability.” This got relatively low score in the survey.

We can notice that technician and professional are least educated about the globalized standard of management such as IEC 61511, IEC 61508 and ISO 45001. Those standards are upgradable and supported by large population of industry throughout the globe, hence it is important to educate the professionals on the mentioned standard and to implement the same within the projects in order to enhance the safety and profitability which are the main goals of any project management system.

REFERENCES

Dobakhshari A. S. and Firuzabad Fotuhi, M., (2009). A reliability model of large wind farms for power system adequacy studies. IEEE Trans. Energy Convers., vol. 24, no. 3, pp. 792-801.

Amir Karbassi Yazdi, Alireza Rashidi Komijan, Peter Fernandes Wanke, Soheila Sardar, (2020). Oil project selection in Iran: A hybrid MADM approach in an uncertain environment, Applied Soft Computing, Volume 88.

Bongseok Choi, Seon Tae Kim. (2018). Price volatility and risk management of oil and gas companies: Evidence from oil and gas project finance deals .Energy Economics. Volume 76.

Boris Asrilhant, Maureen Meadows, (2004). **Robert Graham Dyson,** Exploring Decision Support and Strategic Project Management in the Oil and Gas Sector, European Management Journal, Volume 22, Issue 1.

Boris Asrilhant, Maureen Meadows, Robert Dyson, (2006). Techniques to Support Successful Strategic Project Management in the UK Upstream Oil and Gas Sector, European Management Journal, Volume 24, Issues 2–3.

Centre for Chemical Process Safety (CCPS) (2010). Guidelines for safe process operations and maintenance. **John Wiley & Sons.**

Conley HA. (2012). A new security architecture for the Arctic. In: Center for strategic and international studies (CSIS).

Danielle Urton, Dan Murray, (2021). Project manager's perspectives on enhancing collaboration in multidisciplinary environmental management projects, Project Leadership and Society.

Devold H. (2013). Oil and gas production handbook: an introduction to oil and gas production. ABB.

Gruhn P, Cheddie H. (2006) Safety shutdown systems: Design, analysis and justification. NC: The Instrumentation Systems and Automation Society.

Guoxin LI, Kai LUO, Deqin SHI. (2020). Key technologies, engineering management and important suggestions of shale oil/gas development: Case study of a Duvernay shale project in Western Canada Sedimentary Basin, Petroleum Exploration and Development, Volume 47, Issue 4.

Hiroshi Tanaka. (2014). Toward Project and Program Management Paradigm in the Space of Complexity: A Case Study of Mega and Complex Oil and Gas Development and Infrastructure Projects. Procedia - Social and Behavioral Sciences. Volume 119.

Ivan Litvaj, Dana Stancekova. (2015). Decision-Making, and Their Relation to The Knowledge Management. Use of Knowledge Management in Decision - Making, Procedia Economics and Finance. Volume 23.

Jesus Leodaly Salazar-Aramayo, Roseane Rodrigues-da-Silveira, Mariana Rodrigues-de-Almeida, Tereza Neuma de Castro-Dantas, (2013). A conceptual model for project management of exploration and production in the oil and gas industry: The case of a Brazilian company, International Journal of Project Management, Volume 31, Issue 4.

Jesus Leodaly Salazar-Aramayo, Roseane Rodrigues-da-Silveira, Mariana Rodrigues-de-Almeida, Tereza Neuma de Castro-Dantas. (2013). A conceptual model for project management of exploration and production in the oil and gas industry: The case of a Brazilian company .International Journal of Project Management. Volume 31, Issue 4.

K. Jiang and C. Singh (2011). New models and concepts for power system reliability evaluation including protection system failures. IEEE Trans. Power Syst, vol. 26, no. 4, pp. 1845-1855.

Matej Masár, Mária Hudáková, Ladislav Šimák, Daniel Brezina. (2019). The current state of project risk management in the transport sector. Transportation Research Procedia. Volume 40.

N. B. Negra, O. Holmstrøm, B. Bak-Jensen and P. Sorensen, (2007). Aspects of relevance in offshore wind farm reliability assessment. IEEE Trans. Energy Convers., vol. 22, no. 1, pp. 159-166.

N. Nguyen and J. Mitra (2018). Reliability of power system with high wind penetration under frequency stability constraint. IEEE Trans. Power Syst., vol. 33, no. 1, pp. 985-994.

N. Nguyen, S. Almasabi, J. Mitra and B. B. Shenoy (2018). Correlation of wind speed and wind turbine reliability in system adequacy assessment. Proc. IEEE Int. Conf. Probabilistic Methods Appl. Power Syst., pp. 1-6.

Oussama Meski, Farouk Belkadi, Florent Laroche, Benoit Furet. (2019) Towards a knowledge-based framework for digital chain monitoring within the industry 4.0 paradigm, Procedia CIRP. Volume 84.

Redutskiy Y. (2017). Modelling and design of Safety Instrumented Systems for upstream processes of petroleum sector. Procedia Eng.

Redutskiy Y. (2017). Optimization of safety instrumented system design and maintenance frequency for oil and gas industry processes. Manage Prod Eng Rev a;8(1):46–59.

Seon Tae Kim, Bongseok Choi. (2019). Price risk management and capital structure of oil and gas project companies: Difference between upstream and downstream industries, Energy Economics, Volume 83.

Seon Tae Kim, Bongseok Choi. (2019). Price risk management and capital structure of oil and gas project companies: Difference between upstream and downstream industries. Energy Economics, Volume 83.

The IEEE reliability test system (1996). A report prepared by the reliability test system task force of the application of probability methods subcommittee. IEEE Trans. Power Syst., vol. 14, no. 3, pp. 1010-1020.

