CHAPTER III
METHODOLOGY

3.0 Introduction

This chapter describes the framework and the methodology of the current study, which specifically intends to analyze the direct and indirect impact of human factors of quality management on quality improvement practices and organization performance. In short, this chapter consists of the following sections:

Firstly, this chapter provides overview of the framework of study that explains the relationship of the variables of this study by showing the relationship of human factors of quality management and quality improvement practices and organization performance.

Secondly, defines the hypotheses which were generated to test the relationships between the variables of this study. Next, it shows the research design. The population and sampling of this study is also revealed in this chapter.

After that, this chapter provides enough explanation on how to measure the variables of this study. Thus, it explains the used instruments in evaluating the variables of study: (1) human factors of quality management, (2) quality improvement practices, and (3) organization performance.

Furthermore, this chapter includes the pre-test that was carried out to ensure that the reliability and validity of the scale are acceptability before data collection. Finally, the data collection methods, reliability analysis, data analysis, and structural equation model are presented in full details.

3.1 Framework of the study

Many studies in the literature of quality management discussed the relationship between total quality management practices and organization performance. Most of these studies provided evidences confirmed the significant impact of total quality management practices on organization performance. This study was carried out based on total quality management approaches that have been done by total quality management leaders (such as Deming, Juran, Crosby, Feigenbaum and Ishikawa) and also based on the standard of quality awards (such as Deming Prize in Japan, the European Quality Award in Europe, and the Malcolm Baldrige National Quality Award in the United States of America).

Moreover, other studies attempted to identify the critical successful factors of total quality management implementation (such as Oprime et al., 2012; Guion, 2010; Wahid and Corner, 2009; Fotopoulos et al., 2009; Sarma and Kodali, 2008; Antony et al., 2002; Zhang, 2000; Yusof and Aspinwall, 1998; Hesan et al., 1998; Black & Porter, 1996; Tamimi and Gorshon, 1995; Badri et al., 1995; Flynn et al., 1994; Porter & Parker, 1993).

As we have known, this study emphasizes on the human side of total quality management; and thus, it examines the direct and indirect impact of human factors of quality management on quality improvement practices and organization performance. Indeed, in literature of quality management there were lacks of studies interest on human factors of quality management and their importance to the implementation of total quality management and organization performance, while many studies were carried out to contribute the design development and application of the total quality system. In reality, due to the production orientation of the leaders of total quality management, insufficient attention has been paid to the human factors of quality management that related to behavioural or social aspect of quality management (Hill, 1991; Wilkinson, 1992; Louise, 1996).

Wilkinson (1992) made a super highlighting on the human side of total quality management. He suggested that human side of quality management is a critical aspect for the implementation of total quality management. Actually, he divided total quality management practices into two aspects; soft aspect interests on the human factors of quality management, and hard aspect interests on the technical factors or tools and work process. Furthermore, he claimed that the human side of quality management concerns by creating the customers' awareness within organization as such, which may be seen as a form of internal marketing or employee communication.

Recently, human side of quality management has obtained some more interest in literature of total quality management. Actually, the recent empirical studies that were carried out to investigate total quality management practices confirmed the significance of human factors and their great contribution to the implementation of total quality management, and their significant relationship with technical factors and organization performance as well (e.g. Valmohammadi, 2011; Gadenne and Sharma, 2009; Fotopoulos and Psomas, 2009; Abdullah et al., 2008; Lewis et al., a, b 2006; Rahman and Bullock, 2005; Boon and Arumugam, 2005; Sila and Ebrahimour, 2002; Lau and Idris, 2001; Louise, 1996; Flynn et al., 1994; Motwani et al., 1994)

The empirical studies such as Flynn et al. (1995), Ho et al. (2001), Rahman and Bullock (2005), and Abdullah et al. (2008) examined the direct impact of human factors of quality management on hard or technical factors of quality management and organizational performance, they also examined the indirect impact of human factors on organizational performance through their impact on technical factors of quality management. Indeed, they provided evidences on the direct and indirect impact of the human factors of quality management on technical factors of quality management and organizational performance.

The effective framework that was developed by Flynn et al. (1995) and supported by other researchers (Hendricks et al., 1997; Ho et al., 2001; and Rahman and Bullock, 2005) was shown in Figure 3.1. They concluded that there is a significant direct impact of quality management infrastructure practices on core quality management practices and organizational performance. Moreover, they found that quality management infrastructure practices indirectly impact organizational performance through their impact on core quality management practices.

