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A Framework for Successful TQM Implementation and Its Effect on the Organizational Sustainability Development

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***Abstract*—**The main purpose of this research is to construct a generic model for successful implementation of Total Quality Management (TQM) in Oil sector, and to find out the effects of this model on the organizational sustainability development (OSD) performance of Libyan oil and gas companies using the structured equation modeling (SEM) approach. The research approach covers both quantitative and qualitative methods. A questionnaire was developed in order to identify the quality factors that are seen by Libyan oil and gas companies to be critical to the success of TQM implementation. Hypotheses were developed to evaluate the impact of TQM implementation on O SD. Data analysis reveals that there is a significant positive effect of the TQM implementation on OSD. 24 quality factors are found to be critical and absolutely essential for successful TQM implementation. The results generated a structure of the TQMSD implementation framework based on the four major road map constructs (Top management commitment, employee involvement and participation, customer-driven processes, and continuous improvement culture).

***Keywords*—**TQM, CQFs, Oil & Gas, OSD, Libya.

I. Introduction

IN a global market, knowing how the best organizations conduct their business is a critical element of successful competition. The international paradigms of management that cross national boundaries, the new information revolution, the introduction of new technologies, and the shift towards sustainability strategies have made competition stronger than ever. Organizations and governments can no longer perform their functions with bureaucratic rules, inadequate resource planning, or inefficient managerial approaches. They are challenged by the need for a better quality of products, services, improved performance standards, and greater responsiveness in order to be competitive in the global market.

In total quality management (TQM) implementation the literature illustrates that, as there are many successes as there are failures. The lack of clear implementation methods, the lack of empirically sound models to assist in effective quality management may have contributed to the number of failures. This lack is compound outside the developed economies by total lack of TQM knowledge in developing countries. It seems to be acknowledged limitations of the findings of some of the earlier studies in their applicability across national boundaries. Therefore, the findings of such systematic studies will generate a new way of thinking concerning total quality management and its relation to OSD in the various culture contexts. Consequently, this research will address a major gap in the literature by empirically investigating TQM implementation in a developing country; namely Libya.

What are TQM practices really going on in Libyan organizations? A comprehensive review of literature indicated that the research on Libya's TQM domain, however, has not attracted much attention. As a result, couple research has been conducted in construction and manufacturing field [1]. In recent years, Libya has focused on improving its industry in general and the oil industry in particular. Reference [1] has presented a comprehensive research work in relation to TQM within the cement industry in Libya. However, no research has been conducted in Oil and Gas Sector dealing with TQM practices and their effects on OSD oil and gas sector.

II. Literature Review

In development of quality activities organizations have focusing on sustainability as mean of organizational development in terms of organizations strategy [2]-[4]. To achieve sustainability, organizations must change their business models and undergo a process of unprecedented organizational change, prioritizing social responsibility and business ethics [5]. Sustainability policy management is a challenge for organizations must create a framework to integrate social and environmental issues with economic performance. "Reference [6] considers that sustainable development is essential to achieve and maintain the economic success and commercial advantage through increasing organization reputation among stakeholders''. To face the social and environmental challenges, organizations should undertake a cultural change and sustainable structural transformation [7]-[9]. Organizations must implement a culture of sustainability if they plan to implement organizational change that ensures business sustainability [10]. TQM has been driven way of intervention to operate change in a company.

The literature review has revealed various frameworks proposed by researchers, experts, national/international award agencies. These frameworks are developed based on quality factors (QFs). These QFs cited in the literature are not formulated on the basis of empirical research. Various QFs are identified by various writers based on their own experiences in

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working as consultants, managers or researchers. The first published paper to address the determination of the critical quality factors of TQM was in 1989, [11]. The results of their study empirically reinforced the emphasis on the top management's role and behavior and quality policy in the efforts of quality management. Another result of this study is that organization-wide sharing of responsibility is more conducive to quality management implementation than a centralized approach.

