Investigating the relationship between quality management and productivity: An analysis of quality and productivity in Pakistani manufacturing companies.

INVESTIGATING THE RELATIONSHIP BETWEEN QUALITY MANAGEMENT AND PRODUCTIVITY

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Key Words: Quality Management (QM), Productivity, Foreign owned companies (FOC's), Local owned companies (LOC's), Best Practice (BP).

ABSTRACT

The aim of this study is to determine the extent to which Quality Management Practices has been effectively adopted and implemented by Pakistani manufacturing companies and to identify best practices for adoption by the companies. The study employed primary and secondary data sources to determine the relationship between QM and Productivity. The study used quantitative methodology for data collection and analysis.

The survey responses were categorised into foreign owned companies (FOC's) and local owned companies (LOC's). The outcome of the descriptive and statistical analysis of the survey responses and secondary data of the companies found that, although most of the companies were aware of the significance of the QM practices and Productivity, FOC's were found to have performed highly better in the adoption and implementation of QM practices in their companies compared to locally owned companies.

The study also revealed that there is positive relationship between quality and productivity of the manufacturing companies. The evidence deduced from the study shows that foreign owned companies have performed better compared to local owned companies in terms of quality and productivity. Furthermore, the evidence from this study also points out that, automobile sector of Pakistan performed well in the adoption and implementation of QM practices. Strong positive link between quality and productivity was found in the case of automobile companies.

This study therefore recommends for manufacturing companies in Pakistan to effectively adopt and implement Quality management practices that encapsulate the study's framework for adoption of QM practices (see figure 7.1).

Dedication

I would like to dedicate this thesis to my father and mother, and particularly to my lovely wife Mrs Jaweria Tahir. **I would like to say, Jaweria, I always feel proud to be your life partner. You really are an "Angel" for me and I shall always love you.**

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ABBREVIATIONS

BP	: BEST PRACTICE
CSF's	: CRITICAL SUCESS FACTORS
FDI	: FOREIGN DIRECT INVESTMENT
FOC'S	: FOREIGN OWNED COMPANIES
ISO	: INTERNATIONAL STANDARD ORGANIZATION
JIT	: JUST IN TIME
LOC's	: LOCAL OWNED COMPANIES
MNC's	: MULTI NATIONAL CORPORATIONS
QCC's	: QUALITY CONTROL CIRCLES
QI	: QUALITY IMPROVEMENT
QM	: QUALITY MANAGEMENT
SME's	: SMALL AND MEDIUM ENTERPRISES
5 S	: SORTING, STRAIGHTEN, SWEEPING, STANDARIZING, AND SUSTAINING
SPC	: STATSTICAL PROCESS CONTROL
TQM	: TOTAL QUALITY MANAGEMENT

Chapter One: Introduction

1.1 Organisation of the Thesis

This thesis is organised into eight chapters. Chapter one, which is the introduction focus on the research aims, objectives and research questions. It also includes the statement of research problem and motivation for the research. It also highlights on the background of the economy of Pakistan with particular emphasis on manufacturing companies.

Chapter two reviews the relevant literature on quality. It also covers quality management and productivity, more specifically focusing on quality management of Pakistani manufacturing companies. The chapter presents a conceptual framework for the study by providing a detailed outline of the dynamic of quality management within Pakistani manufacturing sector. The issues that were examined comprise the quality management relationship with productivity and intellectual perspectives of its relevance within the modern manufacturing sector both in developed and in the developing world. This provided the grounding for understanding the manufacturing sector in Pakistan as examined in this study.

Chapter 3 is devoted to the methodological approach used for conducting the research. In order to respond effectively to the research aims and objectives set out in this research. Quantitative research strategy was employed. Due to the overarching aim of the research, quantitative research strategy, which is an effective way of examining numerical data, was judge the suitable strategy to deal with the aims of the study.

Chapter 4 helps to gain an understanding of how quality management initiatives are conceived, designed and implemented by Pakistani manufacturing companies. The

chapter begin with the presentation and analysis of the field data generated for the study. The chapter brings together the presentation of the survey data from the field conducted with the study companies. The chapter identifies the key issues such as company profile, sector categorisation, distribution of respondents based on ownership, status of quality management practices, relationship between QM and practices and type of ownership, relationship between QM and practices and financial performance. The chapter also shed light on elements/barriers in adoption of QM. The chapter end with a summary.

Chapter 5 presents a calculation of the productivity of the study companies. It also includes descriptive statistics such as percentages, crosstabulations as well as central tendencies such as mean, standard deviation, maximum and minimum and ranges of the sample companies. Statistical tests such as T-test, ANOVA and correlations were also capture in this chapter to establish the impact of company size, ownership and sector on productivity.

Chapter 6 builds upon the analysis by focusing on the relationship between quality and productivity. It begins with introduction and discusses the rate of scrap, rework, defects and complaints, of the study companies and how they affect productivity of the study companies. It also discusses the QC practices adopted and implemented by sample companies. The chapter also compares quality performance function on the basis of ownership. The chapter end with a summary.

Chapter 7 focuses on the discussion of the result and outcome of the data presented from the field study. In this chapter, the research aims and objectives are re-visited. The chapter critically assesses the analysis of the data and its contribution to achieving the original research aim and objectives. In doing so, the status of QM

practices in Pakistani manufacturing companies are also discussed. The chapter also highlights on the study proposed framework designed for manufacturing companies in Pakistan to adopt in order to enhance quality and productivity of the companies. The chapter end with a conclusion.

Chapter 8 constitutes the conclusion of the thesis. It brings together the facts that emerged in the presentation of data chapters of the thesis. The chapter highlights the limitations of the study and offers recommendations in order to improve the quality management and productivity of manufacturing companies in Pakistan. The chapter also makes suggestions in areas that future researchers may need to do, with the aim of building upon the findings presented in this study.

1.2 Problem statement of the research

Quality management (QM) has become a critical issue facing manufacturing companies all over the world, and particularly developing countries such as Pakistan. This is because quality management forms the basis for competitiveness in the international market. Infact in some international markets quality is not longer an order winner, it has become an order qualifier. However, in some areas of the home markets in Pakistan quality is still less important than price. In Pakistan, quality management issues have not been taken seriously by either the government or private manufacturing companies, and as a result have had a negative impact on the productivity of many companies (Fatima & Ahmed, 2006). The major problem encountered by these manufacturing companies is that their share of the market for their respective products has declined, due to Pakistan's decreasing competitiveness in terms of quality, cost and delivery (Fatima and Ahmed, 2005, 2006(a),

2006(b)).This has exposed the country's export-based manufacturing sector to increasing threat from external competitors such as India, Bangladesh and China. Currently, some manufacturing companies in the country have attempted to explore QM as a success factor to boost productivity, but this effort has been undermined by the limited quality management opportunities (Fatima and Ahmed, 2006). By limited QM opportunities, Fatima and Ahmed are referring to the price based competition in some home markets and the general apathy towards quality by some companies. Another factor is the large number of family owned businesses in Pakistan. It has also been noted that quality affects the productivity of manufacturing but in Pakistan it is difficult to relate quality management to productivity due to the unfavourable business environment as just states (Khan, 2003). Attempts by several companies to adopt quality management as an instrument to increase productivity and profits have met with mixed results. Whiles some companies who refuse to adopt quality management practice could be earning abnormal profits, because by avoiding the cost element of instituting proper management control or producing substandard products, other companies that have adopted quality management practices have complained about the cost implications, while at the same time competing with non-quality management practice companies, with no enabling environment provided by government (Moosa, 2000).

This study explores the relationship between quality management and the productivity of manufacturing companies in Pakistan to see whether quality management best practice affects productivity, and the investment in quality systems is worthwhile.

1.3 Research aims

The aim of this research is to make a contribution to manufacturing companies in Pakistan by investigating the relationship between quality management practices and productivity. If, as may be expected, a positive relation is found then to recommend the best QM practice necessary for adoption by Pakistani manufacturing companies.

1.4 Objectives of the study

1 To identify the level of adoption of QM practices in manufacturing companies in Pakistan.

2 To explore any barriers to the adoption of QM practices for manufacturing companies in Pakistan.

3 To examine the relationship between QM, and productivity in manufacturing companies in Pakistan.

4 To assess if there is a difference between locally owned companies and FOC's operating in relationship to quality management and productivity.

5 To identify best practice (BP) for adoption of QM by companies in Pakistan particularly, locally owned companies.

1.6 Contribution to knowledge

Most studies on quality management, for example by researchers such as Kontoghiorghes & Gudgel (2004) and McCracken & Kaynak(1996),have focused on QM practices in developed countries but have failed to acknowledge the relevance of quality management practices and their relationship to productivity in developing economies such as Pakistan. This study makes contribution to an understanding of

the relationship between quality management practices and productivity in Pakistan, which is presented as a typical case of a developing country.

A study of the literature has shown that there is a lack of knowledge about the influence of quality management practice on the level of productivity of manufacturing companies in developing countries. Therefore, the ultimate aim of this research is to contribute to knowledge by understanding the impact of the implementation of QM in Pakistan and to identify barriers to its effective adoption and implementation, leading to appropriate policy recommendations for implementation by Pakistani manufacturing companies, especially locally owned companies.

Further, some researchers in quality management in Pakistan, such as Fatima and Ahmed (2005, 2006), have concentrated their study on specific areas such as textiles, while Moosa's (2000) studies on QM in Pakistan were limited to only twenty companies. This study covers a wide range of companies from different sectors, therefore the findings of this study is more representative than the previous studies.

Additionally, several quality management researchers in Pakistan have not identified the barriers to adopting QM (Khan, 2001; Shah, 2002). This study makes a contribution to the general understanding of these barriers, providing a valuable insight into current knowledge of QM, with a view to setting benchmarks for manufacturing companies in Pakistan in adopting QM. The practical challenges of QM in terms of conceptual visions identified in the literature are also examine.

Finally, another significant contribution from this study was to compare, for the first time, the Pakistani dimension of QM and that of multinational companies operating in Pakistan. This offers the researcher the opportunity to contribute to the development

of quality management for developing nations. Therefore, the key contributions of this research can be summarised as:

1. Development of 3 tier framework for adoption and implementation of QM practices for Pakistani manufacturing companies. This framework is based upon the effectiveness of QM practices as demonstrated by the statistical analysis of the data gathered for this research.
2. The adoption of the QM practices alone is insufficient to guarantee the effectiveness and that a number of implementation and methods are required in order for these to be effective. This has been represented as a further framework which needs to be implemented alongside each QM practices. This is based on the statistical analysis shown in table 4.42 and table 6.26 respectively.
3. This study has demonstrated a positive link between increase quality and productivity in companies of all sizes and all sectors in Pakistan both foreign owned and locally owned.
4. This is the first large scale survey linking quality and productivity in Pakistani companies, previous studies have either been restricted to one sector or have only had small survey samples.

1.7 Motivation for the research

Quality production and awareness of the need for high-quality products are issues of supreme importance for Pakistani manufacturing companies. It is noted that some of the managers in developing countries still believe in the conventional view that gains in quality come only at the expense of reduced productivity (Parasuraman, 2002; Omachonu and Ross, 1994; Sumanth and Arora, 1992). In contrast, in developed

countries like the UK, USA, and Japan, it is accept that increases in product quality go hand-in-hand with increased productivity as well as increased competitiveness (Crosby, 1979; Feigenbaum, 1983; Takeuchi and Quelch, 1983; Deming, 1986; Garvin, 1988; Kontoghiorghes and Gudgel, 2003, 2004). Samson and Terziovski (1999) stated, *"*Many Japanese and Western companies did indeed build or rebuild their competitiveness based on the principles of TQM*".*

Statistics from *Table 1.1* depict the contribution of the manufacturing sector to the economic development of Pakistan. The table shows a marginal percentage increase. Again, in terms of the contribution to the GDP of exported of goods and services over the past three decades, the trends have not been encouraging, and although there seems to be a marginal percentage increase in real terms the increment is insignificant. This suggests that Pakistani products may be subjected to stiff competition in the global market, leading to marginal performance at the international level, as shown

by export contribution to GDP (see table 1.1).

Table: 1.1 Contribution of manufacturing sector to Pakistani GDP

Years	1986	1996	2006	2009
Contribution of manufacturing industry in the economy	16.3%	15.2%	19.5%	21.4%
Export of goods/services/GDP	17.3%	14.9%	18.9%	22.7%

Source: www.pkpolitics.com/14/11/2010)

1.8 Justification for the Research

In South East Asia and the developing world in general, there have been several attempts over recent decades at improving the quality and productivity of manufacturing companies through various interventions by governments and private

bodies. However, the evaluation reports of several researchers and practitioners indicate minimal improvement in the quality of manufactured goods (World Bank, 2001). In Pakistan for example, the Quality Control Authority report on quality products trends in the year 2005, shows that companies continue to produce substandard goods (Fatima and Ahmed, 2006). However, given the huge investment that the state makes in addressing quality management problems through quality management programmes, it is important that special attention is given to how such resources enhance the quality of the manufacturing sector.

Again, in recent years, government and private companies have been involved in research into the quality of manufactured products. There is a lack of coordination of these efforts by planners and policy makers to incorporate programmes that directly influence the quality of the products (Khan, 2003). It is widely agreed that strengthening the policy environment is an essential condition for success in quality management (MOF, 2001; UNDP, 2000).

This study is expected to contribute to the understanding of the barriers to QM, and policy recommendation for the adoption of appropriate quality management practices by manufacturing companies, and for government monitoring and ensuring quality standards for manufacturing products in Pakistan.

1.9 Scope of the study

The target population for the study with respect to data collection include the sampled population of all the quality/production managers of manufacturing companies, and material suppliers of manufactured goods, in the city of Karachi, and key people in selected institutions and organizations that are directly involved in manufacturing in Pakistan.

The research was conducted in Pakistan from August 2010 to January 2011. Pakistan is located in South East Asia. In terms of population, it is the sixth largest country in the world, with more than 177 million people (Statistical Survey of Pakistan, 2011). It has the second largest Muslim population in the world after Indonesia (World Bank, 2009). According to the 2006 population census, the total land area of Pakistan is 803,940sq km or 340,403 sq mile. Pakistan has a strong strategic position among its neighbours. It has a 1,046 km coastline along the Arabian Sea and Gulf of Oman in the south, and is bordered by Afghanistan and Iran in the west, the Peoples Republic of China in the far northeast, and the Republic of India in the east. Due to its strategic importance in recent days, Pakistan has been called part of the new Middle East (MOF, 2001). *Figure 1.1* shows a population map of Pakistan.

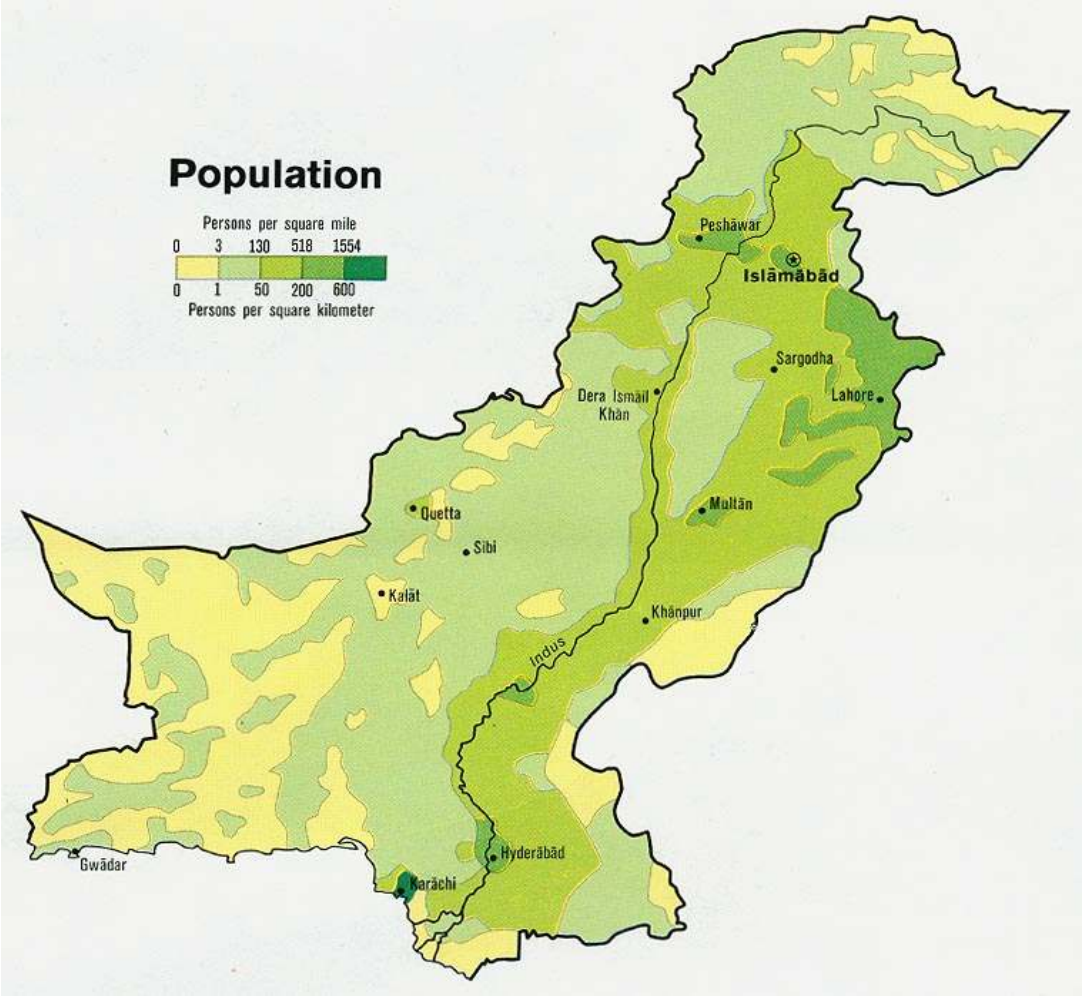


Figure 1.1: Population of Pakistan Source: http://www.lib.utexas.edu/maps/pakistan.html

1.10.1 Pakistan's economy

In Pakistan an emerging developing country, some aspects of QM have recently appeared in a regularized and coherent form. Additionally, in the five years up to 2007-08, the manufacturing and business sector significantly flourished and developed. *Table 1.2* shows the growth of manufacturing and business in Pakistan. However, quality production and an awareness of the need for quality are still issues of supreme importance for Pakistani manufacturing companies (Moosa, 2000).

Table 1.2: Export by economic categories

Year	Total (mil PKR)	Primary commodities (mil PKR)	Semi-manufacturers goods (mil PKR)	Manufactured goods (mil PKR)
2003-04	709,036.1	70,716.0	83,360.9	554,959.1
2004-05	854,087.7	92,018.4	86,483.0	675,586.3
2005-06	984,840.6	112,268.3	106,029.3	766,543.0
2006-07	1,029,311.7	113,954.0	121,929.9	793,427.7
2007-08	1,196,637.6	171,669.9	127,090.4	897,877.2

(millionPKR)= millionPakistani Rupees Source: Federal bureau of statistics

www.statepak.gov.pk[accessed on 7th December 2009]

It is proposed, that most of the manufacturing concerns in Pakistan still believe in the conventional view that gains in quality come only at the expense of reduced productivity (Dorfman and Steiner, 1954; Parks, 1974; Lancaster, 1979; Womack *et al.*, 1990; Kaydos, 1991).

Chapman and Khawaldeh (2002) pointed out that only a few companies in the developing countries have developed a TQM approach, with the exception of a handful of conglomerates, primarily foreign-owned companies within the electronic sector. However, in western countries such as Europe, America and Japan, it is generally accepted that increases in product quality should increase productivity as well as increase competitiveness (Crosby, 1979; Feigenbaum, 1983; Takeuchi and Quelch, 1983; Deming, 1986; Garvin, 1988; Kontoghiorghes and Gudgel, 2003, 2004).

Samson and Terziovski (1999) also stated that:

> *"Many Japanese and Western companies did indeed build or rebuild their competitiveness based on the principles of TQM". (Samson and Terziovski, 1999).*

It is shown below that manufacturing is an important potential tool for the economic and social development of Pakistan. However, some manufacturing firms are

declining in terms of output and contribution to the national income, employment, living standards, in contrast to western countries (Fatima, and Ahmed, 2005, 2006).

- The contribution of manufacturing industry to the national economy (GDP) has fluctuated from 16.3% in 1986, 15.2% in 1996, to 19.5% in 2006; it serves as a major source of revenue to the country.
- The export of goods/services also fluctuated in the period under discussion. The export sector contributed 17.3% to GDP in 1986, 14.9% in 1996 and 18.9% in 2006.Source: www.pkpolitics.com.

The both statistics demonstrate the importance of manufacturing to the Pakistani economy. However, previous studies have shown although some companies have tried to implement quality systems the level of success are still very limited on many occasion. Therefore, an investigation of QM initiatives in the Pakistani context is very significant and important.

Finally, in the publication "Out of Crisis" (1986), Deming stated that:

> *"If Japan be an example, then it is possible that any country with enough people and with good management, making products suited to their talents and to the market, need not be poor. The wealth of a nation depends on its people, management, and government, more than on its natural resources"*
>
> *(Deming, 1986).*

The next section gives an overview of the industrial sector in Pakistan

1.10.2 Overview of Pakistan's industrial sector

The industrial sector of Pakistanis located in four regions:

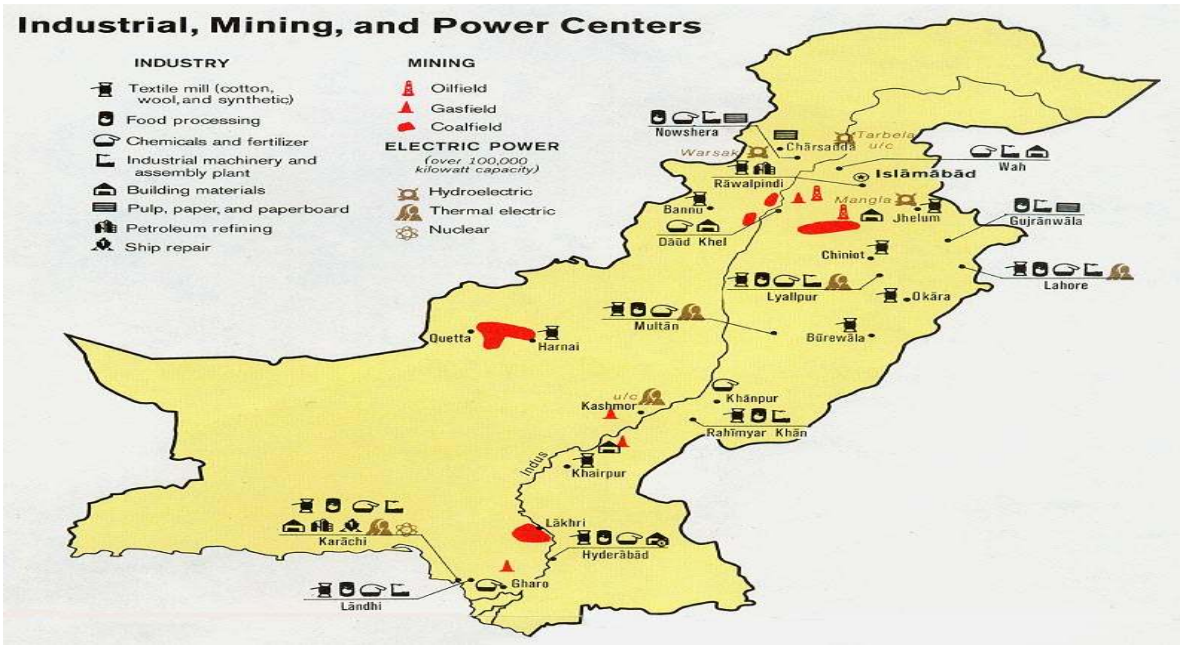
(a) Punjab, with 27 industrial zones.