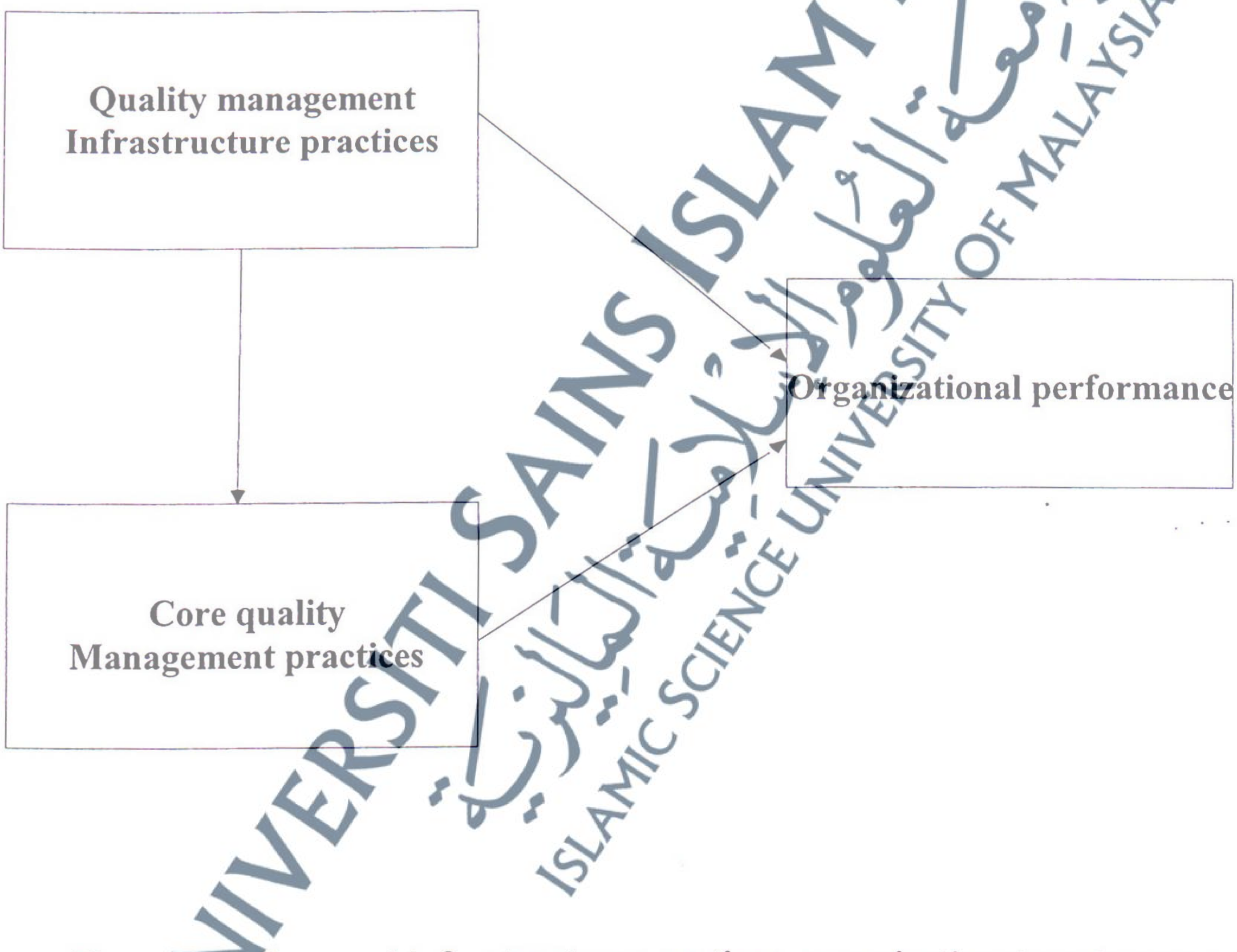

Figure 3.1: Core and infrastructure practices- organizational performance model

Source: Flynn et al. (1995)

On the other hand, Abdullah et al. (2008) developed the framework of Flynn et al. (1995) by an empirical study (Figure 3.2). They studied the relationship between critical soft factors of quality management and quality management and organization performance. They used critical soft factors of quality management as an independent variable, and quality improvement as a mediator variable to the relationship of critical soft factors of quality management and organizational performance.

Abdullah et al. provided evidence confirmed that the critical soft factors of quality management have direct impact on quality improvement and organizational performance. Furthermore, quality improvement mediates the relationship of critical soft factors of quality management and organizational performance.