A study by [12] identified ten critical factors for successful TQM implementation in small and medium-scale enterprises (SMEs), based on an extensive review of the literature. They identified several hypothetical factors: management leadership, measurement and feedback, system and processes, resources, work environment and culture, human resources development, continuous improvement system, supplier quality management, and improvement tools and techniques. The study revealed the absence of conformance practice in some quality factors: continuous improvement system, supplier quality assurance, and improvement tools and technique.

Another study by [13], based on 370 Greek companies from all sectors, showed that both aspects of TQM – the "soft" and the "hard" side – play a significant role in gaining benefits from the quality management system, both inside and outside the business environment. However, it becomes evident that "soft" TQM elements play a major role, while the role of quality management tools is inferior, yet not insignificant.

The result of their study regarding the more significant role of "soft" TQM elements compared to "hard" TQM elements, indicated that the functioning of a company's quality management system depends, to a significant degree, on the use of quality management models such as ISO, EFQM, MBNQA and the level of adoption of three quality management principles (continuous improvement, management by facts and participation of everybody). Moreover, in the study conducted by [14], a small rate of companies considered quality tools as the most important element in a TQM system, contrary to top management commitment and customer orientation.

Many other researchers have also investigated the critical success factors of implementing TQM [15]-[27], [35]. The common conclusions from these studies are that each organization has a set of critical success factors to which it must pay attention, and that the implementation process is firm-specific [28], [32]. Successful implementation of TQM has been hindered by a lack of clear implementation guidance, particularly for organizations in regions where traditional business practices are often very different from those in which TQM evolved and is widely followed. While TQM ideas are not new in developed nations, there is little literature and empirical studies available on TQM implementation in developing countries. However, a review of the current literature on TQM practices indicated that much have been written about TQM implementation in manufacturing and service companies, but little attention has been paid to their implementation in the oil and gas industry. In the same time, there is a lack of literature regarding the effect of TQM implementation on SD of oil and gas.

III. The Study

Based on this literature review of the quality factors, 42 factors were derived to construct the questionnaire of this study. The questionnaire survey targeting the oil and gas organizations aims at identifying the perception of these organizations of each of the 42 quality factors as to its level of criticality in successful implementation of TQM.

A. Sample Selection

This study has focused on the most important sector of Libyan industry. Oil and gas sector constitutes an important and influential part of the entire Libyan industrial economy. The reason for this selection, that these companies have at least adopted ISO 9001, which is shared with their international counterparts.

B. Model and Hypotheses

The conceptual model of the current study is drawn from two streams of research, i.e. TQM literature and SD performance literature. To study the relationship of TQM and SD, Fig. 1 illustrates the conceptual model with the hypothesized relationships between the constructs. These relationships deal with two sets of hypotheses:

1. Hypotheses between TQM Implementation and SD Dimensions

Hypothesis HT1: TQM implementation has a positive effect on economic.

Hypothesis HT2: TQM implementation has a positive effect on social.

Hypothesis HT3: TQM implementation has a positive effect on environmental.

2. Hypotheses among SD Dimensions

Hypothesis HS1: economic has a positive effect on social.

Hypothesis HS2: economic has a positive effect on environmental.

Hypothesis HS3: social has a positive effect on environmental.

IV. Model Formulation

Based on the above six hypotheses, a theoretical model of TQM implementation and OSD was developed, and is displayed in Fig. 1. The links between TQM implementation, economic, environmental, and social are incorporated in one single model. In these three hypotheses, TQM implementation is an independent variable economic, environmental, and social are dependent variables. The relationships between the independent variable (TQM implementation) and dependent variables are examined. To the best of the author's knowledge, no researchers have empirically examined the relationships between TQM implementation and economic, environmental, and social (triple bottom line) in a single model.

