Journal of Positive Sciences (JPS) eISSN: 2582-9351, https://positive-sciences.com JPS. 2021 Aug; 1(5): 1-6

Article info
Received on: 19.07.2021
Accepted on: 24.08.2021
Published on: 31.08.2021
doi: https://doi.org/10.52688/ASP83314

Research Article

Development of smart petroleum projects management using determining technology

Ali Abdulridha Obaid [1, *]

[1] Al kunooze University College, Iraq

[*] ali.abd.r@kunoozu.edu.iq

ABSTRACT

Project managements of oil and gas industry involves development of robust system that is able to integrate many skill professionals to work smoothly and together in the said project fields. This process is 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 paper, data mining i.e. (Delphi method) is used for knowledge enquiry for questionnaire survey data. The same is being established in order to derive a reliable project management system in oil and gas companies.

Keywords: Management, machine learning, reservoirs, petrol exploration, piping network

INTRODUCTION

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 [1]. 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 [2]. Among these barriers, ESD systems are considered to be especially important as they provide the most substantial risk reduction among the preventive safety barriers [3]. 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 [4–6]. The management of oil and gas projects is hard enough sue to the prementioned 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.

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

*Corresponding author
Ali Abdulridha Obaid,
Al kunooze University College, Iraq
e-mail: ali.abd.r@kunoozu.edu.iq

adoption of individual facilities such as transportation, medical, and hospitality sectors. All that 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.

HYPOTHESIS

In order to evaluate the factors contributing the success of project management in the petroleum field, following hypothesis are set.

H1: 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.

H2: 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.

H3: Information technology tools and models if integrated with petroleum project, it may degrade the cost and budgets dedicated for the project.

H4: with existence of machines and computerized technology, human intervention is not required in many sections of petroleum projects.

H5: Petroleum project are mostly situated in remote and hazardous localities, this is good way for land utilization irrespective of high risks of lives.

H6: Results of conceptual project analysis must be depended prior to initiate the petroleum projects in order to ensure performance, profitability and safety.

H7: Good project management must allow diversity of professionals to work all together at same time in the project.

H8: Computerized project management is the key solution for all problems tackling within the petroleum projects.

METHODOLOGY

For validating the hypothesis made in this study, set of questionnaires have been made and shared with field exports 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 thirty 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.

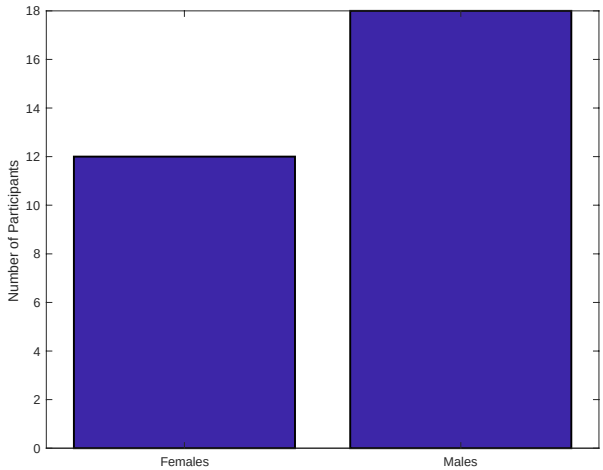

Figure 1: Gender distribution representation of the candidates participated in the study

Total thirty-six 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

*Corresponding author
Ali Abdulridha Obaid,
Al kunooze University College, Iraq
e-mail: ali.abd.r@kunoozu.edu.iq

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". 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 1 demonstrates the gender wise distributions of the candidates those are participated in the survey study. Figure 2.1 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.

DELPHI METHOD

Surveys to collect the information form the exports and attempts reaching a consensus about particular facts [7]. By receiving the information from the field exports, data is to be generated accordingly and used in the analysis. This method is performed through several steps as in hereinafter. 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 [8] [9]. Survey questions might be targeting knowledge inquiry and gaining popular with some hidden or confusing facts. Study candidates are termed to the bodies who 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 [10]. 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 2. Qualifications: candidates selected should be qualified with proper academic qualifications as well as enough field experiments [11]. The age of each candidate should be within the boundary limit which is important to ensure the reliability of the survey. 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. [12]. By providing their responses, exports are being anticipated to reflect their personal experiences from the ground fields [13]. The responses might be carefully made where the candidates (exports) are to make their feedback after melting their practical experience and their educational (academic) qualification so that more reliable responses are ensured. Coding of the responses: responses that provided by the candidates is usually in form of text data or alphabetical-numerical combination [14]. 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 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 "Mr"	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

RESEARCH SAMPLE

All of the questions of this survey are listed in web form (Google) and shared with forty-five field exports, the method of selecting those exports (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.

*Corresponding author
Ali Abdulridha Obaid,
Al kunooze University College, Iraq
e-mail: ali.abd.r@kunoozu.edu.iq

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 texts on the mobile number of the candidate. Thereafter, responses arrived only from thirty candidates. Figure 2 is demonstrating the process of samples collection in this study.

