

# *The Effect of Human Factors on the Quality Improvement Practices in Yemeni Industrial Companies*

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**Abstract-** *This study conducted an empirical investigation of the total quality management practices in 87 industrial companies in Yemen that had local and international quality certificates. It investigated the effect of human factors of quality management on the quality improvement practices. A self administered questionnaire was distributed to 261 quality managers (three from each company). A total of 210 managers participated in the study with a response rate of 80%. A structural equation modelling (SEM) was carried out by Amos program to test the hypothesis of this study. This study was the first in Yemen as well as in the Middle East interested on the human side of quality management. This study found a direct and significant relationship between the human factors and quality improvement practices (standardized coefficient was 0.80,  $P < 0.001$ ).*

**Keywords-** human factors, quality improvement practices, total quality management, Yemen industrial companies

## **I. Background**

It was found that, the theory of quality improvement has been developed based on the contribution of total quality management leaders such as Deming; Juran; Crosby; Feigenbaum and Ishikawa, and also base on quality awards model, as well as measurement studied such as [32]; [14]; [27]; [3]; [31]; and [40]. Quality management gurus defined total quality management program in different ways. Deming [9] defined quality as a continuous quality improvement process towards predictable degree of uniformity and dependability. Juran (1993) defined quality as "fitness for use". He considers that everyone in organization must contribute in effort of achieving the quality aims. Crosby [8] focused on "zero defect" and "do it right in the first time", he defined it as a conformance to requirement. However, Ishikawa [19] considered that quality does not only mean the quality of product, but it also means the quality of service after sales. Finally, Feigenbaum [11] suggested that the quality is continuous work processes start with customer requirements and end with customer satisfaction.

United State Department of Defence in 1988 described total quality management as a series of continuous improvement activities involving everyone in the company in a totally effort toward improving performance at every level in the company. According to International Standardization Organization (ISO) 8402 [20] quality management can be defined as "All activities of the overall management function that determine the quality policy, objectives and responsibilities, and implement them by means such as quality planning, quality control, quality assurance and quality improvement within the quality system".

Despite the differences between scholars and practitioners over the definition of total quality management and its components most of the definitions emphasize on concepts that including customer orientation, human resources focus, management structure, quality tools, and supplier support.

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Critical factors of quality management that support the effort of continuous improvement in organizations were identified by quality leaders and quality rewards models, and also by a lot of researchers, who interested on the field of quality management, (such as [26]; [12]; [16]; [22]; [33]; [23]; [10]; [37]; [4]; [34]; [36];, 1998; [28]; [29]; [6]; [24]; [35]; [5]; [14]; [17]).

Wilkinson [38] divided quality improvement practices into two aspects; the soft aspect interests on human side of quality management and the hard aspect interests on work process. He claimed that the hard aspect (or technical side) may involve the arrangement of the production techniques including statistical process control, quality function deployment, changes in the layout, design procedures of the organization, and just-in-time inventory, while the human side concerns with creating customer awareness within an organization and as such, may be seen as a form of internal marketing or employee communication.

Flynn et al. [15] explored both technical and human side of quality improvement practices and their impact on organization performance and competitive advantage. They divided quality improvement practices into two groups; first group named core quality management practices; it is interested on the technical side of quality improvement practices and includes: process flow management, product design, process and statistical, and control/feedback. Second group named quality management infrastructure practices and interested on human side of quality improvement practices such as customer relationship, supplier relationship, work attitudes, workforce management, and top management support. Flynn et al. found a positive relationship between quality improvement practices and organization performance; whereas both core quality management practices and quality management infrastructure practices directly impact organization performance. Not that only, but they also found that core quality management practices act as a mediator factor for the relationship between quality management infrastructure practices and organization performance that support the purpose of this study, which claimed a positive direct and indirect impact of human factor of quality management on quality improvement practices and organizational performance.

In the same way, Ho et al. [18] divided the eight factors of quality management that were developed by Flynn et al. [14] into two groups; core quality management factors such as process flow management, product design, process and statistical, and control/feedback. The second group was quality management infrastructure factors such as customer relationship, supplier relationship,

work attitudes, workforce management, and top management support. They found a positive direct impact of quality management infrastructure factors on core quality management factors and organization performance, and also they found other indirect impact of quality management infrastructure factors on performance through their impact on core quality management factors.

Rahman and Bullock [30] and Abdullah et al. [2], suggested that the hard factors of quality management need the support of soft factors of quality management to have a significant impact on organizational performance. Rahman and Bullock [30] provided evidence confirming that the soft factors of quality management support the hard factors to impact organization performance. They found a significant relationship between soft factors of quality management (such as workforce commitment, shared vision, customer focus, use of team, personnel training, and cooperative supplier relations) and hard factors of quality management (such as the use of JIT principles, technology utilization, and continuous improvement enablers). Also, they found that both hard and soft factors of quality management directly impact organization performance and also soft factors indirectly impact organization performance through their direct impact on hard factors.