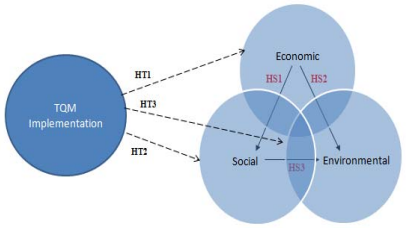

Fig. 1 Theoretical model for the effects of TQM on sustainability development performance

A. The Construction of the Questionnaire and Its Appropriateness to the Study

The design of the research questionnaire was highly dependent on the concepts of theoretical constructs and the operationalization of the theoretical constructs. The major issue of designing the questionnaire was to determine measurement questions, which respondents would be asked to answer. The questionnaire developed in this study consisted of three parts. The first part of the questionnaire (8 questions) was intended to determine fundamental issues, business information; such as the number of years a respondent is involved in quality management, the position of the respondent in the company, size of the organisation, business category, organisation ownership, and whether the company had implemented TQM. The second part consists of 42 items or statements, which were extracted from the published literature of leading TQM practitioners and academics in order to enable the participants to evaluate and measure the implementation of quality initiatives in their organizations. TQM items in the second part questionnaire were measured with a four-point Likert scale (Critical, Important, Minor importance, and don't know). The third part consists of 19 items for measuring the level of respondent's company SD based on the concepts of the three dimensions: economic, social, and environmental. In the third part of the questionnaire, scale ranging were from very low (1) to very high (5) to ensure consistency and the ease of data computation. This scale was also pre-tested several times by academics, consultants, who were well known to the researcher and it was found to be valid on the basis of our study. It was requested that the questionnaire needed to be completed by production manager or any manager in charge of quality management as in [11].

B. Analysis Results

1. Response Rate

42 out of 45 questionnaires were returned sufficiently completed, with a response rate of approximately 93.33%, which is considered large enough to establish a representation and credible data for analysis. The questionnaire with a covering letter was directed to individuals who were considered quality-related managers from the Libyan oil and gas sector as they are in a position to answer the questions and to indicate how they perceive each of quality factors, as to their level of importance to the successful implementation of TQM, and to study the effects of TQM implementation on overall business performance.

2. Profile of the Respondents

Table I presents the demographic profile of the respondents. The survey represented various types of organisations working in oil and gas sectors.

TABLE I
DEMOGRAPHICS OF RESPONDENTS OF THE SURVEY

	No. of respondents	% of respondents
Business Category		
Upstream operation	12	28.57
Oil & Gas production	7	16.67
Refinery & Petrochemical	2	4.76
Service	10	23.81
Consultancy	11	26.19
Year of experience		
Less than a year	12	28.57
1 to < 5 years	26	61.90
>5 years	4	9.52
Number of Employee		
Less than 50	10	23.81
Less than 250	18	42.86
More than 500	14	33.33
Position		
Quality Engineer	18	42.86
Quality manager	8	19.05
Consultant	8	19.05
Technical Engineer	5	11.90
Deputy general Manager	2	4.76
General Manager	1	2.38
Principle Ownership		
Public	18	42.86
private	14	33.33
Sharing	10	23.81
Techniques		
ISO 9001:2000	30	71.43
ISO 14000	8	19.04
TQM	none	0
Other	4	9.53

3. Construct Operationalization

First, it is necessary to operationalize these theoretical constructs so that empirical investigation was possible, in order to empirically test the theoretical model hypothesized in this study (Fig. 1). Therefore, a set of items for measuring the constructs of TQM implementation, economic, social, and environmental SD dimensions had to be adequately developed. Items should be chosen or developed in a careful manner to tap as comprehensively as possible the conceptual domain of the theoretical constructs. The following subsections present how to operationalize these constructs.

C. TQM Implementation

The literature reveals that some studies have been conducted for empirically validated scales of TQM implementation. These studies differ in terms of constructs and measurement items, each instrument having its own strengths and weaknesses. In this study a new set of items for measuring these constructs for Libyan oil and gas companies

developed based on an in-depth review of literature. 42 quality items for measuring the 11 factors of TQM implementation (see Table II). A widely used 4-Likert scale (Critical, Important, Minor importance, and don't know) was employed to enable respondents to have an increased range of choice.