(b) Sindh, also with 27 industrial zones.

(c) NWFP, with 13 industrial zones.

(d) Baluchistan, with 7 industrial zones.

Figure 1.2: Industrial sectors of Pakistan



Source: ***http://www.lib.utexas.edu/maps/pakistan.html***

1.10.3 FDI's in Pakistan

Foreign direct investment (FDI) plays an important role in making the country economically and financially stronger. Table 1.3 shows that Pakistan has made considerable progress in attracting FDI.

Table 1.3 Foreign Investment inflows in Pakistan (Million $)

Years	Greenfield Investment	Privatization Proceeds	Total FDI	Private Portfolio Investment	Public Portfolio Investment	Total Foreign Investment
2001-02	357	128	485	(10)	(483)	(8.4)
2002-03	622	176	798	22	(261)	559.1
2003-04	750	199	949	(28)	339	1,260.7
2004-05	1,161	363	1,524	153	458	2,134.6
2005-06	1,981	1,540	3,521	351	613	4,485.0
2006-07	4,859	266	5,125	1,820	1,471	8,416.6
Total	9,729.3	2,672.7	12,402	2,308.3	2,137.3	16,847.6

Source: www.***pakistan***.gov.pk ***(accessed on 7th July 2009)***

Table 1.3 shows a 46% increase in FDI as compared to 2005-06, and an 88% increase in total foreign investment as compared to 2005-06.

Ahmad and Muhammad (2004) defined the role and importance of FDI as playing the role of catalyst for development in developing countries. They further argued that FDI enhances productivity and competitiveness, as well as contributing directly or indirectly to growth in the host country. FDI can bring technology by means of its highly skilled MNCs. Secondly; FDI brings vast market knowledge and marketing skills accumulated from long-standing experience and broader exposure to worldwide competitive markets. “The indirect contributions of FDI in enriching the overall knowledge of the host economy include productivity and export spillovers”. In short, they recommend that “Pakistan’s capacity to progress on economic development will depend on her performance in attracting foreign capital. Pakistan’s outward looking development strategy should include FDI as an essential part in addition to export promotion strategy”. According to world investment report (2007, pp-43) “The performance of Pakistan in attracting FDI ($4.3 billion in 2006) has been promising. Strong economic growth and an aggressive privatization programme have led to booming FDI inflows during 2004-2006”.

Yousaf *et al.,* (2008) highlighted the recent measures taken by the government of Pakistan for attracting FDI:

- Freedom to bring, hold and take out foreign currency from Pakistan in any form.
- Privatization of an enterprise is fully protected. Neither can it be re-nationalized, nor can the government take over any foreign enterprise.
- Original FDI as well as profits earned can be repatriated to the country of origin.

- Equal treatment is provided to the foreign investor and local investor in terms of import and export of goods. FDI is not subject to taxes in addition to those levied on domestic investment.
- Foreign currency accounts are fully protected and they cannot be frozen.
- All 16 economic sectors, including the services sector, are open to FDI, and foreign equity up to 100 percent is allowed in almost all sectors. However, foreign equity up to 80 percent is allowed in the agricultural sector.
- There is no lower limit on the size of FDI in the manufacturing sector. However, in services, infrastructure and social sectors the minimum amount of foreign equity investment is $0.3 million.
- No government sanction is required to set up any industry, in terms of field of activity, location and size, except arms and ammunitions, high explosives, radioactive substances, security printing, currency and mint, and alcoholic beverages.
- There is no double taxation on income earned by foreign investors.
- Pakistan has also rationalized its tariff regime. Customs duty on import of most primary raw materials is not more than 5 percent, while on imported machinery it is between 0 and 10 percent.
- Copyright law has been amended while laws regarding patents, industrial designs and trademarks have been re-enacted.
- There is no requirement for obtaining a no objection certificate (NOC) from provincial governments for locating the project anywhere in the country, except in areas that are notified as negative areas.

FDI brings advanced technologies in areas such as new production processing techniques, managerial skills and ideas, and new varieties of capital goods. One of

the important aspects of this research study is to compare the performance of foreign owned companies (FOC's) to that of locally owned Pakistani manufacturing companies (LOC's). These issues were discussed during this research:

a) Are the new techniques working in Pakistan?
b) Are the techniques being copied or transferred to locally owned companies?
c) Is there any difference between the education level of the workforce of FOC's and that of local companies?
d) Are Pakistani owned companies borrowing expertise from FOC's?
e) How much importance are locally owned companies giving to issues like employee commitment, motivation, empowerment, training, award and reward system, compare to FOC's?

These general issues, along with specific quality and productivity issues, were also investigated in this research.

1.11 Chapter summary

The main purpose of this study is to determine the relationship between quality management and productivity and to identify the best practices (BP) for adoption by Pakistani manufacturing companies. Therefore, it is expected to contribute to an understanding of the barriers, and policy recommendations for adoption of appropriate quality management practices by manufacturing companies and government monitoring and quality standards for manufactured products in Pakistan.

Quality and productivity play an important role in introducing Pakistan into the list of developed industrial countries. Practical implications of the study could be very useful for Pakistani manufacturing companies to implement QM practices and improve their productivity.

It is hope that this study will also contribute to the body of knowledge by adding to the literature and providing empirical evidence from the Pakistani perspective. Thus, the findings will fill the gap in the literature on quality management and productivity for practical and academic purposes.

Finally, this research make contribution in highlighting the image of “Made in Pakistan” by attempting to provide a road map for locally owned manufacturing companies for adopting best QM practices within the cultural framework of Pakistan.

Chapter 2 Literature Review: Theoretical and Conceptual Framework

2.1 Introduction

This chapter, the theoretical framework for the research, reviews related literature on quality, quality management and productivity in order to place the research in the appropriate context and subsequently consider empirical perspectives.

2.2 The Concept of Quality

The concept of quality is a complex notion and has been contested in the fields of academia, business and everyday life since it is associated with individual perceptions of value for money, as well as performance, expectations and the appearance of a product (Huff et al., 1996). Quality in business is not limited to a product's physical attributes and performance, but includes the range of products and service-related features, packaged as a whole and presented to the customer for sale. According to Crosby (1980), quality is conformance to specifications or standards. Juran (1974) argued that quality is fitness for purpose. Quality from the consumer's viewpoint is the aspect of a product or service that offers consumer satisfaction and meets anticipated performance (Goetsch and Davis, 2000). Similarly, Zabada *et al.,* (1998) pointed out that in the view of the manufacturer or producer, quality may be defined as satisfactory aspect of a product or service, including meeting specifications and cost reduction.

Although there is no consensus on the definition of quality, several similarities and commonalities can be seen in the foregoing definitions. According to Goetsch and Davis (2000), the common characteristics associated with the definition of quality include the following:

- Quality is an ever-changing state (it is dynamic and subject to regular changes with time, taste and fashion).
- Quality applies to products, services, people, processes and environments.
- Quality entails meeting or exceeding customer expectations.
- Broadly, quality is defined with respect to these positions: transcendent quality (superiority or excellence), value-based quality (quality vis-à-vis price), product-based quality (quantities of product attributes), user-based quality (fitness for intended use) and manufacturing-based quality (conformance to the specifications). These are expanded below:
- Transcendent definitions offer little practical guidance for managers.
- Product-based and value-based definitions represent two concepts: price and quality.
- User-based definition is customer-focused.
- Manufacturing-based definition is internally focused and may cause managers to focus on internal efficiency rather than external effectiveness.

The above characteristics presented by Goetsch and Davis whilst been comprehensive are high level and philosophical therefore whilst helping to provoke consideration of quality characterises more detailed and practical guide are required for managers.

According to Evans and Lindsey (1999), businesses define quality as “meeting or exceeding customer expectations”. Quality has many attributes which several writers have shed light on, especially Garvin (1998):

- Performance: the primary operating characteristics of the product.
- Features: the attributes that relate to the “bells and whistles” of a product.

- Reliability: reflects the probability of a product's functioning or failing within a specified period of time.
- Conformance: the degree to which a product's design and its operating characteristics meet pre-established standards.
- Durability: economic and technical long-lasting features of a product.
- Serviceability: the speed of support, level of courtesy, competence, and ease of repair.
- Aesthetics: how a product looks, feels, sounds, tastes or smells. Reflection of individual preferences.
- Perceived quality: the measures that attract buying behaviours of customers.

Quality does not end with improving everything that companies do, whether sales, production, legal, accounting or research and development, purchasing, shipping, marketing and human resources (Hertz *et al.,* 1997). Managing quality is a continuous process in business, to ensure total customer satisfaction through developing the quality of manufactured products, processes, people and services. It also includes ensuring that internal and external environments meet or exceed expectations and requirements.

Quality is also concerned with specification standards and cost-effective management, durability and reliability, regular availability and improvement of products in the market. Customers regard quality a shared commitment from management, with a company strategy that advocates achieving distinction in all aspects of products and services and able to satisfy the customer's needs.

2.2.1 Cost of quality

Quality costs are focused on by management in pursuit of improvement in quality, customer satisfaction, increased market share, and profit enhancement. The main purpose of quality cost considerations is to warn against oncoming dangerous financial situations to the companies. Juran, in his famous quality control handbook (1974), used the analogy of *"Gold in the Mine"* which means that losses due to avoidable mistakes/defects equal the cost of quality control. Deming (1986: 11) pointed out that low quality means high costs, and further argued that "Defects are not free. Somebody makes them, and gets paid for making them. On the supposition that it costs as much to correct a defect as to make it in the first place, then 42 per cent of his payroll and burden was being spent to make defective items and to repair them". About rework Deming further asserted, "The cost of rework is only part of the cost of poor quality". Hertz *et al.,* (1997) linked the cost of ignoring quality to organizational disaster for the following reasons:

- Management teams spend a lot of time trying to work out what to do to fix whatever went wrong.
- Sales people spend a lot of time placating customers because the job is delayed or because quality was not up to customer expectations.
- Purchasers spend a lot of time ordering emergency supplies to replace those used by the hidden plant because it produces more rework and scrap than the estimator allowed for, and the plant is left short.

Besterfield (1994) saw cost of quality as the costs associated with the non-achievement of product or service quality as specified by the company and its contracts with customers and society. In other words, it is the amount spent in

making poor products and services. Harrington (1999) stated that, “whether it is called quality cost or poor quality cost, it is designed to reduce the cost associated with poor quality”. According to Bland *et al.,* (1998), the cost of poor quality to a company is the difference between the actual operating cost and what the operating cost would be if there were no failures in its system and no mistakes by its staff. The cost of poor quality can affect 20% of revenues in manufacturing companies and 35% in service companies (Besterfield, 1994). Gunasekaran *et al.,* (1998) considered the following factors as the *“cost of bad quality”*:calibration, increased maintenance, equipment breakdown, downtime, excess inventory, excess paperwork, waste time in meetings and unproductive discussions with suppliers, dealers, and distributors, and the cost of inspection and measuring the product.

Heizer and Render (1999) present the following definitions of the Prevention Appraisal Failure (PAF) model:

i. Prevention Costs:

Prevention costs are the costs associated with all actions taking place to prevent defects in products or services. These includes the direct and indirect costs related to quality training and education, pilot studies, quality audits, quality circles, quality engineering, process capability analysis, supplier capability surveys, and new product reviews. Prevention costs are used to construct awareness of the quality programme and to stabilize the appraisal and failure costs at a minimum.

ii. Appraisal Costs:

These are the costs associated with measuring and analyzing the product or service quality to certify conformance; they include the inspection cost, manufacturing or process operations, test or audit of purchases, and finished goods or services; as

well as all direct and indirect costs spent on various tests and inspections carried out to determine the degree of conformity for products or services.

iii. Failure Costs: Consist of: (a). Internal Failure costs, and (b). External Failure costs.

Internal Failure Costs are the costs of defects acquired prior to the shipment of the product or service before delivery. They include the net cost of scrap, spoilage, rework and overheads, failure analysis, supplier rework and scrap, re-inspection and re-test, down time due to quality problems, opportunity cost of products classified as seconds or other product downgrades.

External Failure Costs are the costs incurred due to defects discovered after shipment of product or service to the final consumer. These include warranty claim charges, product recalls, customer complaint adjustments, allowances, and product liability, as well as direct and indirect costs such as labour and travel associated with the investigation of customer complaints, warranty field inspection, tests and repairs.

Rao *et al.,* (1996) described prevention and appraisal costs as conformance costs, defined as all those costs associated with products or services delivered according to specification. Both internal and external failure costs are recognized as non-conformance costs.

According to Carr (1992, 1995) many US companies, such as IBM, Xerox, Tennant, Ford, Westinghouse, Pacific Bell, employ the cost of quality approach as an integral part of their quality programme. These companies are flexible in the use of cost of quality definitions, comfortable with cost estimations and realistic in presenting information.

The Xerox Company adopted the quality-cost approach to its US sales and marketing group, realizing an outstanding cost of quality savings of up to $53 million in the first year. The quality-cost improvements were applied relatively painlessly. Managers were trained in the importance of cost of quality, and once they began to appreciate this tool Xerox achieved over $200 million of savings in cost of quality over the subsequent four years. Xerox made this approach an integral part of its leadership (Rao *et al.,* 1996). The same approach was adopted by Tennant, who significantly improved its product quality and reduced its total cost of quality. By using the cost of quality tool, Tennant's total cost of quality decreased from 17% of total sales in 1980 to 7.9% in1986 with a further significant reduction to 2.5% of sales in 1987 (Hale *et al.,* 1987). Oakland (2000) adds that analysis of the cost-quality relationship is a significant management tool that enables assessing the effectiveness of the management of quality, opportunities, savings and, finally, a means of determining problem areas.

From the above the most important issue is a product or service that deviates from specifications is considered as poorly made and unreliable. The manufacturing cost approach leads to improvements in quality, lower costs and better productivity by preventing defects, scrapping and reworking the product. This research study should shed light on the percentage of scrap, rework, defects, and the number of complaints made by Pakistani manufacturing companies during production processes. In-addition this thesis examines progress of quality projects, assess advantages of QM programmes, and link quality effort with productivity.

2.3 Empirical review of critical quality factors

Most QM researchers focus on principles and practices of QM, especially the critical quality factors. In this research, attempts are made to validate empirically the knowledge of critical factors for implementing effective QM.

2.3.1 Garvin's critical quality factors (1983)

One of the most significant studies to determine the critical factors of QM was conducted by Garvin (1983). He investigated the practice of QM in seven Japanese and nine US window air conditioner manufacturing firms. Data on the basis of quality management practices and quality performance were collected through questionnaire and conformance study in factory sites. The research revolved around seven identified factors: quality information systems, management attitudes, quality programmes, product design, policies, supplier management, production and employees policies, and supplier management. Garvin analyzed assembly line reject rates and calls rates after delivery as surrogate measures of quality performance. He identified that the high performers in these areas did especially well in several areas of QM. He came to the following conclusions:

a) Quality is the top priority for management of manufacturing companies. This commitment is actively demonstrated in management meetings, where quality issues have a centre place.
b) Quality is a customer-driven concept, and product quality is defined from the customer's point of view, rather than that of the sales, production, marketing or design groups.
c) Quality departments should have direct access to top management. A number of companies had vice-presidents for quality.

d) Monitor efficiently the improvement of quality through the support of a supplier quality information system. Managers receive timely, detailed and accurate quality data.

e) Steady and consistent improvement through a comprehensive goal deployment process at all levels.

f) Employee performance appraisal is associated not to total output but to defect-free output; for example, supervisors are appraised in terms of defect rates, scrap rates, and amount of re-work attributable to their operations.

g) During the process of product design, emphasis is put on reliable engineering techniques and thoroughness in reviewing and testing of new designs before units reach production. At each stage of the review process, involvement of all related departments is required.

h) Intensive training of new employees to reduce variations in the production process due to inexperience. Employees are well trained in all aspects of the jobs required on the line. Training includes problem solving skills, SPC techniques, and other remedial techniques.

i) Extensive use of quality tools and techniques, such as control charts and SPC to control the production process.

j) Coordination and effective communication, especially before and during model switchovers, to ensure smooth and defect-free production.

k) Suppliers are selected based on their ability to produce and service quality, manufacturing capability and capacity, and value for money. Vigilant monitoring of the supplier's quality commitment, and quality audits of sites, are common.

2.3.2 Saraph, Benson and Schroeder's critical factors (1989)

A study conducted by Saraph, Benson and Schroeder (1989) developed 120 organizational prescriptions for effective implementation of QM by using a judgmental process. These prescriptions are organized into eight categories of critical factors, as shown in *Figure 2.1* and explained below.

Factor 1. Role of management/ leadership and quality policy

(1). Acceptance of quality responsibility by general managers and department heads.

(2). Evaluation of top management on quality.

(3). Participation by top management in quality improvement efforts.

(4). Specificity of quality goals.

(5). Importance attached to quality in relation to cost and schedule.

(6). Comprehensive quality planning.

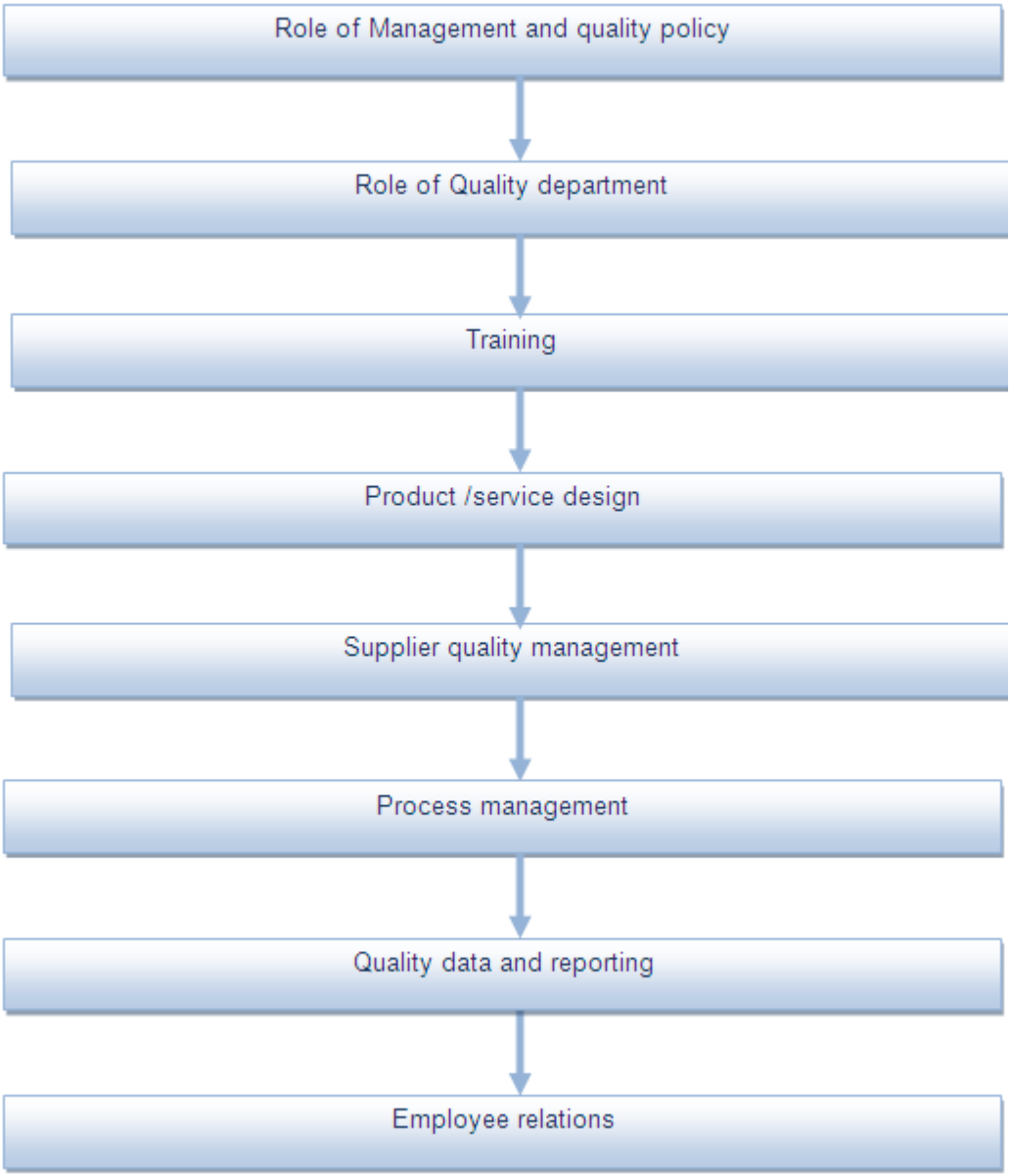


Figure 2.1:QM Critical factors

Factor 2. Role of quality department

a) Visibility and autonomy of quality department.
b) Quality department access to top management.
c) Use of quality staff for consultation.
d) Coordination between quality department and other departments.
e) Effectiveness of quality department

Factor 3. Training

a) Provision of statistical training, trade training and quality-related training for all employees.

Factor 4. Product/service design

a) Thorough scrub-down process.
b) Involvement of all affected departments in design reviews.
c) Emphasis on productivity.
d) Clarity of specifications.
e) Emphasis on quality, not roll-out schedule.
f) Avoidance of frequent redesigns.

Factor 5. Supplier quality management

a) Fewer dependable suppliers.
b) Reliance on supplier process control.
c) Strong interdependence of supplier and customer.
d) Purchasing policy emphasizing quality rather than price.
e) Supplier quality control, supplier assistance in product development.

Factor 6. Process management

a) Clarity of process ownership, boundaries, and steps.
b) Less reliance on inspection.
c) Use of statistical process control.
d) Selective automation.
e) Fool-proof process design.
f) Employee self inspection.
g) Automated testing.

Factor 7. Quality data and reporting

a) Use of quality cost data.
b) Feedback of quality data to employees and managers for problem solving.
c) Timely quality measurement.
d) Evaluations of managers and employees based on quality performance.
e) Availability of quality data.

Factor 8. Employee relations

a) Implementation of employee involvement and quality circles.
b) Open employee participation in quality decisions. Responsibility of employees for quality.
c) Employee recognition for superior quality performance.
d) Effectiveness of supervision in handling quality issues.
e) On-going quality awareness of all employees.

