

IMPLEMENTATION OF TOTAL QUALITY MANAGEMENT COMPONENTS IN LIBYAN IRON & STEEL COMPANY “LISCO”

Hisham Safar¹, Olena Bielova²

¹Ph.D. student of the Department of Project and Process Management, KROK University, Kyiv, Ukraine, e-mail: Safarkm@krok.edu.ua, ORCID: <https://orcid.org/0000-0002-2492-2815>

²Ph.D. (Economics), Associate professor at Marketing and Behavioral Economics department, KROK University, Kyiv, Ukraine, e-mail: Bielovaoi@krok.edu.ua, ORCID: <https://orcid.org/0000-0001-9359-6947>

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Abstract. Quality is usually considered as a combination of characteristics of an object, which testifies to its ability to satisfy identified needs, the author's proposed definition of the concept of quality management for a company as the system of management, aimed at planning, implementation, improvement and quality control of the company in accordance with the established policy and objectives of the company, with the participation of all its units. Customer satisfaction depends on the fact that the company has an effective quality management system. Thus, an integrated quality management system is created and implemented as a means of ensuring the implementation of specific policies and the achievement of quality objectives set by top management. Therefore, special attention is paid to the formation and documentation of the company's management policy on the quality of products provided to consumers. Manufacturing companies in Libya face difficulties to introduce Total Quality Management system. The original result indicates that lack of skilled labor, employee culture resistance to change, and lack of management commitment and leadership are correlated with a variety of factors that hinder advancement. A lack of benchmarking and employee resistance to change were found to be the top two obstacles. Proper training should be provided to workers to reduce employee resistance and there should be more participation in different stages of implementation. Real problem for the construction sector in Libya is the implementation of quality projects. The main factors influencing the implementation of quality management systems in construction projects are top management commitment, communication, teamwork, employee involvement, and work environment and culture. Following a comprehensive review of several studies on TQM and also considering the importance of critical effecting factors of manufacturing sector in Libya, this study proposed 12 components or factors of TQM for LISCO. A questionnaire made to help finding out the factors and components those affecting implementation of TQM system in the company and identifying correlation between these variables (components). Descriptive statistics and SPSS analysis were employed to indicate the TQM effective components for best implementation which can be applied in order to achieve quality performance.

Keywords: management, quality management, operational management, manufacturing, Total Quality Management (TQM), TQM components, TQM Implementation.

JEL Classification: F20, J01, M10, M11, M12, O10, L15

Formulas: 0; **fig.:** 5; **tabl.:** 5; **bibl.:** 17

Introduction. The industrial sector in many countries faces great challenges to local and international competition. The LISCO company has made several efforts to maintain its position in the market through the concern for quality development, as the company has received many quality awards, the most important of which is ISO certification, and with rapid and continuous development of modern management tools and systems in the field of quality where the total quality system TQM is one of the most important of these programs. The company is working hard to adopt such system and apply it within the company despite the presence of many difficulties of culture and environment as well as other technical issues related to the integration and development of workers and since studies on this topic are considered insignificant in Libya in general and in the company in particular, so more studies

have to be done in the field. And focusing in this topic to find out the most important factors on which the application of the total quality management system depends on the company and try to provide the main guidelines that managers and decision-makers in the company may benefit from in order to develop the quality standards and plan and build appropriate strategies for that.

Literature Review. Libyan companies have established their quality platform by gaining the ISO 9000 certificate which is useful for implementing the TQM. Some TQM dimensions, including management, communication, training and development, employee involvement and recognition, and culture. Nowadays, applying quality management system in Libyan companies will be a difficult challenge due to current approaches to management. The adoption of TQM for the company is a major culture and job change, where employees are used to a more conventional method [4]. It's more effective of TQM Knowledge in developing economics such Libya, to establish researches those focusing on practical work rather theoretical reviews, therefore, any study to investigate affecting factors are essential for successful implementation of total quality management (TQM) in Libyan companies [5].