It is difficult to quality tools to contribute to quality improvement, customer satisfaction, and consolidation of its market position without support and guidance by human factors of quality management such as top management and employee and supplier support [13].

Abdullah et al. [1], also found a significant positive relationship between soft factors of quality management (such as management commitment, employee involvement, training and education, and reward and recognition) with quality improvement. While, Abdullah et al. [1] found that quality improvement mediates the relationship between the soft factors and organizational performance. They examined the direct impact of critical soft factors on quality improvement, and the indirect impact of soft factors on organizational performance through their impact on quality improvement. In fact, these results support, in one way or another, the aims of the present study that examine the direct impact of human factors of quality management on quality improvement practices.

In conclusion the relationship between human side of quality management and quality improvement practices as important relations for the success of total quality management implementation. Moreover, the literature of quality management suggested that the human factors of quality management create a suitable environment

to the implementation of total quality management practices. Particularly, this study hypothesised that the Human factors of quality management have direct impact on quality improvement practices.

## II. Methodology

### A. Population and sample

The target population of this study was all Yemeni industrial companies who had received local and international quality certificates due to their interest on total quality management implementations and implicate international criteria in their operations. There are 87 Yemeni Industrial companies have already taken local and international quality certificates; these companies were selected from five industrial cities: they are Sana'a, Aden, Alhudaidah, Hadramout and Taiz.

The participants of this study were the managers who were familiar with the implementations of total quality management. Based on this principle, the respondents of this study were one top management manager and two quality managers from each company. A total of 210 completed surveys were returned out of 261 surveys questionnaire, for a response rate of 80 %.

### B. Measurement

A questionnaire was designed to determine and clarify the relationship between the human factors and quality improvement practices. To measure the human factors, the instrument developed by Zhang [39] was used. This instrument included 40 items which included six factors; leadership, customer focus, employee involvement, supplier relations, training and education, and reward and recognition. To examine quality improvement practices this study adopt Flynn et al [14] instrument to evaluate the human side of quality improvement practices (top management support, teamwork, customer involvement), it included 38 items, This study used Zhang, (2000) instrument to examine the technical side of quality improvement practices (process control and improvement, product design and quality system improvement). Prior to conducting the present study, a pilot study was conducted among 30 quality managers in Yemen industrial companies in order to test the clarity, comprehensiveness and acceptability of the questionnaire. Each measure was assessed on a five-point Likert's scale continuum. Factor analysis and reliability analysis were carried out and the coefficient alpha shown in Table 1.

### C. Statistical analysis

Pearson correlation coefficient test was used to evaluate the relationships between the variables of

this study, and structural equation model by Amos program was carried out to test the hypothesis of this study.

Factor	No of items	Alpha
<b>Human factors</b>		
Leadership	7	0.824
Customer focus	6	0.817
Supplier relations	6	0.777
Employee involvement	6	0.727
Training and education	6	0.860
Reward and recognition	5	0.871
<b>Quality improvement practices</b>		
Top management support	5	0.839
Teamwork	7	0.860
Customer involvement	5	0.793
Process control and improvement	8	0.702
Product design	5	0.700
Quality system improvement	5	0.829

## III. Results

The correlation results in Table 2 reveal a positive correlation between human factors of quality management and quality improvement practices. The results show that all six human factors of quality management (leadership, customer focus, supplier relation, employee involvement, training and education, and reward and recognition) are significantly related to the six factors of quality improvement practices (top management support, customer involvement, teamwork, process control, and improvement, product design and quality system improvement).

TABLE 2: CORRELATIONS BETWEEN HUMAN FACTORS AND QUALITY IMPROVEMENT PRACTICES

QIP \ HFQM	T_M	T_W	C_I	P_C_M	P_D	Q_S_I
L_r	.535**	.498**	.437**	.354**	.266**	.164*
L_p	.000	.000	.000	.000	.000	.017
C_r	.505**	.535**	.502**	.512**	.293**	.369**
C_p	.000	.000	.000	.000	.000	.000
S_r	.339**	.249**	.421**	.217**	.324**	.319**
S_p	.000	.000	.000	.002	.000	.000
E_r	.532**	.602**	.560**	.598**	.460**	.441**
E_p	.000	.000	.000	.000	.000	.000
T_r	.520**	.571**	.528**	.478**	.510**	.411**
T_p	.000	.000	.000	.000	.000	.000
R_r	.557**	.611**	.612**	.539**	.526**	.371**
R_p	.000	.000	.000	.000	.000	.000

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

\* . Correlation is significant at the 0.05 level (2-tailed).

