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QUALITY MANAGEMENT PRACTICES IN OIL AND GAS INDUSTRY

Abstract: *Quality Management Practices (QMP) has evolved as a management philosophy with a claim to improve organizational performance. The oil and gas industries have realized the importance of quality to compete and survive in unpredictable market arena. This paper examines the extent of QMP implementation in Oil and Gas sector. Around 52% of the respondents of oil and gas sector opinioned that QMP is implemented. Based on the literature seven QMP factors with 60 items were considered for the study, through the Exploratory Factor Analysis (EFA) 32 items were extracted based on the item loading more than 0.5. Further, these factors were validated by Confirmatory Factor analysis (CFA) using Structural Equation Modeling (SEM). This resulted in five important factors with 31 items indicating good model fit with fit indices all above acceptable range (chi-square statistics was 246.158 with CMIN 1.399, GFI = 0.929, AGFI = 0.907, NFI = 0.902, IFI = 0.968, CFI = 0.967, TLI = 0.961 and RMSEA = 0.037). The five factor QMP measurement model was tested for discriminant and convergent validity. The study reveals that age, educational qualification of employees; nature of job and nature of activities carried out are significantly associated, while gender and experience are not associated with the level of QMP implementation. The results of this paper provide guidance for managers and practitioners in oil and gas sector to implement the proposed 5 factor QMP model (Top management commitment, Employee involvement, Training and Development, Customer focus, Supplier Quality Management) in a systematic way to enhance organizational performance.*

Keywords: *Oil and gas sector, Exploratory Factor Analysis, Confirmatory Factor Analysis*

1. Introduction

In today's competitive business environment, quality is the key for the success and survival of any organization. To stay competitive in global environment, companies are embracing various quality practices as a fundamental part of their strategic business plans. Quality Management Practices (QMP) in general can be defined as the procedures followed in a workplace which enhances the product quality, overall safety in the workplace and customer satisfaction. With the advent of globalization and privatization, there is an increased focus on quality and many firms are embracing various quality tools and practices to stay competitive (Oakland, 2003). Further, implementation of quality practices will improve the quality products and service and hence more profits

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(Alsaidi, 2014). Furthermore, firms can learn from success stories of quality of other firms and follow best quality practices to achieve success in implementing and sustaining high quality levels (Ahmad & Elhuni, 2014). The effective implementation of QMP will enhance organizational performance (Lakhal et al., 2006) and it competitive position through the knowledge creation (Linderman et al., 2004).

In India, oil and gas sector has confirmed high opportunity for investors (Hussain et al., 2006) thus contributing to the economic growth of the country. The oil and gas industries have acknowledged enhanced delivery chain efficiency in support of cost savings (Hamilton, 2003) by effective implementation of various quality practices. With India being the fifth largest consumer of energy in the world (KMPG survey - 2009) and it is one amongst the most preferred destinations for many of the major oil and gas players (Siddiqui et al., 2012). In recent years, India has witnessed progressive and tremendous growth. To maintain this growth momentum in the years to come, there is an emphasized need to focus on improving quality of the industrial commodities through effective QMP implementation. However, inappropriate understanding on systematic implementation of quality practices can result in failure (Mosadeghrad, 2014).

With reference to Indian context, many empirical studies have presented the comprehensive research frame work on QMP in various sectors. However, no research has been conducted in oil and gas Sector dealing with quality management practices. Thus, the study is designed to identify and empirically validate the QMP factors based on responses collected from oil and gas industry in India. The paper is divided into four parts. The first part is the literature review that examines critical factors of QMP considered by various researchers in general and particularly in oil and gas industry. The second part discusses the research objectives; followed by methodology used, sample profile and data collection. The third part consists of results and analysis in an attempt to answer the research objectives. The final section presents the conclusions and suggestions for further research.