Daniel I. Prajogo and Christopher M. McDermott [6] explore the relationships between TQM and culture. Different subsets of TQM practices are defined by different types of cultures, such as; group-developmental-hierarchical-rational culture. It has been found that hierarchical culture has a significant relationship with some TQM activities. The efficiency of these cultures in assessing organizational output is another important issue. [6]

LISCO, which is considered as a largest steel manufacturing company in the country, has been certified the ISO-9001:2000 award, even though applying TQM tools are still essential to the company in order to improve quality and production operations. [7]. Also, LISCO, owned by the Libyan Government is one of the largest industrial companies in the region and produces a range of iron and steel products. It employs nearly 7000 people distributed in different sectors and facilities [8].

The management structure in means of hierarchical positions for executives in LISCO [9], this structure takes the vertical form in sequence. Top management is representing general manager, managers, and head of departments; together they plan and decide company's policies whereas, other units at lower levels help in these tasks by feeding back to top levels. Cooperation between all levels and people in the company has the potential to ensure implementation and practicing TQM system, where communication of exchanging information clearly and effectively is likely to support and coordinating activities and solving conflicts by several steps or procedures that may include defining problems, selecting and applying options, and reviewing the results of these options prior decision making. TQM is a bulk of either dependent or independent components. According to the literature, these components are: critical factors, tools, techniques and practices. These components can be classified into two dimensions: the management system such as (leadership, planning, human resources, etc.), and the technical system which are (tools and techniques (run charts, control charts, Pareto diagrams, brainstorming, tree diagrams, histograms, scatter diagrams, flowcharts, etc.)) [10]. A study proposes a mathematical model, and

artificial neural networks ANNs, to study and analyze the implementation of TQM and its dimensions towards improving organizational performance. [11]

There are several reasons for educating and training inside the company for continuously improving the employees which would reflect in culture of change, the change that may cause as a result of internal and external conditions or circumstances. This proves that, companies should train their employees in order to improve their expertise and methods that will keep the employees working better and enhancing strategic perspective of the company as well. [17]. Culture of Change or transition is one of the most difficult aspects of TQM to implementation in the culture of an organization. The intrinsic essence of avoiding transition by persons and the anxiety of the unknown. Many people can fear like improvements would put them in the redundancy situation, particularly managers. This apprehension is not readily resolved yet, but can be minimized by engaging them in the course of transition, sincerely considering their recommendations, and develop their basic skills, and constantly sharing these aims [18].

Aims. This study aimed to investigate the critical components for the successful implementation of TQM in Libyan iron & steel company LISCO.

Methods. To solve this goal, the following research methods were used: observation and generalization; ordering of all basic elements; method of scientific generalization, which made it possible to formulate conclusions.

Results. A review of literature on TQM system was carried out to determine the objectives of this research, so then 12 factors including 36 items were considered along the survey. A 50 questionnaires of selected sample were received to obtain a primary data for testing the responses of total quality management implementation effects on LISCO. After verifying, the data then subjected to processing and analysis. SPSS software was applied as the method of analyzing data results. Validity is used to ensure the measure is within actual parameters. The questionnaire items have been examined by number of academics and experts in the field to test them to ensure that the measure covers the all intended areas within the intended study. Some questions were subsequently modified to provide better descriptions of the dimensions of the questionnaire.

Table 1 shows the reliability statistics of the TQM Scale and its subscales. Cronbach's alpha of 0.964 indicates a high level of internal consistency for the TQM scale with a specific sample of 36. Implying that the TQM scale had good reliability. There was a high level of internal consistencies among the sub-scales; leadership and top management, training and education, continuous improvement, supplier focus, customer focus, communication and information system, evaluation, and reward. According to Gliem [15], this is because the Cronbach's alpha coefficients were 0.7 or higher, which is considered "acceptable" in most social science research situations. Subscales such as; the role of quality management, employee involvement, and satisfaction, culture change, vision, and plan statement of TQM did not meet the threshold of 0.7. From the Cronbach's and Shavelson's [13] article, Cronbach's alpha coefficient was not considered to be "acceptable," given a sample size of 3.