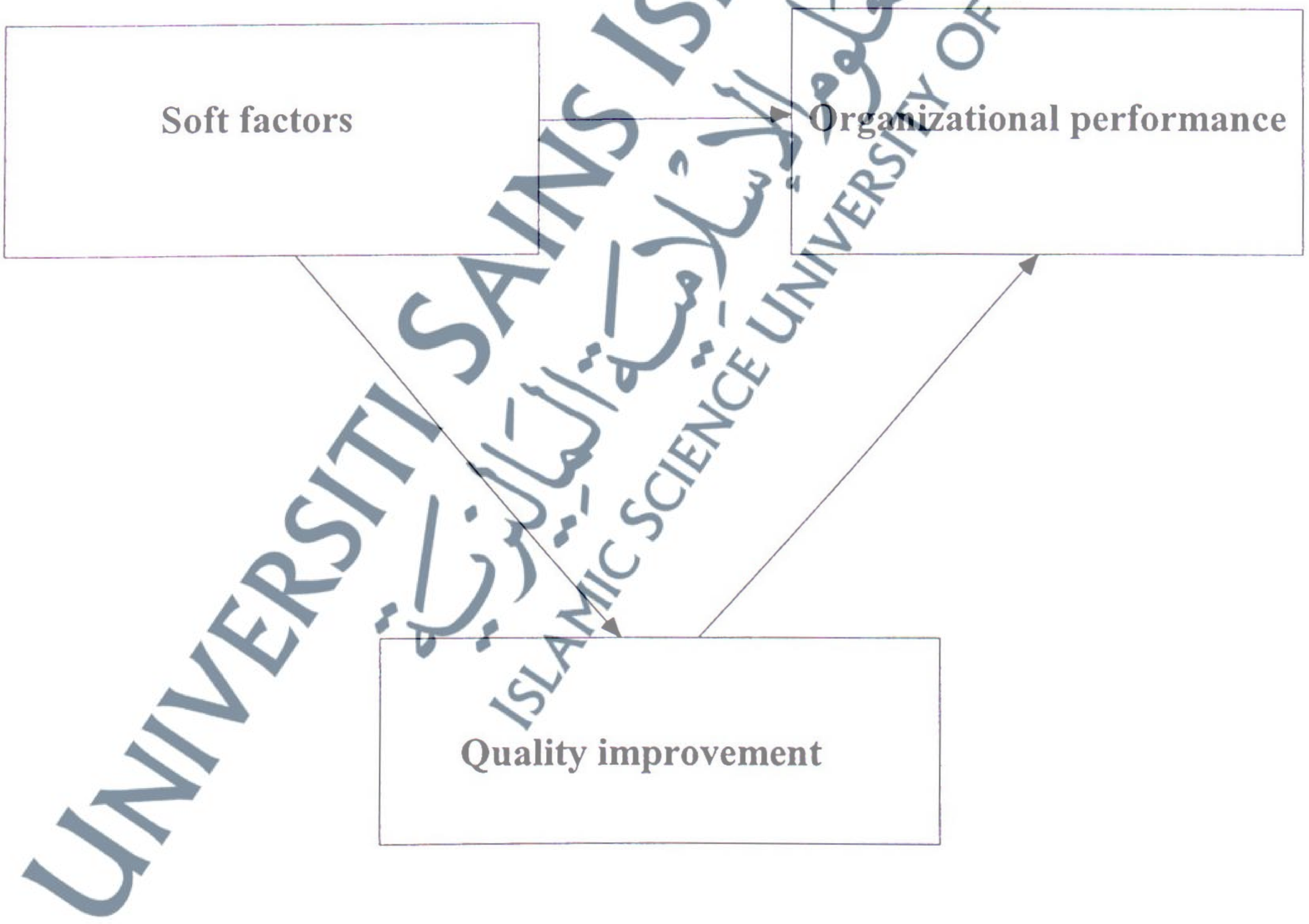

Figure 3.2: Soft factors-quality improvement- organization performance model

Source: Abdullah et al. (2008)

Based on the work that have been done and discussed earlier, the framework of the current study connects the variables of human factors of quality management, the variables of quality improvement practices and the dimensions of organization performance all together. This framework answers the four research questions and achieves the four specific objectives of the study that were designed to examine direct and indirect impact of human factors on quality improvement practices and organization performance.

Actually, the framework that shown in Figure 3.3 includes independent variables represented by six human factors of quality management; they are leadership, customer focus, supplier relations, employee involvement, training and education, and finally reward and recognition.

Moreover, two dependent variables also were included in this framework; first, quality improvement practices as a mediator variables for the relationship of human factors of quality management and organizational performance. It includes six element; they are top management support, teamwork, customer involvement, process control and improvement, product design, and quality system improvement. However, the quality improvement practices include both technical and human side of quality management. Second, organization performance represented by five dimensions; they are customer satisfaction, employee morale, productivity, defects, and delivery in full.