2. Literature Review

2.1. QMP

QMP is a management philosophy to improve competitiveness of the firm. It is a holistic approach involving every individual of organization (Yazdani et al., 2014) extends to suppliers and customers (Siddiqui et al., 2012) to gain competitive advantage (Lin & Chang, 2006). With increased competition, companies have recognized the importance of quality system (Oakland, 2003). Based on thorough literature on QMP by Saraph et al. (1989), Ahire et al. (1996) and Tamimi (1998) around fifty quality factors are developed to measure Deming's 14 principles. Many oil and gas industries across the world are adapting quality practices for high operational performance and competitiveness (Aletaiby, 2018).

The research study by Hmida (2013) suggested that quality management based maintenance program can minimize failure and downtime thereby improving quality to achieve high customer satisfaction (Summers, 2010; Sharp et al., 2002). Vujović et al. (2017) showed that there is a positive influence of ISO 9000 certification on Innovation performance. The study in Indonesian oil and gas industry stated significant association between QMP and financial performance (Ciptono et al., 2011) and innovation performance of the firm (Prajogo & Sohal, 2004).

The empirical study in Indian oil and gas industry by Siddiqui (2012) indicated that top management, team work and employee empowerment are the vital factors to enable QMP and to translate inventive ideas in to actions. The study by Linderman et al. (2004) revealed that top management support, employee training, and employee

involvement are significantly associated with QMP implementation and performance.

The study by Yazdani et al. (2014) in Pars Oil and Gas Company identified leadership, strategic planning and customer focus to be the critical factors to improve the quality problems in the Oil and Gas industry. The research conducted by Oliver (1988) and Mohrman et al. (1995) revealed that involvement of employees in problem-solving and decision making process is strongly associated with QMP. The study Mehra and Ranganathan (2008) examined the association between QMP and customer satisfaction and reported positive and association. Many empirical studies have shown significant association between critical factors of quality with QMP (Rahman & Bullock, 2005; Sila, 2007). From all the above studies it is evident that QMP is significantly related with critical factors of quality and several organizational factors.

2.2. Critical Factors of QMP

The last two decade has witnessed the increased awareness and adaption of QMP across various sectors. As a management process it helps in achieving continuous improvement in all facets of the organization. In developing countries, like India where the knowledge of QMP is still in nascent stages (Bubshit, 2006). For successful implementation of QMP, it is necessary to identify the critical factors of QMP (Hietschold et al., 2014) to exploit the benefits of QMP. Therefore, a thorough review of the literature was carried out to identify the various critical factors of QMP considered by various researchers:

Juran (1994) argued that the success or failure of quality initiative depends on commitment by top management towards quality improvement. The study by Ahire and O'Shaughnessy (1998) claimed that employee training, level of continuous and intensive training effects on the quality management implementation.

The quality improvement programme devised by Crosby (1979) included commitment of top and intermediate management, evaluation of quality costs, taking corrective action, measurement of quality indicators, a philosophy of zero defects, training, setting of clear objectives and a scheme for employee recognition. The study conducted by Saraph et al. (1989) identified and validated Quality data and reporting, Product/ Service design, Training, Supplier quality management, Process management, Role of top management and quality policy, Employee relations and Role of the quality department to the critical factors of QMP. Feigenbaum (1991) stated that with implementation of quality processes the company would operate at high efficiency with minimal cost. The study by Flynn et al. (1994) identified the critical factors of QMP that are to be used at operational level. The factors are: top management support, process management, quality information, product design, supplier involvement, workforce management and customer involvement.

The survey instrument designed by Black and Porter (1996) consisted of ten critical factors of QPM and it was devised based on Baldrige Award Model. The study conducted by Rahman and Bullock (2005) aimed at identifying the soft and hard quality factors its association with organizational performance. The survey conducted in Small and Medium Enterprises (SMEs) by Lewis et al. (2006) identified and ranked the twelve factors of QMP. The factors are: quality data and reporting, customer satisfaction, human resources utilization, management of process quality, training and education, management commitment, continuous improvement, leadership, strategic quality planning, performance measurement, customer focus, and contact with suppliers and professional associates.

