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To Link this Article: http://dx.doi.org/10.6007/IJARBSS/v11-i3/8884 DOI:10.6007/IJARBSS/v11-i3/8884

Received: *01* January *2021,* ***Revised:*** *27* January *2021,* ***Accepted:*** *24* February *2021*

Published Online: 28 March 2021

In-Text Citation: (AL-Qadhi, 2021)

To Cite this Article: AL-Qadhi, A. (2021). Constructing Competency Model for Yemeni Oil and Gas Operators & Technicians Based on Training, Assessment, Motivation and the Role of Skilled Pool Experts. *International Journal of Academic Research in Business and Social Sciences*, *11*(3), 1143-1161.

Vol. 11, No. 3, 2021, Pg. 1143 - 1161

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Constructing Competency Model for Yemeni Oil and Gas Operators & Technicians Based on Training, Assessment, Motivation and the Role of Skilled Pool Experts

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Abstract
The main objective of this study was to develop a competency model and study the relationships of intensive training, quality assessment, motivation, and skill pool expert on the core competencies of workers serving in the oil and gas industry in Yemen to maintain sustainable productivity, development of the country's economy, employees' safety and clean environment in the O&G production. A preliminary study and questionnaire were used to assess the technical trainees' perceptions in operation, maintenance, and safety of five oil companies in Yemen. The sample was 350 trainees in this study. The data were analyzed by using SPSS software and Structural Equation Modelling (SEM). The result found that intensive training, quality assessment motivation has a significant positive effect on employees' core competence, however, the skill pool expert specifically in line supervisor and coach has a strong effect on employees' core competencies. Multiple linear regression analysis was used to test a hypothesis. This study was conducted in five oil companies and among 350 trainees only. For this reason, the results cannot be generalized to other contexts, where the other companies not interested and implemented conventional training programs, characteristics, and peer support from the work environment, were outside the scope of the study. This study will add value to the efforts of the oil exploration and production board in Yemen, by providing an increased understanding of the factors that create competent technicians based on the competency model
Keyword: O&G Companies, Competency Models, Personal Development Plan, Risk, And Hazard In Petroleum Companies, Structural Equation Model

Introduction

The issue of the competency of employees and their performance in the petroleum industry is an ongoing concern. Concerning the Oil and Gas (O&G) industry, they are committed to ensuring that their workforce is knowledgeable and skillful enough to address the issue of competency in executing their tasks and activities in the process of O&G production. It is becoming increasingly difficult to ignore the importance of the factors influencing the performance of employees in petroleum industries (Connor, 2014). Human Resources (HR) form part of the competence structures of O&G companies in which the staff engagement

ensures the protection of all future risks (Wolf & Pollitt, 2009). The support required by O&G staff to improve their expertise and abilities will permit them to meet the requirements of the International Human Resources Development Corporation.

This risk may lead to environmental harm, economic loss to businesses, and even humans death. The working staff may take the risk mitigation involved in balancing all potential hazards in the O&G sector (Morrison, Bachmann, & Saccomanno, 2017). The staff in the O&G businesses should be capable to organize appropriate essential abilities in a committed skills framework. The availability of this staff is therefore important in ensuring that both the required knowledge and aptitudes are accurately inserted and upgraded to ensure their safe working environments without sacrificing quality efficiency (Morrison et al., 2017).

There has recently been increased enthusiasm for establishing a skills framework for employees in the field of technology despite the nature of this activity, subjected to high risks (Wolf & Pollitt, 2009).

The recommendation sent by IHRDC is to broaden the basis of sections that enhance the understanding and build capabilities of staff through the O&G association. One of the major problems in this sector is to educate new employees about health safety and environment (HSE) so, that they can perform their duties efficiently in line with HSE norms (Al-Awai, Samir, & Binthabet, 2002a). Similarly, it should achieve the required HR efficiency by improving the workforce's consciousness that falls under the banner of Well Operations Crew Resource Management (WOCRM) and their performance and competency should meet the requirement drawn by the International Association of Oil and Gas Producers (IOGP) (Smith & Lock, 2015).