Source: Saraph *et al.,* (1989)

The tool was validated using a survey questionnaire directed towards twenty firms in Minnesota, USA, using a five-point Likert scale (1 very low, and 5 very high).

Respondents were asked to rate the level of factors or 'items', as practised in their organizations. 162 responses from managers were subjected to reliability and detailed item analysis; Saraph and colleagues identified the eight grouped items listed above as critical factors of quality management.

2.3.3 Critical factors identified by Yusuf and Aspinwall (2000)

Yusof and Aspinwall (2000) identified ten critical factors for effective QM implementation in small and medium enterprises (SME's), based on an extensive literature review. They recognized several hypothetical factors: continuous improvement system, management leadership, supplier quality management, resources, measurement and feedback, human resources development, system and processes, improved tools and techniques, and work environment and culture. The study further explained the absence of conformance practice in some quality factors such as continuous improvement system, supplier quality management, and improvement tools and techniques.

2.3.4 Zhang, Wasznick and Wijingaard's approach (2000)

Zhang *et al.,* (2000) identified 11 constructs for effective QM implementation based on a comprehensive literature review. Data was collected from 212 Chinese manufacturing companies in nine industrial sectors, for testing and validating the instrument. The central aim of their study was to develop an instrument for measuring QM implementation for Chinese manufacturing companies. The QM constructs consisted of customer focus, leadership, employee participation, supplier quality management, evaluation, vision and plan statement, process control and improvement, recognition and rewards, product design, education and training, and quality system improvement.

2.3.5 Quality success factor by Harjeev et al., (2007)

Harjeev et al., (2007) has identified seven critical quality factors for effective implementation of TQM for Indian manufacturing companies based on extensive literature review. These factors are management commitment, customer satisfaction and delightedness, continuous overall improvement, Positively carried out teamwork, purposeful training of employees, feedback and perfect measurement for recognition, and effective communication. They found that all seven-success factors are considered to have lower importance for TQM practices in Indian service industries as compared to manufacturing companies. Although, both sectors have different priorities for TQM, but both described effective communication as being not so important, which is contradictory to the literature review but seems correct when compared with the findings of other researchers. Finally, both sectors found management commitment as being key for effective implementation of TQM.

Another similar study conducted by Jha et *al.,*(2008) has identified leadership, employee commitment, teamwork, and employee motivation as a vital factors for improving performance of Indian manufacturing companies.

The study of literature so far has indicated a number of critical factors that need to be considered when implementing QM programs. Within the context of this research these factors may be investigated in order to assess the efficiency with regard to supporting QM implementation. These will be important to provide framework no matter which data collection and analysis is eventually chosen.

The literature review shows that adopting different quality improvement approaches will ultimately improve quality and productivity (Lee *et al.,* 2001). Although this argument has been proposed by many researchers through data collected from

developed countries, it is not certain whether it applies to less develop or developing countries like Pakistan.

2.4 Understanding Quality Management (QM)

As with quality itself, the definition of QM is also the subject of debate and academic discourse. While Kendrick (1993) defines QM as a philosophy of management with a collection of tools and strategies for implementing that philosophy, Oakland (1993) sees it as a methodology for enhancing the performance of an organization. Omachonu and Ross (1994) identified QM as an integrated approach of all functions and processes within an organization in order to achieve continuous improvement and innovation in the quality of goods and service. QM is beyond quality, it is a philosophy, a process and a well distributed set of techniques whose application yields continuous improvement and customer satisfaction (Weinstein, 1996). Crawford and Fisher (1999) also suggested that QM practices require a shared way of thinking (culture) that highlights customer satisfaction, shared leadership, and obtaining the right results the first time. It can be seen from these definitions that QM is a methodical way which depends on continuous improvement to meet long-term organizational goals and objectives.

Contemporary business literature centres on the need for all corporate leaders to make QM a priority on their agenda. According to Goetsch and Davis (2000) and Kontoghiorghes and Gudgel (2004), many quality experts and practitioners have agreed on the following QM characteristics: customer focus; continuous improvement of the process; leadership and long-term commitment of top management; training and education; and empowerment and participation of employees.

Business today has become highly competitive, so to succeed in the global market, companies are expected to manufacture and supply quality goods or services in line with consumers' requirements and at minimum cost. They therefore need to understand their role in the market place, manage themselves to fulfil that role and ensure all employees understand and are dedicated to fulfilling consumer requirements. Generally, QM requires a change in how a company operates. It also requires changing the mindset of all employees, to make "quality" the first priority of everybody. Their efforts should be made to focus on preventing errors and doing things right the first time and every time. Saylor (1992) argued that QM points an organization in the direction of continually improving quality, increasing productivity, and reducing cost to ease economic pressures. He further pointed out that QM focuses on customer satisfaction through highest product and service quality at lowest life cycle costs to enable them to compete in the global setting.

Zabada *et al.,*(1998) regarded TQM as a combined effort to achieve competitive advantage by continuously upgrading every aspect of organizational culture; TQM is total (every person in the firm is involved, and where possible its customers and suppliers) quality (customer requirements are met exactly) management (senior executives are fully committed).

Although the debate about QM is ongoing, there are three major contributors whose work has been acknowledged by many authors and researchers: Deming, Juran and Crosby (Chapman and Khawaldeh, 2002). The Deming cycle (plan-do-check-act) links the production of a product with customer needs by focusing on resources of all departments (design and process, research and development, marketing and sales) in a joint effort to meet or exceed customer requirements. Deming, in his famous 14 points, emphasized the following elements of QM: continuous improvement,

statistical quality control, teamwork, training and education, and employee involvement (Deming, 1982, 1986). Juran also divided quality management into quality planning, quality control, and quality improvements; this strategy is famous as “Juran trilogy” (Juran and Gryna, 1998). Juran added to the QM philosophy by stressing training, problem solving, continuous improvement, statistical quality control, and long-term commitment to quality (Juran, 1991). Crosby (1979), however, identified the cost of quality concept which stresses conformance to specification. It also includes cost of quality which provides objective measures of quality standards. The non-conformance to requirements means that quality has not been achieved.

Finally, QM comprises five essential components: quality, productivity, profitability, ability and capability. The literature review confirms that the QM approach creates overall positive effects for organizations, in the improvement of processes, profits, customer satisfaction level, productivity and a achieving competitive business position.

QM is a holistic management approach that offers a variety of benefits including cost savings for the employer and greater job satisfaction for the employees (Mahour *et.al.,* 2011). It also comprises open communication within the organization; increased job knowledge; reduced scrap, rework and errors; and improved quality and productivity. QM is an extensive framework for the improvement of the quality of a product. The objective of QM practice is to improve the performance of an organization. QM indicates a process of continuous customer and supplier feedback to improve quality. QM is a method of appropriate performance indicators and rewards.

The literature review in this section indicates that the original objective of investigating the relationship between QM and productivity in Pakistani manufacturing companies in order to establishing BP is valid.

2.4.1 Quality Award Models

There are three main quality award criteria that recognise that customer satisfaction, business objectives, and safety and environmental considerations are mutually dependent and are applicable in any organization:

a. **The Deming Prize**
b. **The Malcolm Baldrige National Quality Award (MBNQA)**
c. **The European Foundation Quality Management: The Excellence Model (EFQM)**

(a) The Deming Prize was introduced in 1951 by the Japanese Union of Scientists and Engineers (JUSE) in recognition of Dr Deming's contribution to the Japanese quality movement after World War II. This prestigious award is given to firms with significant achievements and improved performance through application of a quality culture in company-wide activities.

(b) The Malcolm Baldrige National Quality Award (MBNQA), one of the most renowned and widely used quality award excellence models, was introduced in 1987 by the US Department of Commerce for US-based organizations. The objectives of the award are to: encourage companies to improve productivity and quality, recognize the achievements of those companies to improve the quality of their goods and services, and established guidelines and criteria that can be used by any organization in evaluating its own quality improvement efforts. Various companies have realized the necessity to assess themselves against the Baldrige model, if not to enter for the Baldrige award then certainly as an excellent basis for self-judgement

and review, to stress areas for priority attention and also provide internal and external benchmarking. According to Sunday *et al.,* (1992), thousands of companies use the Baldrige criteria for benchmarking purposes, although only a few hundred actually apply for the award.

(c) The European Foundation for Quality Management's (EFQM) award for excellence was launched in 1992. Its criteria are now widely used for systematic review and measurement of operations. The EFQM demonstrates that processes are the means by which a company or organization utilizes the talents of its employees to get desirable results. Moreover, improvement of the processes can simultaneously improve the performance of an organization. Assessment for this award is based on business results, customer satisfaction, leadership, processes, people management, people satisfaction, resources, policy and strategy, and impact on society.

In short the criteria for these quality awards play an important role in promoting and rewarding quality and business excellence, and encourage competition. The excellence model provides a framework for companies to apply self-assessment and to improve quality standards. Comparisons of results with internal targets, competitors, or similar "best in class" organizations enable companies to prioritize and drive improvements.

In the context of this research, these excellence model criteria were also used in judging management knowledge. In the questionnaire some questions related to different aspects of these award models, such as operations and functional areas, were used in determining the knowledge of managers of manufacturing companies in Pakistan. These criteria are served as catalysts to introduce quality management practices and quality conscious cultures among Pakistani companies. They also encourage companies and management to produce and provide a better quality of

goods and services to customers and boost industrial output, as well as internal and external trade in Pakistan.

2.4.2 QM and ISO certification

One of the keys to being able to compete in the global marketplace is the ability to meet or exceed applicable standards. In reality, ISO certification is the most successful attempt to develop an internationally uniform quality standard. According to Omachonu and Ross (1994) the ISO standards are generic in that they apply to all services and all industries, from banking to chemical manufacturing. Evans and Lindsay (1999) explain five objectives of ISO certification:

1) Improve the quality of operations to continually meet customer stated and implied needs.
2) Achieve, maintain, and seek to continuously improve product quality in relationship to requirements.
3) Provide confidence that quality system requirements are fulfilled.
4) Provide confidence to internal management and other employees that quality requirements are being fulfilled and that improvement is taking place.
5) Provide confidence to customers and other stake-holders that quality requirement are being achieved in the delivered product.

Although, ISO certification does not provide specific solutions to quality problems, it does provide from the outset a solid platform for quality and productivity for companies. Moosa (2000) recognized that ISO 9000 is becoming popular in Pakistan, but it will only provide a transition to quality assurance. He further asserted that while many companies in Pakistan are ISO 90001/2/3 certified and require third party audits, these companies do not even possess a good quality assurance

programme. According to Lee *et al.,* (2001), there are two main reasons for manufacturing companies to use ISO certification:

1. The production processes of companies can be easily documented.
2. The European Community allows only those products into their countries that have ISO certification.

Further, Fatima and Ahmed (2006) pointed out that most of the companies in Pakistan are using ISO certification merely as entry level passports into export markets.

As identified by previous QM researchers, most companies in Pakistan are still using ISO certification as a formality or in an inadequate manner just to enter the export market.

2.5 Quality Management initiatives in developing countries

Agus and Abdullah (2000) studied the level of QM practices in public-listed manufacturing companies and their economic benefits. Secondly, they evaluated the role of ISO certification in companies' quality initiatives. They selected thirty companies on the basis of stratified random sampling and divided them into two groups: consumer product companies and industrial product companies. The research was carried out with the help of a questionnaire. They found that most of the quality programmes were initiated by top management. Approximately 53% of companies developed their own quality model, the remainder using Deming's, Juran's and other Japanese models. Companies who had used QM for a long time and had an ISO certification had better quality implementation processes and an edge over competitors. Moreover, quality index analysis indicated that QM had a more significant impact on the automobile and gas sectors than on manufacturers of consumer goods. This research also provides significant guidelines to new adopters

of QM; consistency, continuous improvement of process, and total commitment of top management are the core for implementation and success of a quality management programme in any organization.

An empirical study on quality management practices in Shanghai manufacturing industries by Hua *et al.,* (2000) used a survey questionnaire based on the Malcolm Baldrige Quality Award Model. This questionnaire was administered to 100 managers of Shanghai based manufacturing companies. The results found that, in general, top management played an effective role in implementation of quality management programmes in Shanghai manufacturing companies. These companies were producing better quality goods, had higher customer satisfaction, and were highly competitive. On the other hand, it was found that the employees of most of the companies were not fully trained in quality management principles, while their level of education was below satisfactory.

Secondly, employees and suppliers have a limited participatory role in quality affairs. It was observed that there was little feedback for quality improvement and quality management initiatives addressed directly to the shop floor employees. This study also confirmed that quality management practices played an important role in business development in the shape of higher market share, growth, higher profitability, and low costs. It was also found that ISO certification had no significant effect on the quality management initiatives of Shanghai manufacturers.

Lastly, employee involvement had a positive impact on QM results (Hua *et al.,* 2000). Companies which encouraged their employees to become involved in quality management practices obtained better results than those that did not. Also in China, Lee *et al.,* (2001) examined the relationships between quality and productivity improvement strategies adopted by Chinese manufacturing companies. The purpose

of the study was to investigate how the performance of Chinese companies was associated with the quality and productivity improvement approaches they used. Lee and colleagues developed a questionnaire with 87 questions. They used the three dependent variables “quality performance”, “operating performance, and “financial performance”, and independent variables are “quality improvement approaches” and “productivity improvement approaches”.

They found a strong relationship between quality and productivity improvement factors and the quality and financial performance to a large extent.

Chapman and Khawaldeh (2002) carried out an analytical research study of QM and labour productivity in Jordanian industrial companies. They examined the link between eight selected elements of QM based on a literature review and labour productivity of Jordanian manufacturing companies. In order to investigate in-depth information about the relationship between QM and productivity, they collected both quantitative and qualitative data. The selected QM elements were measured through questionnaire and in-depth interview. They used a five-point Likert scale for answers to the questionnaire. Their target respondents were all quality/production managers of Jordanian companies. The survey questionnaires replied were carefully analyzed and on the basis of the results, responding companies were categorized into two groups: high QM and low QM companies. The majority of the high QM companies were larger in size, with more than 100 employees, while the low QM companies had small numbers of employees. They further selected five high QM companies and five low QM companies for detailed in-depth interviews. They concluded that:

In high QM companies, top management motivated and encouraged their employees to be involved in decision making and empowered them through decentralization of decision making. The communication between different levels of employees was

open and continuous. High QM companies created opportunities for their employees by providing training, lectures, conferences, and visiting experts. They performed decision making on the basis of reliable and factual data. These companies continuously tried to build long-term trust relationships with their employees. Companies in the high QM group tended towards market analysis, customer satisfaction, and market segmentation.

On the other hand, low QM companies did not show any evidence of employee participation in decision making and there was no open communication policy. They conducted very few market studies to identify the needs of their customers. Most of the time decision making was based on senior managers' "best estimates". The mean labour productivity of high QM companies was significantly higher than that of low QM companies, and the growth in labour productivity rates was also higher.

The results of the study also suggest that ISO 9000 was an excellent base for QM philosophy because it provides management and employees with the knowledge and expertise to build, improve and maintain the total quality approach. Finally, this study showed a direct relationship between QM and labour productivity.

A review of the literature has shown that there is a lack of knowledge about quality management practices that influence the level of productivity of manufacturing companies in developing countries (Moosa, 2000, Lee *et al.,* 2001, Chapman and AL-Khawaldeh (2002)). Therefore, the ultimate aim of this research is to contribute to knowledge by understanding the impact of the implementation of QM in Pakistan and to identify quality success factors for the effective implementation of QM, leading to

appropriate policy recommendations for implementation by local manufacturing companies.

Again, in developing countries, there is a lack of studies attempting to link QM with productivity (Moosa, 2000; Lee *et al.,* 2001; Chapman and AL-Khawaldeh, 2002). Generally, studies have been restricted in scope and frequently suffered from methodological limitations or imprecision. Some of these linked only one or two elements of QM with productivity. Most of the studies are theoretical studies and only a few provide empirical evidence to support their conclusions. This study is look at the link between all common elements of QM and productivity.

2.5.1 Quality Management in Pakistan

Quality appears to be top priority in many companies because of two important factors: expansion and globalization of world trade; and competitive pressure from the rising demands of customers, with their need for better services and products. In the case of Pakistan's manufacturing sector, no comprehensive QM research study has been carried out (Fatima and Ahmed, 2006). Therefore, one of the main purposes of this study is to explore in depth information about the status of QM practices by manufacturing companies in Pakistan. Careful review and analysis of QM literature and existing knowledge of QM implementation policies in both developed and developing countries were also used in this research.

If the Pakistani economy is to grow based on manufacturing, then the manufacturing sector must grow along with acceptable practice of good quality management to ensure the quality of its products. Poor quality goods will not support the sustainable growth of manufacturing in Pakistan. In order to achieve this quality, it is suggested

that traditional attitudes towards quality and productivity need to be changed (Moosa, 2000; Fatima and Ahmed, 2005, 2006).

It is proposed that, some of the managers and entrepreneurs have shown lack of familiarity with the basic principles of good business administration. What is quality? How can we improve it? And how does it affect production? Are there areas where industrialists in Pakistan are especially weak? (Zubair,1996; Thaver, 1998; Moosa, 2000; Fatima and Ahmed, 2005, 2006.) These people do not have a keen eye on developments in the wider world; their planning is mostly short term, aiming to get maximum profits as quickly as possible.

Table 2:1 Distribution of quality culture in Pakistani companies

Level 0	***No customer concern/No inspection-based companies***	***Those companies that remain enjoy a monopoly under this category. Government departments/organizations, utility suppliers, revenue departments &government universities etc. are the example. These organizations/departments do not focus on customers nor incorporate management systems to measure or control the quality of their products or services. In the case of open competition, such organizations are eliminated very quickly.***
Level 1	*Quality control*	*According to Moosa, most of the manufacturing companies in Pakistan fall into this category. Defects in manufacturing are considered inevitable, and a defect is considered to be a defect only when it is detected. Only an inspection-based quality control department is responsible for quality. The role of production and other people is only to report defects.*
Level 2	*Quality assurance*	*Some companies in Pakistan are trying to standardize their processes, and use internal audits to check them. According to Moosa, the recent popularity of ISO certification is a part of upgrading companies from level 1 to level2.*
Level 3	*Continual quality Improvement*	*Very few companies in Pakistan fall into this category, and ISO 9000 becomes insufficient at this level. Companies at level 3believe that conformance to the specification is not enough in the current global competitive environment. Continuous process improvement is required at all levels. The concept of quality has been changed from product quality to performance improvement of organizations.*
Level 4	*Quality award models*	*No company in Pakistan, so far, falls into this category except some FOC's like Toyota, IBM & Microsoft, who are operating fully or partially in Pakistan.*

Source: Moosa, 2000

Moosa's (2000) study of quality management practices by Pakistani companies classified the quality culture of companies in terms of their practice levels of quality management. He divided the companies into five levels, as shown in *Table 2.1*.

The main purpose of his research was an in-depth assessment of companies in Pakistan regarding quality management. He selected seven aspects for the purpose of explaining quality culture in Pakistani companies.

1) Technological status
2) Quality of management functions
3) Effectiveness of quality assurance/ISO 9000
4) Levels of continual quality improvement
5) Quality of human resource development
6) Degree of awareness and implementation of QM tools
7) The status of organized QM programme or process

A total of 20 companies were selected and analyzed: 8 from the textile sector, 5 from the mechanics sector (automotive, medical & steel bars and fasteners), 3 from chemicals (oils & cement), and finally 3 from the electrical sector (telecoms& capacitors). The size of the selected companies in terms of employees varied from 50 to 3,000.

Findings of Moosa's survey

The outcome of the survey showed that 80% of the companies did not have any organized design or development department. Most of the entrepreneurs felt that formation of R & D was an expensive investment needing a long-term survival strategy. These companies usually depended on others for product improvements and innovations. Of the remaining companies, 15% had a satisfactory **design department** and 5% a poorly functioning department.

The criteria for judgement were technological know-how about products, competence of the designers, and resources including information and design control systems.

Production planning was judge by the use of appropriate tools for resource planning, with a just-in-time policy for project planners and control on production checked by conformance to the specification. The results showed that 60% of the companies followed satisfactory planning procedures and 40% had poor planning. 90% showed good control and 10% poor. He concluded that the reason behind better control was ISO 9000 implementation.

Quality assurance was assessed based on ISO 9000. ISO 9000 defines the criteria for what should be measured. ISO 9001 covers design and development. ISO 9002 covers production, installation and service, and ISO 9003 covers final testing and inspection. He found 85% of companies implemented ISO 9002 and 15% implemented ISO 9001; none survey company has implemented ISO 9003. However 60% companies were found to have poor implementation of ISO 9000 standard.

Financial activities are analyzed on the basis of book-keeping, accounting, budgeting, and effective reporting. Fifty percent had a finance department headed by professionals, 25% were weak and 25% had a poor finance department.

QM implementation requires effective competence, shared commitment, resources and organization. During the survey, these factors were checked. 60% of the companies had no intention or proposal for implementation of any QM programme. They considered ISO certification was enough for their survival and progress. Only 35% intended to use QM for the improvement of overall processes, but had not yet started, mainly due to the lack of support and knowledge of top management. QM was correctly used by 5% of the organizations. The survey indicates that QM is still in the initial stages and is used more as a slogan that as an implementation programme.

The findings of Moosa's study identified one of the key factors responsible for ineffective quality management practices in Pakistani companies as the poor quality management skills of top and middle level management personnel. Further, he pointed out that systems were design, developed and run by management who lacked basic professional management skills. This may be why they are not fully aware of and committed to quality measures.

A study conducted by Ahmed and Fatima (2006a) into quality management practices in Pakistan's knitwear industry. The responding companies had annual sales ranging from less than US$50,000 to US$20 million, with work forces of less than 10 to 1200. It was claimed by 15 of the 17 responding companies that quality was the basis of their competitive advantage. Ten (10) companies, already had ISO certification and five (5) were planning to get it. This signifies that most of these companies believed that ISO certification would play an effective role in their sustainability in the current global competitive environment. Fifteen (15) of them claimed to be involved in different quality management efforts in order to get competitive advantages. Eight (8) companies claimed that they had graduated with quality assurance; six (6) followed SPC, one (1) followed Kaizen and three (3) also had quality circles. According to the authors, "even though the level of quality awareness is high, quality management is in its very early stages of development because the most popular technique remains the traditional quality control of the inspection type". They added that most of the companies had not adopted any professional method to gauge the effectiveness of their quality programmes. Most could not determine customer satisfaction professionally. Only two (2) out of the 17 actually interviewed customers. As far as the rate of rejection and rework were concerned, 10 respondents indicated that both

were greater than 2%. The exact rate after statistical testing proved to be 2-5%, signifying that quality is a big issue for this sector.

The above study reveals that quality is a major issue for Pakistani knitwear manufacturers. There is a lack of knowledge regarding the adoption of quality management programmes like TQM, Six sigma, Kaizen and quality circles. Even where one had been applied, it was without high level commitment and sufficient knowledge. The skills and commitment of top and middle managers were limited. Although 10 respondents claimed to be using modern technology, this by itself cannot turn over into quality until or unless the technology is managed for quality. The high rate of rejection and rework clearly identified problems in the implementation of QM practices.