V. S. Lopes and C. L. Borges (2015), Impact of the combined integration of wind generation and small hydropower plants on the system reliability. IEEE Trans. Sustain. Energy, vol. 6, no. 3, pp. 1169-1177.

Vincent H Y Tam, (2020). Inherently safer design in offshore oil and gas projects, Journal of Loss Prevention in the Process Industries, Volume 68.

Yue Huang, Paul McCullagh, Norman Black, Roy Harper, (2007). Feature selection and classification model construction on type 2 diabetic patients' data, Artificial Intelligence in Medicine, Volume 41, Issue 3.

APPENDİX

Appendix 1

Dear Sir/Madam:

I am glad to invite you for participating in my research entitled as "Project Management in Oil and Gas Industry Sector". Kindly fill the attached survey with the answers suits your opinion. Questions are available in Appendix II.

Regards.

Appendix 2

1. Working in harsh environments such as desert, offshore and hill stations is required extensive training for all workers including engineers and staffs as well as other crow members (all evenly) in terms of survival knowledge.

2. Engineering crow is educated in safety technologies is not compulsory to be undergo survival training before working in remote and harsh environments.

3. Working in deep canal where various types of poisonous gases such as NOx and CO will required instrumenting the workers with safety masks only.

4. Establishment of oil and gas projects at remote and unemployed locations is beneficial for business owners as well as workers.

5. Hazardous environment such as deserts are creating challenges for the investors in gas and oil projects due to highly risk of lives.

6. Advancement in engineering management tools has tackled all the challenges acting against oil and gas project expansion into hazardous areas.

7. Adaptation of complex information technology (IT) systems in engineering project management of gas and oil projects is encountering extra costs that degrade the budgeting performance.

8. Safety Instrumented Systems (SIS) is one IT tools for prevention a hazardous consequence in gas and oil projects.

9. As a management action, emergency shutdown (ESD) which is used for shutting down entire process can be dispensed in case of miner fires and other events where human intervention might only initiated for tackling the event.

10. Instrumenting workers with special dress i.e. sensors integrated suite is vital for early prediction of fault (unwanted event).

11. Knowing that works are not always available at the site especially at areas where bulky machines are installed. Depending on human sense to solve the technical problems at gas and oil fields is always worthier than other alternatives.

12. Exploration and production companies (E&P) must be initiating the gas and oil projects by using conceptual design with general information about the project is gathered including risks factors and barriers analysis.

13. Safety requirements specifications (SRS) phase is to be mandatory made before execution of gas and oil project.

14. Contractors and third party involvement in the gas and oil projects is crucial for enforcement of specific technology and engineering solutions for particular sectors in the project.

15. Knowing that oil and gas project is consisting of multiple departments looking after various engineering concerns such as drilling, soil and rocks geological study, mechanical engineering, electrical engineering, IT department, etc. All of the departments must be available in the site for 24 x 7 in order to tackle any upcoming problem.

16. Knowing the fact mentioned in first phrase of Q. 15, the diversity of professionals in the oil and gas projects enforces a coordination problem.

17. Knowing the fact mentioned in first phrase of Q. 15, the diversity of professionals in the oil and gas projects one of the cost hike reasons due to extra management payload.

18. All the departments in gas and oil project must be aware about each other work nature by getting the training of each other work and responsibilities in order to ensure the corporation between the experiments diversity.

19. Adaptation of heretical management system involves clustering the workers into technical related clusters and every cluster owns cluster manager is not always suitable especially during emergency phases.

20. Heretical management system where each cluster head is reporting to upper layer cluster head is important to tackle experience and work profile diversity.

21. Computer vision based management system including predicting the faults and site problems using the big data processing technology is vital for cost reduction in gas and oil projects.

22. Project manager, is a post that allotted person with good field experiment for handling the different responsibilities including engineering and human resource as well as business related matters.

23. It is vital for success to spate between financial and business related work and other site related responsibilities alike staff management, engineering and technical responsibilities in gas and oil projects.

24. In order to find the oil reservoir, drilling must be done for soil and geological analysis. However, the same is guarantee existence of oil reservoirs and can be depended for drilling work initiation.

25. Machine learning and data technology can replace the soil and geological analysis and save the cost.

26. The robust engineering management in gas and oil projects involves conceptual frame work prior to the project establishment that done by the beneficiary side i.e. MOO before hiring the third party contractors for execution of project.

27. In project management system adopted by gas and oil company, national safety code/protocol is more than enough for better safety performance.

28. Standards alike IEC 61511, IEC 61508 and ISO 45001 may provide more specific safety management system according the size and type of project revenue and the resources availability.

Biometrical Questions:

Gender (Male, Female)

1. Age (less than 25), (25-34), (35-44), (above 45)
2. Qualifications (Bachelor, Diploma, Master)
3. Working field (maintenance, pipe networks, bore exploration, projects management, Computer programming)
4. Field experience (13-20), (7-12), (<6) and (>21).
5. Professional training if any (relevant, not relevant)

RESUME

EDUCATION:

1. High School: 2005 graduated from Hozan High School, Kirkuk, Iraq.
2. Bachelor: 2010 graduated from the University Of Kirkuk, College of Engineering, Petroleum Department.

PROFESSIONAL EXPERIENCE AND REWARDS:

1. Kirkuk Technical Institute (2011-2014) Kirkuk, Iraq.

   Worked as lecturer in the Chemical Industries Department in the oil laboratories.

2. Kirkuk Technical Institute (2015-present), Kirkuk, Iraq.

   Worked as lecturer in the Mechanical Technics Department giving lessons in:

   - Auto Cad laboratories
   - Electrical Technics.
   - English courses.
   - Industrial Management and Safety.

publication then please feel free to mail us or contact us.

Regards
Techinical Editor,
IRAJ International Journals
Mail:Â editor@iaj.in