Additionally, it is necessary to implement different activities from diverse zones by properly managing them. Therefore, the O&G management and employee groups in the platform region offshore are capable to carry out operations in a safe manner

The O&G organizations have the opportunity to improve their existing skills framework through persistent progress in these essential facilities (Al-Awai, Samir, & Binthabet, 2002b). This should enable the front-line staff of O&G to meet the basic requirement for the safety of agents to prevent accidents and company disruption in cases where components of the competency framework do not appear (Al-Awai et al., 2002b).

O&G businesses and their associations should provide advancement in adjusting and modifying the current competency framework. Over the last century, the O&G industry has rapidly evolved and the interests of skills and academic qualifications have been significantly increased. However, from the perspective of workers and employers, it has been shown that the qualifying skills are vital compared to those of the power companies. The latest sophisticated technology shows that the identification of jobs is different from other classical methods, while skills alone are not informative enough (Figgis & Standen, 2005).

There should be no major difference between changes in the fundamental section of the competence structure and the procedure for implementing the aspects of different sections of O&G businesses. According to (van Wieringen, 2019), the O&G companies are considered to be of international standing with a workable skills framework, fulfilling the O&G goals. The skillful and well-prepared workforce will benefit the O&G companies and in the end, will contribute to the success of the entire O&G business (Abueva, 2011).

These employees' successes and disappointments will have an overall impact on O&G Company’s sustainability in the future, and competent employees contribute mightily to the entire industry, whose successes and failures can have a global effect.

Competencies in the Oil and Gas Industry in Yemen

There has been great concern by several organizations concerning the poor competency workforce in the petroleum sector (Rothwell, Graber, & Graber, 2010). The concern raised includes the disorders of the employee's competencies of the specific work procedure. The other is a rundown in implementing the assignments important to the employee's activity related to the individual employee-specific extraordinary performance.

The recent economic recession that hits the global O&G industry caused O&G employers to either be laid off or on the waiting list to resign (Connor, 2014; Ogle, Burley, Magan, Senapati, & Connor, 2012). This situation has interrupted the current framework of O&G's competencies to prevent employees from performing.

Over a century of the O&G industry, there has been a dramatic increase in major accidents that have been occurred in petroleum processing and production. The Occupational Safety and Health Administration (OSHA) and organization managers are keen that their workforce is skilled, knowledgeable, experienced, responsible, and competent to assess the risk and place the right measures for safety, health, and environment. Therefore, the organization should provide intensive training, quality assessment based on the competency model.

Specialized political economy scientist, (Barahim Adnan, Khanbari Khaled, Algodami Amal, Almadhaji Ziad, & Adris Ahmed, 2018) has stated that local capacity building programs should be implemented in the Yemeni local force, which requires necessary skills and knowledge related to the use of technology in business. (Hakimi, Al-Sufi, Al-Hamadi, & Al-Sharabi, 2015). According to (Lewis, 2003), many accidents are occurring every day in petroleum companies due to the lack of skills, knowledge, and experience. Nevertheless, the investigation revealed that the operators were the major cause of these accidents, performing jobs in the O&G sectors (Leveson, 2011).

Thus, the absence of skills in the workforce is the primary cause of these accidents occurring in the O&G sectors (Andrews, 2011), therefore staying on top of best practices and growing on the job can ensure that an employee will remain valuable to his or her employer.

The lack of a Strategic Facility Training and Facilities Training plan in today's news dealing with Yemeni oil/gas shortcomings lead to the skill lacking, poorly qualified staff, human errors, business disruptions, damage to the environment, and lots of accidents

Table1. The different causes of accidents occurring in the O&G sector

Accident	Company /date	Cause	Authors
Chemical storage explosion	Yemen Total, 2008	Human Error, ignoring safety regulation	(Alkhaldi, Pathirage, & Kulatunga, 2017; Bhavsar, Srinivasan, & Srinivasan, 2016)
Ridan wellhead blowout	Safer Co. 2012	Ineffective safety, management programs	(Press; Tamers et al., 2018)
LNG storage tank leaking	YLNG, 2011	Unsafe act, and corrosion Failure of effective hazard identification	(Acciaro, 2014; Hakimi et al., 2015)
Power station trips	Aden Refinery,	Inexperienced workers, Inadequate supervision	(Newstrom, 2012)
Total shutdown, instrument air failure	Al-Masilah Co, 2007	Human error, Inadequate training strategies	(Hakimi, Abdullah, & Shalaby, 2012)

Research Objectives

To study the factors affecting the core competency of employees in oil and gas companies in Yemen

Theoretical Conceptual Model

The mapping literature and the industrial model related to the competency model provided the foundation for selection criteria of core competence and demonstrated the essential components in the O&G competency model based on 2 categories.