Another similar study by Ahmed and Fatima (2006b) about quality management in Pakistan's bed wear industry further investigated QM initiatives in Pakistani manufacturing companies. The 30 members of Pakistan's Bed wear Manufacturers and Exporters Association (PBMEA) were asked to participate in a survey questionnaire study, with a response rate of 79%. ISO was shown to provide only a transition quality assurance. Most of the companies who qualified for ISO criteria were not able to articulate their quality goal clearly. About 70% had a poorly defined quality policy and objectives, 70% had ineffective internal audits, 75% had unsatisfactory levels of auditor's competence, 80% had insufficient depth of management reviews and 85% had poor SPC. Eight (8) firms claimed to be using TQM in conjunction with one or more stages of QM, but only (5) firms claimed to be using TQM quality circles.

Summary

It can be concluded from all these three studies that even though the level of awareness of quality issues is high, quality management is in its early stages of development because most of the companies in Pakistan continue to rely on traditional inspection-based quality control. Although ISO certification plays an important role in quality assurance levels, Pakistani organizations still need more support on the path to continuous improvement through TQM, Six sigma, quality circles, Kaizen, etc.

The initial literature review showed a lack of research in the context of quality management in Pakistan, compared to neighbouring countries like China, India, Malaysia and Japan. The current research is therefore to provide additional empirical evidence about the relationship between quality and productivity in the manufacturing sector of Pakistan.

Some researchers in quality management in Pakistan, such as Fatima and Ahmed (2005, 2006a, 2006b) have concentrated on quality management in specific areas such as the textile sector, while Moosa's (2000) study was limited to twenty companies. This study covers a wide range of companies from different sectors therefore, the findings of this study is more representative than the previous studies.

Additionally, several researchers were unable to identify the barriers to adopting quality management practices by Pakistani manufacturing companies (Khan, 2001; Shah, 2002). This study makes contribution to the general understanding of these barriers. This provides a valuable insight into current knowledge of QM, with a view to setting benchmarking for Pakistani manufacturing companies in adopting QM. It also

examines the practical challenges of QM in terms of conceptual visions identified in the literature.

2.6 Quality improvement initiatives

In Pakistan most of the local entrepreneurs and managers of industrial concerns ignore the concept of QM (Khan, 2003). Even where it is applied, it is done partially and lacks the true spirit and totality (Zubair, 1996; Thaver, 1998; Fatima and Ahmed, 2005, 2006a, 2006b). Samson and Terziovski (1999) claimed that *"Very few manufacturing companies have been able to ignore the elements of TQM and still prosper"*.

Quality plays a vital role in maximizing profit as well as being key to competitive advantage (Lee *et al.,* 2001). *"The significance of the critical success factors (CSF's) is yet to be internalized in Pakistan's business circles in general, and its industrial sphere in particular"* (Fatima &Ahmed, 2006). Moosa (2000) also stated that most of the industries in Pakistan relied on inspection-based quality control systems. It is assumed that, in most cases, the main concern of business is to maximize profit and to pay less attention to the quality of the product or service. However, Drucker (1991) contested this and pointed out that the role of business is to satisfy customers within the context of generating profit. This means the purpose of business is to make money now and in the future by keeping focus on customer satisfaction.

According to Deming (1986), dedication to improvement of quality keeps companies alive and creates jobs for their employees. He further asserted that *"Top management should publish a resolution that no one will lose his job for contribution to quality and productivity".* Shetty and Buehler (1985) declare *"quality improvement as a catalyst for productivity improvement"*. Wetzel and Maul (1996) suggested that

the most important phenomenon is variation. Once variation is controlled, the producer can think of quality improvement. Variation in manufacturing processes is primarily observable in product characteristics, process parameters, and gauging systems, which is why reducing variation in these three areas is the main goal of effective process management. Khan (2003) argued that QM develops a culture which creates continuous improvement in customer satisfaction by minimizing the actual cost of production. Continuous improvement, once achieved, gives rise to innovation, value addition and better performance (Wilber, 2002); quality and innovation are the ingredients that determine the distance an innovator stays ahead of its inevitable competition. Quality is a key to maximizing return on investment. On the other hand, Feigenbaum (1983) introduced an approach called total quality control.

> *"Total quality control is an effective system for integrating the quality development, quality maintenance, and quality improvement efforts of the various groups in an organization so as to enable marketing, engineering, production, and service at the most economical levels which allow for full customer satisfaction"*
> (*Feigenbaum, 1983).*

Quality improvement in manufacturing is a never-ending process. So far in Pakistan, many manufacturing companies are still relying on traditional inspection-based quality control systems (Moosa, 2000; Fatima & Ahmed, 2005, 2006a, 2006b).

The traditional quality control programme tended to focus on preventing bad quality products reaching the market, while the QM approach focuses on prevention at an earlier stage. Moosa's (2000) survey identified 85% of his sample companies as still using unsatisfactory SPC, because of low commitment of employees to quality and the inability of the top management to motivate employees to achieve quality improvement.

On the other hand, Raouf (1998) pointed out that in Pakistan, “Most of the SMEs have insufficient funds, low technological capabilities, outdated production factors and non-competitive products. Such companies are only concerned with the critical problems for survival, such as marketing and financing for operation costs. These companies, by and large, have not started tackling their problems through integrated approaches which target not only certain areas but all related factors”.

Agus and Abdullah (2000) argued that organizations that improved quality should be able to improve their market share five or six times greater than those whose products declined in quality. This means that companies producing superior quality products can charge higher prices and make more profit.

It is expected that efficient use of management tools like SPC and TQC reduces waste, scrap and reworks, which also have a significant impact on quality and productivity. Top management and employee commitment to participation in quality management activities could significantly improve companies’ overall performance. In the context of this study, the researcher will examine the current Pakistan companies with respect to the types of measure taken to improve quality, and how they maintain a consistent quality. It will determine the values companies attach to variables such as performance rating and performance-based award systems.

2.7 Quality and productivity link

World class companies, such as Xerox, General Motors, Ford, and Motorola have increased their productivity and regained their competitive positions as industry leaders through implementation of QM (Kano, 1993; Price & Chen, 1993). Many attempts at QM implementation have resulted in a failure, because it requires a shared commitment of employees and management, time and capital (Cole, 1993).

On the other hand, Golhar and Deshpande (1999) identified lack of employee training, lack of coordination of teamwork, and not linking employee compensation to achieving quality goals, as barriers to QM implementation. One of the most significant works is by Gunasekaran and Cecille (1998), presenting a real example of a quality and productivity implementation programme. A French automotive wiper supplier company 'Valeo Wiper System' was facing many problems regarding quality and productivity. They applied just-in-time (JIT) techniques in implementing a productivity enhancement programme. Valeo's main focus was to improve productivity and the quality of its wipers by reducing cycle time, solving under-capacity problems, and increasing the efficiency of its delivery system. Before implementation of JIT they conducted a training session for employees. Successful implementation of JIT reduced cycle time from 18 to 14 seconds per item in three weeks. Output per person per hour was increased from 76 to 89 parts. This study identified the following key critical factors essential for implementation of a productivity programme:

- Top management commitment and support for the process of change.
- A team of key managers from different functional areas of the organization.
- Education and training of employees to accept changes.
- Empowerment of employees to play a significant role in the implementation of the quality and productivity plan.

Garvin (1988) presented an example of the cost of poor quality, estimating it as $0.003 per part if it is properly inspected by the supplier, but $300if it is neglected by the supplier and handed to the customer as an external quality failure. A case study by Velloci (2002) provided evidence that when two components of quality

management, customer focus and quality performance, were applied in a casting plant they resulted in reductions of 75% in rework, 40% in scrap and 50% in customer complaints, and doubled the productivity of the plant. Another study by Gudgel and Feitler (2000) showed a significant improvement of 57% in quality, and a massive 81% in productivity.

Kapuge and Smith (2007) asserted that the implementation of a QM programme with the help of effective leadership and employee participation could have a significant effect on the financial performance of the firm. The main objective of his research was to compare the performance of companies in Sri Lanka, which had implemented a QM programme with those, which had not. The results showed that companies, which had adopted the QM philosophy, performed far better internally and externally.

It is suggested that, based on the above evidence, manufacturers in Pakistan have to reorganize their product quality-wise and to motivate entrepreneurs to make products acceptably free from all errors. Quality improvement is the route to restoring competitiveness and sustainability in the global market.

Many authors have stressed the importance of a company's corporate culture in the implementation of quality management programmes (Asrofah *et al.,* 2010, Pineda and Gazo, 2007). Jabnoun (2001) claimed that without changing its internal climate, a company's quality implementation efforts are useless. Another study by Jabnoun and Sedrani (2005) revealed a strong relationship between the cultural dimensions of a people-oriented, customer focus and continuous improvement in performance.

Mohanty (1998) points out three factors for managing quality and productivity.

(a) Connectivity: the degree of link between top management and different working departments, including connectivity between people and leadership and between strategic initiatives and the environment.

(b) Sensitivity of top management towards identifying signs of change in four domains: technology, market place, people and management itself.

(c) Organizational focus on quality and productivity.

Golhar and Deshpande (1999) investigated the productivity of auto parts manufacturers in the USA and Canada. They used three different measures of productivity for calculating performance:

(a) Financial measures, comprising the following indicators: market share, sales per employee, return on assets, return on sales.

(b) Customer-related measures: overall customer satisfaction, customer retention, number of customer complaints, order processing time, number of defects per unit, reliability of product, and cost of poor quality.

(c) Internal business-related indicators: attendance, number of accidents per year, employee turnover, employee satisfaction, number of suggestions per employee, number of quality improvement projects.

This research provides significant evidence of improvement in productivity resulting from implementation of QM as a management philosophy. The key finding is that both the US and Canadian manufacturing firms reported an increase in productivity as measured by customer-related and internal business-related indicators.

Summary

QM is a strategic approach concerned with a total system aspect of companies. QM presents a range of tangible and intangible benefits which amount to cost savings for the employer and also greater job satisfaction for the employee, including: increased work knowledge; improved quality and productivity; reduced waste, errors and product reworks; and improved communication. The term QM incorporates all the activities in a company. This leads to the production process, design and delivery of products and services which meet the customer's demands and expectations at an acceptable price and quality. QM creates a "significant impact" in a company. Happy workers do a better job, making better quality products and services that satisfy and makes customers happier (Khan, 2003). Sales and productivity increase profits margins. Higher profit margins may result in new investments, improved working conditions for employees and so on.

It is evident from the literature that some key elements which need to be considered before implementing any quality management programme include the following:

- Top management share commitment and willingness for transformation.
- Training/briefing of employees before conducting quality management programmes and keeping employees' confidence that in the case of success or failure their jobs are secure.
- Neglect bureaucratic style of management, encourage participative style of management throughout the organization.
- All participants are at liberty to present free opinions regarding quality initiatives (empowerment).
- Treat supplier and vendors as partners and keep them updated.

- Integrate all departments of the organization (clear communication).

The current study shed light on the above subject matter to discuss key essentials for implementation of effective quality management of manufacturing companies by introducing related questions in the questionnaire in order to identify the level of adoption of TQM in Pakistani companies.

2.8 Productivity and measures of productivity

The subject of productivity has been studied extensively, and it constitutes an important component of the literature on management. Productivity is an active instrument with which to assess the utilization of limited resources, which include land, capital, labour, and organization. Efficient use of available resources increases productivity which in turns translates into profitability of firms operating in the industrial, commercial and agricultural sectors. Productivity is intimately linked to the returns of projects, so the measurement of productivity is a vital technique to rationalize the decision-making process.

2.8.1 Productivity

Like the term quality, productivity has been defined in many different ways. Generally, it is the ratio between inputs and outputs. According to Mohanty and Yadav (1994), inputs may include the following: labour (human resources), capital (physical and financial assets), energy, materials and information. Gedye (1979) pointed out that productivity means how resources are measured; it can be stated in the form of a fraction, output being the numerator and the resources taken as the denominator.

Several writers stress profitability, quality, innovation, efficiency, effectiveness, value, and quality of work life in defining productivity. Other definitions have mixed exclusive

human and organizational efficiency variables. Productivity is commonly expressed as the end result of all personal and organizational collective missions associated with production, use, and delivery of products and services (Smith, 1995). It also measures the capacity of individuals, firms, industries or an entire economy to alter the balance of inputs into outputs. Higher productivity signifies that extra goods and services can be produced with the same effort and resources (Pritchard, 1995). Increased productivity connotes receiving additional goods and services from less input of human effort, capital, material, space, energy and technology (Pritchard, 1995). According to Parsons and Corrigan (1998), four key advantages of measuring productivity for accountants include the following:

1. It gives detailed information on performance measurement and contributions to profitability in US dollars.
2. It calculates productivity change in terms of US dollar and serves as the basis for analyzing both quantitative and qualitative trade-off.
3. It reconciles performance analysis to the financial results.
4. It isolates the effect of productivity and prices.

The general characteristic of all productivity indexes is that they measure the amount of output that can be attained from a given volume of input. Productivity measurements may be used to assess performance at a particular time or over time. If we are to compare producers at a given period, productivity measures would be able to provide a clue to performance. Sumanth (1998) stated that the most efficient use of productivity indicators is improving a firm's performance.

McGavin (1993) argued that increase in productivity takes place when output or product per unit factor input increases. In spite of the fact that the concept of

productivity is clear-cut, its accurate measurement is complex. The factors of production, namely labour, materials, capital, management, etc. are not easily turned into to a common unit of measurement that can identify units of inputs related to units of output. The common problem associated with units of measurement also applies to output. Productivity growth is the critical means for organizations to improve their performance. It is a sign of both technological change and organizational change. Both measures operate at the same time and, in practice, it is difficult to differentiate between their effects (Gretton & Fisher, 1997).

VanArk (1995) has identified that productivity also serves as a determining factor in business competition. As a result, productivity monitoring is essential and largely designed for strategic reasons by companies in areas such as corporate planning or improvement in business competitiveness.

Summary

On the basis of the above explanation, productivity is seen as an output that is measured against resources expended to generate that output. Productivity is the sum of factors of production i.e. land, labour, capital, and organization. If the above factors of production have been use in an efficient and effective manner, it may have a deep impact on productivity and lead to increased profitability of firms operating in the industrial, commercial, and agricultural sectors (Gaither, 1992).

It is also concluded that productivity is not simply the result of all inputs deployed in making a product, but how well a product meets the aim of the organization and how they meet and satisfy customer expectations. It also a measure of the capacity of individuals, organizations, industries or entire economies to convert inputs into outputs. Nowadays, the manufacturing and business environment is dynamic,

complex and competitive. Total productivity is the result of two inputs: labour/manpower productivity and capital productivity.

Labour productivity can be measured on the basis of output per worker and involves employees, supervisors, managers, workers and union officials. Labour productivity has been influenced by factors such as the level of skills in terms of management, combined efforts by management and labour to increase productivity, supervision techniques and labour management. Capital productivity is the ratio of output to capital. It comprises hardware inputs such as mechanization, computerization and automation, and technology inputs such as production technology, research and development.

Productivity represents the organization's ability to create wealth, while prices are basically the vehicle for distributing it (Smith, 1995). In order to achieve better productivity, an organization needs to develop productivity plans that are integrated, coordinated, and consistent with the overall business plan. Productivity has also been defined on the basis of various performance measures such as performance according to the schedule, machine utilization, total output divided by company's total headcount, or on the cost of variances. Therefore, productivity blends profitability, quality, efficiency, innovation, value, and quality of work life. All these factors and inputs combined lead towards total productivity, which in turn creates wealth. Wealth is then distributed in the forms of profits for stock holders and investors.

2.8.2 Measures of Productivity

Productivity measurement is to some extent easier than measuring quality because although the former is determined by the output of many functions or activities, many of which are also difficult to define, the latter is determined by the customer and may

be fragmented and unclear. What is the measurable output of design, market research, training, or quality assurance? In spite of the difficulties associated with the measurement of these variables, measures are necessary for each activity. Standards are required for assessment against past performance, the experience of competitors, and on that basis an action plan could be designed for improvement. Omachonu and Ross (1994) have identified various principles for measuring productivity and quality. These include:

- Meet the customer's need. The customer could be internal or external.
- Measures to control and be understood by those being measured. This principle could be more effective if those being measured are allowed to participate.
- Emphasis should be on direct feedback to workers and the process that is being measured.
- Base measures on available data. Application of cost benefit analysis could be used to generate new data. Do not ignore information because of the cost of gaining it, as it is rarely worth more than without it.
- The main objective of performance measure should be to measure what is essential. This may not be possible with the traditional cost control report.

On the basis of the aforementioned criteria, productivity can be measured in several ways, but the most common is the ratio of output to input:

Productivity = Output / Input

(Input may include labour, capital, material, energy or other miscellaneous resources).

According to Gaither (1992) productivity in a given time period is usually measured with the formula below:

Productivity =Quantity of products or services produced/ Amount of resources used

Smith (1995) presented two alternative concepts of productivity measurement: costs + profits/costs; and the value-added concept. The costs+ profits/costs method argues that the productivity measure is nothing other than costs plus profits divided by costs. The value-added concept explains that productivity can be quantified in terms of a value-addition formula:

Productivity= Value added / (Capital Input+ Labour Input)

Productivity measurement is a management technique to evaluate and monitor the performance of businesses operations. It is thus a key focus in modern business. It enables companies to survive and make reasonable returns on their investment, and consequently profits. Productivity measures are also based on the thrust of profitability for which management is answerable. They demonstrate how successfully and efficiently management uses resources to produce quality goods and services (Aboganda, 1994). It is not easy to measure productivity variables in disciplines such as management and economics. Productivity can nevertheless be measured indirectly by quantifying the variables and then mathematically calculating the productivity element from them, as described by Alby (1994).

Productivity measures serve as criteria for assessing and comparing production processes in efficient terms and how they utilizes resources to produce output (Chapman and Khawaldeh, 2002). According to Edosomwan (1988), productivity measures have been categorized as:

a. Total factor productivity: the ratio of total measurable output to the sum of labour, capital, and material inputs.

b. Partial productivity measures: the ratio of total measurable output to one class of measurable input.

Total factor productivity measures the influence of changes in the inputs of all factors of production; partial productivity measures changes in one or more inputs against output. Total productivity measures not how many units or services are produced but the features of products and services. Therefore, this measure is about the efficiency of the whole plant or company. Total productivity is the broadest measure of output to input and was expressed by Smith (1995) as:

Total Productivity = Total Output / Capital+ Labour+ Materials+ Energy+ Miscellaneous Inputs

The factors of production used in the productivity measure include labour, capital, materials and energy. Since total productivity ratios may possibly cover partial factors, some uses may be alike. Smith (1995) identified the advantages of the total productivity ratio as follows:

1. National indicator for economic productivity and growth. This is a universal approach to illustrate the overall economic growth in an economy.
2. Interpret the results of many partial productivity gains or losses.
3. Interpret individual product lines and separate services obtained in or outside a company.
4. It gives an insight into net pricing which alerts management to take control measures to reduce costs and increase revenues.

A partial factor measure of productivity is the process of setting out ratios of total output to one or more inputs in a group. Some partial productivity ratios are calculated by dividing the total output of the company by a single input such as capital, labour, energy or materials (Smith, 1995). The most popular partial productivity measure used was identified by McGavin (1993) as labour productivity. According to Omachonu and Ross (1994), labour productivity can be expressed as follows:

Labour Productivity = Total Output / Labour Input

The focus of this study is to calculate productivity from a range of companies across multiple sectors, including automobiles, chemicals, engineering, food, pharmaceuticals and textiles. As identified by Aggarwal (1980), different industries use different productivity measures. He proposes that the labour-dominated industries should be measured by the productivity of direct labour alone; capital intensive industries should use capital productivity measures; and similarly, materials-dominated companies should be measured by materials productivity alone. In order to overcome these differences, a proxy measure of productivity was used in this research (see detailed in section 5.1).

2.9 Relationship between quality and productivity

According to Hart and Hart (1989), many writers are under the misconception that quality and productivity are conflicting goals. Others perceive an inverse relationship between productivity and quality. Parks (1974) and Lancaster (1979) argued that an attempt to improve quality and productivity concurrently reduces the level of production or sometimes does not respond accordingly. However, this assertion has

been criticised in the field of management by several writers (Lee *et al.,* 2001; Khan, 2003; McCracken & Kaynak, 1996).

Kontoghiorghes and Gudgel (2003, 2004) show evidence of a direct and positive relationship between quality and productivity. According to Huff *et al.,* (1996), quality and productivity are two synonymous terms and equate quality to productivity. According to Lee *et el.,* (2001) productivity is a potential ingredient in enhancing the cost of quality. This means that when the quality of a product improves it has a corresponding impact on productivity. Deming (1986) also recognized the relationship between quality and productivity by pointing out that when quality improves, productivity will also improve due to less rework and waste; improvement of quality transfers waste in the form of labour hours and machine time into the manufacture of good products and better services. Productivity (value addition) and quality (value enhancement) determine the competitiveness of manufacturing companies (Mohanty, 1998). Many writers agree that for companies to remain competitive, it is important that they incorporate productivity and quality.

Omachonu and Ross (1994) identified five ways by which companies can improve quality and productivity:

- Reduce costs: the conventional and most widely used method for improving productivity.
- Accelerate growth: this method proposes additional investment or cost addition, in order to increase returns beyond the overall cost, thus increasing the ratio. There are many ways to accelerate growth: organizational design, capital and technological improvement, training, systems design, wages and incentives, etc.

- Work smarter: increase output from the same input, by increasing production or sales from the same gross input; by reducing manufacturing costs through product planning and design; by improving manufacturing processes; or by increasing inventory turnover using the same level of raw materials to generate more production.
- Pare down: a proportionately large amount of input should be reduced compared to sales and production.
- Work more effectively: efficient and effective use of all resources is the best route to productivity and quality improvement.

The review of literature reveals that modern manufacturing economies cannot survive if they produce poor quality goods or services. Poor quality leads to reduced productivity levels and poor customer satisfaction. If Pakistan is going to develop as a manufacturing economy, quality and productivity must go hand in hand. Traditionally, productivity is supposed to emphasize the end result, the profit; more recent views of quality and productivity suggest that the process of improvement—not the profit—is the key to improving the quality of a product, and thus productivity, which in turn directly increases profit. This study explores how the productivity and quality of manufacturing companies in Pakistan go together.

2.10 QM and Productivity

Total business productivity is the combination of quality, efficiency, design, administration, cycle time of marketing, and manufacturing; good quality products are manufactured at lower cost, thus generating more sales through lower prices and increased productivity. It also relates to a situation where more products are introduced, resulting in more sales for a given investment, and raising productivity.

According to Shores (1990), if inventory and cycle time are shorter, it will create a higher return on assets and a higher level of productivity. The attainment of a high level of productivity will not alone guarantee a company's success; a corresponding level of quality is required.