The framework of this study is illustrated in Figure 3.3.

Figure 3.3: Framework of Study

3.2 Hypotheses

Based on the theoretical framework that has been discussed above and the previous studies, which investigated the direct relationship between human factors of quality management and quality improvement practices and organization performance, furthermore the mediator role of quality improvement practices for the relationship of human factors of quality management and organization performance (Flynn et al., 1995; Ho et al., 2001; Rahman and Bullock, 2005; and Abdullah et al., 2008), the following hypotheses were generated to answer the selected research questions, which examine: (1) the direct impact of human factors of quality management on quality improvement practices and organization performance, (2) the direct impact of quality improvement practices on organization performance, and (3) the indirect impact of human factors of quality management on organization performance through their impact on quality improvement practices.

H1o: Human factors of quality management have no direct impact on organization performance.

H1a: Human factors of quality management have direct impact on organization performance.

H2o: Human factors of quality management have no direct impact on quality improvement practices.

H2a: Human factors of quality management have direct impact on quality improvement practices.

H3o: Quality improvement practices have no direct impact on organization performance.

H3a: Quality improvement practices have direct impact on organization performance.

H4o: Human factors of quality management have no indirect impact on organization performance through their impact on quality improvement practices.

H4a: Human factors of quality management have indirect impact on organization performance through their impact on quality improvement practices.

3.3 Research Design

In social science, there are two methods of data collection: Qualitative and quantitative. The two methods have much argument, which both of them have their strength and weaknesses. According to Zikmund et al. (2010), qualitative approach can be defined as a research that addresses objectives through techniques that allow the researcher to provide elaborate interpretations of phenomena without depending on numerical measurement; it is focus on discovering true inner meanings and new insights. While, quantitative approach is a research that addresses research objectives through empirical assessment, which involves numerical measurement and analysis.

In other words, qualitative data is not characterized by numbers, and instead, are textual, visual, or oral; the focus is on stories, visual portrayals, meaningful characterization, interpretations, and other expressive descriptions. The quantitative data, on the other hand, represents phenomena by assigning numbers in an ordered and meaningful way.

Furthermore, the truth is that qualitative approach can accomplish research objectives that quantitative approach cannot. Similarity truth, quantitative approach can accomplish objectives that qualitative approach cannot. The successfully used procedure is to match the right approach to the right research context (Zikmund et al., 2010).

To achieve the purpose of this study, quantitative approach is used. Karami et al. (2006) made it clear that the research questions and context should dictate the choice of appropriate method. Moreover, they suggested that quantitative approach is more widely accepted in the establishment of reliability and validity. According to Swanson & Holton (2005), the quantitative approach is a suitable method to make generalization from the sample. Furthermore, Zhang (2000) claimed that the advantage of a quantitative approach is that it is possible to measure the reactions of a great many people to a limited set of questions; thus, facilitate the comparison and statistical aggregation of the data, which gives wide, generalization set of findings presented succinctly and parsimoniously.

Generally, the data collection procedure that carried out to investigate the purposes of this study was questionnaire. Ary et al. (1990) suggested that the survey methods as a form causal-competitive is suitable for conducting studies that are seeking an explanation attitude and behaviour on the basis of data collection at a point in time. The questionnaire that used in this study, however, provided enough data illustrating the direct and indirect relationship between human factors of quality management and quality improvement practices and organization performance in Yemeni industrial companies. Flower (1988) claimed that the survey methods can provide a quantitative or numeric explanation of some fraction of the sampling through the data collection process of asking questions of people.

Moreover, the collected data was analyzed statistically by using Statistical Package for Social Sciences (SPSS) program for descriptive analysis, factors analysis, reliability analysis, and correlation analysis, while structural equation model (SEM) was carried out by using statistical program Amos version 16.0 to analyze the hypotheses of the study.

3.4 Population and Sampling

The target population of this study is all Yemeni industrial companies, who had received local and international quality certificates due to their interest on total quality management implementations and also implicate international and local quality criteria in their operations.

In fact, There are 87 Yemeni industrial companies that have already taken local quality certificates, which were given by Yemen Standardization Metrology and Quality Control Organization (YSMQCO), and also international quality certificates (such as European Business Excellence Model (EBEM), ISO 9000, and also other international quality awards). These companies are divided into five industrial cities; they are: Sana'a, Aden, Alhudaidah, Hadramout, and Taiz (Table 3.1).