Considering the Cronbach's alpha coefficient and the Mean Inter-Item Correlations [12] argued that, given the sub-scales have reached a threshold of at least 0.7 or when their Mean Inter-Item Correlations are between 0.2 and 0.4 and the Cronbach's alpha coefficient is less than 0.7, the scales can be deemed to be reliable. Thus, the results indicate that the scale and the sub-scales can be used to measure the predicted variable. Therefore; the instrument developed to measure effective components to TQM implementation within the case study is considered to be reliable.

Table 1. Reliability Statistics of TQM Scale and its Subscales

Scale and Sub-scales	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items	Mean Inter-Item Correlations
TQM Scale	0.964	0.963	36	0.419
<i>Leadership and top management commitment</i>	0.861	0.861	3	0.673
<i>Role of quality management</i>	0.598	0.588	3	0.322
<i>Training and education</i>	0.755	0.756	3	0.508
<i>Continuous improvement</i>	0.766	0.770	3	0.528
<i>Employee involvement and satisfaction</i>	0.640	0.639	3	0.371
<i>Understanding TQM practices</i>	0.691	0.692	3	0.428
<i>Supplier focus</i>	0.764	0.762	3	0.516
<i>Culture to change</i>	0.652	0.663	3	0.396
<i>Customer focus</i>	0.824	0.827	3	0.615
<i>Communication and information system</i>	0.790	0.802	3	0.574
<i>Vision and plan statement of TQM</i>	0.532	0.542	3	0.283
<i>Evaluation and Reward</i>	0.706	0.699	3	0.436

Source: compiled by the authors

Table 2 shows frequencies and percentages of study sample for job description, qualification, and work experience.

Table 2. General demographic information of the Study- frequencies and percentages

Profile	Respondents	Category	Frequency	Percentage
Job description	50	Quality manager	1	2%
		Project manager	2	4 %
		Chief department	13	26%
		Quality control/ assurance professionals	3	6%
		Financial & marketing	2	4%
		Senior engineer	9	18%
		Supervisor	14	28%
		Technician	6	12%
Qualifications	50	Postgraduate	5	10%
		University degree	27	54%
		Higher diploma	7	14%
		Diploma holder	11	22%
Work experience	50	1 – 10	8	16%
		11 – 20	15	30%
		21 – 30	20	40%
		> 30	7	14%
Total =	50	-----	50	100%

Source: compiled by the authors

From the survey done on 50 respondents, 28% of the respondents were supervisors, 26% were departmental chiefs, 18% were senior engineers, 12% were technicians, 6% were quality control/ assurance officers, 4% were project managers and finance and marketing officers respectively, and 2% were quality managers (Figure 1).