The study by Sila (2007) revealed that Leadership, Strategic planning, Customer focus, Information and analysis, Human resource management, Process management

and Supplier management dimensions are positively associated with QMP. Another study by Fellows and Liu (2008) revealed that QMP is associated with some interrelated factors like top management, training and development, customer focus, knowledge and information management, process management, supplier quality, benchmarking, information management etc.

The survey based study by Koh and Low (2010) investigated the level of QMP implementation and the quality practices used in construction industries. The quality practices used were top management leadership, people management, customer management, supplier management, process management, organizational learning, quality information management and continual improvement.

The study by Kumar et al. (2011) in manufacturing and service industries of North India revealed seven critical factors of quality but ranked and implemented differently in both the industries. The factors were: top management commitment, continuous improvement, customer satisfaction, teamwork, feedback, employee training and effective communication. Another study by Mellat et al. (2011) in oil and gas industry in Iran revealed that management involvement, employee development and training, and worker involvement are major factors in illuminating the inconsistency in operational performance.

Gherbal et al. (2012) conducted the study in Libyan Construction Industry to identify the key factors of quality. The factors were: organization management, communication to improve quality, training and development, culture and employee involvement & recognition. Muturi et al. (2013) investigated the level of QMP implementation by considering the following factors: Continuous support, Customer focus, Employee participation, Employee training, Information and analysis, Organization for quality, Supplier quality management, Quality system improvement, Statistical quality technique and Top management support.

The study conducted by Sawalim (2014) revealed that there was a constructive significant association among quality practices and project performance in oil and gas-related projects. The study by Yazdani et al. (2014) argued that leadership, strategic planning and customer focus to be the critical factors that the practitioners need to focus more to solve quality related issues in the Oil and Gas industry.

The research by Dubey and Kumar (2017) used Top Management Skill, Technology factor, Consumer factor, Teamwork, Communication factor, Competitive Advantage, Economic factor, Market Orientation, Government Policy and Financial factor to quantify the level of QMP implementation in Indian SMEs.

The study by Panuwatwanich and Nguyen (2018) evaluated internal quality of the firm based on following eight quality constructs namely: top management support for quality management; training on quality; product/service design, quality data and reporting, process management, continuous improvement, problem-solving and rewards. Many other researchers (Ahire et al. (1996); Dow et al. (1999); Everett (1994); Powell (1995); Samson and Terziovski (1999); Dimitriades (2000); Khwaja et al. (2020); Curkovic et al. (2000); Allen and Kilmann (2001); Sila and Ebrahimpour (2002); Kumar et al. (2009); Talib et al. (2011); Elhuni and Ahmad (2012); Bani Ismail (2012); Valmohammadi (2011); Al-Otaibi et al. (2015); Aquilani et al. (2016); Mehralian et al. (2016)) have worked on identifying the critical factors of QMP in different cultural contexts. The outcomes of these studies are varied with respect to the type and number of quality factors considered but with common results (Aletaiby, 2018). The table 1 below will emphasize on QMP factors that have been considered by different researchers across the globe.