TABLE II
OPERATIONALIZATION OF TQM IMPLEMENTATION CONSTRUCTS

Quality constructs	No. of Items
1.Top management commitment & leadership	2
2. Vision and Quality Policy	4
3.Employee Participate	8
4. Customer Focus	2
5. Training & Education & Reward	3
6. supplier Management	3
7. Continues Improvement	10
8. Process Control	4
9. Cost of Quality	1
10. Information Technology	1
11. Culture	4

D.Organizational SD

In Table III 19 items have been identified based on Global Reporting Initiative (GRI)to measuring triple bottom line sustainability indicators. In part three of questionnaire, respondents were asked to rate the level of their companies performance in regarding to these 19 items. Theses sustainability indicators were identified to be answered based on Comparing their indicators to other companies in same sector (if external data are available); otherwise based on their own data over the past several years. The scale rate used in this questionnaire part 5 likertscale of company's performance which are: 1 (very low), 2 (low), 3 (Average), 4 (high), 5 (very high).

TABLE III
OPERATIONALIZATION OF ORGANIZATIONAL SUSTAINABILITY DEVELOPMENT

No.	Sustainability Indicators	No. of Items
1.	Economic Dimension of Sustainability	**7**
2.	Social Dimension of Sustainability	**7**
3.	Environmental Dimension of sustainability	**5**

E. Questionnaire Reliability

Cronbach's alpha scores were computed for each construct (TQM factors, economic factors, social factors, environmental) to measure the internal consistency and to indicate how different items can reliably measure the construct. Reference [34] pointed out that a reliability coefficient of around 0.90 can be considered "excellent", values of around 0.80 as "very good," and values of around 0.70 as "adequate", depending on the questions.

Data were entered into a computer, the SPSS 17 reliability program was performed separately for the all practices. An internal consistency analysis was performed on the set of 61 items. Table IV lists Cronbach's alpha for different TQM implementation and sustainability factors. This indicated that the reliability of multi-item scales corresponding to them ranged between 0.792 and 0.912. Generally, a reliability coefficient of 0.70 or more is considered to be good [29]. The instrument developed for measuring TQM implementation using CSFs and sustainability was considered to be reliable.

TABLE IV
INTERNAL CONSISTENCY ANALYSIS

Factors	No. of items	Cronbach's alpha
TQM		
Top management commitment	2	0.898
Vision and Quality Policy	4	0.827
Employee Participate	8	0.912
Customer Focus	2	0.881
Training & Education & Reward	3	0.875
Supplier Management	3	0.902
Continues Improvement	10	0.891
Process Control	4	0.863
Cost of Quality	1	0.893
Information Technology	1	0.888
Culture	4	0.896
Sustainability		
Economic	7	0.834
Social	7	0.828
Environmental	5	0.792

F. Item Analysis

Table V lists the correlation matrix for the 11 constructs of the TQM implementation (constructs1-11) and their measurement items. This table shows that all values of item to scale correlations were greater than 0.50.

TABLE V
ITEM TO SCALE CORRELATION MATRIX (PEARSON CORRELATION)

	Item number									
Factors	1	2	3	4	5	6	7	8	9	10
1	0.7	0.8	--	--	--	--	--	--	--	--
2	0.7	0.7	0.8	0.7	--	--	--	--	--	--
3	0.8	0.8	0.5	0.8	0.8	0.5	0.7	0.7	--	--
4	0.7	0.7	--	--	--	--	--	--	--	--
5	0.7	0.6	0.7	--	--	--	--	--	--	--
6	0.6	0.6	0.6	--	--	--	--	--	--	--
7	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7	0.6
8	0.7	0.7	0.8	0.6	--	--	--	--	--	--
9	0.7	--	--	--	--	--	--	--	--	--
10	0.8	--	--	--	--	--	--	--	--	--
11	0.8	0.7	0.8	0.8	--	--	--	--	--	--

From the above table, it's obvious that all items had relatively high correlations with the factors to which they were originally assigned, compared with all the other factors. Therefore, it was concluded that all items had been appropriately assigned to factors.

1. Organizational Sustainability Instrument

For testing and validating the three dimensions of organisational SD, internal consistency analysis, item analysis, and exploratory factor analysis had been conducted. The detailed analysis results are listed in Tables VI, and VII, respectively.