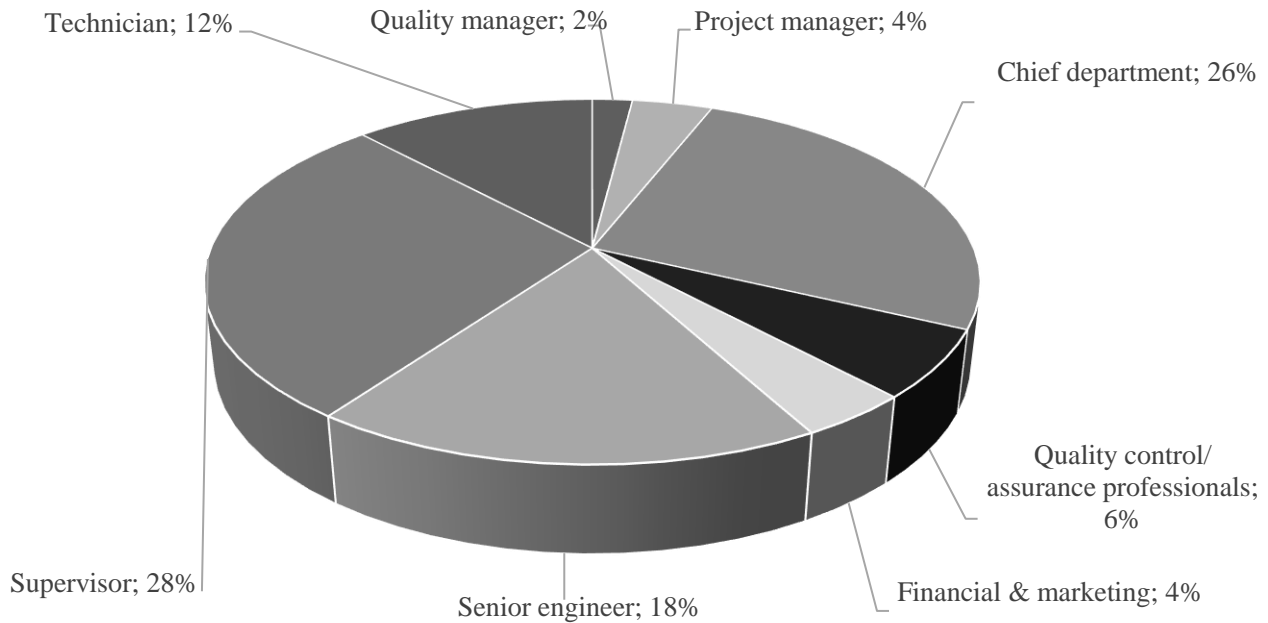


Figure 1. Job description percentages in LISCO

Source: compiled by the authors

Qualification is a significant determinant of the kind of job description and individual gets [16]. From the survey done on 50 respondents, the majority 54% of the respondents had university degrees, 22% were diploma holders, 14% had higher diplomas, and 10% had postgraduate qualifications (Figure 2). Quality top management is usually influenced by the amount of work experience an individual possesses [14]. From the survey done on 50 respondents, the majority (40%) of the respondents had 21 to 30 years of work experience, 30% had between 11 and 20 years of work experience, 16% had between 1 and 10 years of work experience, and 14% had over 30 years of work experience (Figure 2).