Table 1. Summary of QMP Factors Considered By Researchers

References	QMP Factors Considered
Saraph et al. (1989)	Management leadership, Training, Product/service design, Process management, Role of the Quality Department, Supplier quality management, Employee relations, Quality data and reporting
Kessler (1993)	Leadership, Teamwork, scientific approach to problem-solving, customers focus
Anderson et al. (1995)	Visionary leadership, Continuous improvement, Employee fulfillment, Learning Process management, Internal and external cooperation Customer satisfaction
Mohrman et al. (1995)	Statistical control methods, Quality improvement teams, Customer satisfaction monitoring, Work simplification, customers satisfaction, Self-inspection, Process reengineering, Production-oriented practices, Work cells or manufacturing cells, Just-in-time deliveries, Cost-of-quality monitoring, Quality councils, Cross-functional planning, Collaboration with suppliers in quality efforts
Flynn et al. (1995)	Top management support, Process control Feedback, Product design, Supplier involvement, Quality improvement rewards, Quality leadership, Workforce management, Process management, Selection for teamwork potential, Teamwork, Quality information, Customer involvement
Ahire et al. (1996)	Top management commitment, Employee empowerment, Internal quality information usage, Supplier performance, Supplier quality management, Customer focus, Benchmarking, Design quality management, Statistical process control usage, Employee training, Employee involvement
Black and Porter (1996)	Corporate quality culture, Strategic quality management, People and customer management, Teamwork structures, Operational quality planning, Communication of improvement information, Quality improvement measurement systems, External interface management, Supplier partnerships, Customer satisfaction orientation
Samson and Terziovski (1999)	Leadership, Customer focus, Use of just-in-time principles, Personnel training, Use of teams, Use of benchmarking, Workforce commitment, Cooperative supplier relations, Use of advanced manufacturing systems, Shared vision
Rasheed & Khalifa (2009)	Top management, education & training, work environment, quality culture, involvement of employee and teamwork
Wilson and Collier (2000)	Leadership, Strategic Planning, Information & Analysis, HRM, Process Management
Ho et al. (2001)	Quality Data and Reporting, Employee Relations and Training and Supplier Quality Management
Parast et al. (2011)	Top management support, Customer orientation Benchmarking, Product/process design, Employee involvement, Quality information availability, Strategic quality planning, Quality information usage, Employee training, Supplier quality, Quality citizenship
Al-Ani and Adhmawi (2011)	Incoming-Material Control, New Design Control, Special Product Studies and Product Control
Singh et al. (2012)	Benchmarking, Quality Costing, Quality Function Deployment
Goicoechea and Fenollera (2012)	Project Management, Quality Standards, Quality Tools
Faisal et al. (2012)	Leadership, Human Resources, Customer Focus, Training And Education, Process management
Jaafreh and Al-abedallat (2012)	Customer focus and organization performance, Strategic planning, Process management, Supplier quality
Siddiqui et al. (2012)	Employee empowerment, Top Management, Teamwork, customer focus, quality control

Table 1. Summary of QMP Factors Considered By Researchers (continued

References	*QMP Factors Considered*
Essays, UK. (November 2013)	Top Management Commitment, Product Design, Process Management, Benchmarking & Measurement, Vendor Quality Management, Empowerment & employees training and Customer Involvement
Ahmad and Elhuni (2014)	Top management commitment and leadership, Training and education and reward, Employee participate, Vision and quality policy, Supplier management, Process control, Continuous improvement, Customer focus, Information technology, Cost of quality and Culture
Sadikoglu and Zahir (2014)	Leadership, Supplier Quality Management, Knowledge & Process Management, Training and Customer Focus
Jain and Samrat (2015)	Top management, Quality assurance, Production planning
Putri et al. (2016)	Management Responsibility, Resource-People and Supplier Management, Customer focus
Dey (2016)	Leadership vision

The worldwide recognized quality models and awards such as Deming prize model, Malcolm Baldrige National Quality Award, EFQMA and others will set a base line from which all the QMP factors are derived and implemented. From the review of literature, it can be concluded that QMP is a multi-dimensional approach, since it is a combination of various factors that are used to measure and improve quality levels. The following QMP factors for the present study have been identified based on the frequency in which they appear in various studies carried out by researchers and supported by quality pioneers through empirical studies and case-based studies. The QMP factors are: Top management commitment, Employee Involvement, Team Work, Training and Development, Customer Focus, Process Management and Supplier Quality Management.

3. Research Objectives

The objectives of the present study are:

- To identify and validate the QMP factors for oil and gas industry.
- To explore the status to QMP implementation in oil and gas industry.
- To identify the relationship between QMP and Demographic attributes.

4. Methodology

The methodology used for the research is survey based using a structured questionnaire. Using the survey instruments the responses were collected from employees of oil and gas industry. A total of 340 questionnaires were distributed and 41 questionnaires were rejected as they were incomplete and this resulted in 299 useable questionnaire for further analysis. The collected data was analyzed using Structural Equation Modeling (SEM) using SPSS software and chi-square test was performed to analyze the relationship between demographic attributes.