TABLE VI
RELIABILITY ANALYSIS AND ITEM ANALYSIS

Dimensions	items	Item-total correlation						
		It. 1	It. 2	It. 3	It. 4	It. 5	It. 6	It. 7
Economic	7	0.87	0.86	0.84	0.79	0.77	0.85	0.81
Social	7	0.85	0.83	0.83	0.81	0.79	0.76	0.81
Environmental	5	0.71	0.75	0.84	0.78	0.79	--	--

TABLE VII
UN-ROTATED EXPLORATORY FACTOR ANALYSIS

Dimensions	EV	Factor loadings							% of var.
		It. 1	It. 2	It. 3	It. 4	It. 5	It. 6	It. 7	
Economic	4.01	0.83	0.85	0.77	.082	0.88	0.84	0.79	72.45
Social	2.00	0.87	0.859	0.886	0.872	0.77	0.81	0.79	71.35
Envir.	1.16	0.73	0.69	0.70	0.61	0.49	--	--	43.76

Notes: EV means Eigenvalue and Eigenvalues greater than 1 were used as criterion for factor extraction.

2. Result of Theoretical Model Test

In part three of questionnaire, for testing the theoretical model hypothesized in this study a structural equation modelling (SEM) was employed. The theoretical model hypothesized was to combine all of the 11 TQM implementation factors into one independent variable, which was used to test the relationships between TQM implementation and organisational SD.

IBM SPSS 17 was used in calculating the Pearson correlation matrix and checking normality of inputting data. The correlation matrix calculated served as the input matrix for SEM in estimating the hypothesized theoretical model. Table VIII lists the summary statistics of the four variables, and shows that the variables have a relatively normal distribution since the skewness and kurtosis do not exceed the absolute value of 1. Therefore, SEM can be used to estimate the theoretical model.

TABLE VIII
SUMMARY STATISTICS FOR THE FOUR VARIABLES

variables	Mean	S.D	Skew	Kurt.	Min	Freq	Max	Freq
TQM implementation	295.2	48.0	-0.45	-0.36	0.5	1	40	25
Economic	30.54	2.97	-0.22	0.15	5	1	25	30
Social	14.22	10.7	-0.46	-0.34	2	1	10	22
Environmental	10.12	5.86	-0.55	-0.66	8	1	35	15

3. Testing the Measurement Models

A confirmatory factor analysis (CFA) using IBM SPSS version 17 package was used to test the theoretical model. To evaluate the fit of CFAs, several goodness-of-fit indicators were used to assess the model's goodness of fit including the ratio of x2 to degrees-of-freedom (df), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), non-normalized fit index (NNFI), comparative fit index (CFI) and standardized root mean square residual (SRMSR) (see Table IX). The theoretical model of TQM implementation and organisational SD incorporates six hypotheses that will be tested simultaneously. A hypothesis is confirmed if the estimated path coefficient is significant. All the path coefficients are displayed in Table IX. All hypotheses were strongly confirmed by the empirical data since the t-values were greater than 2.326. Table IX also lists the overall goodness-of-fit statistics.

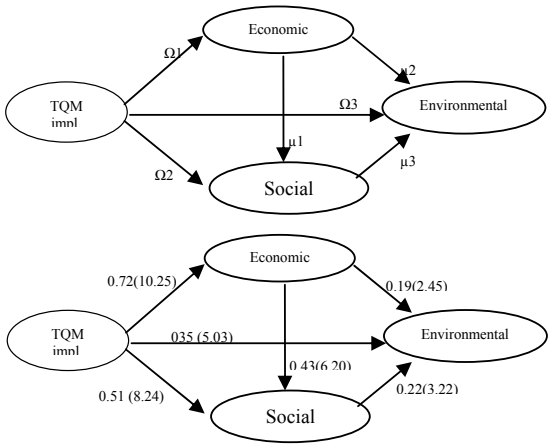

Fig. 2 Test the theoretical model for the effects of TQM on sustainability development performance

4. Structural Model Fit

IBM SPSS provides not only estimated coefficients but also standard errors and calculated t-values for each coefficient. A hypothesis is confirmed if the estimated path coefficient is significant and has the hypothesized sign. In this study, one-tailed significance levels are used since the hypotheses

formulate explicit predictions of the direction of the effect of one variable on another. A t-value larger than 1.282 corresponds to $p<0.10$ (weakly significant), a t-value larger than 1.645 to $p<0.05$ (moderately significant), and a t-value greater than 2.326 to $p<0.01$ (strongly significant) [36].