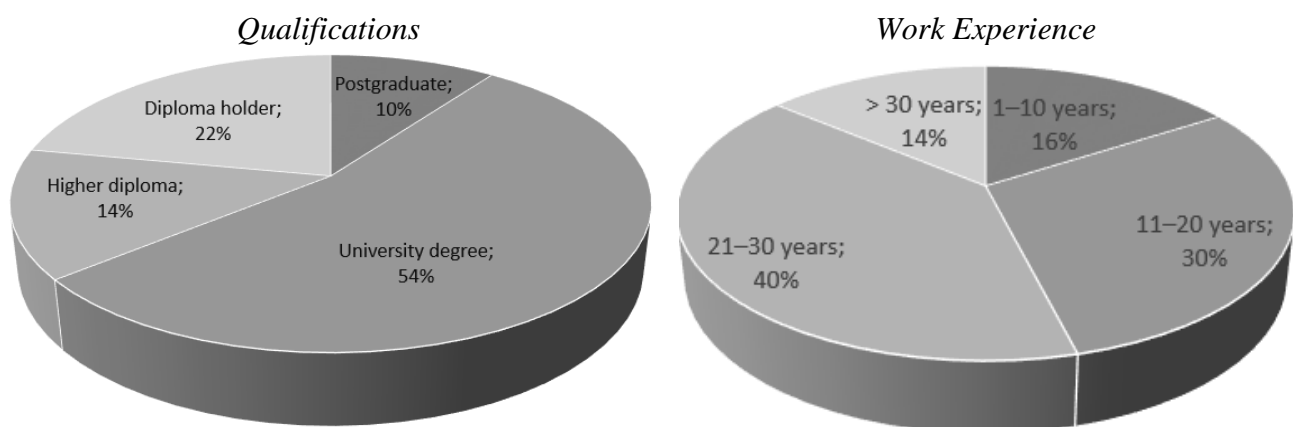


Figure 2. Work experience and qualifications analysis in LISCO

Source: compiled by the authors

Considering the dimensions of the study variable, leadership and top management commitment (LTMC) had a mean of 2.61, the role of quality management (RQM) had a mean of 2.21, training and education (TE) had a mean of 2.96, continuous involvement (CI) had a mean of 2.65, employee involvement and satisfaction (EIS) had a mean of 2.96, understanding TQM practices (UTQMP) had a mean of 2.48, supplier focus (SF) had a mean of 2.82, culture to change (CC) had a mean 2.83, customer focus (CF) had a mean of 2.62, communication and information system (CIS) had a mean of 2.19, vision and plan statement of TQM, (VPSTQM) had a mean of 2.45, evaluation and reward (ER) had a mean of 2.81 (Figure 3).

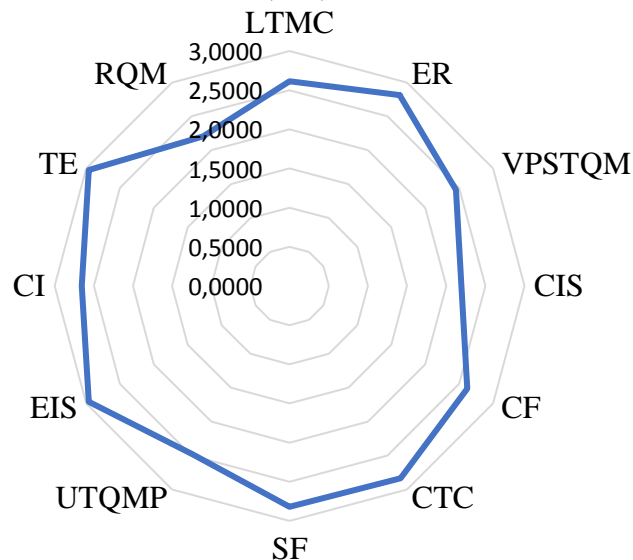


Figure 3. Mean radar plot for the TQM dimensions in the survey

Source: compiled by the authors

There were no significant differences in the means between the three dimensions in each sub-scale in the survey (Figure 4).