5. Design of Questionnaire

The questionnaire was designed both in Kannada and in English language using Five-point Likert scale with "1" being "strongly disagree" and "5" being "strongly agree". The questionnaire had two sections namely:

- Demographic Information of firm and employees
- 7 Factors of QMP consisting of 60 items.

6. Analysis and Results

6.1. Status of QMP

The level of QMP implementation in firm was determined based on summative scores

of responses collected. The QMP score for each respondent was determined by taking the mean of all responses for seven QMP factors consisting of 60 items. Further, the grand mean was calculated by taking the average of all the responses and this grand mean was considered to be the cut-off value for determining the level of QMP implementation. Those scoring which are greater than grand mean were categorized has implemented and otherwise not implemented. For the present study the grand mean was found to be 4.12. According to Jerome (2013); Anand (2013) and Nanjundeswaraswamy and Swamy (2015) the grand mean was considered as a cut-off score for the Likert scale. The Table 2 show the level of QMP implementation in oil and gas industry.

Table 2. Status of QMP in oil and gas Sector

Level of QMP Implementation	No of Respondent	% of Respondent
Implemented	155	51.8
Not Implemented	144	48.2

Based on the responses it is evident from the above table: 2 that level of QMP implementation in oil and gas sector was 52%. This indicates that, there is a high scope for improving quality by effectively practicing and adapting to various critical factors of QMP.

6.2. Relationship between Level of QMP Implementation and Demographic Attributes

In any survey based studies it is important to consider the demography, since the quality practices and approaches are region and culture specific (Aletaiby, 2018).

The demographic characteristics of the firm and employees are analyzed using chi-square test. The five demographic attributes such as gender of employees, educational qualification of employees, nature of job, nature of activities and experience of employees are chosen to establish the significant differences with respect to QMP implementation. The Table 3 below indicate the relationship between level of QMP implementation and demographic attributes.

Table 3. Relationships between Level of QMP Implementation and Demographic Attributes

Demographic Characteristics		% of Respondents	QMP implementation		Cal Chi square	p Value	Sig
			Imp (%)	Not Imp (%)			
Gender of employees	Male	98.90	51	48	0.267	0.605	NS
	Female	1.10	1	0			
Employees educational qualification	SSLC	19.06	14.38	4.68	51.774	0.000	5%
	ITI	9.36	6.02	3.34			
	Diploma	50.84	16.39	34.45			
	Graduate	16.39	11.37	5.02			
	PG	4.35	3.68	0.67			
Nature of Job	Technical	42.81	32.44	10.37	51.386	0.000	5%
	Non Technical	57.19	19.40	37.79			
Nature of Activities	Maintenance	14.38	9.70	4.68	56.862	0.000	5%
	Operations	52.51	17.73	34.78			
	Production	11.37	9.36	2.01			
	Planning	10.70	9.70	1.00			
	Safety	11.04	5.35	5.69			
Employee Experience	1 to 5 years	77.93	40.80	37.12	0.781	0.677	NS
	6 to 15 years	15.72	7.36	8.36			
	> 15 years	6.35	3.68	2.68			

Based on the chi-square analysis, educational qualification of employees, nature of job and nature of activities are significantly associated (at 5%) while gender and experience had no association with QMP implementation. Traditionally, oil and gas industry is male–dominated due to the hazardous working conditions. Since safety is the main priority in such working conditions and workers are constantly exposed to hazardous chemicals and may develop occupational diseases. Hence woman employees are not recruited in large number.

6.3. Exploratory Factor Analysis (EFA)

Based on literature review and frequency of consideration following seven factors of QMP were considered for the study: Top management commitment, Employee Involvement, Team Work, Training and Development, Customer Focus, Process Management and Supplier Quality Management. The sampling adequacy test was performed and Kaiser-Meyer-Olkin (KMO) statistic was found to be 0.80 as shown in the Table 4.