This study emphasizes on industrial sector due to their importance to Yemeni Economy, as well as to support government's effort to enhance this sector via improving total quality management implementation (www.yemen.gov.ye/). Essentially to note that the researcher chose this kind of companies due to their interest on the implementation of total quality management and using international and local criteria in their operations, which give them familiarity with the issues that addressed in this study (Curry and Kadasah, 2002).

Choosing the appropriate sample is the most important element to answer the research questions and investigate the objectives of any study (Sekaran, 2000). Based on this logic, the participants of this study are the managers, who are familiar with the implementations of total quality management in their organizations and at the same time have knowledge about the performance. Therefore, the respondents of this study are; one top management managers and two quality managers of each Yemeni companies of interest. Thus, a total of 261managers from 87 Yemeni industrial companies were listed as respondents of this study.

Table 3.1: Population of study

Industrial cities	Number of companies
Alhudaidah	21
Hadramout	20
Sana'a	18
Taiz	17
Aden	11
Total	87

Source: Yemen Standardization Metrology and Quality Control Organization

3.5 Instrumentation

In order to achieve the aims of the present study and examine the generated hypothesis, survey method accompanied with a questionnaire survey was the most suitable method to be used. In other words, survey method is important to be used in such research in order to statistically validate the hypothesis since the questionnaire can be sent to a large sample size through many companies (Antony et al., 2007).

This study conducts four hypotheses to investigate its purpose. Hence, the questionnaire that used as data collection procedure was divided into four sections (see Table 3.2); the first section includes information about samples' personal such as gender, age, working experience, and qualification. The second section includes the items that represent the human factors of quality management (such as leadership, customer focus, supplier relations, employee involvement, training and education, and finally rewards and recognitions). And the third section contains the items that represent quality improvement practices (such as top management support, teamwork, customer involvement, process control and improvement, product design, and quality system improvement). Finally, the forth section was particularly designed to collect data regarding organization performance. Therefore, the following section explains the source that was used to build the current instrument.

The first section of the questionnaire was developed by the researcher. This section contains statements seeking for the personal information of the respondents.

The second section was conducted to measure human factors of quality management. This study used the instrument that was developed by Zhang et al. (2000). This instrument was developed based on an extensive literature of total quality management that was built by quality gurus and total quality awards, in addition to empirical studies that were carried out by many researchers in total quality management field.

Table 3.2: Sections of the survey questionnaire

Section	Description	Number of items	Source
1	Personal and Demographic	4	Researcher
2	Manager's perception towards human factors of quality	40	Zhang et al. (2000)
3	Manager's perception towards quality improvement practices	38	Zhang et al. (2000) & Flynn et al. (1994)
4	Manager's perception towards organization performance	7	Samson and Terziovski (1999)

In Zhang et al. study, the data was collected from 212 Chinese manufacturing companies in nine industrial sectors by 212 quality managers; they tested the validation of this instrument. They identified 11 factors of total quality management practices as critical factors of total quality management implementations. Practically, this instrument covers a broader scope of total quality management, it includes six human factors of quality management; they are: leadership, customer focus, employee involvement, supplier relations, training and education, and reward and recognition. Actually, these factors divided human factors of quality management into 40 items. They used the five point Likert scale. The reliability alpha values of the human factors of total quality management ranged between 0.892 (leadership) and 0.838 (supplier relations).

The third section of this instrument was constructed to evaluate quality improvement practices. Actually, quality improvement practices include both human and technical side of total quality management. However, in order to measure the human side of quality improvement practices (top management support, teamwork, and customer involvement) this study used the items that were adopted by Flynn et al. (1994) and developed by Fynes and Voss (2001). Furthermore, to measure technical side of quality improvement practices (process control and improvement, product design, and quality system improvement); this study adopted the items that were used by Zhang et al. (2000). However, overall 38 items were adopted to evaluate quality improvement practices in the current study.

Forth section of this instrument was designed to measure organization performance. In current study, the instrument that was adopted from Samson and Terziovski (1999) and later developed by Rahman and Buluk (2005) was used. This instrument includes seven dimensions of organization performance; they are customer satisfaction, employee morale, productivity, defects, delivery in full, cost of quality and warranty claims cost.

Samson and Terziovski made one of the largest surveys in the field of total quality management through 1024 respondents from Australian and New Zealand manufacturing companies. This instrument was developed by committee of academics, managers, and chairman of the Australian Quality Awards Foundation by using a variety of sources such as the Malcolm Baldrige National Quality awards criteria (1994), the Deming Prize award criteria, the European Quality Award criteria, and the Australian quality award criteria (1994).

Actually, the questionnaire items, which used in the present study to measure the relationship between the variables, were written by English Language, while the target populations of this study are from Yemen, a country which first and formal language is Arabic. That means, the researcher must translate these items clearly to Arabic Language to be understandable by the respondents in order to achieve the purpose of this study.

