

An Empirical Study of TQM and its Effect on the Organizational Sustainability Development: A Successful Model for Implementation

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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 performance (OSDP) of Libyan oil and gas companies using the structured equation modeling (SEM) approach. To achieve this aim, the adopted research approach covers both quantitative and qualitative methods. Based on the literature search, eleven quality factors with 42 items were identified to develop a questionnaire 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. 42 out of 45 questionnaires were returned sufficiently completed with response rate 93.33%. Hypotheses were developed to evaluate the impact of TQM implementation on OSDP. The empirical analysis demonstrates several key findings: data analysis reveals that there is a significant positive effect of the TQM implementation on OSDP. The analysis indicated that 24 quality factors are found to be critical and absolutely essential for successful TQM implementation. Semi-structured interviews were also conducted to discover how these CQFs are experientially rated in specific organisational contexts. An in-depth case study analysis of two selected organisations provided understanding of the process of successful TQM implementation. The results generated a structure of the TQM implementation framework linked to OSDP based on the four major road map constructs (Top management commitment, employee involvement and participation, customer-driven processes, and continuous improvement culture). Libyan oil companies should consider TQM as an innovative tool for improving OSDP in today's dynamic industry environment. The findings suggest the notion that the TQM critical success factors (CSFs) should be implemented holistically rather than on a piecemeal basis to get the full potential of the TQM.

1. INTRODUCTION

In a global market, knowing how the best organizations conduct their business is a critical element of successful competition. The beginning of the third millennium witnessed significant changes in organizations strategy in terms of focusing on sustainability as a mean of organizational development [1] - [2]. 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. Organisations 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 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 OSDP 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.

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What are TQM practices really going on in Libyan organisations? 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 [3]. In recent years, Libya has focused on improving its industry in general and the oil industry in particular. [3] have 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 OSDP.

2. LITERATURE REVIEW

An extensive 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 working as consultants, managers or researchers. The first published paper to address the determination of the critical quality factors of TQM was in 1989, [4]. The results of their study empirically reinforced the emphasis on the top management's role and behaviour and quality policy in the efforts of quality management. Another result of this study is that organisation-wide sharing of responsibility is more conducive to quality management implementation than a centralised approach.

A study by [5] 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 conducted by [6]. The study had presented the results of a study on Critical Success Factors for Total Quality Management (TQM) implementation in UK organisations. A survey instrument (10 Success Factors) developed by Yusof and Aspinwall for use in the automotive sector was used after some modification. The findings have supported Yusof study and validated the instrument as a reliable tool. The results indicated that the Manufacturing sector in UK is embarked towards quality excellence. Suggestions were made to replicate the study in some developing countries.

[7] study, 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).

Many other researchers have also investigated the critical success factors of implementing TQM [8]-[9]-[10]-[11]-[12]-[13]-[14]-[15]-[16]-[17]-[18]-[19]-[20].

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 [21]. Successful implementation of TQM has been hindered by a lack of clear implementation guidance, particularly for organisations 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. To date no empirical study has been done on the nature and scope of TQM implementation in the oil and gas industry in developing countries. In the same time, there is a lack of literature regarding the effect of TQM implementation on SD of oil and gas.

3. THE STUDY

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

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 thesecond 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 [22].

3.1. 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.

3.2. MODEL AND HYPOTHESES

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

3.2.1. 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.

3.2.2. 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.

4. MODEL FORMULATION

Based on the above six hypotheses, a theoretical model of TQM implementation and SD was developed, and is displayed in Figure 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.

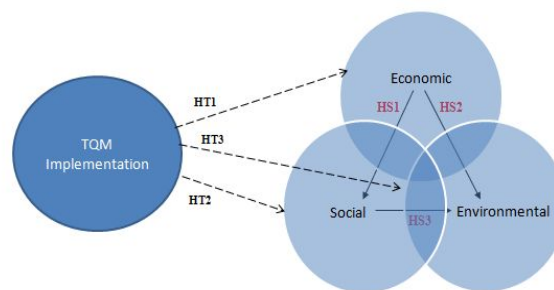


Figure 1. Theoretical Model of TQM Implementation and sustainability development dimensions.

5. ANALYSIS RESULTS

5.1. RESPONSE RATE

42 out of 45 questionnaires were returned sufficiently completed, with a response rate of approximately 93.33%. 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.