Structural model was established to investigate the casual relationship between human factors of quality management and quality improvement practices. The estimated model fit showed a good fit, as shown in Table 3 and Figure 1 The value of chi-square was (139.530), degree of freedom d.f

was (46), CFI was (0.943), RMSEA (0.099),  $P < 0.001$ .

of human factors of quality management on quality improvement practices.

## iv. Discussion

Wilkinson [38] started to make highlight emphasis on human factors of quality management. He divided quality management practices into two aspects, soft aspect interest on human side of quality management and hard aspect interest on work process. Actually, quality improvement practices consist of both technical and human factors, which human factors of quality management act to create suitable environment to implement technical aspect of quality management. Abdullah et al [3], suggested that effective implementation of human factors in organization act and play as a central role to quality improvement which acting to improve performance and productivity.

The results of this study reveal a positive direct impact of human factors of quality management on quality improvement practices, which make this research in consistency with previous studies that brought evidence confirmed the positive relationship of human factors of quality management and quality improvement practices such as [14]; [25]; [3]; Dow et al 1999; & [1].

In fact, there is insufficient research in literature of quality management investigate the contribution of human factors for the success of quality improvement practices. However, it is necessary to evaluate this relationship due to the important of human factors that act to effective of the performance of total quality management program.

In Yemen, there is effort making by Yemen Government and industrial companies to improve industrial sector and enhance the competitive advantage of the companies through adopt and efficient total quality management implementation. Indeed, the results of this study make it clear to both Yemen Government and companies that human factors of quality management are essential factors to enhance and support their effort and achieve their aims. In fact, literature of total quality management divided quality improvement practices into technical and human factors which human factors act to create a suitable environment to implement technical factors which in total both human and technical factors play a central role in success of quality improvement implementation and increase performance and productivity.

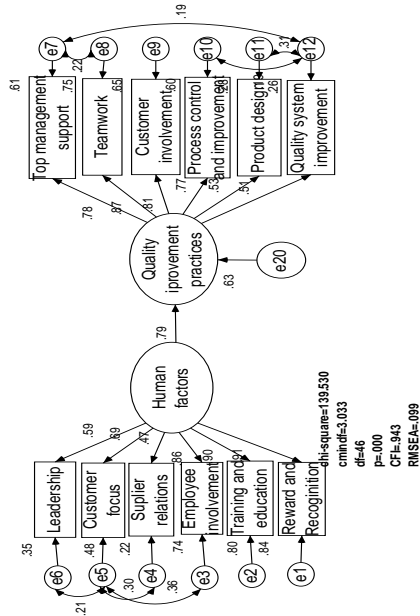


FIGURE 1: STRUCTURAL MODEL OF RELATIONSHIP BETWEEN HUMAN FACTORS AND QUALITY IMPROVEMENT PRACTICES

TABLE 3:  
 STRUCTURAL PARAMETERS OF THE RELATIONSHIP BETWEEN HUMAN FACTORS AND QUALITY IMPROVEMENT PRACTICES

			Unstandardized	Standardized	S.E.	C.R.	R <sup>2</sup>	P
Q_I	←	H_F	0.60	0.80	.054	11.019	.635	.000

The results that shown in Tables 2 and 3, and Figure 1 are reveal a positive relationship between human factors of quality management and quality improvement practices. These results also present that human factors of quality management have positive direct impact on quality improvement practices; the standardized coefficient was 0.80, effect size (R<sup>2</sup>) was .632,  $P < 0.001$  ) This means that 63% from quality improvement practices was accounted by human factors of quality management, which considered as a large effect size [7]. This positive results support the hypothesis that mentioned earlier and claimed a direct impact

The results of the current study found positively direct impact of all six human factors of quality management (leadership, customer focus, supplier relation, employee involvement, training and education and reward and recognition) on quality improvement practices. This result confirms that technical side of quality improvement practices can not be contributing to the implementation of total quality management without support and guidance by human side.

## v. Conclusion

This study explored the contribution of the human side of quality management to the implementation of total quality management program through examine the direct impact of human factors on quality improvement practices. This study was carried out through 87 of Yemeni industrial companies by sample of three managers each company; one of whom is top managers and two are quality managers). However, they were different size in population from small, medium and large, also they were different terms in local and international certified. In methodology. Results found that the human factors of quality management have a significant direct impact on quality improvement practices

This study recommend that other Middle East Countries could be included in order to make comparisons in terms of human side of quality management and quality improvement practices. Second, other human factors of quality management such as communication, empowerment, teamwork, quality culture, human resource management, and employee satisfaction could be included as well.

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