Edosomwan (1995) emphasized that the "quality road to productivity is the shortest and most effective route to higher productivity". The QM approach provides the necessary integration of quality and productivity and in many cases has rapidly delivered measurable savings. Certainly, when compared with the gains, the implemented cost associated with QM is negligible. QM is an innovative approach, but involves conviction and commitment from the top to the bottom of an organization. This is necessary to sustain the innovative practices that are needed for the gains in quality which result in substantial gains in productivity. Mohanty and Yadav (1994) linked the different aspects of quality and productivity in the following ways: customers are supposed to be future assets of an organization; adding value at every step of each operation; shifting of emphasis from maximizing individual capitalist gains to improving quality; and finally fostering respect for the human system. Quality means meeting the needs of customers, while productivity is the cost associated with consistency, effectiveness, timeliness, conformance and quality of the service that is delivered by the organization in order to achieve its mission from a macro-level perspective and the satisfaction of customers from a vision perspective.

Increasing the quality increases productivity and the two go together. Productivity is normally equated with more output at the same unit of cost or less cost. QM is a wide management strategy which maximizes the benefits of productivity if it is adopted effectively. Productivity is however, a strategic method with a time dimension (short and long) to reduce costs, enhance efficiency, and ensure optimum use of company

resources. Total Quality Management is also about cultural transformation and the construct of a company's visions and mission.

This study has identified how QM is directly and positively related to productivity of manufacturing companies in Pakistan by examining the attitude, perception and knowledge of managers and employees, their commitment levels, and awareness of quality management techniques.

2.11 Improvement of productivity

People, process and productivity are influenced by positive and negative effects.. Some of the causes are foreseeable and could be handled by management. Effective planning and forecasting of company activities enables redirection of the causes in a consistent and productive manner (Smith, 1995). In a study conducted by Crawford and Fisher (1999) on productivity, the results were that there is no relationship between the size or age of a company on the one hand, and productivity on the other. Judson (1982) identified factors that determine productivity: employee relationships, motivation, research and development, labour ethics, managerial efficiency, and machinery.

The composition of the workforce may act together with information technology in accounting for variations in productivity. Generally, management makes investments decisions on information technology alongside other decisions in relation to other variables by measuring the associated effects; positive outcomes improve productivity (Francalanci & Galal, 1998). Productivity involves many causal factors, which produce a series of consequences. According to Alby (1994), the main factors influencing productivity are: training and experience of the workforce, quality of management, investment in production, technology, equipment and facilities, general level of education and social environment (labour relation patterns, social tensions).

The productivity of labour measures the extent to which products or services are produced in relationship to the amount of labour needed. Productivity of labour is influenced by hard work, the methods employed, and the tools and machinery employed (Gaither, 1992). According to Dixon and McDonald (1991), labour productivity is also affected by factors such as changes in the following: technology, capital/labour ratios, allocation of capital across industries, and changes in agricultural output connected to climatic conditions. Labour productivity can be enhanced by introducing capital equipment and capital productivity by employing extra workers (Saha, 1994). Basically, labour productivity is shaped by factors such as: employees' qualifications; supervision methods; investment in production technology, equipment and facilities; job design and training; wages system; teamwork; and production control methods. It is especially affected by employees' job performance and machines and tools. The former is a difficult issue in the sense that people are not alike. Personalities, abilities, education, energy levels, interests, ambitions, training and experience usually differ from one to another. Motivation is possibly the most important variable in the measure of productivity. According to Gaither (1992), motivation was identified by Abraham Maslow as having five levels of need that make people act: physiology, safety, society, esteem and self-fulfillment. These are arranged hierarchically, with physiological needs occupying the lowest position and self-fulfillment the highest. It is noted that the only needs that are not satisfied that is interested to motivators or simply let people to act. Gaither (1992) has suggested amendments to motivation for specialized jobs to satisfy a broader range of needs for workers:

- Job rotation
- Job enlargement

- Job enrichment
- Team production.

Several writers on productivity improvement presume that output is a fixed factor and that improving productivity is only a matter of reducing the amount of input consumed for each unit of output. Improved productivity must start with developing sound strategic plans, setting objectives and goals, and setting out priorities areas (Mohanty &Yadav, 1994). According to Smith (1995), to enhance productivity effectively also requires strategic planning and regular change of effort, including contribution and assistance of all the work force. Sumanth (1998) has demonstrated how productivity can be increased:

- Increase output with the same or a smaller amount of resources.
- Reduce the amount of resources used while maintaining the same output or raising output.
- Ensure the resources used to increase output increase further.
- Allow output to fall as long as the amount of resources used falls more.

Picard and Seay (1996) pointed out that productivity is related to efficiency and effectiveness of work. Therefore to improve productivity, a reliable evaluation is required, first to discover actions that need to be considered and their impact quantified. Productivity improvement can be looked at as a persistent and systematic management procedure, which means change. Companies, especially the statisticians in companies, are required to estimate realistic output values. To identify and evaluate the causal effects, productivity is one of the essential issues confronting today's business executives. To ensure that companies become successful, they should show positive action to ensure total management of productivity throughout,

with a prescribed, documented process. The process should be based on past productivity analysis, and the information obtained should form the basis of estimating future productivity levels (Motwani *et al.,* 1995).

Productivity also increases if capital is invested in physical, financial and human assets, with better workplace relations. This is likely to increase output, reduce costs and increase profits margins. According to McGavin (1993), employers are likely to pay higher wages to retain valued employees and, at existing wages, to expand wage employment and output.

Productivity can be seen as the measure of the efficiency of production and operations of management. Actual growth in productivity can be achieved from the optimum use of new technology and capable employees. Labour productivity can be improved in the process of selecting qualified employees, minimizing waste and time.

To achieve improvement in productivity, managers need to develop good relations between all employees concerned in productive activities; productivity improvement is a collective aim, that engages employees together through group dedication and personal loyalty. McGavin (1993) stated that accomplishing productivity improvement entails three choices: increasing the product values for existing resources used in production processes, substituting resources used so that product values are increased, and using additional resources of a kind that increases product values more than the increase in inputs. Enhancing productivity requires concentrating on the foundation of productivity growth. This indicates taking advantage of advances in knowledge and technology, and healthier association with associated firms and industries.

Increased productivity has positive effects on product purchases, providing customers with more for the same price and thus raising standards of living (Huff *et al.,* 1996). It may also increase earnings, buying power and returns on investment. Most importantly, it can improve companies' competitiveness. Different approaches to productivity improvement suggest that if companies continuously and methodically improve their input processes, this will significantly improve their productivity score (Gaither, 1992). Productivity is directly related to efficiency and effectiveness of work. This study also identify the differences between FOC's and local companies in terms of the extent to which productivity improvement has been seriously considered, by looking at the extent of education and training, skills development, adoption of technology and style of management..

2.12 Summary of literature review

This chapter discussed the importance of quality, quality management and productivity in manufacturing companies. It also highlighted productivity measures, the relationship between quality and productivity. The literature revealed that QM is an area which is increasingly recognised all over the world by businesses, owing to the importance of the quality element in providing services and products to consumers. Quality is seen as an organization's continuous improvement process. Applying quality to managements leads to improving performance and customer satisfaction. The QM approach is a continuous process for organizations to achieve improvement in the quality of their products and services through the integration of all functions and processes, in order to ensure customer satisfaction.

In the context of developing countries, a few studies have attempted to test the relationship between QM management practice and productivity (Moosa, 2000; Lee *et al.,* 2001; Chapman and Khawaldeh, 2002; Chin, 2003; Khan, 2003; Fatima and

Ahmed, 2005, 2006a, 2006b). These studies discussed the following constructs of QM: management commitment and leadership style, employee participation and continuous improvement, education and training, teamwork and award/reward system, customer focus and customer satisfaction, percentage of rejection and statistical quality control and, finally, ISO and traditional quality control. These researchers agreed that most of the above elements have positive effects on quality and productivity. They identified the bureaucratic style of management, lack of employee training, lack of coordination of teamwork, and not linking employee compensation to achieving quality goals as barriers to adopting QM practices.

Most of these authors measured quality on the basis of the annual figures for percentage rejection of goods manufactured, the total number of claims received, the percentage of scraps and rework, the amount spent on training and development and, finally, the cost of inspection.

Most of the research relating to developing countries measured labour productivity, because exact figures for material, energy and other inputs are hard to find, and it is difficult to pin-point total factor productivity. Finally, labour productivity was highly correlated with total factor productivity (Chapman and Khawaldeh, 2002).

Although the significance of QM is widely recognized, in the context of Pakistan, the literature showed weaknesses in understanding its utility in manufacturing. Therefore, this study offers valuable insights into current knowledge of QM in Pakistan and their effects on quality and productivity. Secondly, this study contributes to a general understanding of barriers to the adoption of QM programmes in locally owned companies. Finally, comparing and contrasting local Pakistani manufacturing

practices with those of FOC's operating in Pakistan helps to identify "Best Practice" that could be easily adopted by locally owned manufacturing companies.

2.13 Conceptual and Theoretical framework for the study

The theoretical and conceptual framework shown in *Figure 2.2.* The key concepts and how they may be related to each other are shown. It is meant to guide the research process in exploring possible relationships between concepts, and the data collection and analysis.

Figure 2.2: Conceptual and Theoretical framework

Source: Adopted by Chapman and Al-Khawaldeh, 2002

The study's conceptual framework explains how the concepts of quality management relate to quality and productivity. The significance of this framework is that if quality

management is applied it should positively lead to high quality products which will increase productivity (see figure 2.2). As the manufacturing based approach leads to reduced waste this should lead to higher productivity assuming that the cost of prevention do not exceed the benefits of waste reduction. This is one of the pre-requisites of JIT and Lean production techniques which will also be studied in this research project as supply chain practices that link quality and productivity.

2.14 Conclusion

This chapter has reviewed important literature informing the study in examining the relationship between QM practices and the productivity of manufacturing companies. The initial literature review confirmed that quality has a significant impact on productivity. Better productivity gives cost advantages over competitors, thus resulting in lower prices and higher profit margins for manufacturers. It also revealed that in formulating and implementing quality management, the commitment of top management and employees' participation is indispensable. To this end, quality improvement will ultimately create a significant impact on companies' revenue and market share. Better quality also results in higher demands for goods and services. Companies with superior productivity would be able to pay higher wages, thus attracting more highly skilled and qualified employees, in turn having a positive effect on productivity. Properly applied quality management initiatives not only enhance the skills of employees, but also motivate people to grow, increasing productivity and satisfying customer needs and expectations.

Chapter 3: Research Methodology

3.1 Introduction

The preceding chapters have discussed the literature review and theoretical framework. This chapter outlines the research aims and links the methods, data to be collected and research objectives. It explains the research approaches, strategies and designs, methods of data collection and analysis used in the study.

3.1.1 Aim of the study

The aim of this research is to make a contribution to manufacturing companies in Pakistan by investigating the relationship between quality management practices and productivity. If, as may be expected, a positive relation is found then to recommend the best QM practice necessary for adoption by Pakistani manufacturing companies.

3.2 Research strategy

According to Saunders and Thornhill (2003), research strategy is a plan that allows researchers to answer research questions. They identified eight research strategies: Surveys, experiments, case studies, ethnography, grounded theory, action research, cross-sectional studies and exploratory studies. According to Robson (2002), although all these strategies are useful the three key strategies are surveys, case studies and experiments.

Bryman (1989) points out that the survey approach involves the collection of data that allows for systematic and quantitative information with respect to variables which are then examined to guide the researcher to draw relationships. In the view of Saunders and Thornhill, this method is a widely used strategy in management and business research (Saunders &Thornhill, 2003).

The case study is defined as the research approach which involves an empirical investigation of particular events or phenomena within a real life situation by means of multiple sources of facts (Robson, 2002).

The experimental strategy measures the effects of one variable on another. It has a vital impact on social science research, and its design is fully specified before the main data collection (Robson, 2002).

For this project, there are two key research strategies available. The first is large scale data collection by questionnaire and the second would be the case study approach. Within the case study approach, two mechanisms might be used to collect data interviews or detailed case studies analyzing complete documents. Previous research in looking at the link between quality and productivity in developing countries such as (Fatima and Ahmed, 2006, Moosa, 2001, Chapman and Al-Khawledh, 2002, Khan, 2003) have used questionnaires but have been limited to one industry or sector, or narrow range of industry or sector and small sample size. Therefore, as theory building projects they have severe limitations. Therefore, it may be desirable for this project extend their work by looking across multiple industrial sectors and collecting a large data set to allow theory building. The alternative approach of case study usually either interviews or detailed analyses of company documents or both of these would be more appropriate to testing their theory or investigating particular aspects of their theory that are perceived as important or not well understood. In this research the questionnaire approach to develop the theories from Fatima and Ahmed, Moosa, Chapman and AL-Khawaldeh has been chosen because of the following reasons:

1. The previous studies were based upon small data sets and the theory needs further development.

2. The time required for detailed case studies based on interviews and document analyses would be too great for the study.
3. It is unlikely we would be able to gain access to sufficient depth to case study companies to adopt that approach within this research.
4. Pakistani companies have a financial disclosure problem, which is means that they do not like to give any information about their businesses easily.
5. The generalisability of a case study will be limited in its scope because the participants would be selected based on a sample of convenience, which may not be representative of other industrial types or demography.
6. There may be cultural issues of managers being reluctant to allow access to too much data, or being reluctant to criticise owners.

3.3 Quantitative approach

Many researchers in social sciences consider the quantitative approach an appropriate way of conducting research. This approach is embedded in the scholarly conviction that places importance on facts and figures that signify diverse views or ideas. Hence, quantitative research is carried out by focusing on quantification of data collection and analysis. Quantitative research largely depends on assumptions or propositions which are drawn from theory. The aim is to analyze the theory by studying the data to be collected, drawing on findings and on the basis of the analysis to confirm or reject the proposition (Bryman, 2004). Remenyi (2000) pointed out that quantitative research is linked to a positive stand which lays particular claim to the application of scientific methods. The quantitative approach is very structured in nature and its main aim is to provide a detailed and reliable data outcome which, for instance in businesses or management allows top management, policy makers and other stakeholders to decide whether particular actions are worthwhile.

Quantitative research procedures are often viewed as providing 'macro' and 'micro' level perspectives on the social world. Quantitative researchers often explore numerical data within a study to investigate 'macro' and 'micro' aspects of the problem in a comprehensive manner (Gilbert, 2001).

3.4 Methodology and methods for the study

Quantitative research approaches have been used by several researchers in the field of quality management (Chapman and Khawaldeh, 2002; Yong and Wilkinson, 2001; Najeh, 2006; Islam and Karim, 2011). The quantitative approach is usually used in situations where insightful understanding of the phenomenon being studied is required with regard to particular quality issues. Non-experimental quantitative research is adopted in this study. This type of research studies the naturally occurring variations in the dependent and independent variables without any intervention from the researcher or anyone else. Therefore, no treatment are given and it does not involve using experimentation for collecting data, but rather description of phenomena, often by survey (Forza, 2002; Bell, 1999).

This approach is also useful where hard data is needed. Furthermore, survey research has been successfully used in different operations of the management field (Forza, 2002). This research states that, there is no unique research methodology, the reason being that every methodology and method has its advantages and disadvantages. Researchers are therefore expected to use the methodology that would best fit their research framework and best answers their research aims and objectives.

Guided by these discussions, the research methodology, strategy and methods used are expected to answer the research aims and objectives. This serves as an opportunity to employ a quantitative strategy to collect field data for the study, thus

adopting a single strategy. This includes a survey using a questionnaire and documentary evidence such as company report. The researcher based on the extensive literature review developed a questionnaire survey.

3.4.1 Reasons for using questionnaires

A questionnaire was used to administer the survey for the following reasons:

- It is a well-organised and highly ordered data collection instrument.
- It is the data collection instrument most commonly used by researchers, particularly in the field of management and business research (Saunders and Thornhill 2003).
- It facilitates the generalisation of the data (Mason, 1984).
- It is an important means of collecting data quickly and cheaply (Bell, 1999).
- Its level of coverage is high and it can capture a greater number of respondents.
- Questionnaires can ensure high degree of validity and reliability of the outcomes when statistical tools or techniques are applied to data analysis and interpretation if the number of responses is high.

The questionnaire was the appropriate tool to collect the survey data, enabling the researcher to answer the research questions and the research objectives effectively.

3.5 Sources of research data

The data for this study were generated from both primary and secondary sources, as discussed below.

3.5.1 Primary data

According to Saunders and Thornhill (2003), primary data is the data collected purposely for the research project. The data for this research was collected in Pakistan with a survey strategy, which involved administering questionnaires.

3.5.2 Secondary data

Secondary data has already been collected in some other situation (Robson, 2002). It gives detailed background information and helps to clarify the research problem. This information forms an importance basis that embody quality management practices and the causes that facilitate or inhibit the successful adoption of quality management practices, collected by reviewing the literature. Again, the purpose of secondary data is to obtain additional data and information about the demographic characteristics of the sample companies. The secondary data was also used in calculating financial constructs (return on assets, return on sales, market share, and sales per employee) in some of the sample companies. This information was collected through companies' annual reports, and other published and unpublished material.

3.6 Sample design

The research focuses on the relationship between quality management and productivity in Pakistani manufacturing companies, and aims at identifying best practices for local companies. The scope is therefore exclusively Pakistan, and it is expected to generate reliable and generaliseable results.

It is not possible to reach the entire population for any practical study, for monetary considerations, time and logistical factors (Sekaran, 2000), so this research selected a sample from the total population(Bryman and Bell, 2003).

Careful selection of the sample is important, as it represents the entire population under study. According to Krathwohl (1997), the sampling procedure refers to the way in which a small number of units are selected from a larger population to enable researchers to make inferences about the population. Aaker *et al.,* (2004) also identify sampling as, "*The process of surveying only a sample of the whole population to make inferences about the population"*.

In designing the sample for this study the following considerations were made: the research population, sample frame, and sample size.

3.6.1 Population

The general research population is the whole manufacturing sector in Pakistan. In order to get the best possible response rate to the survey questionnaire and have a reasonably representative sample of the whole population it was decided to survey 500 companies based in the Korangi Association of Trade and Industry Karachi (KATI) and Karachi Export processing zone (KEPZ).

The field study was carried out in Pakistan from August 2010 to January 2011. Karachi was selected because it is the capital of financial, commercial and industrial activities in Pakistan. It accounts for the lion's share of Pakistan's manufacturing companies' revenue generation, generating 63.38% of the total collections of the Federal Board of Revenue. Karachi produces about 30%of value added in large-scale manufacturing, and contributes 20% of the total GDP of Pakistan. In 2007, the World Bank declared Karachi as the most business friendly city in Pakistan (http://en.wikipedia.org/wiki/Economy_of_Karachi).Secondly, it is an area which the researcher knows and has established links with different manufacturing companies which could help in the field work.

3.6.2 Sample frame, sample selection and sample size

To obtain adequate data for the analysis, the sample was selected from various categories of industry:

1) Automobile sector
2) Textile sector
3) Chemicals
4) Pharmaceutical sector
5) Food industries
6) Engineering sector.

In order to have a meaningful representation of all the industries operating in the manufacturing sector, data was needed from the above industries to facilitate analysis sector by sector. A minimum of ten responses from each sector was used. The study planned to obtain responses from different industries so that generalisation of the findings could be established.

3.6.3 Unit of enquiry and analysis

According to Hamersley (1992), the unit of enquiry and analysis is the source from which information is obtained and analysed. Given the major objectives of this study, the unit of analysis was manufacturing companies. Hence, managers from quality control and production departments of manufacturing companies were the main source for obtaining the desired research data.

3.7 Questionnaire design

The questionnaire was design based on primarily the previous research by Sarph *et al.,* (1989) who identified critical factors for the adoption of QM techniques see section 2.4.2. Also the work of Yusuf and Aspinwall (2000), also the work of Zhang *et al.,* (2000), Moosa (2000), Lee at al., (2001), Chapman and AL-Khwaldeh (2002) and

Fatima and Ahmed, (2006). In-addition questions were included based upon areas of specific interest for this research project.

The specific relationship between the previous researches and the questionnaire as developed is shown in table 3.1 below.

Table 3.1: Relationship between methods, data to be collected, and research objectives.

Method	Data to be collected	Literature Review	Objectives to achieve
Questionnaire survey	-Demographic factors (Type of manufacturing sectors, size of the responding companies, ownership status, quality control department, ISO certification) -QM practices (ISO 9000, SPC, TQM, QC circle's, JIT, 5S, Six sigma, Kaizen, Lean, and reengineering)		-Examination of the level of adoption of QM practices by manufacturing companies in Pakistan
	-Management knowledge (management awareness of different tools and techniques of QM, planning, quality initiatives, consciousness of quality) -Management commitment (management attitude towards implementation of QM practices, value assigned to quality and productivity.)	Critical factors by Saraph *et al.(1989) Yusuf and Aspinwall (2000), Zhang et al., (2000),Moosa (2000), Lee et al.,(2001), Chapman and Khawaldeh (2002),Fatima and Ahmed (2006)*	
Questionnaire cont.	-Organization's communication (identification of level of communication between various levels, vision & mission. Information about quality policy& quality planning of the company and their basis for competitive advantages)		-Identification of barriers to the adoption of QM practices.
	-Management style (leadership style participative or authoritative, decision-making process, value assigned to suppliers.)		
	-Training (management attitudes towards training, training departments, quality education and skills of the employees, training plans, training budgets, training programmes, problem-solving skills training) - Empowerment (role of employees in the decision-making process, companies' level of delegating authority to employees) -Employee motivation (working conditions, trust building, morale) -Teamwork (relationship between top management and employees,	Critical factors by Saraph *et al.(1989) Yusuf and Aspinwall (2000), Zhang et al., (2000),Moosa (2000), Lee et al.,(2001), Chapman and Khawaldeh (2002),Fatima and Ahmed (2006*	

	workers' involvement and empowerment, supplier suggestion system, team building, workers' feedback system) -Award/reward procedure (wages structure, compensation procedures, award and reward based on quality performance)– Technology and innovation (Research and development, technical benchmarking, investments in technology, equipment, plant, etc.) -Customer focus (perceived acceptance level of quality, market studies, customer satisfaction surveys and complaint procedures, internal customer-supplier relations, and customer retention)		
Questionnaire **cont.**	-Calculation of Productivity based on production performance functions (production machinery downtime, manufacturing lead time, machine idle time, on-time delivery of customer orders, over production, excessive inventory) -Internal and external measures of quality (percentage scrap, percentage rework, percentage defects and number of complaints received by the sample companies) -Production control(preventive measures, established procedures, and effectiveness of supervision) -Business performance indicators(return on assets, return on sales, sales volume and market share)		-Identification of relationships between QM, and productivity in the manufacturing companies in Pakistan. -Assessment of the difference between locally owned companies and FOC's in relationship to quality management and productivity.
Questionnaire **cont.**	-Quality performance functions -Quality control practices -In-depth investigation into selected QM practices (ISO 9000, SPC, TQM, QC circle's, JIT, 5S, Six sigma, Kaizen, Lean, and reengineering) and QM implementation factors based on statistical data		-Identification of BP for adoption by Pakistani companies. -Identification of implementation factors that contribute to effective adoption of QM practices.

Table 3.2: Relationship between methods, data to be collected, and research objectives.