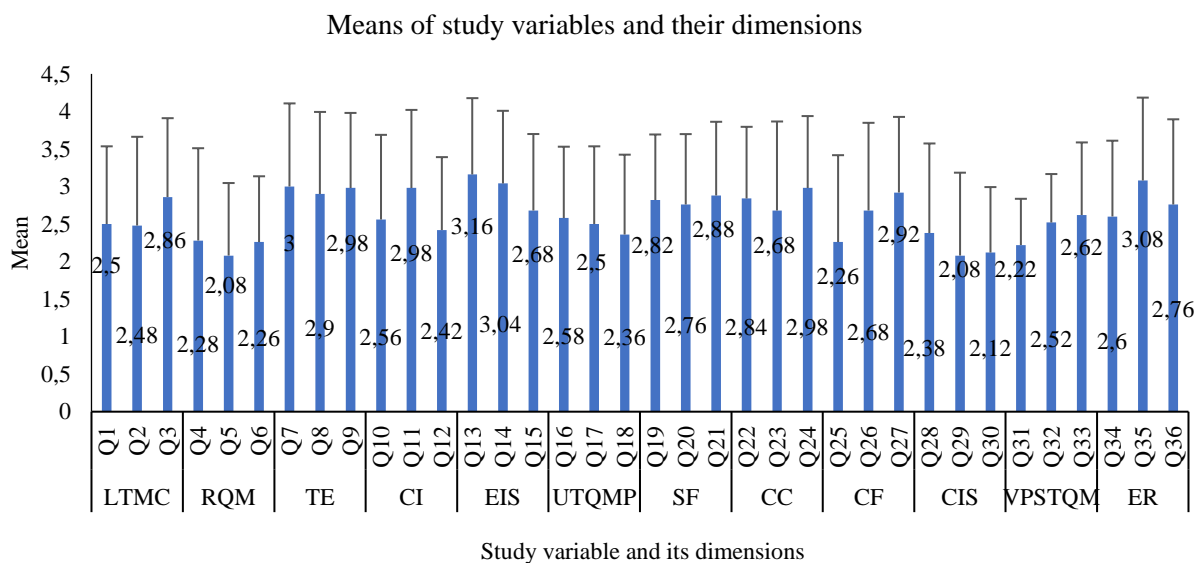


Figure 4. Means of the dimensions in the survey

Source: compiled by the authors

Pearson correlation was used in the survey to ascertain the relationships between the TQM dimensions. Leadership and top management commitment (LTMC) had a significant positive moderate correlation with; the role of quality management (RQM), vision and plan statement of TQM (VPSTQM), employee involvement and satisfaction (EIS), understanding TQM practices (UTQMP), and communication and information system (CIS). Furthermore, LTMC had a significant positive, strong correlation with; training and education (TE), continuous improvement (CI), supplier focus (SF), culture to change (CC), and evaluation and reward (ER).

RQM had a significant positive moderate correlation with all the other dimensions except for EIS, which had a significant positive weak correlation. TE had a significantly strong correlation with CI, SF, and ER. Furthermore, TE had a moderate correlation with EIS, UTQMP, CC, CF, CIS, and VPSTQM. CI had a significant positive, strong correlation with UTQMP, CC, CF, and ER but had a moderate correlation with EIS, CIS, and VPSTQM. EIS had a significant positive moderate correlation with UTQMP, SF, CC, CF, CIS, VPSTQM, and ER. UTQMP had a significant positive, strong correlation with CC and CIS but had a moderate correlation with SF, CF, VPSTQM, and ER. SF had a significant positive, strong correlation with CC and ER but had a moderate correlation with CF, CIS, and VPSTQM. CC had a significant positive, strong correlation with CF, CIS, and ER but had a moderate correlation with VPSTQM. CF had a moderate positive correlation with VPSTQM and ER but had a strong correlation with CIS. CIS had a significant positive weak correlation with VPSTQM but had a moderate correlation with ER. ER and VPSTQM had a significant positive moderate correlation between them (Table 3).

Table 3. Pearson correlations between dimensions of TQM variable

	1	2	3	4	5	6	7	8	9	10	11	12
1-Leadership and top management commitment	1											
2-Role of quality management	.592**	1										
3-Training and education	.809**	.649**	1									
4-Continuous improvement	.708**	.671**	.713**	1								
5-Employee involvement and satisfaction	.606**	.404**	.588**	.634**	1							
6-Understanding TQM practices	.604**	.671**	.628**	.711**	.563**	1						
7-Supplier focus	.751**	.505**	.742**	.614**	.644**	.674**	1					
8-Culture to change	.713**	.563**	.670**	.746**	.692**	.704**	.746**	1				
9-Customer focus	.704**	.662**	.613**	.725**	.658**	.631**	.654**	.795**	1			
10-Communication and information system	.635**	.642**	.524**	.655**	.520**	.762**	.560**	.775**	.758**	1		
11-Vision and plan statement of TQM	.507**	.581**	.561**	.676**	.577**	.618**	.582**	.521**	.588**	.416**	1	
12-Evaluation and Reward	.821**	.535**	.819**	.722**	.689**	.660**	.765**	.734**	.650**	.594**	.657**	1

**. Correlation is significant at the 0.01 level (2-tailed).

Source: compiled by the authors

Do TQM Dimensions Fall Significantly Below the Benchmark Value (3) of a Five Points Scale (the “null hypothesis”), H_0 : TQM dimensions, does not fall below the benchmark value (3) of a five-point scale. (the “alternative hypothesis”), H_a : TQM dimensions fall below the benchmark value (3) of a point scale.

One sample t-test is used to test the above hypotheses for the TQM dimensions. We can reject the null hypothesis from the survey because the p values are below 0.05, and imply that LTMC, RQM, CI, UTQMP, CF, CIS, and VPSTQM dimensions fall below the benchmark value (3) of a five-point scale. Furthermore, we can fail to reject the null hypothesis because the p values are greater than 0.05, and conclude that TE, EIS, SF, CC, and ER dimensions do not fall below the benchmark value (3) of a five-point scale (Table 4).