Therefore, the English version was translated to Arabic language by the researcher himself. After translation, the Arabic version was sent to 5 quality management consultants in Yemen to ensure that this version reflects the same meaning with the English concept and understandable by the respondent in Yemen industrial sector. Actually, their comments and alterations were made as they suggested.

The Arabic version of questionnaire was pretested through 10 respondents (consultants, managers and supervisors) in Yemen industrial companies and the final version was prepared based on their comments.

3.5.1 Pre-test of questionnaire

Pre-testing the questionnaire is ensuring that there is no problems with wording and measurements, which ensure that the reliability and validity for the scale used are acceptable before data collection is carried out (Sekaran, 2003). In this study, the questionnaire that was developed to measure the perception of the respondents on the human factors of quality management, quality improvement practices, and organization performance was pre-tested prior the study.

Thirty respondents were selected for the purpose of the pre-testing. Cronbach's Alpha coefficient was used to estimate the survey instrument. Therefore, Cronbach's Alpha was calculated to measure the internal consistency of the questionnaire. The study instrument was pre-tested with 30 respondents, who were not involved in the actual study.

The pre-test version of questionnaire was sent to the respondents by email and personal contact; furthermore, in this period some of the pre-test samples were interviewed over the telephone and personal contacts to enhance the pre-test operation. The researcher carefully studied and considered the feedback of trial samples, which made the survey instrument to be understandable by respondents.

Below are the tables that show the results of pre-testing operation. Table 3.3 reveals the reliability estimates of the variables of human factors of quality management. The Alpha coefficient ranged between (0.811) and (0.878) respectively; customer focus (0.811), employee involvement (0.832), reward and recognition (0.841), supplier relations (0.846), leadership (0.872), and training and education (0.878). These results show that all six variables of human factors of quality management are acceptable for the consideration of this study.

Table 3.3: Reliability pre-test of human factors of quality management

No	Factor	No of items	Cronbach's Alpha (original, Zhang et al., 2000)	Alpha score
1.	Leadership	8	0.892	0.872
2.	Customer focus	6	0.875	0.811
3.	Supplier relations	6	0.838	0.846
4.	Employee involvement	8	0.883	0.832
5.	Training and education	6	0.885	0.878
6.	Reward and recognition	6	0.857	0.841

Table 3.4 shows the reliability of the variables of quality improvement practices and comparing with original instrument that was carried out by Flynn et al. (1994) and Zhang et al. (2000). Alpha coefficient ranged between (0.718) and (0.879) respectively; product design (0.718), process control and improvement (0.718), top management support (0.803), quality system improvement (0.823), customer involvement (0.838), and teamwork (0.879). Thus, based on these results the six variables of quality improvement practices are acceptable for the concern of this study.

Table 3.4: Reliability pre-test of quality improvement practices

No	Factor	No of items	Cronbach's Alpha (original, Flynn et al 1994, Zhang et al 2000)	Alpha score
1	Top management support	5	0.726	0.803
2	Teamwork	7	0.704	0.879
3	Customer involvement	5	0.657	0.838
4	Process control and improvement	8	0.839	0.718
5	Product design	8	0.890	0.718
6	Quality system improvement	5	0.925	0.823

Table 3.5 shows the results of the pre-test of organization performance dimensions and also compare these results with the original instrument that was adopted by Samson and Terziovski (1999).

The Alpha coefficient of organization performance is shown in Table 3.5, while the pre-test reliability of overall variables is shown in Table 3.6. The Alpha coefficient confirmed the acceptance of organization performance for this study.

Table 3.5: Reliability pre-test of organization performance

No	Factor	No of items	Cronbach's Alpha (original, Samson and Terziovski 1999)	Alpha score
1.	Performance	7	0.674	0.724

Table 3.6: Reliability pre-test of overall variables

Factor	N of items	Cronbach's Alpha
Human factors	40	0.951
Quality improvement practice	38	0.941
Organization performance	7	0.724

Finally, the pre-test results that were revealed in Tables 3.3, 3.4, 3.5, and 3.6 indicated that the questionnaire for the study is reliable. Sekaran (2003) suggested that the Cronbach's Alpha value greater than 0.70 are acceptable for the research.

3.6 Reliability analysis

According to statistical packages for the social sciences (SPSS) 2001, the reliability analysis acts to provide information about the relationships between individual items in the scale and their internal consistency, in addition to examine the properties of measurement scale and the questions that make it. Wuest et al. (2006), however, considered the calculating estimates of reliability as an essential prerequisite for the instrument's validation.