	Information/data to be collected	Objectives to achieve
Review of documents	Quality Management and Productivity, annual reports, quality manuals, government and company quality policies and published reports. Company success stories.	Investigation into the nature of the relationship between quality management, quality and productivity in the sample companies.

3.8 Level of measurement

Within this study, the data is measured by using 5-point Likert scales. Although some studies are a 7-point options, a much related study of quality and productivity by Chapman and Khawaldeh (2002) used 5-point Likert scales, where 1=strongly agree, 2=agree, 3=neutral, 4=disagree, and finally 5=strongly disagree. Similarly, (Zubair, 1996, Thaver, 1998, Samson and Terziovski, 1999, Lee at al., 2001 and Khan (2003) all used 5-point Likert scales.

Thus, this study also used 5-point Likert scales. In discussion with other researchers the 5-point scale was considered most appropriate as the descriptions are easily understood.

3.8.1 Pre-testing of research instrument

After the questionnaire had been designed, it went through rigorous tests to ensure that it was adequate, feasible and ethically acceptable. First, several wordings of the questions were prepared to remove ambiguity and to achieve the degree of precision necessary to ensure that the subjects understood exactly what they would be asked. The instrument was then checked to ensure that the language was jargon free, to decide on which question type to use, and to ensure that the responses could be classified and analysed as recommended by (Denzen, 2009). After this exercise, the draft was given to colleagues supervisors for them to review and offer comments.

In Pakistan, after successful negotiation for access, twenty respondents with characteristics similar to the study populations were chosen to pre-test the research instrument (questionnaire), to ensure that the instrument was adequate and acceptable to respondents. The feedback received helped the researcher to evaluate how long it would take respondents to complete the survey questionnaires, how adequately the questions would be answered, and the general impressions of the respondents about the questions and the instructions. After the pre-testing, a few questions that needed alteration were rephrased and others were dropped; then the final questionnaires were printed for the study (see appendix C). The pre-testing also provided an opportunity for sharpening data collection skills and rapport building.

3.9 Managing data collection

Ethical issues relating to the confidentiality of information given to the researcher and the anonymity of respondents were taken seriously, and the consent of respondents obtained. Respondents were informed that the study was for academic purposes only, and was not intended for any financial gain.

Prior to the field work and the pre-testing of the research instruments, heads of departments of manufacturing companies, and individual respondents, were made aware of the researcher's intentions through an official letter of introduction from the researcher's supervisor. The letter stated the research topic, purpose, institutional affiliation, duration of the data collection, possible use of the research results, and assured participants of the confidentiality of the results (see appendix A for ethical issues).

3.10 Methods of data processing and analysis

Data processing included coding, editing and data entry, facilitated by a computer software program; the quantitative analysis made use of SPSS. A code book was purposely designed to assist this process. Frequency tables, crosstabs, correlation, t-test and ANOVA were used to test the dependence of attributes, along with measures such as correlations and other ordinal data analysis techniques.

3.11 Variable Measurement

According to Churchill (1999), measurement of research is the rules that are assigned to objects to represent quantities of characteristics. This study is to determine the degree of association between quality management and productivity, so productivity serves as the dependent variable, while selected components of QM serve as independent variables. The research instruments were then used to analyse the pattern of relationships that exist between these two types of variable.

3.12 Measuring variables involved in the study

This section shows the methods used for measuring all the variables in the data gathered during the field study in Pakistan.

1. Measuring productivity for the study

Summarizing the detailed discussion in the previous chapter, productivity, according to Huge (1990), is expressed as measuring the performance of how the best machine is made use of, performance schedule, cost variance or output divided by headcount of companies. In terms of head count, the productivity ratio may contain the amount manufactured per employee, sales per employee, profitability per employee or other important output per employee. Productivity is quantified at company level, such as unit of output per unit of labour to measure labour productivity. Total factor productivity is one of the vital determinants since it includes

all factors of production in the denominator; it is regarded as a more complete measure of productivity than labor productivity. However, it is more difficult to compute and data are less readily available than for labor productivity, so labor productivity is the measure most widely employed by management.

Productivity measurement is a management tool which reflects profitability. Measures of value-added are commonly used for broad comparison of aggregate sector productivity (Jablonski, 1995); whereas the use of output per unit labor has been used frequently to measure labor productivity for individual companies (Byrne, 1994; Chapman *et al.,* 1997). Labor productivity can be measured in terms of labor/hour, given by a formula adopted from Diewert and Nakamura (2005):

Labour productivity = Number of units produced / Unit of labour used in production

Labour productivity can also be measured according to the ratio of unit produced per hour used in production; this is given by the formula:

Labour productivity = Number of units produced / Hours used in production

or it may be shown from the point of view of sales as

Sales= Number of units produced/ Number of units sold

It can also include unit produced per amount of capital investment, given by the formula:

Capital productivity = Number of units produced/ Amount of Capital invested

Additionally, the number of units produced per unit of raw material consumed, is:

Material productivity = Number of units produced / Units of raw material consumed

Based on the above discussion, it was concluded that productivity is one of the variables that can only be measured indirectly. This requires measuring other variables and then calculating productivity from them. Additionally, it was difficult to compare productivity across different industries such as automobile, chemicals, food,

engineering, pharmaceuticals, and textiles especially when using a questionnaire survey. However, measures that are more direct would be better if a reliable data are obtained. Hence, the calculation of productivity for this study was made on the basis of production performance functions such as production machinery downtime, average manufacturing lead time, worker/machine idle time, timely delivery of customers orders, over production, and excessive inventory (see item 40 in the questionnaire: appendix 3).Section 5.2 presents a detailed discussion of the calculation of productivity of the sample companies.

The independent QM variables measured through the survey questionnaire took into consideration the following components, with their associated questions (see section two of the questionnaire appendix c):

- **Management knowledge:** measured by asking managers about different QM tools and techniques, quality initiatives of the companies, awards models, quality policy of the companies and their basis for competitive advantage, etc.
- **Management commitment:** determined the responsibilities of managers for quality and productivity, the role of management in planning and benchmarking.
- **Organizational communication:** questions about vision and mission, instructions and policies, communication media, and improving communication.
- **Style of management:** questions about top management involvement and responsibilities, the value assigned to quality, top management attitudes, communication and relationship with general workers.
- **Training:** questions on qualifications and skills, improving learning, training department, and training plans and budgets.

- **Empowerment:** questions on employee involvement, decentralizing, and delegating authority to employees.
- **Employee motivation:** questions about working conditions, job stability, trust building and morale of the employees.
- **Teamwork:** questions on decision-making processes, improving suggestion systems, quality circles, and team building.
- **Award/reward procedures:** questions about satisfaction levels of employees, top management, with colleagues, salary, and award and incentive schemes.
- **Technology/innovation:** questions about continuous improvement programmes, research and development, company decision-making capabilities about new purchases and buying behaviour.
- **Customer focus:** questions on market studies, customer satisfaction, internal customers, and customer retention.
- **Business performance:** questions on the return on assets return on sales, sales volume and market share.

These selected components have been tested by QM researchers in developing countries (Moosa, 2000; Khawaldeh, 2001; Jabnoun and Sedrani, 2005), so their application to the Pakistani situation provides greater validity that normally needed for this type of exploratory study.

2. Measurement of quality

Within this research project, quality was assessed by investigating present practices in the manufacturing sector with reference to quality and productivity. This manufacturing-based approach provided directions to the managers to focus on internal efficiency rather than on external effectiveness. During this research various

manufacturing-related issues like role of suppliers, methods of considering waste, errors, reworks, designs and specifications adopted by different companies were analyzed. One of the important aspects is to understand the value assigned to quality by different companies during manufacturing process inputs, and their attitudes (including employees' attitudes and their satisfaction level).

The manufacturing quality of the sample companies was measured on the basis of percentage of scrap, percentage of rework, percentage of defects, and number of complaints on a monthly basis.

3.13 Limitations

Limitations in this study include restrictions on access to documents, limited finance, logistics, and time and difficulty of getting respondents to answer the questionnaire.

3.14 Chapter summary

This chapter discussed the methodology used to conduct the research study, as well as the issues related to the choice of research methodology. The discussion was centred on three main areas: research design, data collection and the analysis methods. These were discussed in relation to the research aims and objectives.

The chapter also outlined the measures used to determine quality and productivity, which would enable inferences and comparisons to be made between the variables.The literature review of quality management and productivity, and quantitative data informed the choice of methodology and methods adopted for the study. The selection of the research methodology was justified in terms of its appropriateness and effectiveness to the research in achieving the aims of the research.

The overall research methodology is demonstrated graphically in Figure 3.1 below

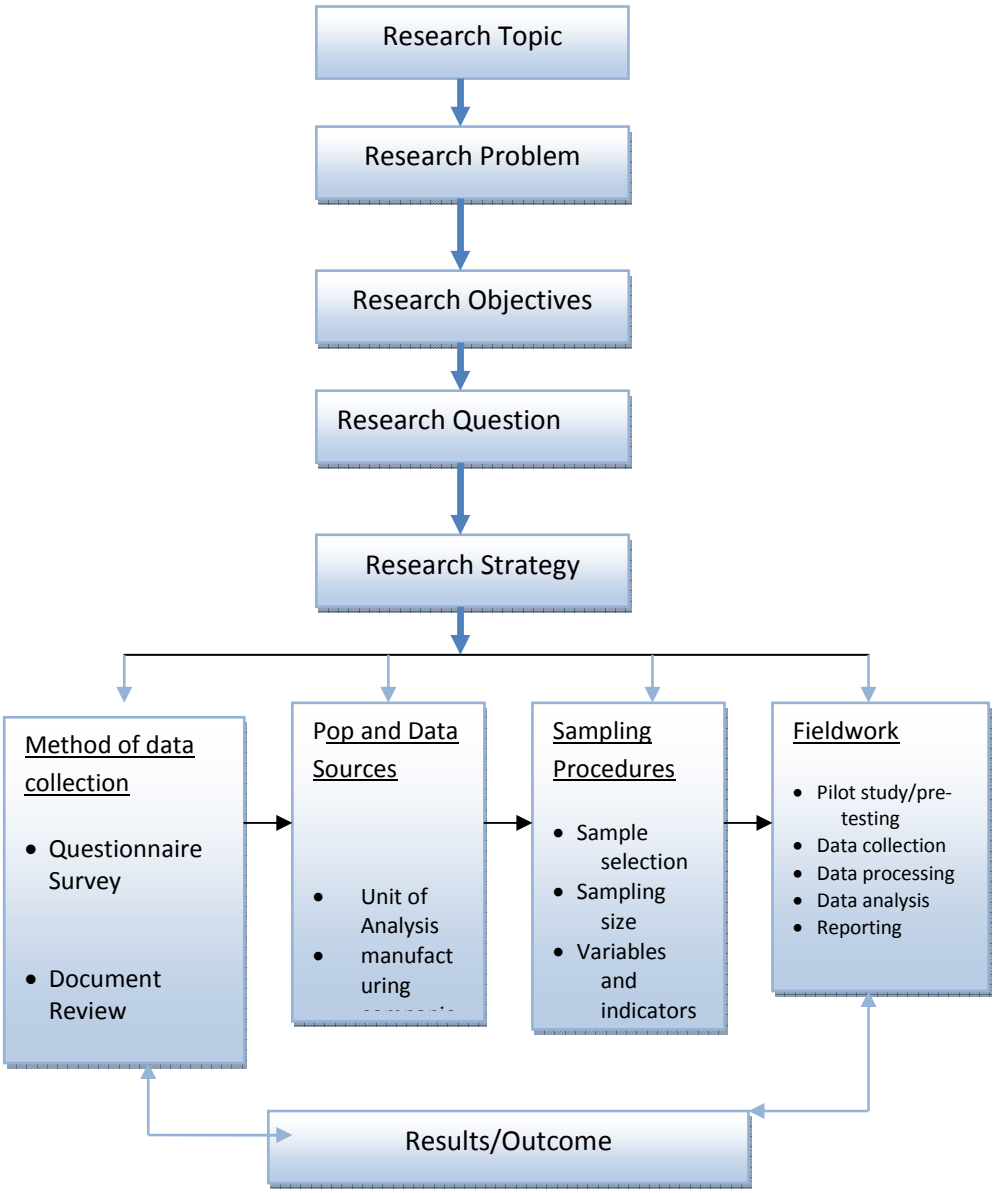


Figure 3.1: Research Process

Chapter Four: Analysis Of Quality Management

4.1 Introduction

In chapter three, the methodology and research approach employed for this research were presented. This chapter commences with the analysis of the field data, focusing on survey data. The relevance of this chapter is that it assesses the quality management practices of Pakistani companies. The chapter presents background information on the studied companies, their adoption of quality management practices and the barriers to quality management.

4.2 Responses to questionnaire

467 manufacturing companies were given questionnaires, either in person or via the Internet. 293 companies returned the questionnaire, of; data from 24 was not used for the following reasons: Nine questionnaires were returned blank, 13 were incomplete and two were completed wrongly. This left 269 usable questionnaires, which represents a net usable response rate of 58%, which is considered acceptable for this type of survey (Saunders, 2010).

4.2.1 Data management

The method followed on receipt of the completed questionnaires is discussed in this section. Each was given an identification code number and to ensure anonymity, the company names were removed. Prior to data entry, responses were systematically coded. Dichotomous and numeric responses were entered as the actual numeric order, i.e. 0=yes and 1=no. Likert scale responses were also coded by assigning numeric values to “ticked” responses, i.e. 1=strongly agree, 2=agree, 3=unsure, 4=disagree, and 5=strongly disagree.

Finally, responses were entered into SPSS version 19. Each row contained data for a single company. The data were 100% checked for completeness and accuracy.

4.3 Background Information/Company Profile

This section discusses the background information by manufacturing sector, distribution of managers/respondents, number of employees, type of ownership, length of time ISO Certification was held, and turnover.

4.3.1. Sector categorisation

This section of the analysis presents the field data according to the distribution of the companies within industrial sectors, as illustrated in *Table 4.1* below.

Table 4.1: Industrial categorization of companies

Name of the Business Sector	No. of companies	Percent (%)
Automobile	25	9.3
Chemical	20	7.4
Engineering	43	16.0
Food	15	5.6
Pharmaceutical	37	13.8
Textile	129	48.0
Total	269	100.0

The table shows that the 269 companies represent a wide range of industrial sectors. Textile is the biggest sector in terms of the number of respondents, with129 companies, or 48%.Engineering is the second largest sector, with 43 companies or 16%, followed by pharmaceuticals and the automobile sector respectively. The smallest sector is the foods, with 15 companies or 5.6% of the total population.

4.3.2. Distribution of managers/respondents

The distribution of managers was made according to their backgrounds, such as manager QC/QA, Manager Production, MD/CEO and any other executives, as illustrated in *Table 4.2* below.

Table 4.2: Distribution of the respondents/managers

Background Of Respondents	No. Of Respondents	Percent (%)
Manager QC/QA	146	54.3
Manager production	66	24.5
MD/CEO	49	18.2
Any others executives	8	3.0
Total	269	100.0

Manager QC/QA is the ideal resource person with respect to quality management practices in companies. More than half, 146 out of 269, are managers QC/QA, followed by 66 production managers and 49 MD/CEO, all belonging to top management. This suggests that the respondents should be familiar with QM.

4.3.3. Number employees of companies

The distribution by number of employees is illustrated in *Table 4.3*.

Table 4.3: Size of the companies according to number of employees

Number of employees	No. Of Companies	Percent (%)
Less than 100	85	31.6
100-300	89	33.1
300 or above	95	35.3
Total	269	100

The sample companies vary in size. The largest group have over 300 employees, over one-third of the total population; the medium-sized and smallest companies represent just under one-third each.

4.3.4. Type of ownership

The categorisation of the participating companies' in terms of ownership is illustrated in *Table 4.4* below.

Table 4.4: Type of ownership of the responding companies

Type of companies	No. Of companies	Percent (%)
Foreign owned	75	27.9
Local owned	194	72.1
Total	269	100.0

One of the most important characteristics of the data is the distribution on the basis of ownership. The table presented above shows that 75 or 28% are foreign-owned companies, and the remaining 194, 72%, are locally owned companies.

4.3.5. Period of establishment of QC department

The distribution of the participating companies according to year of establishment of a quality control department is illustrated in *Table 4.5* below.

Table 4.5: Establishment of QC Department

Establishment of QC Department	No of Companies	Percent (%)
Less than 3 years	9	3
4-7 years	59	22
Greater than 7 years	174	65
Companies without QC department	27	10
Total	269	100

242 of the 269 companies reported that they have a separate quality control department. 65% companies have had a quality control department for more than 7 years, but only 9 have had one for less than three years. This suggests that the sample companies have some maturity in terms of QC departments. Of the 27 respondents, which did not have a QC department, 20 claimed that they had plans to establish one.

4.3.6. Period of holding ISO certification

The distribution by number of years holding an ISO certification is illustrated in *Table 4.6* below.

Table 4.6: No of years getting ISO certified

Period of getting ISO Certification	No of Companies	Percent (%)
Less than 3 years	16	6.0
4-7 years	68	25.0
Greater than 7 years	99	37.0
Without ISO companies	86	32.0
Total	269	100

About 68% of the companies have ISO accreditation, and 37% have held ISO certification for more than seven years. Twenty five percent (25%) have held ISO

certification for 4-7 years and only 6% have been accredited for less than three years. The table also illustrates that 32%of companies have no ISO certification.

4.3.7. Companies Turnover

Information about the companies' turnover is illustrated in *Figure 4.1*.

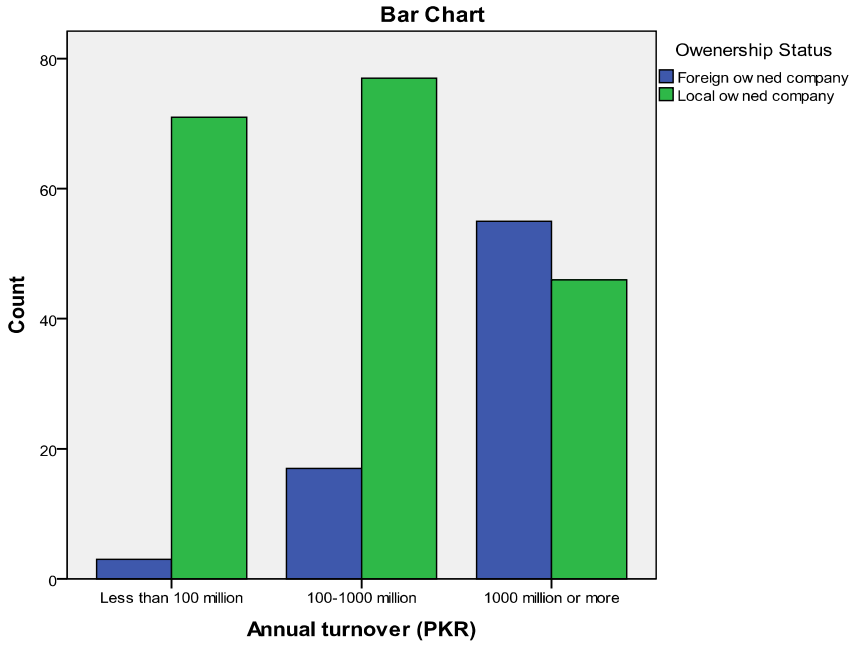


Figure 4.1 Annual turnovers of study companies

The bar chart in *Figure 4.1* represents the annual turnover of the sample companies on the basis of type of ownership. This ranges from less than 100 million PKR to more than 1000 million PKR. Seventy four (74) companies fall into the cluster of less than 100 million annual turnovers; 71 of these are LOC's, and three (3) are FOC's. Of the 94 companies in the middle group, 77 are LOC's and 17 foreign. In the final cluster (1000 million or more), FOC's outperform LOC's, respectively 55 and 46.

4.4 Quality Management Practices

4.4.1 Status of Quality Management Practices

The distribution of the responding companies on the basis of QM programmes currently being used is illustrated in *Figure 4.2* below.

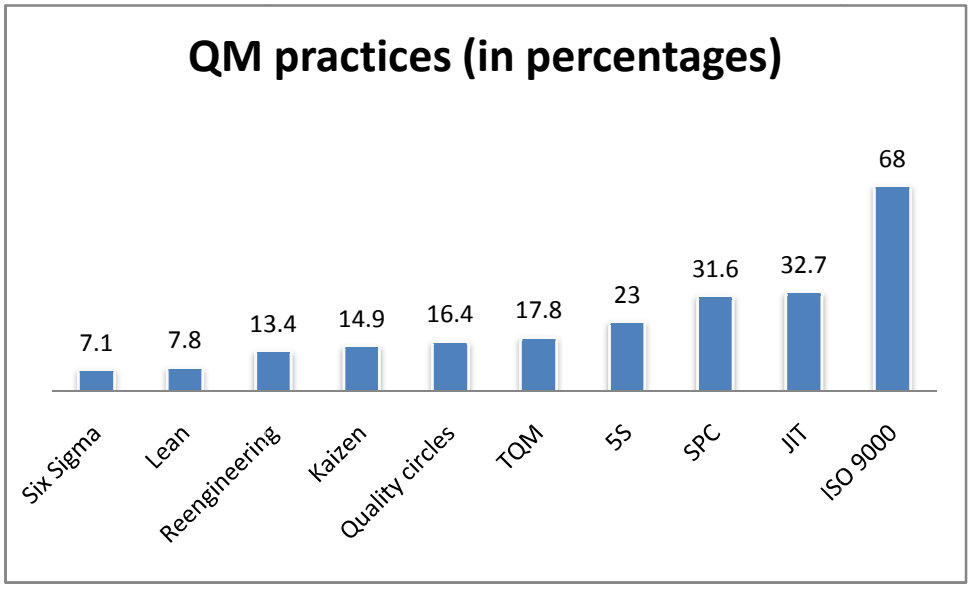


Figure 4.2 Type of QM programmes used by manufacturing companies

Figure 4.2 shows that the most popular QM practices adopted by the selected Pakistani manufacturing companies is ISO 9000. 68% rely on ISO 9000 solely or in combination with other practices, followed by JIT 32.7%, SPC 31.6% and 5S 23%. TQM and Quality Control Circles have been adopted by 17.8% and 16.4% respectively, Kaizen and Reengineering by 14.9% and 13.4% respectively, and Lean and Six sigma by 7.8% and 7.1% respectively.

4.4.2 Relationship between QM practices and type of ownership

In order to investigate the level of adoption of QM by Pakistani manufacturing companies, the relationship between selected QM practices and type of ownership was analysed. First, cross tabulation tables were constructed separately for each selected QM practice to determine the exact percentages of companies using them. The relationship between ISO 9000 and the nature of ownership is illustrated in *Table 4.7*.Of the 269 companies, 75 are FOC's and 194 are LOC's. 70 out of the 75 FOC's answered yes to using ISO 9000 QM practice, as did 113 of the 194 LOC's.