The category is based on the competency approach in the literature review.

The category is based on the competency framework of major O&G companies.

The competency factors outcomes of literature and industries are summarized in Figure 1.

The selection of most variables or factors has been made to construct a theoretical, conceptual model and achieve the current study's objectives, with the selection of intensive training, quality assessment, motivation, and skill pool expert in attaining competent operators and technicians. With a specific end goal to consider the components related to the competency-based training, ways have been constructed based on the member's responses to design the competency system and the workplace factors

Selection Criteria for Competency Components

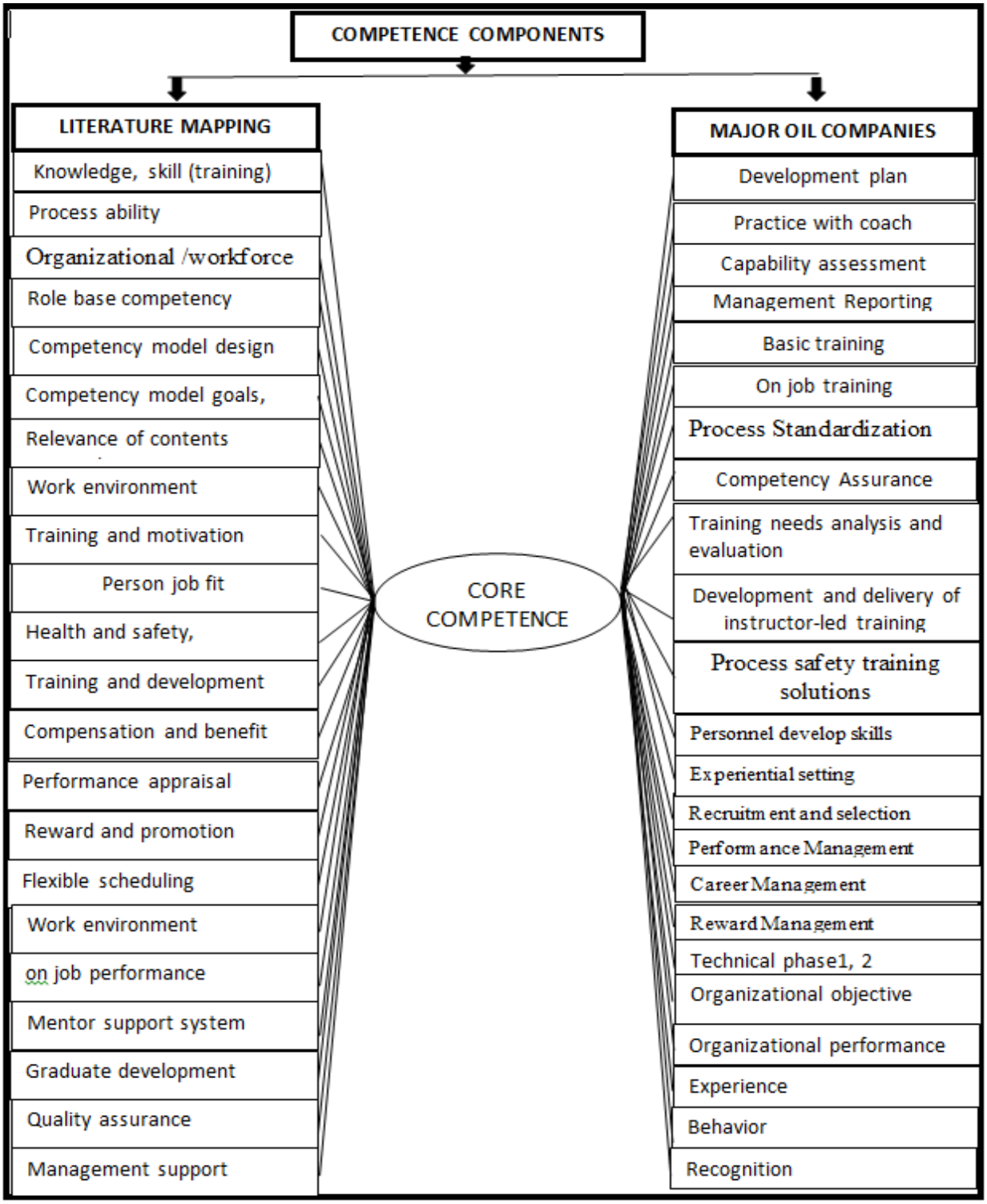


Figure 1 Selection variables of competency model

Table 2. Competency Model Comparison in Global O&G Companies

Company	Competency Model Variables	Training Support	Performance Method	Author
Petro skill	CM Tailored competency map Gaps define Development plan Knowledge and assessment Practice with coach Capability assessment Management Reporting	e-Learning Pilot library HSE Unit operation	Assessment1, 2	(Matteo, 2019)
Abu -Dhabi national oil company (ADNOC)	CM – CAMS Induction of industry Basic training On job training External training Quality assurance	CBT computer-based training E-learning, Quiz, video	Six months of basic training Assessment, criteria Awareness, acknowledgment, skill, and mastery assessment	(Almatroushi, 2006)