Table 4. One sample t-test for TQM dimensions

<i>One-Sample Test</i>						
	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Leadership and top management commitment	-2.833-	49	.007	-.38667-	-.6609-	-.1124-
Role of quality management	-7.281-	49	.000	-.79333-	-1.0123-	-.5744-
Training and education	-.323-	49	.748	-.04000-	-.2885-	.2085
Continuous improvement	-2.834-	49	.007	-.34667-	-.5925-	-.1009-
Employee involvement and satisfaction	-.370-	49	.713	-.04000-	-.2571-	.1771
Understanding TQM practices	-4.596-	49	.000	-.52000-	-.7474-	-.2926-
Supplier focus	-1.656-	49	.104	-.18000-	-.3984-	.0384
Culture to change	-1.478-	49	.146	-.16667-	-.3933-	.0600
Customer focus	-2.807-	49	.007	-.38000-	-.6520-	-.1080-
Communication and information system	-6.383-	49	.000	-.80667-	-1.0606-	-.5527-
Vision and plan statement of TQM	-7.078-	49	.000	-.54667-	-.7019-	-.3915-
Evaluation and Reward	-1.534-	49	.131	-.18667-	-.4311-	.0578

Source: compiled by the authors

A simple and brief guideline has been proposed to help managers and supervisors to design plans for effective TQM implementation. Major components found in the research were regarded to establish the auxiliary guidelines. Table 5 expose the findings of constructed components and their expected actions for each implementation element.

The guidelines to be put in practice for better implementation of TQM system reveal that; customer satisfaction, involvement of everyone in the company, and ensuring continuous improvement represent the main chamber for achieving the required performance for such management system implementation that mainly depend on Strategic planning, TQM behavioral culture, and organizational success in business.

Figure 5 shows a TQM Model for successfully implementation the quality system to assist in meeting organization objectives.

Table 5. Proposed guidelines of TQM implementation

Constructed components	Proposed actions to Implementation
Top management commitment	<i>Make a long-term commitment for top-management</i>
Role of quality management	<i>Discuss quality issues</i>
Training and development	<i>Make training and education a high priority</i>
Continuous improvement	<i>Define, standardize, and improve processes Remove barriers to improvement Develop a strategy for further improvement Analysis and actions based on facts Continuously monitor the process</i>
Employees involvements, satisfaction and recognition	<i>Involvement and participation of everyone in all activities in the company in different levels</i>
Understanding TQM practices	<i>Discuss TQM throughout the organization</i>
Customer/supplier focus	<i>Understand customer needs and expectations and meet requirements with quickly response Identify and involve supplier/customer relationship Develop a survey tool to gain feedback</i>
Work environment and culture to change	<i>Create culture inside the company and its surrounding environment</i>
Communication and information system	<i>Examine communication processes Share information and experience with others like companies and stockholders then contribute to development</i>
Vision and plan statement of TQM	<i>Establish a vision, develop a business strategy, and prepare a mission statement, Examine policies and practices Establish goals and objectives</i>
Evaluation, measurements, and Reward	<i>Evaluate and Measure performance Conduct cause-and-effect analyses Analyze root causes and eliminate errors Recognize and reward TQM behavior</i>

Source: compiled by the authors

TQM implementation as a dependent variable is a result of inputting independent variables represented by affecting factors those generated in this research. After processing the satisfied implementation can be measured by measuring a number of essential indicators including Customer/employee satisfaction, rate of defected products, and production rate.

Conclusion. This study has identified the vital components or factors of TQM implementation in LISCO which would help managers and decision makers to understand TQM practices and plan a better strategy for quality visions. It is challenging to implement a new quality management system in the company; this is due to the management structure and culture. The company has been awarded ISO 9000 certificate which is a good base of changing culture for implementing the TQM program.