There are two common methods to evaluate the reliability of instrument namely; test/retest and internal consistency. In this research, internal consistency was adopted to estimate the reliability of instrument.

Test/retest simply means that the instrument should have the same results in test one as it does in test two. In other words, the idea of test/retest is implementing the measurement instrument at two separate times for each subject. Then, computing the correlation between the two separate tests; the result should reflect that there is no difference between test 1 and test 2 and the correlation coefficients must be 0.70 or more to be considered good reliability (Litwin, 1995).

Internal consistency is the most commonly used methods to evaluate the reliability of measurement instrument. It estimates the reliability of instrument through grouping questions in a questionnaire that measures the same concept; computes the correlation of questions and in turn determines the reliability of the instrument. In this research, internal consistency was measured by Cronbach's coefficient alpha, the higher Alpha value or the closer reliability coefficient to 1.0 is considered the higher measurement items, Therefore, in this study, any Alpha values 0.6 or less, generally will indicate to the unsatisfactory internal consistency reliability, and Cronphach's Alpha values exceed 0.7 will represent the acceptable reliability, while any Alpha values over 0.8 will be considered as extremely good (Cronbach, 1951).

3.7 Factor analysis

According to Hair et al. (1998), the main purpose of factor analysis is to find a way of condensing or summarizing the information into a smaller set of new composite dimensions (factors) with a minimum loss of information.

In fact, factor analysis is a way of testing how well measured variables represent the constructs. Moreover, factor analysis results can provide evidence for the convergent and differentiate validity of theoretical constructs (Brown, 2006).

Indeed, factor analysis can help to identify whether the selected items cluster on one or more than one factor. Factor loadings are used to present these relations. Hair et al. (1992) regarded factor loadings greater than 0.30 as significant factors, loadings of 0.40 as more important, and if the loadings are 0.50 or greater; they are considered very significant. The previous studies in field of total quality management such as Saraph et al. (1989), Flynn et al. (1994) and Zhang (2000) used factor analysis and they claimed that factor loading 0.50 is acceptable in their studies.

Therefore, in the current study, a factor loading of 0.50 or greater is considered significant. The statistical program of SPSS was used to perform factor analysis.

3.8 Data collection

Choosing an appropriate method depends on research problem, objectives, and hypotheses. For the current study, depend on objectives of this research a quantitative approach was used to elicit a data. To make generalizations from the selected sample of this study, the quantitative approach was the most suitable method to be applied (Swanson and Holton, 2005). Many researchers in the area of total quality management used questionnaire survey for data collection such as Saraph (1989), Flynn (1994), Samson and Terziovski (1999), Zhang (2000), Ho et al. (2001), Abdullah et al. (2008), Rahman and Bullock (2005), Oprime et al. (2012), and Guion (2010). It is more easily and lower cost compared to other methods.

In this study, after pre-testing the questionnaire to ensure that its items have a high reliability, the final version of questionnaire was sent to the companies. It is worthy to be mentioned here that we used quantitative method due to its capability to measure the reaction of many people to limited questions which facilitate the comparison procedure and statistical aggregation of the data. However, a questionnaire was designed to collect the data which identify, determine and clarify the relationship between the variables of this study.

The data collection procedures were administrated personally by the researcher's assistants, friends and colleagues in Yemen. Mail survey methods were used to data collection in this study. Each questionnaire was accompanied by cover later with an introduction and explanation for the purpose of the study. Actually, each respondent was requested to respond within two weeks of receiving the questionnaire.

A personally contact by researcher was made with companies directly and also by friends and colleagues to increase the response rate of the survey. The total companies were 87, the total samples were 261, and the final sample size was 210 questionnaires; this final sample size was used to analyze the data.

3.9 Data analysis

All information and data collection were transferred into the data entry template using Statistical Packages for the Social Sciences (SPSS) version 19. In addition, Structural Equation Model (SEM) by Amos program was also used to test and evaluate the theoretical framework and its hypotheses due to their flexibility in this respect.

Appropriate tests such as descriptive statistics, factor analysis, reliability analysis, correlation analysis, and structural equation model were carried out accordingly.

In this study, SPSS statistical program was used to test the factor analysis and reliability statistics of the variables of this study, and descriptive statistics of study as well. Moreover, the correlation analysis was carried out by SPSS to test the relationship between the variables of the study due to their flexibility in this respect. While structural Equation Model (SEM) was carried out by using statistical program Amos version 16.0 to evaluate the theoretical framework and its hypotheses, which examine the direct impact of human factors of quality management on quality improvement practices and organization performance, furthermore an indirect impact of human factors of quality management on

organization performance through their impact on quality improvement practices.