Table 4.7: Cross tabulation of ISO 9000 with type of ownership

		ISO 900 QM Practice		Total
		No	Yes	
Ownership Status	Foreign owned Company	5 (6.7%)	70 (93.3%)	75 (100%)
	Local owned Company	81 (41.8%)	113 (58.2%)	194 (100%)
Total		86 (32%)	183 (68%)	269 (100%)

The majority of the respondents, 68% of the total population, are thus using ISO 9000.The reasons for this may be:

(a) 70% of the sample companies are export-oriented.

(b) All are manufacturing companies; therefore production processes can be documented.

The relationship between ISO 9000 practice and industrial categorisation of responding companies is illustrated in *Table 4.8*.

Table 4.8: The relationship between ISO 9000 with type of companies

Name of QM practices	Auto	Chem.	Engg	Food	Pharm	Textile	Total
ISO 9000	23 (92%)	12 (60%)	32 (74%)	14 (93%)	29 (78%)	73 (57%)	183 (100%)

The ISO 9000 quality standard appeared to be the most popular application among all six sectors. However, although the vast majority of food and automobile companies have ISO 9000 certification, the largest sector, textiles, has only 73 ISO 9000 certified companies. The high rate of ISO certification suggests that most of the manufacturing companies believe that the ISO standard makes a big contribution to improving quality and productivity. However, Yong and Wilkinson (2001) highlighted that ISO 9000 is oriented towards repetitive processes, and not geared towards critical quality issues.

Table 4.9: Cross tabulation of SPC with type of ownership

		SPC		Total
		No	Yes	
Ownership Status	Foreign owned Company	31 (41.3%)	44 (58.7%)	75 (100%)
	Local owned Company	153 (78.9%)	41 (21.1%)	194 (100%)
Total		184 (68.4%)	85 (31.6%)	269 (100%)

The relationship between statistical process control (SPC) and the nature of ownership are illustrated in *Table 4.9*.

Again, out of 75 FOC's, 44 reported that they are using SPC; 41 of the 194 LOC's claimed to use it. *Table 4.9* shows that 85 companies altogether, about 31.6% of the total population, are using SPC.

Table 4.10: The relationship between SPC and type of company

Name of QM practices	Auto	Chem	Engg	Food	Pharm	Textile	Total
SPC	19 (76%)	6 (30%)	18 (42%)	6 (40%)	13 (35%)	23 (18%)	85 (100%)

Table 4.10 presents the relationship between SPC and industrial categorisation of the sample companies. Overall, SPC has been more widely adopted by the automobile sector, with about two-thirds of automobile companies are using it; similarly, 42% of general engineering companies use SPC. Again, the textile sector was found to be the biggest user of SPC in terms of number, although this represented only 18% of textile companies. Nevertheless, 32% of manufacturing companies are using SPC, it has been most widely adopted by FOC's. According to QM experts like Deming and Juran, strong statistical tools and techniques are required for QM initiatives to succeed (Deming, 1986, Juran, 1994). Among the manufacturing companies operating in Pakistan, these statistical skills are more

actively practised by foreign owned manufacturing companies than by local companies (see table 4.9).

Table 4.11: Cross tabulation of TQM with type of ownership

		TQM		Total
		No	Yes	
Ownership Status	Foreign owned Company	43 (57.3%)	32 (42.7%)	75 (100%)
	Local owned Company	178 (91.8%)	16 (8.2%)	194 (100%)
Total		221 (82.2%)	48 (17.8%)	269 (100%)

The relationship between TQM and the nature of ownership is illustrated in *Table 4.11*. 48 companies,17.8% of the total population, are using TQM. Interestingly, out of the 48, 32 companies are foreign ones.

Table 4.12: The relationship between TQM and type of company

Name of QM practices	Auto	Chem	Engg	Food	Pharm	Textile	Total
TQM	13 (52%)	2 (10%)	7 (16%)	3 (20%)	8 (22%)	15 (12%)	48 (100%)

It is evident from *Table 4.12* that auto manufacturers are ahead of all other sectors in terms of adopting TQM practice. The second adopter of TQM was pharmaceutical manufacturing companies. However, from the data presented in *Table 4.11,* it was seen that more foreign owned manufacturers have adopted TQM than locally owned ones. One may argue that this was due to the fact that the FOC's have adequate resources and a better pool of internal expertise to draw from. It may also mean that, foreign companies makes more extensive use of QM practices and were more experienced with different QM tools and techniques than the locally owned companies. In contrast, local manufacturing companies' lack expertise among top managers and their low-skilled workforce may be behind this low adoption.

Table 4.13: Cross tabulation of quality control circles with type of ownership

		QC circle's		Total
		No	Yes	
Ownership Status	Foreign owned Company	60 (80.0%)	15 (20.0%)	75 (100%)
	Local owned Company	165 (85.1%)	29 (14.9%)	194 (100%)
Total		223 (83.6%)	44 (16.4%)	269 (100%)

The relationship between quality control circles and the nature of ownership is illustrated in *Table 4.13*. Out of 75 FOC's, 15 are using quality control circles. Likewise 29 LOC's, which is about 14.9% of total users of QCC's, claim to be using QCC's.

Table 4.14: The relationship between QC circles with type of companies

Name of QM practices	Auto	Chem	Engg	Food	Pharm	Textile	Total
QC circle's	2 (8%)	1 (5%)	5 (12%)	2 (13%)	13 (35%)	21 (16%)	44 (100%)

Evidence generated from *Table 4.14* found QCC's is one of the least adopted QM practice by both types of company. During the survey, one top executive of an automobile company pointed out that the company had replaced the QCC technique with a cross functional team. As stated by Yong and Wilkinson (2001),*"compared to QC circles – which are small groups of individuals doing similar work who voluntarily come together to identify, analyse and solve work-related problems – cross functional problem solving teams are usually project taskforces comprising employees from different functions looking at problems that are decided by management".*

Another reason for the low popularity of QCC's in Pakistan may be voluntary participation by employees, which is uncommon in Pakistan.

Table 4.15: Cross tabulation of JIT with type of ownership

		JIT		Total
		No	Yes	
Ownership Status	Foreign owned Company	30(40.0%)	45(60%)	75(100%)
	Local owned Company	151(77.8%)	43(22.2%)	194(100%)
Total		181(67.3%)	88(32.7%)	269(100%)

Table 4.15 shows the relationship between JIT and the nature of ownership. Again there is strong evidence of practising JIT, illustrated in *Table 4.15*. Sixty percent of FOC's, reported using JIT practices. Similarly, 43 LOC's, constitutes about 22.2% of the LOC's population, acknowledge using JIT.

Table 4.16: The relationship between JIT and type of company

Name of QM practices	Auto	Chem	Engg	Food	Pharm	Textile	Total
JIT	21 (84%)	3 (15%)	16 (37%)	6 (40%)	10 (27%)	32 (25%)	88 (100%)

Table 4.16 indicates the significant statistical association between the QM practice JIT and industrial categorisation of the responding companies. The high level of adoption of JIT by foreign companies suggests that they pay special attention to employee skills training and collaboration with suppliers on quality issues. In contrast, local manufacturing companies are usually characterized as authoritarian, and these companies also have limited resources to train, and to adopt collaborative approaches with suppliers.

Table 4.17: Cross tabulation of 5S with type of ownership

		5S		Total
		No	Yes	
Ownership Status	Foreign owned Company	47 (62.7%)	28 (37.3%)	75 (100%)
	Local owned Company	160 (82.5%)	34 (17.5%)	194 (100%)
Total		207 (77.0%)	62 (23.0%)	26 (100%)

Table 4.17 informs us that 23% of the total population are using 5S practices, comprising 28 foreign owned companies and 34 LOC's.

Table 4.18: The relationship between 5S with type of companies

Name of QM practices	Auto	Chem	Engg	Food	Pharm	Textile	Total
5S	19 (76%)	2 (10%)	11 (26%)	4 (27%)	8 (22%)	18 (14%)	62 (100%)

Again, the automobile sector was found to have widely adopted 5S QM practices, almost two-thirds of this sector.

Table 4.19: Cross tabulation of Six sigma with type of ownership

		Six Sigma		Total
		No	Yes	
Ownership Status	Foreign owned Company	63 (84.0%)	12 (16.0%)	75 (100%)
	Local owned Company	187 (96.4%)	7 (3.6%)	194 (100%)
Total		250 (92.9%)	19 (7.1%)	269 (100%)

Table 4.19 draws on the relationship between Six sigma and the nature of ownership. Refer to *Figure 4.2* on page 100; Six sigma is the least adopted practice in Pakistani manufacturing companies. Table *4.19* shows that only 7.1% of the total population are using it; of the 19 companies,12 are automobile manufacturers.

Table 4.20: The relationship between Six sigma with type of companies

QM practices	Auto	Chem	Engg	Food	Pharm	Textile	Total
Six sigma	12 (48%)	2 (10%)	1 (2%)	0	3 (8%)	1 (0.7%)	19 (100%)

Despite the wide use of QM practices by foreign owned manufacturers, practice like Six sigma was very rarely used even among the big resource multinationals in Pakistan. As is evident from the above table, Six sigma was found to be the least adopted QM practice. The *Table 4.20* also shows that the largest adopters of Six sigma are automobile, chemical and pharmaceutical companies respectively. The adoption of a practice like Six sigma needs a company-wide effort, along with strong leadership. Similarly, the size of the company also influences the pattern of QM

implementation. The larger companies are better equipped with QM practices than the small companies, and tend to have more resources for technological innovations, including corporate staff departments to champion and support the changes, and the financials means (Yong and Wilkinson, 2001). Intense QM programmes like Six sigma and Lean need highly advanced technological knowledge and skills before implementation.

Table 4.21: Cross tabulation of Kaizen with type of ownership

		Kaizen		Total
		No	Yes	
Ownership Status	Foreign owned Company	54 (72.0%)	21 (28.0%)	75 (100%)
	Local owned Company	175 (90.2%)	19 (9.8%)	194 (100%)
Total		229 (85.1%)	40 (14.9%)	269 (100%)

The relationship between Kaizen and the nature of ownership is illustrated in *Table 4.21.* About 28% of FOC's used Kaizen, and only 9.8% of LOC's.

Table 4.22: The relationship between Kaizen with type of companies

Name of practices	QM	Auto	Chem	Engg	Food	Pharm	Textile	Total
Kaizen		13 (52%)	1 (5%)	6 (14%)	3 (20%)	5 (14%)	12 (9%)	40 (100%)

Once again, there is a high degree of association between automobile companies and QM practice Kaizen, followed by food and beverages, engineering and pharma.

Table 4.23: Cross tabulation of Lean with type of ownership

		Lean		Total
		No	Yes	
Ownership Status	Foreign owned Company	62 (82.7%)	13 (17.3%)	75 (100%)
	Local owned Company	186 (95.9%)	8 (4.1%)	194 (100%)
Total		248 (92.2%)	21 (7.8%)	269 (100%)

Table 4.23 highlights the relationship between Lean and the nature of ownership.

According to *Figure 4.2* on page 106, Lean is the second least adopted practice in Pakistani manufacturing companies. *Table 4.23* shows that only 7.8% of the total companies have adopted Lean QM practices for their manufacturing processes:13 FOC's and 8 LOC's.

Table 4.24: The relationship between Lean and type of company

Name of QM practices	Auto	Chem	Engg	Food	Pharm	Textile	Total
Lean	14 (56%)	1 (5%)	2 (5%)	1 (7%)	3 (8%)	0	21 (100%)

Table 4.24, showing responses similar to *Table 4.20,* almost confirms that automobile companies have a strong association with Lean.

Table 4.25: Cross tabulation of Reengineering with type of ownership

		Reengineering		Total
		No	Yes	
Ownership Status	Foreign owned Company	59 (78.7%)	16 (21.3%)	75 (100%)
	Local owned Company	174 (89.7%)	20 (10.3%)	194 (100%)
Total		233 (86.6%)	36 (13.4%)	269 (100%)

Lastly, the cross tabulation of the relationship between reengineering and type of ownership shows that, overall 13.4% of the companies are using reengineering as illustrated in *Table 4.25*. Of 75 FOC's responses, 16 reported having used Reengineering, while only 20 LOC's, or 10% of the total LOC's users, had used it.

Table 4.26: The relationship between Reengineering with type of companies

Name of QM practices	Auto	Chem	Engg	Food	Pharm	Textile	Total
Reengineering	15 (60%)	1 (5%)	10 (23%)	2 (13%)	7 (19%)	1 (0.7%)	36 (100%)

Table 4.26 suggests that automobile, engineering and pharmaceutical companies are the primary users of QM practice Reengineering.

Table 4.27: Cross tabulation between exports oriented companies with type of ownership

		Export		Total
		No	Yes	
Ownership Status	Foreign owned Company	13 (17.3%)	62 (82.7%)	75 (100%)
	Local owned Company	68 (35.1%)	126 (64.9%)	194 (100%)
Total		81 (30.1%)	188 (69.9%)	269 (100%)

The above *Table 4.27* sheds light on the percentage of exporting companies among the sample population. Of the 269 responses, 188 reported that they export their products. Of these 188 exporting companies, 62 are foreign, and the remaining 126 are local manufacturing companies.

4.5 Is QM dependent on ownership?

Research question 4 asks what relationship exists between quality initiatives and productivity of foreign and locally owned companies. A t-test statistical test is used to identify any differences in adoption of QM between foreign owned companies and LOC's. The T-test is appropriate as it serves to compare mean scores between two different groups of companies (FOC's and LOC's). The result is illustrated below in *Table 4.28*. The research evidence showed that more foreign owned companies have adopted QM practices than locally owned ones. Although the survey found significant differences in all selected QM practices, significantly greater use of practices like ISO 9000, SPC, JIT, TQM and 5S was found (see highlighted data in table 4.28). Although foreign manufacturers showed a greater likelihood of adopting QM, we saw from the results depicted in *Tables 4.7 to 4.26* that a growing number of locally owned companies have also started adopting QM practices; particularly noteworthy is the prominent use of ISO 9000 QM systems, indicating the extent to which international quality standards have been impressed on the local business community.

Table 4.28: T-test between QM practices and type of ownership

Name of QM practices	Sig.value	t-value	Sig.(2tailed)	Mean diff
ISO 9000	***.000***	***7.655***	***0.000***	***.351***
SPC	***.000***	***5.833***	***0.000***	***.375***
TQM	***.000***	***5.660***	***0.000***	***.344***
QC circle's	.052	1.003	0.317	.051
JIT	***.000***	***5.882***	***.000***	***.378***
5S	***.000***	***3.967***	***0.001***	***.198***
Six sigma	.000	2.773	0.007	.124
Kaizen	.000	3.277	0.002	.182
Lean	.000	2.885	0.005	.382
Reengineering	.000	2.103	0.038	.110

Notes: *Level of significance is calculated by using t-test statistics for independent sample. The practices in bold & italics represent those practices where there are large significant statistical differences between FOC's and LOC's.*

It is also noticeable from *Table 4.28* that, despite the broad use of QM practices by foreign companies, practices like six sigma, Lean, Kaizen, 5S, and Reengineering were very sparsely used even among the rich-resourced foreign owned companies. A lack of specialist expertise among management and a low-skilled workforce may be behind this low adoption.

The t-test confirms that there is a statistically significant difference between the foreign owned companies and locally owned companies in terms of adoption of QM practices.

4.5.1 Relationship between QM practices and financial performance indicators

The correlations between the QM practices and financial performance indicators (ROA, ROS, and sales per employee) for the responding companies are displayed for LOC's and FOC's in *Tables 4.29* and *4.30* respectively. *Table 4.29* depicts the average correlation of each QM practice with the respective financial performance indicator, as well as the average correlation between each financial indicator and the respective QM practice for locally owned companies.

Interpretation of correlation statistics is always difficult and depends on context. For example the Cohen scale 0.50 has between medium correlation (0.30 to 0.49) and strong (0.50 to 1.00). However, vast correlation of 0.5 might be considered strong in

some social science situations (for example when using a five point likert scale) but may be considered weak in a physical science experiment where instrumentation can be precise. In this research a 5-point likert scale has been used therefore in interpreting the results a correlations between 0.30 to 0.49 will be considered as moderate and correlation over 0.50 will be considered as strong. This is consistent with the interpretation used in previous research by Fatima and Ahmed (2006), Kontastine and gudgel (2000).

As illustrated in *Table 4.29*, all QM practices were found to be positively and significantly correlated with every financial performance indicator (see table 4.29). The correlations ranged from 0.166 to 0.581 and were significant at the 0.01 level. In sum, the correlational data in table 4.29 indicates that each financial performance indicator exhibited an average correlation of 0.176 or higher with the corresponding QM practices. The result indeed confirms the positive association between QM practices and financial performance indicators. However, relatively low average correlation was found in the case of QM practices Lean and Six sigma, which indicates the weak impact of these two practices on financial indicators of LOC's. The QM practice that was found to exhibit the highest average correlations with the respective financial performance indicator is JIT (average $r=0.565$; $p<0.01$). The second highest correlation with the respective financial performance indicator is ISO 9000 (average $r=0.527$; $p<0.01$). The rate of correlation in the case of SPC was found to be (average $r=0.520$; $p<0.01$).5S and QC circle secured fourth and fifth positions respectively having (average $r=0.472$; $p<0.01$ and average $r=0.403$; $p<0.01$). Similarly, moderate rates of correlation were found for Reengineering (average $r=0.397$; $p<0.01$) and Kaizen (average $r=0.345$; $p<0.01$).Moderate correlation was also found for TQM (average $r=0.324$; $p<0.01$).

The statistics displayed in *Table 4.29* suggest that so far in Pakistan, QM practices such as Lean and Six sigma have a limited impact on financial performance indicators. A strong association was also found between ISO 9000, SPC, JIT, TQM, 5S, Kaizen, QC circles, and Reengineering with all the three selected financial indicators. *Table 4.30* depicts the relationship between QM practices and financial performance indicators (ROA, ROS, and sales per employee) for FOC's. The strongest average correlation between financial performance indicators and QM practice was with TQM (average r=0.426; p<0.01).

Table 4.29: Correlation between QM practices and financial performance (LOC's)

QM PRACTICES	ROA	ROS	SALES	Average " r_{pb}"
ISO	***0.522***	***0.545***	***0.514***	***0.527***
SPC	***0.522***	***0.521***	***0.517***	***0.520***
TQM	0.387	0.321	0.264	0.324
QC circle	***0.391***	***0.383***	***0.435***	***0.403***
JIT	***0.553***	***0.581***	***0.563***	***0.565***
5S	***0.445***	***0.467***	***0.504***	***0.472***
Six sigma	0.188	0.170	0.170	0.176
Kaizen	0.326	0.390	0.319	0.345
Lean	0.166	0.189	0.175	0.176
Reengineering	0.366	0.434	0.393	0.397
Average " r_{pb}"	3.866	4.001	3.854	3.907

Notes: *The practices in bold & italics represent those practices where there is strong relationship between QM practices and financial performance indicators.*

A moderately average correlation was found for SPC (average r=0.317; p<0.01). The rest of the QM practices showed weak correlation with all financial performance indicators (see table 4.30).

However the strength of correlation in the case of FOC's is relatively weak compared to LOC's. The major reasons for this weak correlation for foreign companies are:

(a) All companies have a constant rate of high average score in terms of financial performance indicators compared to LOC's (see figures 4.3, 4.4 and 4.5 below).

(b) Similarly, we can clearly see from the evidence in section 4.4.2 that the FOC's have adopted many of QM practices.

The consistent application of QM practices in FOC's and their consistent high performance on financial measures is the probable reason for a weak correlation when the FOC's are analysed as the independent population.

Table 4.30: Correlation between QM practices and financial performance (FOC's)

QM PRACTICES	ROA	ROS	SALES	Average " r_{pb}"
ISO	0.158	0.18	0.193	0.177
SPC	0.398	0.35	0.203	0.317
TQM	***0.448***	***0.471***	***0.359***	***0.426***
QC circle	0.011	0.066	0.161	0.079
JIT	0.088	0.143	0.037	0.089
5S	0.143	0.2	0.09	0.144
Six sigma	0.153	0.253	0.152	0.186
Kaizen	0.063	0.026	0.008	0.032
Lean	0.202	0.173	0.152	0.175
Reengineering	0.221	0.151	0.184	0.185
Average " r_{pb}"	1.885	2.013	1.539	1.812

Notes: *The practices in bold & italics represent those practices where there is strong relationship between QM practices and financial performance indicators.*

4.5.2 Comparison between ownership and financial performance indicators

Although *Table 4.29 and 4.30* illustrates the strength of relationship between selected QM practices and selected financial performance indicators, it does not demonstrate the differences between FOC's and LOC's in terms of financial performance indicators.

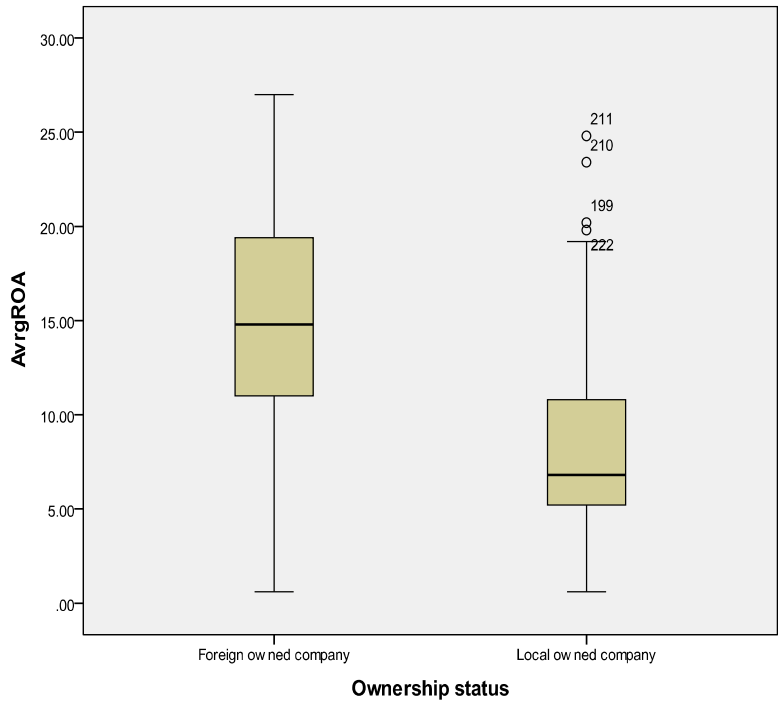


Figure 4.3 Comparison between type of ownership and average ROA

Box plots are used to compare the financial performance of responding companies based on ownership. *Figure 4.3, 4.4,* and *4.5* show a graphical representation of the distribution of financial scores by mean of box plots.

As can easily be seen from *Figure 4.3*, the average ROA for foreign owned manufacturing companies is visibly higher than for locally owned manufacturing companies. The middle line in each box represents the median value for each group. The box plots also illustrate that FOC's have median values which are more stable than those of LOC's. Although, in the case of LOC's there is some variability by mean of outlier, by and large *Figure 4.3* shows a distinct score pattern for both types of company.