5.2. CONSTRUCT OPERATIONALISATION

First, it is necessary to operationalise these theoretical constructs so that empirical investigation was possible, in order to empirically test the theoretical model hypothesized in this study. Therefore, a set of items for measuring the constructs of TQM implementation, economic, social, and environmental SD dimensions had to be adequately developed. The following subsections present how to operationalise these constructs.

5.2.1. TQM IMPLEMENTATION

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 1). A widely used 3-Likert scale (Critical, Important, and Minor importance) was employed to enable respondents to have an increased range of choice.

Table 1. Operationalization of TQM Implementation factors.

Quality Factor	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

5.2.2. ORGANISATIONAL SUSTAINABILITY DEVELOPMENT

In table (2) 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. The scale rate used in this questionnaire part 5 likert scale of company's performance which are: 1 (very low), 2 (low), 3 (Average), 4 (high), 5 (very high).

Table 2. Operationalization of Organisational sustainability development.

Sustainability Dimensions Indicators			
No.	Economic	Social	Environmental
1	Net profits	Workforce engagement	Oil spills
2	Revenue growth	Workforce training and development	Waste reduction
3	Return on assets	injury frequency rate	Greenhouse gas emissions
4	Profit to revenue ratio	Diversity and inclusion.	Flaring gas
5	Cost reduction	Preventing corruption	Fresh water
6	Adherence to production plan %	Social investment	
7	Improving delivery performance	Local procurement and supplier development	

5.3. 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. The reliability of multi-item scales corresponding to them ranged between 0.792 and 0.912. The instrument developed for measuring TQM implementation using CSFs and sustainability was considered to be reliable.

5.4. ITEM ANALYSIS

Table (3) lists the correlation matrix for the 11 factors of the TQM implementation (factors1-11) and their measurement items. This table shows that all values of item to scale correlations were greater than 0.50.

Table 3. Item t Scale Correlation Matrix (Pearson Correlation).

Factors	Item number									
	1	2	3	4	5	6	7	8	9	10
1	0.784	0.810	--	--	--	--	--	--	--	--
2	0.741	0.787	0.814	0.703	--	--	--	--	--	--
3	0.844	0.861	0.585	0.860	0.859	0.865	0.741	0.799	--	--
4	0.740	0.745	--	--	--	--	--	--	--	--
5	0.725	0.678	0.738	--	--	--	--	--	--	--
6	0.689	0.652	0.654	--	--	--	--	--	--	--
7	0.741	0.738	0.765	0.705	0.685	0.741	0.799	0.721	0.723	0.695
8	0.766	0.760	0.802	0.687	--	--	--	--	--	--
9	0.782	--	--	--	--	--	--	--	--	--
10	0.835	--	--	--	--	--	--	--	--	--
11	0.813	0.747	0.825	0.846	--	--	--	--	--	--

Notes: Item number in this table is the same as the item number in the instrument. The symbol “--” means not available.

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.

5.4.1. ORGANISATIONAL SUSTAINABILITY INSTRUMENT

For testing and validating the three dimensions of organisational SD, internal consistency analysis, item analysis had been conducted. The detailed analysis results are listed in Tables (4).

Table 4. Reliability Analysis and Item Analysis.

Dimensions	items	Item-total correlation						
		Item 1	Item 2	Item 3	Item4	Item 5	Item 6	Item 7
Economic	7	0.870	0.806	0.842	0.796	0.779	0.852	0.812
Social	7	0.825	0.834	0.830	0.812	0.798	0.763	0.814
Environmental	5	0.718	0.755	0.845	0.786	0.791	--	--

5.4.2. TESTING THE MEASUREMENT MODELS

In table (5) all hypotheses were strongly confirmed by the empirical data since the t-values were greater than 2.326. Table 9 also lists the overall goodness-of-fit statistics.

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.

Table 5. Maximum Likelihood Estimates.

Parameters	Coefficients	T-values
Ω1	0.72	10.25
Ω2	0.51	8.24
Ω3	0.35	5.03

μ_1	0.43	6.20
μ_2	0.19	2.45
μ_3	0.22	3.22
Chi-square (X ²)	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	--

Note: The symbol "--" means not available.

6. RESEARCH FINDING

6.1. RESULT OF THEORETICAL MODEL TEST (STRUCTURAL EQUATION MODELLING, 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 organisational SD
2. Economic indicator has positive effects on both social indicator and environmental indicators
3. Social indicator has positive effects on environmental indicator.

6.2. STRATIFICATION OF CRITICAL QUALITY FACTORS

From three levels of investigation, analysis results indicated 24 quality factors stratified into three levels of criticality as shows in table (6), based on statistical analysis (central tendency and dispersion) and further qualitative analysis as follows.