5. Overall Model Fit

In theoretical model testing, a major issue is how well the theoretical model fits the data. Many indicators are calculated by IBM SPSS 17, which can be used to evaluate the global model-fit. Five common measures for judging goodness-of-fit are the Chi-square (X2), the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the root mean square error of approximation (RMSEA), and the root mean square residual (RMR). These five measures are:

1. The likelihood-ratio Chi-square statistic (X2) is the most fundamental measure of overall fit in a SEM. A p-value larger than 0.05 is generally considered acceptable.
2. The goodness-of-fit index (GFI) is a non-statistical measure ranging in value from 0 (poor fit) to 1.0 (perfect fit), which measures the degree to which the actual input matrix is predicted by the estimated model. Higher values indicate a better fit [33].
3. The adjusted goodness-of-fit index (AGFI) differs from the GFI only in the fact that it adjusts for the number of degrees of freedom in the specified model. For both indices, a value larger than 0.90 is considered an acceptable, good fit [33].
4. The root mean square error of approximation (RMSEA) takes into account the error of approximation in the population. The RMSEA value is the difference per degree of freedom, and is measured in terms of the population, not just the sample used for estimation. It is commonly considered that values less than 0.05 indicate a good fit; values from 0.05 to 0.08 represent a fair fit; values ranging from 0.08 to 0.10 indicate a poor fit; and those greater than 0.10 indicate a very poor fit [30], [31].
5. The last one is the root mean square residual (RMR), which is the square root of the mean of the squared residuals, an average of the residuals between observed and estimated input matrices. RMR represents the average value across all standardized residuals, and ranges from 0 to 1.00. Reference [30] suggested that in a well-fitting model this value will be smaller than 0.05.

TABLE IX
MAXIMUM LIKELIHOOD ESTIMATES

Parameters	Coefficients	T-values
Ω1	0.72	10.25
Ω2	0.51	8.24
Ω3	0.35	5.03
μ1	0.43	6.20
μ2	0.19	2.45
μ3	0.22	3.22
Chi-square (χ2)	0.066	--
Degree of freedom (d.f)	1	--
P-value	0.67	--
Goodness-of-fit index (GFI)	1.0	0.98
Adjusted goodness-of-fit index (AGFI)	1.0	0.92
Root mean square error of approximation (RMSEA)	0	0.0064
Root mean square residual (RMR)	0.045	--

From the results of testing the model of TQM implementation and organisation SD, it can be concluded that TQM implementation has positive effects on economic, social, and environmental performance.

Result of theoretical Model test (structural equation modeling, SEM)

The four variables have a relatively normal distribution since the skewness and kurtosis do not exceed the absolute value of 1. Several findings obtained from testing the hypothesized model are:

1. TQM implementation has positive effects on economic, social, and environmental dimensions of organizational SD
2. Economic indicator has positive effects on both social indicator and environmental indicators
3. Social indicator has positive effects on environmental indicator.

V. FINDINGS

1. Stratification of Critical Quality Factors

From three levels of investigation, analysis results indicated 24 quality factors stratified into three levels of criticality based on statistical analysis (central tendency and dispersion) and further qualitative analysis as follows (*see appendix*)

Level I Critical Quality Factors

These factors are found to be fundamental and have to be addressed in the early stages of implementation process

Level II Critical Quality Factors

These factors are suggested to be addressed immediately after addressing the first level in the implementation framework

Level III Critical Quality Factors

These factors are which have lowest impact on the implementation process of TQM.