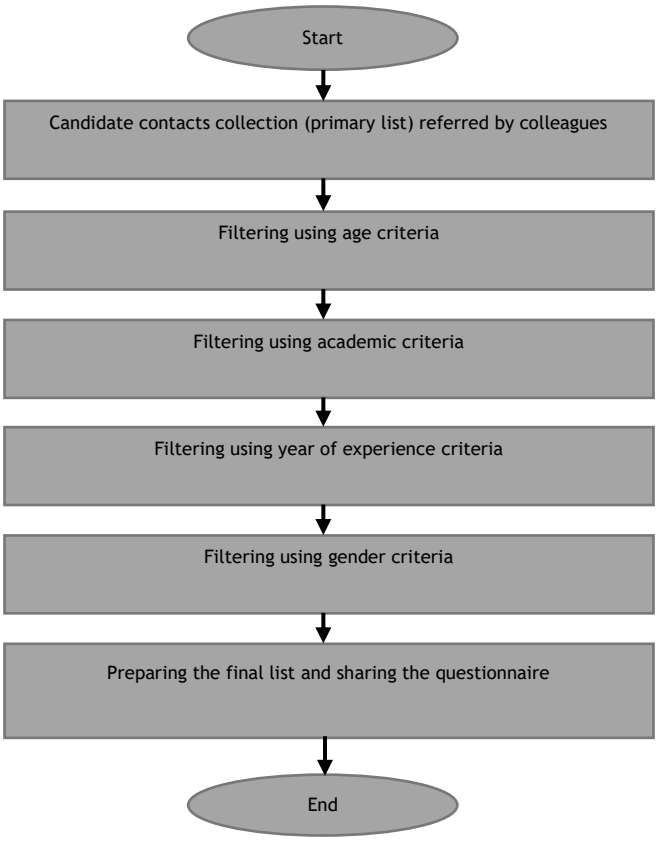

Figure 2: Demonstrating of the process of samples collection in this study

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.

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

where S is standing for the score of question Q and 30 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 below:

*Corresponding author
Ali Abdulridha Obaid,
Al kunooze University College, Iraq
e-mail: ali.abd.r@kunoozu.edu.iq

H1 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

H2 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

H3 Information technology tools and models if integrated with petroleum project, it may degrade the cost and budgets dedicated for the project. Rejected

H4 with existence of machines and computerized technology, human intervention is not required in many sections of petroleum projects. Rejected

H5 Petroleum project are mostly situated in remote and hazardous localities, this is good way for land utilization irrespective of high risks of lives. Accepted

H6 Results of conceptual project analysis must be depended prior to initiate the petroleum projects in order to ensure performance, profitability and safety. Accepted

H7 Good project management must allow diversity of professionals to work all together at same time in the project. Rejected

H8 Computerized project management is the key solution for all problems tackling within the petroleum projects. Accepted

CONCLUSION

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 fifty 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 H1, H5 and H6.

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 H2.

Question 3 “working in deep canal where various type of poisonous gases such as NOx and CO will required 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 H3.

Hypothesis H4 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 good agreement response which is confuter hypothesis H4.

Hypothesis H7 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.

*Corresponding author
Ali Abdulridha Obaid,
Al kunooze University College, Iraq
e-mail: ali.abd.r@kunoozu.edu.iq

Hypothesis H8 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 favor of the hypothesis content.

REFERENCES

[1] Conley HA., “A new security architecture for the Arctic”, In: Center for strategic and international studies (CSIS), 2012.
[2] Devold H., “Oil and gas production handbook: an introduction to oil and gas production”, ABB, 2013.
[3] Centre for Chemical Process Safety (CCPS), “Guidelines for safe process operations and maintenance”, John Wiley & Sons, 2010.
[4] Gruhn P, Cheddie H., “Safety shutdown systems: Design, analysis and justification”, NC: The Instrumentation Systems and Automation Society, 2006.
[5] Redutskiy Y., “Optimization of safety instrumented system design and maintenance frequency for oil and gas industry processes”, Manage Prod Eng Rev a, 2017.
[6] Redutskiy Y., “Modelling and design of Safety Instrumented Systems for upstream processes of petroleum sector”, Procedia Eng, 2017.
[7] Yue Huang, Paul McCullagh, Norman Black, Roy Harper, “Feature selection and classification model construction on type 2 diabetic patients’ data”, Artificial Intelligence in Medicine, Volume 41, Issue 3, 2007.
[8] Seon Tae Kim, Bongseok Choi., “Price risk management and capital structure of oil and gas project companies: Difference between upstream and downstream industries”, Energy Economics, Volume 83, 2019.
[9] Danielle Urton, Dan Murray, “Project manager’s perspectives on enhancing collaboration in multidisciplinary environmental management projects”, Project Leadership and Society, 2021.
[10] Jesus Leodaly Salazar-Aramayo, Roseane Rodrigues-da-Silveira, Mariana Rodrigues-de-Almeida, Tereza Neuma de Castro-Dantas, “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, 2013.
[11] Boris Asrilhant, Maureen Meadows, Robert Dyson, “Techniques to Support Successful Strategic Project Management in the UK Upstream Oil and Gas Sector”, European Management Journal, Volume 24, Issues 2–3, 2006.
[12] Amir Karbassi Yazdi, Alireza Rashidi Komijan, Peter Fernandes Wanke, Soheila Sardar, Oil project selection in Iran: A hybrid MADM approach in an uncertain environment”, Applied Soft Computing, Volume 88, 2020.
[13] Boris Asrilhant, Maureen Meadows, “Robert Graham Dyson, Exploring Decision Support and Strategic Project Management in the Oil and Gas Sector”, European Management Journal, Volume 22, Issue 1, 2004.
[14] Vincent H Y Tam, “Inherently safer design in offshore oil and gas projects”, Journal of Loss Prevention in the Process Industries, Volume 68, 2020.

*Corresponding author
Ali Abdulridha Obaid,
Al kunooze University College, Iraq
e-mail: ali.abd.r@kunoozu.edu.iq