3.9.1 Descriptive statistics

Descriptive statistics (frequency and standard deviational) were used to understand the profile of the respondents and to get the feeling of the data, in addition to mean, median, mode, minimum, maximum and standard deviation for each variable.

3.9.2 Correlation analysis

In this study, the correlation analysis method was carried out to determine the strength of linear relationship between the variables of the study, which aims to examine the interrelationship between human factors of quality management and quality improvement practices and organization performance, and the relationship of quality improvement practices and organization performance.

According to Bolboaca and Jantschi (2006), the value of this test is ranged between (-1 to +1). In other words, the value of +1 reveals that the variables are strongly linear related by an increasing relationship, and the value of -1 reveals that the variables are strongly linear related by a decreasing relationship, while the value of 0 shows that the variables are not linear related at all. There is consideration that if the correlation coefficient is more than 0.8, it refers to the existence of a strong correlation; while, if the correlation is less than 0.5, it means that the correlation is very weak .Table 3.5 provides more explanation regarding this point.

Table 3.7: The Value of *r*

Value of r	Relationship Strength
0.8 to 1.0	very strong
0.6 to 0.8	strong
0.4 to 0.6	medium
0.2 to 0.4	weak
0.0 to 0.2	very weak

Source: Salkind, 2003

3.10 Structural Equation Modeling (SEM)

Structural equation modeling (SEM) was carried out to investigate the hypotheses of this study using statistical program Amos version 16.0. In fact, there are two main advantages for using structural equation modeling in quantitative researches; (1) allows the distinction to be made between observed and latent variables, and thus (2) enables variables that were not directly observed to be included (Mueller, 1996 and Kline, 1998).

In structural equation, modeling models simultaneous equations can be estimated by obtaining information about indirect effects when mediator variable are included, and the mediator variable in this study represented by quality improvement practices (Bollen, 1989 and Mueller, 1996).

The methods of structural equation modeling include four steps (Kline, 1998). First: specification step, which defines the research hypotheses. Second: identification step, which examines the possibility of model to drive a unique estimation of each model parameters. Third: analyzing step, which analyzes the model by obtaining estimation of models parameters. Forth: evaluating step, which evaluates the model fit to be tested through chi-square value.

Structural equation model includes two models; measurement model and structural model. The measurement model interests on the relationship between latent and observable variables, while the structural model specifies linkages between different latent variables (Bollen, 1989).

In this study, structural model was established to test the hypotheses of the causal effects between different latent variables. In this model, exogenous latent variables represented the independent latent variables, which were not predicted by any variables in this model, by the human factors of quality management. In this study, the latent endogenous variables were determined by other variables; quality improvement practices and organizational performance.

The estimation of structural models should follow two steps; firstly, it must assess the fit of the proposed model to the observed data since if the model does not acceptably fit the data, the individual hypotheses cannot be examined. Secondly, the statistical significant and magnitude of structural parameters are carried out together with the reliability of the structural equations.

In this study, the structural model was established to evaluate a full relationship between human factors of quality management and quality improvement practices and organization performance, which evaluate the direct and indirect impact of human factors of quality management on quality improvement practices and organization performance.

Furthermore, there are three separate models were established to separately evaluate the hypotheses of this study; they are the first model was established to evaluate the direct impact of human factors of quality management on organization performance, the second model was carried out to assess the direct impact of human factors of quality management on quality improvement practices, and the third model was established to examine the direct impact of quality improvement practices on organization performance.

3.11 Summary

This chapter describes the research framework and methodology. In doing so, the framework of study was conducted based on extensive studies of literature of total quality management, which this section explains the relationship of the variables of this study by revealing the relationship of human factors of quality management and quality improvement practices and organization performance.

Based on the theoretical framework of the study four hypotheses were generated to answer the selected questions and investigate the objectives of study that mentioned earlier. In this chapter also the population and sampling of study were presented; a total of 87 Yemeni industrial companies distributed into five Yemeni industrial cities, and the samples of this study were three quality managers from each company; they are one top manager and two quality managers.

The measurement of the study got enough explanation. The current study used Zhang et al. (2000) instrumentation to evaluate the human side of total quality management. To measure quality improvement practices, this study used Flynn et al. (1994) instrumentation, while Samson and Teraiovski (1999) instrumentation was used to evaluate organization performance. Actually, the instrumentation of this study was per-tested through 30 quality managers from Yemeni industrial companies. Furthermore, this chapter discusses the data

collection and analysis methods, which this study used SPSS program and Structural Equation Modeling by Amos program to analyze the data of this study.