International human resources development corporations (IHRDC)	Competency Management Process standardization Competency content Learning and development Gap analysis and planning	Software e-learning	Individual competency profile	(Connor, 2014)
Shell	CM- strategic competency management Competency assurance include risk, position, task, role competency development	Simulator, e-learning Short courses Video Drill	Assessing, Approach Storing, tracking, and reporting	(Kedzierski, 2016)
Wood Group	Training, training simulation, competence, assessment	3d simulator	Assessment process	(Van De Port, Wood-Dauphinee, Lindeman, & Kwakkel, 2007)
PETRONAS EPDC	PETRONAS Competency-based assessment system (PECAS)	Simulator, e-learning Upstream Downstream	Assessment process Internal ass External ass	(Hashim, Ahmad, & Rohiza, 2010; McKinley &

	Standard, assessment, quality assurance, certification	Training Plant (UDTP) Projector	Internal verification 2,5 year,3-6 month assessment	Huebner, 2018)
Qatar Petroleum	Competency development Recruitment and Selection Induction Foundation (24 weeks) Technical phase1 (24 weeks) Workplace learning (4 weeks) Employee Status (Assessment) Technical phase 2 (24 weeks) Workplace learning (24 Weeks) Job Holder (Integration)	Simulator, e-learning Short courses Video Drill	2-year program assessment after technical phases one and two. Final assessment and verification	(Retnanto, Fadlelmula, Alyafei, & Sheharyar, 2019)