Table 4. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.801
Bartlett's Test of Sphericity	Approx. Chi-Square	3447.184
	df	496
	Sig.	.000

The EFA was conducted using SPSS software to reduce the items using Principal Component Analysis (PCA) method with varimax rotation. This process resulted in seven factors with 32 items with loadings more than 0.58 and above. The reliability coefficient Cronbach's alpha value was 0.85. The Table below shows the item-wise factor loadings for 7 QMP factors with F11, F12, F13, F14, F15, F16 and F17 items representing top management commitment, F21, F22, F23 and F24 items representing factor 2, F31, F32, F33 and F34 items representing factor3, F41, F42, F43, F44 and F45 are items representing factor 4, F51, F52, F53 and F54 are items representing factor 5, F61, F62, F63 and F64 are items representing factor six and F71, F72, F73 and F74 are the items representing Factor7. The Table 5 present the item loadings for 7 QMP factors**.**

Table 5. Items Loading Using PCA with Varimax Rotation

		Rotated Component Matrix[a]						
Name of the Factor		**Component**						
		1	**2**	**3**	**4**	**5**	**6**	**7**
Top Management Commitment	F11	.732						
	F12	.703						
	F13	.699						
	F14	.666						
	F15	.661						
	F16	.637						
	F17	.586						
Employee Involvement	F21		.840					
	F22		.823					
	F23		.809					
	F24		.749					
Team Work	F31			.822				
	F32			.815				
	F33			.800				
	F34			.723				

Table 5. Items Loading Using PCA with Varimax Rotation (continued)

Name of the Factor	Rotated Component Matrix[a]							
	Component							
		1	2	3	4	5	6	7
Training & Development	F41				.743			
	F42				.726			
	F43				.717			
	F44				.708			
	F45				.613			
Customer Focus	F51					.790		
	F52					.788		
	F53					.753		
	F54					.731		
Process Management	F61						.837	
	F62						.789	
	F63						.736	
	F64						.679	
Supplier Quality Management	F71							.792
	F72							.729
	F73							.692
	F74							.593

From EFA, following 7 QMP factors were extracted namely: Top management commitment, Employee Involvement, Team Work, Training and Development, Customer Focus, Process Management and Supplier Quality Management. Further for the purpose of validation of these 7 QMP factors, confirmatory factor Analysis was performed.

6.4. Confirmatory Factor Analysis (CFA)

For the purpose of validating the results of EFA, CFA was done through Structural Equation Modeling (SEM) using Analysis of Moment Structures (AMOS) software. The seven factors QMP model was tested for validation through CFA which resulted in 5 QMP factors namely: Top Management commitment (TM), Employee Involvement (EI), Training and Development (T&D), Customer Focus (CF) and Supplier Quality Management (SQM). The first order 5 factor QMP measurement model revealed an adequate fit as shown in Figure 1. All the fit indices namely chi-square statistics was 246.158 with Cmin was 1.399 which is less than 3, GFI = 0.929, AGFI = 0.907, NFI = 0.902, IFI = 0.968, CFI = 0.967, TLI = 0.961 and RMSEA = 0.037 less than 0.08 revealed acceptable and good values indicating good model fit.

6.4.1. Convergent Validity

The convergent validity refers to the degree of variance shared between the items of same factor or constructs (Hair.et al., 2010). This is evaluated through item loadings, Average Variance Explained (AVE) and Composite Reliability (CR). The value of CR must be 0.7 and above and AVE equal to.7 or above (Hair et al., 2006, p.777) to confirm convergent validity. For the present study, all the five factors of QMP measurement model have AVE and CR value above the acceptable criterion and it is shown in the Table: 6 and item loadings are indicated in Table:7.