Table 6. Quality factors.

Seq.	Q. No.	Level 1: Quality Factors (9 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.

6.3. 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.

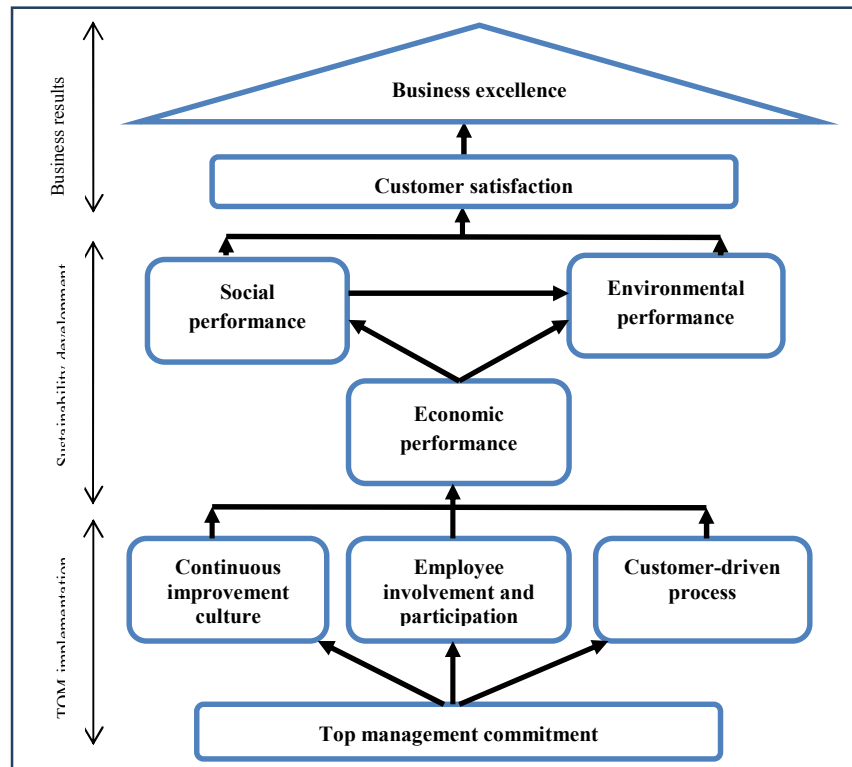


Figure 2. Components of TQM implementation framework.

As show in figure 2, 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.

6.4. IMPLEMENTATION STRUCTURE

Based on the road map construct, there is a need to design a framework of implementation. Figure 3 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.

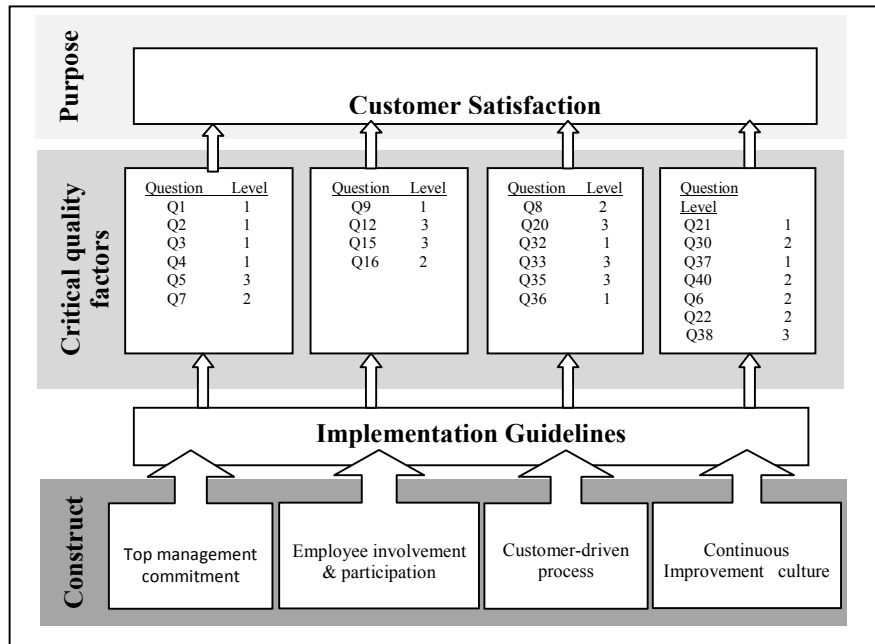


Figure 3. Components of TQM implementation Road Map.