Theoretical Conceptual Competency Model

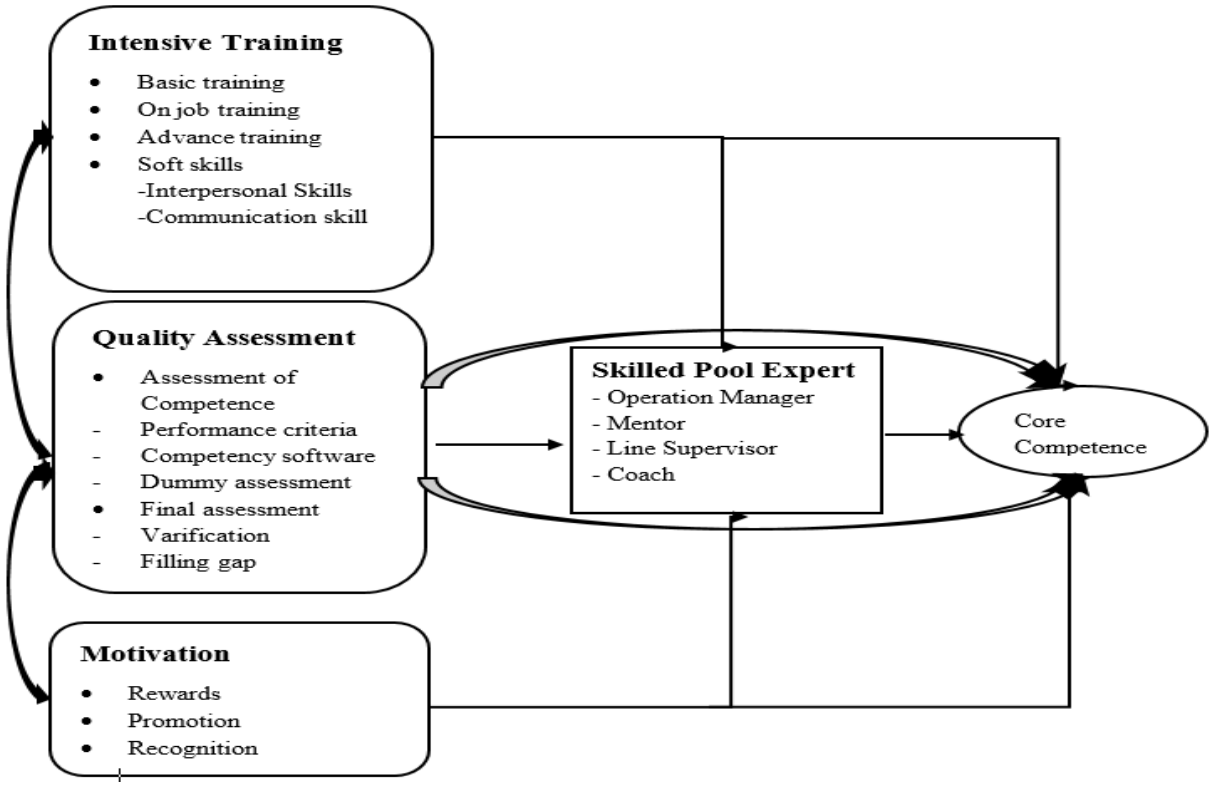


Figure 2. Proposed theoretical competency model

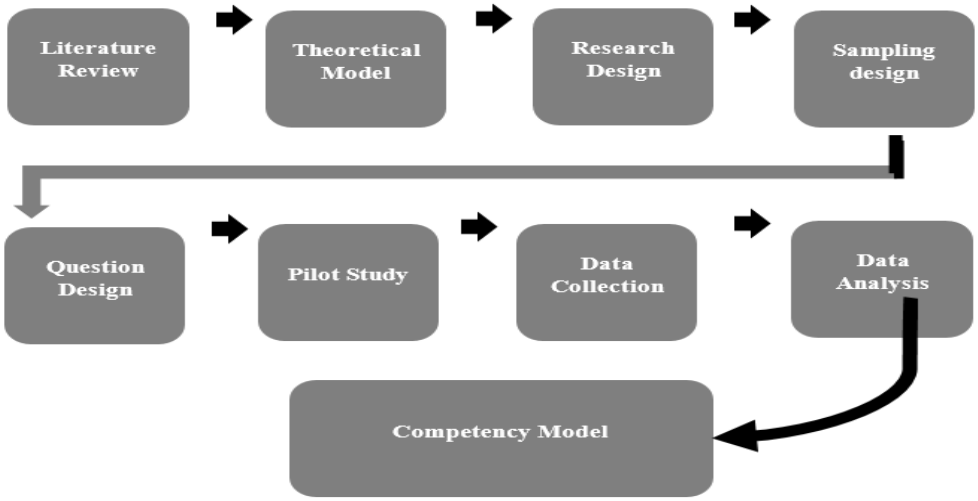
Scope of the Study

The current study is concentrating on the technical people working in the O&G industry in Yemen, particularly in the operation, maintenance, and safety division of upstream and downstream facilities. The operators and technicians are intended as they are working in the hazard areas including wellhead operation, separation, refinery, and gas processing (Andersen & Mostue, 2012). The most recent industrial literature mentioned that the majority of accidents occurred in the high-risk areas, exposed to flammable gases, liquids, high pressure, and temperature due to inadequate competence of technical workers (Andersen & Mostue, 2012; Lord & Fenton, 2019)

Research Methodology

The research methodology consists of research design, sampling design, data collection, and method of analysis. The study's research process has been derived from the design procedure applied by (Shelbourn, Bouchlaghem, Anumba, & Carrillo, 2007). It is designed to use the preliminary works as an exploratory study before starting the quantitative study's first phase. The central part of the current research will address the quantitative technique to assure the target metric and the statistical analysis of data collected through questionnaires and surveys.