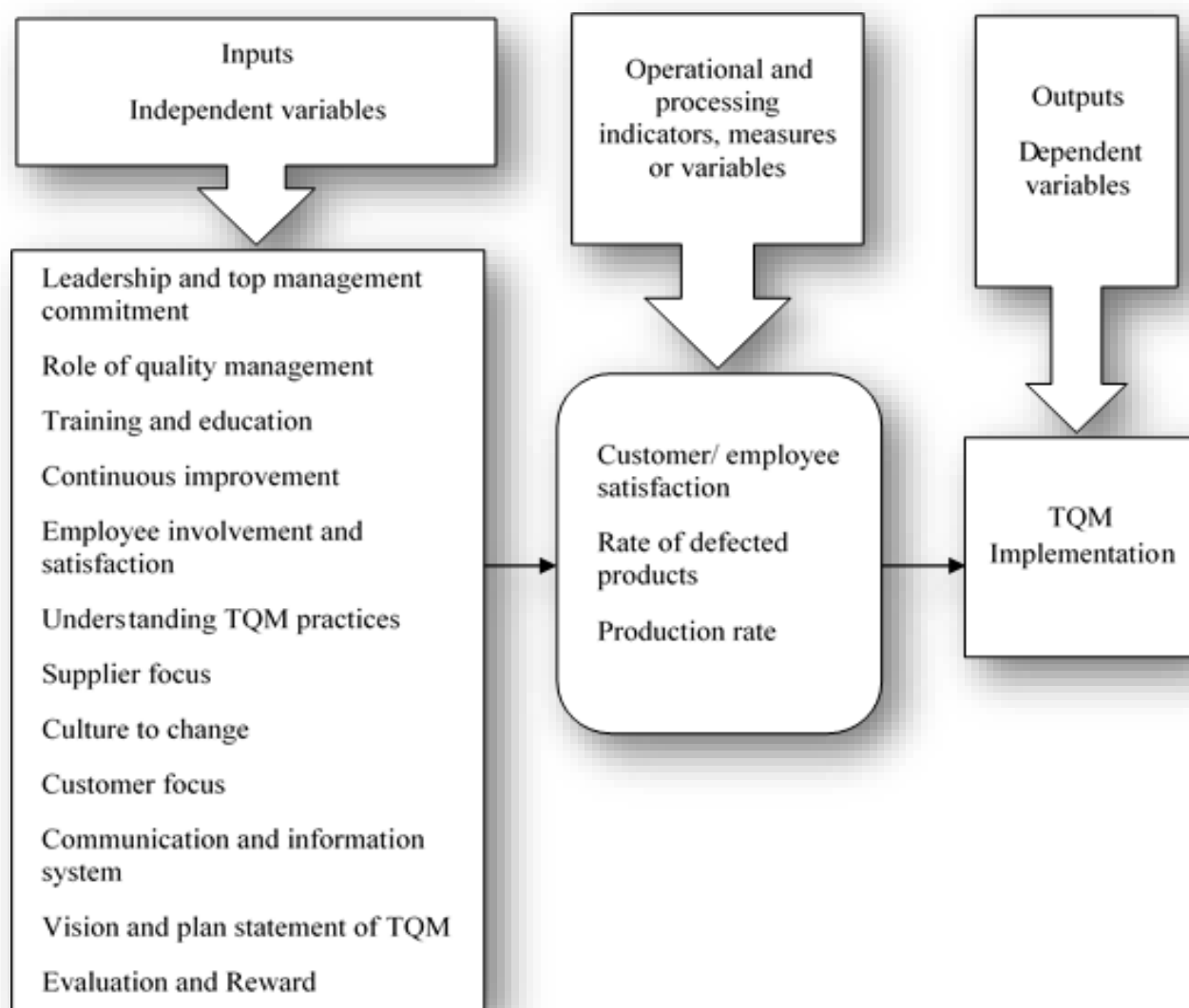


Figure 5. TQM Model for successfully implementation to help meeting organization objectives

Source: compiled by the authors

Author contributions. The authors contributed equally.

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