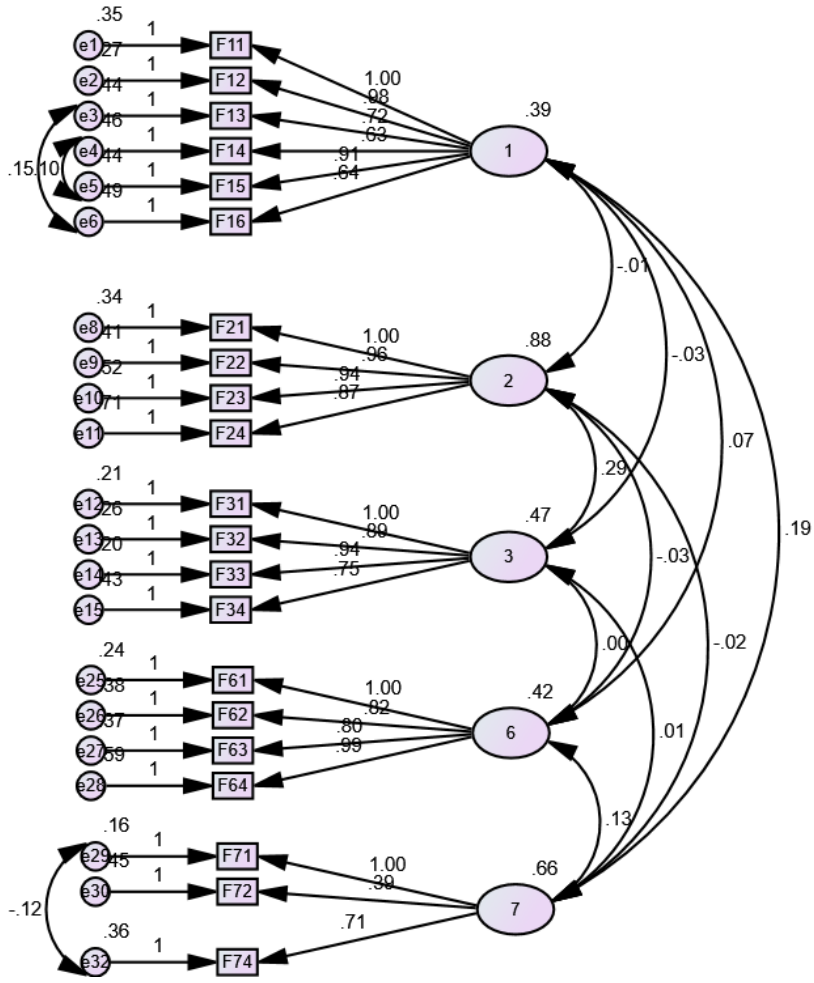

Figure 1. First order 5 factor QMP Measurement Model
Note: 1-TM, 2 – EI, 3 – T&D, 6 – CF, 7 – SQM

Table 6. Standardized Coefficient Estimates and R squared loadings of Measurement Model

Parameters	QMP FACTORS					Acceptable criterion range
	TM	EI	T&D	CF	SQM	
Factor loading or Standardized coefficient estimates	1.00 0.98 0.72 0.63 0.91 0.64	1.00 0.96 0.94 0.87	1.00 0.89 0.94 0.75	0.10 0.82 0.80 0.99	1.0 0.89 0.71	Greater than 0.30 shows convergent validity
R-squared value (Percentage of variation)	0.35 0.27 0.44 0.40 0.44 0.49	0.34 0.41 0.32 0.11	0.21 0.26 0.20 0.43	0.24 0.38 0.37 0.39	0.16 0.46 0.36	

Table 7. Convergent Validity of QMP Measurement Model

Proposed QMP factors	Composite Reliability (CR)	Average Variance Explained (AVE)
Top Management	0.87	0.83
Employee Involvement	0.83	0.81
Training & Development	0.82	0.80
Customer Focus	0.74	0.76
Supplier Quality Management	0.77	0.75

6.4.2. Discriminant Validity

The measure of discriminant validity is the distinctiveness of each and every item of the factors. If the square root of AVE) of the factor is greater than its correlation values then discriminant validity is satisfied (Sosik et al., 2009). The Table: 8 below indicate that square root of AVE values for all five factors are greater than its correlation value, thereby confirming discriminant validity.