2. Development of a TQM Road Map

The CQFs identified through the three stages of the research are used to deploy the stages of implementation of the road map. These stages are:

1- Preliminary stage: foundation factors identified and

stratified into level 1
2- Early stages: implement TQM of level 1 and 2 CQFs
3- Advanced stage: consolidate TQM further improvement of level 2 and 3 of CQFs.

A. Road Map Constructs

Organisations wishing to adopt TQM need to take a stock of road map constructs (or options) in the form of critical factors, and the following four critical categories:
1- Top management commitment.
2- Employee involvement and participation.
3- Customer driven processes.
4- Continuous improvement culture.

These categories are developed from a careful reconstruction of prioritised critical factors into merged categories. Essentially, these road map constructs identify the wide elements that a company must adopt in its quality drive towards best practice and, ultimately, TQM and enhancing sustainability. A committed leadership is a vital requirement for top management commitment to TQM. Indeed, Top management commitment offers a `compass' for the quality road map, providing the company with a `spear head' for embarking on the journey towards TQM. Similarly, continuous improvement of the business processes of company is directly related to continuous customer satisfaction, but highly dependent on top management commitment, as well as the support and loyalty of middle management and shop floor. Company-wide support and involvement are necessary for any company that seeks to execute effectively its business process (see Fig. 3).

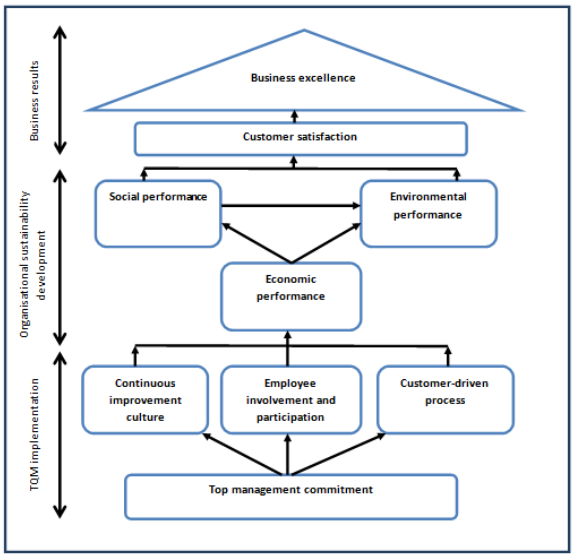

Fig. 3 Components of TQMSD implementation framework

The TQMSD framework suggests the inter-relationships of the road map constructs. The diagram shows that Top management involvement and support is a driving force with potentials for commanding employee involvement and participation, customer driven-processes, and adoption of continuous improvement. Then all these may affects OSD to meet customer satisfaction and finally reach business excellence.

B. Implementation Structure

Based on the road map construct, there is a need to design a framework of implementation. Fig. 4 shows a proposed structure of the TQM implementation and how the elements inter-connect with each other. On the top of the road map are the constructs for the implementation process, which include top management commitment, employee involvement and participation, customer-driven processes, and adoption of continuous improvement.

VI. Conclusions

The purpose of this research is to construct a generic model based on CQFs identified for successful implementation of Total Quality Management (TQM) in Oil sector. The novelty of it lies in investigating the effects of the TQM implementation on the OSD performance of oil companies. The finding from testing the theoretical hypothesized model reveals that there is a substantial positive effect of the TQM implementation on OSD dimensions. The findings confirm the significant relationship between TQM and OSD.