Figure 3: Research Process Chart



Approximately 3000 technical employees have been targeted in this survey, working in the production, maintenance, and safety sectors of 5 selected O&G companies in Yemen (z YLNG, SAFER CO, Aden refinery, and Jannah Hunt AL-Masila) (Bloomfield et al., 2016; Thomson, 2018; Yemen) LNG, 2010). According to (Comrey & Lee, 1992), the sample size is 300 is right, while 1000 is the best. In this study, the sample size is 400, which is the proper sample size for achieving useful data for analysis.

Findings and Discussion

This study offers analytical evidence, first, intensive training has a significant positive impact on employees' core competence in the oil and gas industry. Second, quality assessment has no significant impact on employees' core competency. Third, motivation has a strong positive effect on the core competency of workers. Lastly, there was no positive relationship between skill pool expert and core competency of the employees working in the oil and gas industry in Yemen, according to the trainees' perception

The research design is considered reliable when a construct attains at least 0.7 Cronbach alpha value. The current study's results demonstrated adequate validity as the Cronbach alpha values ranged between 0.876 and 0.948. Thus, the instrument was accurate to proceed with the actual study.

Table 3. The results of Cronbach alpha

	Cronbach's Alpha	N of Items
Intensive training	0.916	17
Quality assessment	0.948	13
Motivation	0.876	11
Skill pool expert	0.921	13
Core competence	0.888	13
Overall	**0.944**	**67**

Relationship with Core Competence.

A regression test was conducted to analyze the impacts of intensive training, quality assessment, motivation, and skill pool expert on core competence. The current study results

reported that 23.9% of the variance in the dependent variable (core competence) was explained by four sub-dimension of intensive training, quality assessment, motivation, and skill pool expert. The findings of multiple regression demonstrated that intensive training [b=0.042, t=0.588, p<0.05] and motivation [b=0.570, t=9.601, p<0.05] have significant impacts on core competences. Nevertheless, several dimensions, including quality assessment [b=−0.055, t=−0.734, p>0.05], and skill pool expert [b=−0.079, t=−1.044, p<0.05] did not show any relationship with core competence.

Table 4. **Relationship with Core Competence.**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.854	.213		4.002	.000
	Intensive Training	.042	.072	.040	0.588	.000
	Quality Assessment	−.055	.075	−.050	−0.734	.464
	Motivation	.570	.059	.498	9.601	.000
	Skill_Pool_Expert	−.079	.076	−.072	−1.044	.297

a. Dependent Variable: Core Competence

Interpretation of the Results

The intensive training influences the trainees' core competence in most conventional training programs (Indira, 2008). The intensive training has a significant positive impact on the employees' core competence (H1, with $p > 0.01$). The recent literature stressed the significance of appropriated intensive training in conventional training since its appropriateness strongly influences trainees' core competence working in the oil and gas industry (Alvarez, Salas, & Garofano, 2004).

On the other side, (Lee & Ming, 1999) found a positive relationship between quality assessment and employees' core competence in the oil and gas industry. In the same way, (Glassner, 1983) discovered that quality assessment significantly affects employees' core competence. The quality assessment ensures that workers can perform their duties according to companies' guidelines (Davidson & Al Zadjali, 1999; Fletcher, 1997). Quality assessment is not straightforward since trainees are measured under predefined guidelines established by the business industry.

Trainees are deemed professional, and thus assessors ought to ensure that they can perform the job independently without supervisor assistance (Davidson & Al Zadjali, 1999; Fletcher, 1997; Novia & Fernandes, 2014). The assessor's activities are therefore critical since they judge the evidence offered by the trainees to decide whether they are competent or not.