Table 8. Discriminant Validity of QMP Measurement Model

	TMC	EI	T&D	CF	SQM
TMC	**0.91**				
EI	0.659	**0.90**			
T&D	0.464	0.492	**0.89**		
CF	0.437	0.468	0.374	**0.87**	
SQM	0.584	0.582	0.396	0.437	**0.86**

7.0 Discussion and Recommendation

The quality practices play a pivotal role in any kind of business environment for sustainable growth of firm. In the changing global context, organizations are under pressure to improve quality and QMP is the strategic quality tool to persistently improve it.

The purpose of this study was to analyze the level of QMP implementation and to identify and validate the QMP factors suitable for oil and gas industry. The level of QMP implementation in oil and gas industry was 51%. From the demographic analysis it was found that educational qualification, nature of activities and nature of job are significantly associated with QMP, while gender and work experience were not associated. The CFA resulted in five factors QMP measurement model with 31 items and the validated factors are: Top management commitment, Employee Involvement, Training and development, Customer focus and Supplier Quality Management. The QMP measurement model revealed good model fit with model fit indices all above acceptable range. The identification and validation of quality factors for the study are based on responses gathered from employees/managers of oil and gas sector. Further, the identified QMP model is in accordance with highest quality certification award such as the Malcolm Baldrige Award Criteria (2000); Shingo Prize (1988) and previous studies (Saraph et al., 1989; Flynn et al., 1994; Black and Porter, 1996; Ahire et al., 1996; Tamimi, 1998; Kumar et al., 2011). With the use of proposed QMP model, the authorities of the oil and gas industries can identify the areas of improvement and look up for opportunity of success (Ahmad & Elhuni, 2014). By saying these authors would also accept the fact that, QMP implementation methodology and level (Baidoun, 2003) varies based on importance assigned to the QMP factors. Further studies can look into the possible insertion of QMP factors for quality improvement and firm performance (Delgado-Hernandez & Aspinwall, 2005).

QMP is a business strategy for improving organizational competitiveness (Yazdani et al., 2013). It is well recognized and embraced in developed countries (Thiagarajan & Zairi, 1997/1998) than developing countries like India. Hence, there is a need for good number of empirical studies on QMP in developing countries. The present research attempts to develop a QMP model which is empirically tested. Further the research results have various managerial implications for oil and gas sector. Firstly, management should initiate the quality movement and educate the managers and workers on QMP and its benefits. Secondly, to survive and sustain in the changing business environment implementation of QMP can create organizations can create opportunities by effective.

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Appendix

Table 9. Proposed QMP components with Weights

Sl. No.	Proposed Component	Items	Weights
1	Top management commitment	Management is continuously involved in the quality management process.	.732
		Quality improvement tools and techniques are widely used.	.703
		Management allocates sufficient funds for quality management.	.699
		Management treats quality as being more important than cost.	.666
		Management puts in continuous efforts in enhancing the quality of product.	.661
		There is a quality improvement coordinating body.	.637
2	Employee involvement	Employee's contributions are well recognized.	.840
		Employees are encouraged to do improvement work.	.823
		Teamwork and involvement are normal practices.	.809
		Employees are involved in decision making and problem-solving activities.	.749
3	Training and Development	Periodic training is imparted to enhance the employee skills.	.822
		Training on quality is considered as essential factor for the organization.	.815
		Employees are trained on various quality tools and techniques.	.800
		Employees are given information and training to do the job effectively.	.723
4	Customer focus	Level of Customer satisfaction are measured and assessed periodically.	.743
		Customer's feedbacks are considered for quality improvement activities.	.726
		Employees are aware about which attributes of the products will customer value the most.	.717
		Quality activities are driven more on Customer satisfaction than on cost reduction.	.708
5	Supplier Quality Management	Company regularly conducts supplier's quality audits.	.790
		Suppliers are selected on the basis of quality aspects.	.788
		Organizations' quality standards are regularly updated to the supplier.	.753