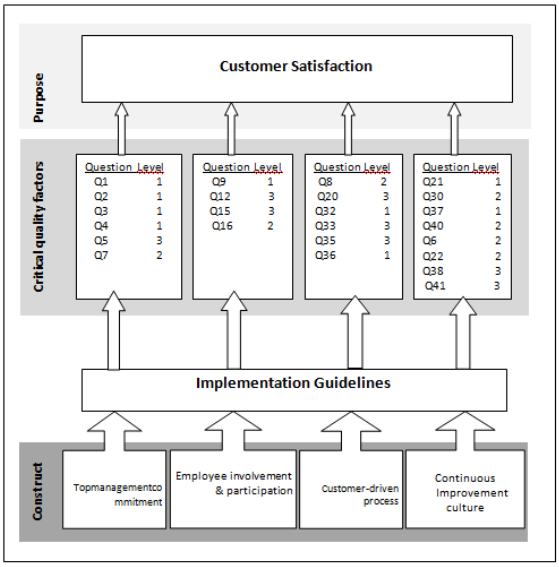

Fig. 4 Components of TQM implementation Road Map

The study identified 24 critical factors for the successful implementation of TQM in Libyan O&G sector through a combination of both quantitative and qualitative methods of the research. These CQFs were then divided into three levels of criticality concerning their perceived importance to the implementation process. From these components a road map was developed, presented, and discussed. The TQMSD framework is primarily based on the findings of quantitative and qualitative surveys conducted among the Libyan O&G companies, and systematic analysis, as well as integration

of the data collected. The core elements of this implementation road map are the CQFs in all. The road map is descriptive in nature, and does not present any fixed list of factors, as in the case of many prescriptive models. The road map reflects theoretical assumptions of quality gurus/academics, and each company is ultimately responsible for adapting the road map to its own goals, agenda and culture, as far as the implementation of the proposed framework is concerned. The proposed TQMSD framework has all the key TQM implementation concepts as its basis, and it is desirable that companies complement the guidelines by constantly considering the best implementation practices of other companies which have achieved success in implementing and sustaining TQM.

The framework is seen as useful for the initial stage of the first five years of adopting the road map. This is because, in a developing economy (such as Libya's), the adoption of new policies and programs takes a long time to mature and actualise. Moreover, such a framework contributes a lot to the Libyan context, particularly with the absence of any implementation framework and any national quality award model. Moreover, this study adds to the available literature an-empirical research that considers the TQM system as a whole.

APPENDIX: QUALITY FACTORS

Seq.	Q. No.	Level 1:Quality Factors (8 factors)
1	Q1	Senior executive assume active responsibility evaluation and improvement of management system, and leading quality drive.
2	Q2	Visibility of senior executive commitment to quality and customer satisfaction.
3	Q3	Clear, consistent communication of mission statement and objectives defining quality values expectations and focus.
4	Q4	Comprehensive policy development and effective deployment of goals.
5	Q9	The entire workforce understands, and is committed to the vision, values, and quality goals of the organization.
6	Q21	Problem-solving and continuous improvement processes based on facts and systematic analysis.
7	Q32	A formal documented quality management system in place.
8	Q36	The use of customer surveys and feedback process, and tracking of other key measures to asses' customer satisfaction.
9	Q37	The use of Information Technology (IT) considered as important tool in achieving strategic objective.
	Q. No.	**Level 2: Quality Factors (7 factors)**
10	Q6	Effective top-down and bottom-up communication.
11	Q7	Elements of quality management structure are in place to manage the organisation's quality journey.
12	Q8	The entire organization understands that each individual and each process has internal customer and suppliers.
13	Q16	Training for employee to improve interactive skills (such as communication skills, effective meeting skills, empowerment and leadership skills).
14	Q22	Application of total quality approach to the management of support services and business processes.
15	Q30	Cost of quality process to track rework, waste, rejects, and for continuous improvement.
16	Q40	We have a culture of continuous improvement.
	Q. No.	**Level 3: Quality Factors (8 factors)**
17	Q5	Top management push decision-making to the lowest practical level.
18	Q12	Supervisors, unit heads and divisional managers assume active roles as facilities of continuous improvement, coaches of new methods, mentors and leaders of empowered employees.
19	Q15	Training objectives of the organisation corresponded with the main objectives of the organisation.
20	Q20	Systematic review and analysis of key process measures that have a direct impact on value-addition to customer satisfaction.
21	Q33	Reliance on reasonable few dependable suppliers who are evaluated and selected based on their capability and commitment to product and service quality, and value for money.
22	Q35	Comprehensive identification of customers and customers' needs and alignment of processes of satisfy the needs.
23	Q38	Quality forms part of our organisation culture.
24	Q41	I look upon change as a challenge.

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