The assessors ought to check candidates' performance while performing their job, which is a part of the evidence (Almatroushi, 2006; A. Matroushi et al., 2008). Assessing trainees' expertise and knowledge under the competency model enables the training program to be more effective from the trainees' viewpoint. A study by (Praslova, 2010) reported that quality assessment could be effectively used to assess the efficacy of conventional training programs

and the efficiency of competency models. However, in the current survey, the participants did not support the hypothesis that quality assessment in training programs influences the core competencies (H2, p = programs' efficacy.

In contrast, the trainers' motivation during the training program has had a positive impact on the core competency of the workers according to the trainees' perception in this survey (H3, with $p < 0.01$). The trainers should identify different types of motivations required for employees' core competencies at organizational and job levels (Mukherjee, 2011). This will enable businesses to compete effectively with their contenders, providing them a strategic edge (Hamel & Prahalad, 1990). According to Mukherjee (2011), motivations should apply to the trainees' objectives, so they become competent and skilled workers (Holton III, Bates, & Ruona, 2000).
However, this does not apply to the competency model, where both the content and resources contribute to the trainees' performance
Finally, the skill pool experts is the factor that influences the core competence of employees in the oil and gas industry (Le Deist & Winterton, 2005). However, this study found that there is no relationship between skill pool experts and the core competence of employees according to the trainees' perspective (H4, with $p = 0.297$).
The study's findings confirm that intensive training and motivation influenced all the employees' competency activities (H1, H2). The explanation is that in executing the training program in a company, the trainers should ensure that the contents of the training are clear, indisputable, rational, simple, and applicable to the tasks of the workers (Lucia & Lepsinger, 1999; Mukherjee, 2011; Whiddett & Hollyforde, 2003; Whiddett & Hollyforte, 1999).
In doing so, supervisors, trainers, experts, and advisors will offer trainees the best guidance to the trainees and consolidate their goals and idea of what the professional trainees desire (Lucia & Lepsinger, 1999).

The trainers and supervisors may execute the best training programs needed for the trainees' core competencies in their works (Lucia & Lepsinger, 1999). Trainers should be capable of becoming great mediators. They also effectively evaluate trainees, helping them become top performers, where the primary purpose was to ensure the worker is skilled in performing the risk duty in a safe manner
The above-mentioned discussion demonstrates how significant were the intensive training and motivations in the core competencies of employees in the oil and gas industry (Almatroushi, 2006; Dordan, 2014; Leuro & Kruger, 2012; H. A. Matroushi, Jabeen, & All, 2018).

Explanations for Non-Findings

In conventional training programs, the trainer's engagement is a significant element, influencing the trainees' core competency (Baldwin & Magjuka, 1997; Fishbein & Stasson, 1990; Noe, Hollenbeck, Gerhart, & Wright, 2017). The trainees' transition of training is prevented due to the lack of trainers' assistance (Lim & Morris, 2006; Martin, 2010). However, trainers' assistance does not affect the potential core competency of employees. As the trainees indicated, the trainers are overwhelmed by the work and do not have enough time to check the trainees' progress. Trainees recommended that they have multiple trainers, so the other trainer will be available for their help if one is busy. The predicted result in this research is the positive impact of intensive training on employees' core competence. The

trainees presented the explanation that the trainer has a limited period due to his/her other duties.

Suppose the trainer did not give the trainees proper training, why they still expect greater core competency from the trainees. Various other reasons could be asserted for this outcome. The recent literature indicates that certain factors can motivate trainees to pursue a self-directed learning process, such as support from colleagues, willingness to learning, and consciousness (Boyer, Edmondson, Artis, & Fleming, 2014).
Although the impact of colleagues' input on a core competency does not shape the current study's scope, the initial explanation has been identified from the trainees' input. In conventional training programs, assistance from trainers helps execute the latest acquired skills on the job and modifies the behavior of trainees at work (Bates, Kauffeld, & Holton, 2007; Colquitt, LePine, & Noe, 2000; Homklin, Takahashi, & Techakanont, 2013; Tracey & Tews, 2005).
The members who finished the training program will instruct their colleagues currently on the course when the trainer is busy. The second explanation is the high rate of self-efficacy of the research trainees. The trainees' feedback affirmed that their training programs' progress came through their obligation and inputs and approached the learning experience. Self-efficacy is the conviction of trainees that they can perform work competently (Bandura, 1986). Trainees with strong self-efficacy are more proficient as they had better understand the impact of training.