7. SUMMARY

The purpose of this research is to construct a generic model 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 OSDP of oil companies. The finding from testing the theoretical hypothesized model reveals that there is a substantial positive effect of the TQM implementation on SD dimensions. The findings confirm the significant relationship between TQM and SD. 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. This road map 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 road-map is concerned. The proposed 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 programmes 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.

REFERENCES

- [1] Enquist, B., Edvardsson, B. and Petros, S.S., 2007. Values Based Service Quality for Sustainable Business. *Managing Service Quality*, 17(4), pp. 385–403.
- [2] Ihlen, O. and Roper, J., 2011. Corporate Reports on Sustainability and Sustainable Development: 'We Have Arrived'. *Sustainable Development*, [e-journal] doi: 10.1002/sd.524. Available through: Wiley Online Library. (Accessed 21 June 2013)

- [3] R. Hokoma, Khan, K. and Hussain, K. (2010), "The present status of quality and manufacturing management techniques and philosophies within the Libyan iron and steel industry", *The TQM Journal*, 22 (2):209–221.
- [4] Saraph, J.V., Benson, P.G. & Schroeder, R.G. (1989) An instrument for measuring the critical factors of quality management, *Decision Sciences*, 20(4), pp. 810–829.
- [5] Yusof, and Aspinwall, Case studies on the implementation of TQM in the UK automotive SMEs, *International Journal of Quality & Reliability Management*, Vol. 18 No. 7, 2001.
- [6] Al-khalifa, K. N., and Aspinwall, E.M. (2008). "The Development of Total Quality Management in UK". *The TQM Magazine*, 12(3), pp.194–204.
- [7] Fotopoulos, C.V., Psomas, E.L. (2009), The impact of "soft" and "hard" TQM elements on quality management results. *International Journal of Productivity and Performance Management*, 26 (2): 150–163.
- [8] Allen, R. S. and Kilmann, R. H. (2001) Aligning reward practices in support of total quality management. *Business Horizons*, pp 77–84.
- [9] Dean, J. & Bowen. D. (1994) Management theory and total quality: Improving research and practice through theory development, *Academy of Management Review*, 19(3), pp. 392–418.
- [10] Douglas, T. J. and Judge, W. Q. (2001) Total quality management and competitive advantage: The role of structural control and exploration. *Academy of Management journal*, 44, pp 158–169.
- [11] Easton, G.S. and Jarrell, S.L. (1999), "The effects of total quality management on corporate performance, an empirical investigation", *Journal of Business*, Vol. 71 No. 2, pp. 253–307.
- [12] Nilsson, L, Johnson, M. D. and Gustafsson, A. (2001) The impact of quality practices on customer satisfaction and business results: product versus service organizations. *Journal of Quality Management*, 6, pp 5–27.
- [13] Waldman D. (1994) The Contributions of Total Quality Management to a Theory of Work Performance. *Academy of Management Review*, 19, pp 510–536.
- [14] Parast, M.M., Adams, S.G., Jones, E.C., Rao, S.S., & Raghu-Nathan, T.S. (2006). Comparing quality management practices between the United States and Mexico. *The Quality Management Journal*, 13(4), 36–49.
- [15] Sila, I. (2007), "Examining the effects of contextual factors on TQM and performance through the lens of organizational theory: an empirical study", *Journal of Operations Management*, Vol. 25 No. 1, pp. 83–109.
- [16] Oakland, J.S. (1993) *Total Quality Management* (Oxford, Butterworth-Heinemann).
- [17] Oakland, J. (2008) *Total Quality Management—Text with Cases*, 2nd edn (Butterworth-Heinemann).
- [18] Dahlgard, J. J., Kristensen, K. and Kanji G. K. (2007) *Fundamentals of Total Quality Management* London, Taylor and Francis.
- [19] Kumar, M.R. (2011). Comparison between DP and MBNQA: Convergence and divergence over time. *The TQM Magazine*, 19(3), 245–258.
- [20] Louise Aveling, Graham Martin. (2012), Quality improvement through clinical communities: eight lessons for practice, *Journal of Health Organization and Management*, 26 (2).
- [21] Ghobadian, D. A. and Gallea, D. (2005) TQM implementation: an empirical examination and proposed generic model. *Omega*, 29, pp 343–359.
- [22] Brah, S. A., Wong, Lim., Madhu, B (2006). "Relationship between TQM and Performance of Singapore Companies". *International Journal of Quality & Reliability Management*, 19(4), pp.356–379.