Moreover, they respond positively to improving their attitudes once they return to work (Switzer, Nagy, & Mullins, 2005). According to (Hudson, 1999), self-efficacy is a conscience and cannot be forced by someone else. Self-efficacy does not closely associate with training (Millar, Gitsham, Bozer, Sarros, & Santora, 2013; Wakkee, Elfring, & Monaghan, 2010), but it can be improved by training (Joyce & Showers, 1981). The literature shows that trainees are responsible for the training program's development (Leuro & Kruger, 2012). The trainer is a mediator only, not a problem solver, and the more the trainees pursue their things at work, the more they will teach (Gallwey, Hanzelik, & Horton, 2009).

The trainers in the oil and gas industry under investigation seem to have understood adult learning concepts and sought to help their trainees in learning. It is expressed in the trainees' complaints that their trainers did not give them sufficient time. According to (Grow, 1991), the role of trainers changed accordingly to the phase of learning. The third possibility can be the motivation of trainees. It has appeared from the literature that businesses typically concentrate on motivation as it influences trainees' core competency (Bell & Ford, 2007; Clark, Dobbins, & Ladd, 1993; Klein, Noe, & Wang, 2006; Nease, 2000; Seyler, Holton III, Bates, Burnett, & Carvalho, 1998). Training motivation influences the interactions between the training program and the core competence of the employees. Training characteristics that influence training motivation include training layout, significance, and quality of the contents to the trainees' job requirements. A reward is a decent instance of training design features, which influence trainees' training motivation (Whitehill & McDonald, 1993).

The relevance of conventional training toward trainees' demands would enhance the trainees' proficiency, resulting in training motivation and transmission (Clark et al., 1993; Nikandrou, Brinia, & Bereri, 2009). Another element, which influences the motivation of

trainees, is the quality of training for their work demands (Noe et al., 2017). The last factor that influences the training motivation is the quality of the training required for trainees' demands. This element comprises three prospects from the trainees. First, the extrinsic motivation factors refer to the trainees' expectancies after completing a training program, including increased wages, promotion, or recognition. Second, motivation factors refer to the trainees' expectations that the training program was influencing trainees' competencies.

Thirdly, the training program's expectations will be successful, and the targets will be effectively achieved. This would influence trainees' motivation for learning, such as the effectiveness of the training program and the impressions of the trainees (Tsai & Tai, 2003). It will not be comfortable asking trainees to pass their acquired expertise in the training without motivation. Therefore, the relationship between self-efficacy and pass training is facilitated by learning and transition motivations (Wen & Lin, 2014). The competency model fulfills trainees' requirements for acquiring the required knowledge and skills to conduct their works and training for even further tasks. This fulfills the intrinsic motivation factors. In extrinsic motivation, trainees undergo a training program to get promotions and salary adjustments by finishing each evaluation(A. Matroushi et al., 2008). After completing the training program, trainees will be considered competent workers and perform the duties independently (Almatroushi, 2006).

The above explanations illustrate why trainees are encouraged to pursue their training with trainers' assistance. Similarly, some previous studies have demonstrated that focusing on training goals and rewards enhances self-efficacy and strengthens trainees' desire for learning (Wen & Lin, 2014). The trainees' response to training suggests that motivation influences trainees' core competency (Baldwin & Magjuka, 1997; Bell & Ford, 2007; Cannon-Bowers, Salas, Tannenbaum, & Mathieu, 1995). As competency models rely on extrinsic and intrinsic motivation factors, resulting in a positive response from trainees to the competency model, irrespective of limited training.

Conclusion

In the oil and gas sector, the need for competent employees continues to be perceived. The implementation of competency-based models is a tool for developing competent workers. This study suggested that specific goals, intensive training, motivation, and skill pool experts ought to achieve a successful competency model and competent employees. The study also recommended studying the self-efficacy impacts of trainees on core competence in term of a developed competency model, other domains recommend conducting extensive research to study the impacts of line supervisor on the trainee's core competence in the event of pre-commissioning, and commissioning the plant, plant troubleshooting and an emergency status

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