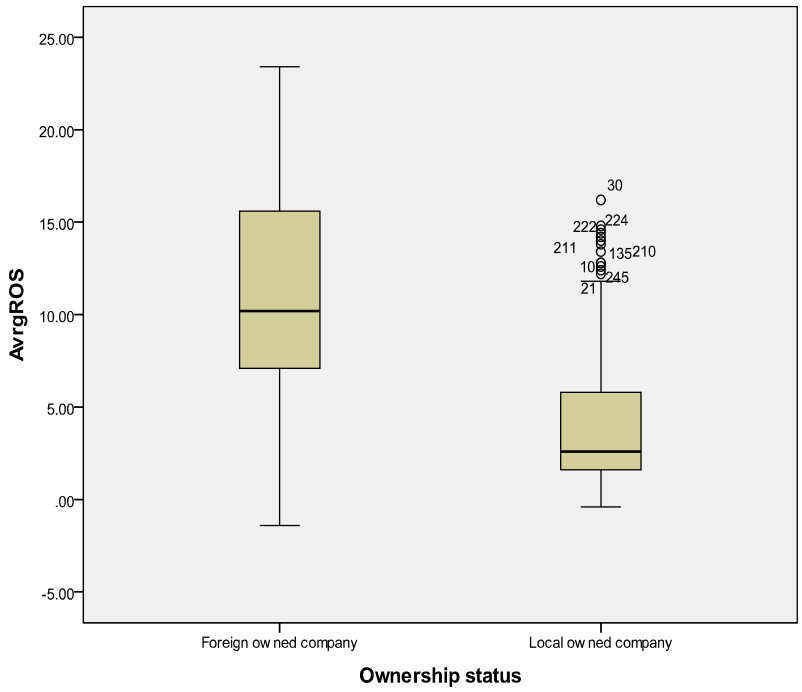


Figure 4.4 Comparison between type of ownership and average ROS

The pictorial representation of ROS and type of ownership can be seen in *Figure 4.4*: once again, the average ROS for foreign owned manufacturing companies is clearly higher than that of locally owned companies.

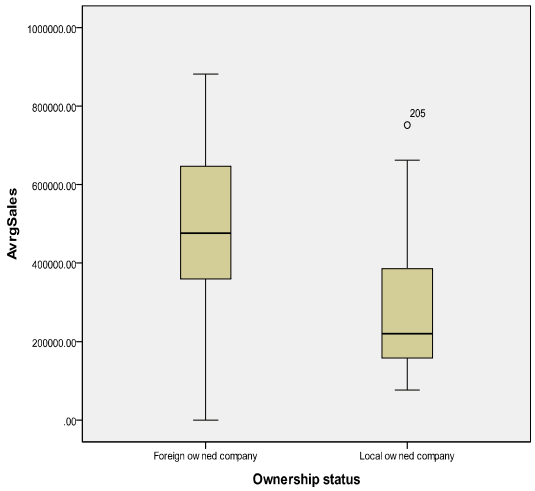


Figure 4.5 Comparison between type of ownership and average sales per employee

Similarly, the median value for FOC's illustrates the same rate of uniformity that was found in ROA analyses. However, in the case of LOC's, it shows a marginal increase in outlier scores. The comparison between type of companies and average sales per

employee is presented in *Figure 4.5*; foreign companies clearly outperform the local Pakistani manufacturing companies in terms of sales per employee.

Section summary

The response patterns may be interpreted in a variety of ways. The 269 responding companies were classified into two distinct groups: foreign owned and locally owned manufacturers. Many types of QM programme have been adopted by the respondent companies. The majority of responding companies have used a number of QM programmes, measured in percentage terms as ISO 9000 (68%), JIT (33%), SPC (32%), 5S (23%), TQM (18%), QC circles (16.4%), Kaizen (15%), Reengineering (13.4%), Lean (7.8%) and Six sigma (7.1%). The research shows that foreign manufacturing companies have implemented QM practices more than the local Pakistani manufacturers (see cross-tables 4.7- 4.26). However, the overall level of adoption of QM practices by local Pakistani manufacturing companies was found to be increasing compared to previous research studies on QM conducted by Moosa (2001) and Fatima and Ahmed (2006). According to table 4.27, 70% of the responding companies are export oriented. Therefore, they may need to maintain quality and productivity on a long-term basis in order to compete in the global market environment if they are to make good returns to their investments. This may be the reason why they have tended to increase their focus on the adoption of best QM practices. This study found that manufacturing companies in Pakistan make extensive use of international quality standards like the ISO 9000 series. This result corroborates the findings of Yong and Wilkinson's (2001) study, that most of the manufacturing companies in Singapore saw ISO 9000 as an ideal means to improve quality performance. Besides quality improvements, it appears that many companies see ISO 9000 as a competitive marketing tool. However, its drawback is that it is

oriented towards repetitive processes, and not geared towards critical quality issues (Riemann &Hertz, 1993). This suggests that even though the ISO standard provides a good platform to quality for a starter company, its role is limited to QA only. The sole reliance on ISO certification by locally owned manufacturing companies in Pakistan seems inadequate to provide a vital solution to quality and productivity issues. This suggests that these companies need to focus on other QM practices as well. The most widely QM practices are in order of importance:

- ISO 9000
- JIT
- 5S
- SPC
- Kaizen
- TQM
- QC circle's
- Reengineering
- Six sigma
- Lean

Additionally, t-test statistics generated from the study data further point out that foreign owned companies have a higher rate of adoption of selected QM practices than locally owned companies. This may mean that FOC's are stronger and focus on improving quality and productivity. Similarly, correlation between selected QM practices and financial indicators shows significant positive relationships (see table 4.29). Finally, pictorial representation by means of box plots further revealed that FOC's are far better in all selected financial performance indicators than LOC's.

4.6 Elements/Barriers To quality Management

Section two of the questionnaire consists of Likert-scale questions about different QM barriers during adoption and implementation of QM practices: Leadership, management knowledge, top management commitment, organizational communication, management style, training, empowerment, employee motivation, teamwork, award and reward, technology, and customer focus. The Likert-scale questions are further explained in the tables below, 4.31 to 4.40, by providing a percentage breakdown of the responses including frequency distribution for each question.

Q20a.Top management is fully aware about different tools and techniques of QM.

The responses to the different quality management tools and techniques question suggests that almost 90% of the respondents agreed that they have complete awareness of the different tools and techniques of QM.

Q20b.Top management leads from front. Assuming full responsibility about all quality Initiatives.

Again, almost all respondents answered that the top management assumes full responsibility for quality initiatives.

Q20c.Overall top management knowledge about utilization of different QM programmes Is comparable to the managers of similar levels

In comparing overall top management knowledge about utilization of different QM programmes, almost all the foreign owned manufacturers replied positively. On the other hand, almost half of the local manufacturers indicated a lack of understanding.

The combination of respondents who disagreed and those who were uncertain suggests that local companies are not effectively using techniques like benchmarking, surveys and focus groups.

Table 4.31 Leadership/Management Knowledge

20.Leadership/Management knowledge		SA	Agree	Uncertain	disagree	SD	Total
a. Top management is fully aware about different tools and techniques of QM.	FOC'S	52 (69.3%)	23 (30.7%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	68 (35.1%)	97 (50.0%)	24 (12.4%)	5 (2.6%)	0 (0%)	194 (100%)
Total		120 (44.6%)	120 (44.6%)	24 (8.9%)	5 (1.9%)	0 (100%)	269 (100%)
b. Top management leads from front. Assuming full responsibility about all quality initiatives.	FOC'S	48 (64.0%)	27 (36.0%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	66 (34.0%)	123 (63.4%)	5 (2.6%)	0 (0%)	0 (0%)	194 (100%)
Total		114 (42.4%)	150 (55.8%)	5 (1.9%)	0 (100%)	0 (100%)	269 (100%)
c. Overall top management knowledge about utilization of different QM programs is comparable to that of managers at similar levels in competing companies.	FOC'S	32 (42.7%)	38 (50.7%)	5 (6.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	27 (13.9%)	75 (38.7%)	83 (42.8%)	9 (4.6%)	0 (0%)	194 (100%)
Total		59 (21.9%)	113 (42.0%)	88 (32.7%)	9 (3.3%)	0 (100%)	269 (100.0%)
d. Quality improvement initiatives in the company may be best described as top management initiatives and responsibility.	FOC'S	24 (32.0%)	50 (66.7%)	1 (1.3%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	43 (22.2%)	115 (59.3%)	30 (15.5%)	6 (3.1%)	0 (0%)	194 (100%)
Total		67 (24.9%)	165 (61.3%)	31 (11.5%)	6 (2.2%)	0 (100%)	269 (100%)
e. Quality improvement needs are identified before developing quality improvement plans.	FOC'S	35 (46.7%)	37 (49.3%)	3 (4.0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	47 (24.2%)	85 (43.8%)	50 (25.8%)	11 (5.7%)	1 (0.5%)	194 (100%)
Total		82 (30.5%)	122 (45.4%)	53 (19.7%)	11 (4.1%)	1 (0.4%)	269 (100%)

Q20d. Quality improvement initiatives in the company may be best described as top Management initiatives and responsibility.

The response to this question is similar to questions 20a and 20b. This suggests that most of the respondent companies have a consensus that top management are fully responsible for carrying out quality measures.

Q20e.Quality improvement needs are identified before developing quality improvement plans.

In terms of quality improvement needs and developing quality improvement plans, FOC's out perform LOC's. More than one-third of the local manufacturing companies responded negatively about development QI plans. This may mean that they are weaker in terms of planning and identifying the needs for improving quality in their companies. On the other hand, foreign companies focus on quality before implementing QM programmes.

Q21a.Top management assumes quality as a key factor for getting competitive advantages over competitors.

In response to this question, 96% of respondents agreed that quality is the key to success. This suggests that almost all respondents are familiar with the importance of quality. This could be seen as a contradiction to motivation to this research which stated that QM systems have not widely adopted in Pakistani companies. Evidence from questionnaire survey has indicated that the rate of adoption of QM is increasing when compared to previous studies such as Moosa (2000), Fatima and Ahmed (2005), (2006). Therefore, this research is still important in order try to support companies in identifying BP for adopting QM.

Q21b.Top management appreciates and recognises quality performance of its employees.

Once again, this question suggests that there is a positive relationship among both groups (FOCs and LOCs). The evidence from the table indicates that the majority of respondents believe that, if given the value and support of employees, they could perform better.

Table 4.32 Top Management Commitment

21. Top Management commitment		SA	Agree	Uncertain	disagree	SD	Total
a. Top management assumes quality as a key factor for getting competitive advantages over competitors.	FOC'S	46 (61.3%)	29 (38.7%)	0 (0%)	0 (0%)	0 (0%)	75 (100 %)
	LOC'S	78 (40.2%)	106 (54.6%)	7 (3.6%)	2 (1.0%)	1 (0.5%)	194 (100 %)
Total		124 (46.1%)	135 (50.2%)	7 (3.6%)	2 (1.0%)	1 (0.5%)	269 (100 %)
b. Top management appreciates and recognises quality performance of its employees.	FOC'S	31 (41.3%)	43 (57.3%)	1 (1.3%)	0 (0%)	0 (0%)	75 (100 %)
	LOC'S	35 (18.0%)	143 (73.7%)	13 (6.7%)	3 (1.5%)	0 (0%)	194 (100 %)
Total		66 (24.5%)	186 (69.1%)	14 (5.2%)	3 (1.1%)	0 (100%)	269 (100 %)
c.Management believe that quality and productivity goes side by side	FOC'S	27 (36.0%)	45 (60.0%)	3 (4.0%)	0 (0%)	0 (0%)	75 (100 %)
	LOC'S	35 (18.0%)	88 (45.4%)	64 (33.0%)	7 (3.6%)	0 (0%)	194 (100 %)
Total		62 (23%)	133 (49.4%)	67 (24.9%)	7 (2.6%)	0 (100%)	269 (100 %)
d. The focus of top management is to improve productivity and increase effectiveness by using its resources efficiently.	FOC'S	37 (49.3%)	36 (48.0%)	2 (2.7%)	0 (0%)	0 (0%)	75 (100 %)
	LOC'S	34 (17.5%)	85 (43.8%)	65 (33.5%)	9 (4.6%)	1 (0.5%)	194 (100 %)
Total		71 (26.4%)	121 (45.0%)	67 (24.9%)	9 (3.3%)	1 (0.4%)	269 (100 %)
e. Top management prepares comprehensive plans for crucial changes.	FOC'S	34 (45.3%)	40 (53.3%)	1 (1.3%)	0 (0%)	0 (0%)	75 (100 %)
	LOC'S	33 (17.0%)	91 (46.9%)	53 (27.3%)	16 (8.2%)	1 (0.5%)	194 (100 %)
Total		67 (24.9%)	131 (48.7%)	54 (20.1%)	16 (5.9%)	1 (0.4%)	269 (100 %)

Q21c.Management believes that quality and productivity goes side by side.

In terms of management beliefs about whether quality and productivity go side by side, almost all the foreign managers responded positively, while most of the local companies were undecided about the relationship between quality and productivity. The evidence in this table tends to support that the original proposition that the manager in Pakistani companies still not convinced about positive link between quality and productivity.

Q21d.The focus of top management is to improve productivity and increase effectiveness by using its resources efficiently.

Nearly all the managers of foreign owned companies replied either “strongly agree” or “agree”. On the other side, a large number of local respondents showed a lack of quality consciousness. The evidence from this study suggests that managers in LOC’s are not focusing on resource efficiencies which should result from better adoption of QM practices.

Q21e.Top management prepares comprehensive plans for crucial changes.

The responses of this question are similar to those to question 20e, which suggested that the foreign companies are good planners, and have a long-term strategic vision for improving quality and productivity. Again, from the study data, one may be tempted to conclude that most of the local companies lack planning. Similarly, the response to this question further highlighted that, in the case of local companies, the plans are not reviewed, revised or updated on a regular basis.

Q22a.Instruction and procedures are clear and easy to follow.

This question was the one to which a majority of respondents from both groups replied either “strongly agree” or “agree”. This may shows that Pakistani manufacturing companies have clear instruction and procedures to follow. However, the high rate of scrap, defects, and rework among the locally owned companies (see section 6.6) suggest that instructions and procedures are not as clear as management believed them to be. Alternatively, the processes and procedures are not been communicated effectively throughout the companies.

Table 4.33 Organizational Communication

22.Organisation Communication		SA	Agree	Uncertain	Disagree	SD	Total
a. Instruction and procedures are clear and easy to follow.	FOC’S	47 (62.7%)	28 (37.3%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC’S	68 (35.1%)	120 (61.9%)	4 (2.1%)	2 (1.0%)	0 (100%)	194 (100%)
Total		115 (42.8%)	148 (55.0%)	4 (1.5%)	2 (0.7%)	0 (100%)	269 (100%)
b. The vision and mission of the company is openly stated and understood by every employee of the company.	FOC’S	36 (48.0%)	39 (52.0%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC’S	48 (24.7%)	122 (62.9%)	20 (10.3%)	3 (1.5%)	1 (0.5%)	194 (100%)
Total		84 (31.2%)	161 (59.9%)	20 (7.4%)	3 (1.1%)	1 (0.4%)	269 (100%)
c. The quality policy is communicated at all levels.	FOC’S	36 (48.0%)	38 (50.7%)	1 (1.3%)	0 (0%)	0 (0%)	75 (100%)
	LOC’S	47 (24.2%)	107 (55.2%)	30 (15.5%)	9 (4.6%)	1 (o.5%)	194 (100%)
Total		83 (30.9%)	145 (53.9%)	31 (11.5%)	9 (3.3%)	1 (0.4%)	269 (100%)
d. Quality policy of the company is periodically reviewed and updated.	FOC’S	36 (48.0%)	36 (48.0%)	3 (4.0%)	0 (0%)	0 (0%)	75 (100%)
	LOC’S	35 (18.1%)	65 (33.7%)	71 (36.8%)	21 (10.9%)	1 (0.4%)	193 (100%)
Total		71 (26.5%)	101 (37.7%)	74 (27.6%)	21 (7.8%)	1 (0.4%)	268 (100%)

Q22b.The vision and mission of the company is openly stated and understood by every Employee of the company.

In terms of vision and mission, almost all respondents replied positively that they are aware of the vision and mission of their company. However, although the majority of LOC's replied positively, the statistics show that local manufacturing companies are less productive compared to FOC's (see section 5.3). This may suggest that their vision and mission may have been misdirected and not effective in enhancing their quality initiatives and productivity; or it may mean that effective communication is a barrier in the case of local owned companies.

Q22c.The quality policy is communicated at all levels.

Again, almost all foreign manufacturers responded to this question as certainly agree. On the other hand, the study found that local companies are unable to communicate their quality policy at all levels; this may be mainly due to lack of quality education, awareness and understanding of employees. It may also be due to ineffective communication mechanisms to enable workers to keep a breast of the company's quality policy.

Q22d.Quality policy of the company is periodically reviewed and updated.

This aspect of the analysis was devoted to the issue of quality policy. The majority of the foreign companies pointed out that their quality policy is regularly reviewed and updated. On the other hand, almost half the local companies replied negatively. This evidence from the data suggests that FOC's review and update their quality policy periodically more than do LOC's. The fact that local manufacturing companies in Pakistan do not undertake periodical review and update of their quality policy may be

because their focus has been on numbers and figures. This attitude might have affected the quality of their products.

Q23a.Top management is democratic in style.

This question, once again, shows a positive relationship among both groups. The majority of respondents from both group claimed that their top management is democratic in style.

Q23b.Employees have liberty to discuss work problems with supervisors/managers without any stress

The majority of respondents “strongly agreed” or “agreed” with this statement, for both groups. This may suggest that coordination between management and lower level employees is positive.

Q23c. Most of the time employees are well informed about decisions made by top Management.

Most foreign companies replied positively, but most LOC’s responded negatively. This evidence show that LOC’s are far behind FOC’s in terms of taking their employees confidence seriously.

If employees are aware of the decisions and changes in the strategies adopted by the companies, they have a better chance of adjusting their mindset to the situation (Lee *et al.,* 2001); this is true with this study’s findings. If employees lack information about the decision-making process and outcome, they may also lack important information that will increase their capacity to deliver in the workplace. This study’s data provided enough evidence to suggest that local companies in Pakistan do not have level playing fields with their employees when it comes to decision making.

This evidence corroborates the study of Ahmed and Fatima (2006), who concluded that the decision-making processes of local manufacturing companies are not open to their employees. It is pointless to implement quality initiatives without the employees' involvement (Agus & Abdullah, 2000). The modern QM literature focuses on active employee involvement (Chapman & Khawaldeh, 2002).

Table 4.34 Management style

23. Management style		SA	Agree	Uncertain	disagree	SD	Total
a. Top management is democratic in style.	FOC'S	40 (53.3%)	34 (45.3%)	1 (1.3%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	49 (25.3%)	116 (59.8%)	21 (10.8%)	7 (3.6%)	1 (0.5%)	194 (100%)
Total		89 (33.1%)	150 (55.8%)	22 (8.2%)	7 (2.6%)	1 (0.4%)	269 (100%)
b. Employees have liberty to discuss work problems with supervisors/managers without any fear.	FOC'S	24 (32.0%)	49 (65.3%)	2 (2.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	30 (15.5%)	132 (68.0%)	26 (13.4%)	6 (3.1%)	0 (0%)	194 (100%)
Total		54 (20.1%)	181 (67.3%)	28 (10.4%)	6 (2.2%)	0 (100%)	269 (100%)
c. Most of the time employees are well informed about decisions made by top management.	FOC'S	26 (34.7%)	44 (58.7%)	5 (6.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	10 (5.2%)	62 (32.1%)	71 (36.8%)	47 (24.4%)	3 (1.6%)	193 (100%)
Total		36 (13.4%)	106 (39.6%)	76 (28.4%)	47 (17.5%)	3 (1.1%)	268 (100.0%)
d. Reasons behind top management decisions are communicated to employees.	FOC'S	40 (53.3%)	33 (44.0%)	2 (2.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	9 (4.6%)	38 (19.6%)	84 (43.3%)	59 (30.4%)	4 (2.1%)	194 (100%)
Total		49 (18.2%)	71 (26.4%)	86 (32.0%)	59 (22.0%)	4 (1.4%)	269 (100%)
e. Top management believes on long-term relationship of loyalty and trust with the employees.	FOC'S	25 (33.3%)	45 (60.0%)	4 (5.3%)	1 (1.3%)	0 (0%)	75 (100%)
	LOC'S	22 (11.3%)	122 (62.9%)	33 (17.0%)	16 (8.2%)	1 (0.5%)	194 (100%)
Total		47 (17.5%)	167 (62.1%)	37 (13.8%)	17 (6.3%)	1 (0.4%)	269 (100%)
f. Management assumes supplier as a major stakeholder and adopt collaborative strategies.	FOC'S	32 (42.7%)	41 (54.7%)	2 (2.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	18 (9.3%)	84 (43.3%)	65 (33.5%)	23 (11.9%)	4 (2.1%)	194 (100%)
Total		50 (18.6%)	125 (46.5%)	67 (24.9%)	23 (8.6%)	4 (1.5%)	269 (100%)

The evidence in this study suggests that there is a positive relationship between attitudes of employees and quality improvement engendered by their involvement in decision-making processes which may affect productivity.

Q23d. Reasons behind top management decisions are communicated to employees.

In exploring the reasons behind top management decisions being communicated to employees, almost all respondents from foreign manufacturing companies were positive; on the other hand, more than 75% of local respondents answered negatively. The response to this question suggests that employees in foreign companies show a visible commitment and active involvement in the organization's activities, unlike employees in local manufacturing companies. Decisions that were made in isolation may have adverse effects on the productivity of employees. Similarly, well informed employees are more willing to take responsibility for quality improvements.

Q23e. Top management believes on long-term relationship of loyalty and trust with the employees.

A long-term relationship of loyalty and trust creates a prevalent culture, which is fruitful in enhancing quality and productivity (Jackson, 1994). Most of the foreign companies agreed, and had adopted collaborative approaches to build confidence and trust with their employees. However, the evidence from this study suggests that loyalty and trust are low in the LOC's. Moreover, locally owned Pakistani companies have a high rate of employee turnover (see table 6.29). Equally the answer to question 23 d indicates poor communication between management and employees in LOC's. This may be the results of autocratic style of management which does not fosters loyalty and trust.

Q23f. Management assumes supplier as a major stakeholder and adopt collaborative strategies.

In analyzing how management recognizes suppliers as major stakeholders and adopts collaborative strategies, most of the FOC's were found to have responded positively. On the other hand, almost half of the local respondents answered this question unsatisfactorily. Modern QM literature provides much evidence about the positive relationship between management and suppliers (Goetsch & Davis, 2000). Most QM practitioners have suggested that "treat supplier as partner" creates positive effects on productivity and quality (Evans & Lindsey, 1999). The results from the current study suggest that a majority of local manufacturing companies assume relationships with suppliers are just those between buyers and sellers, and collaborative strategies are lacking. The evidence from this study suggests that Pakistani companies have not recognized supplier quality as a part of their own quality culture.

Q24a. Company provides sufficient quality training opportunities to its employees.

All 75 foreign owned companies replied that they provided sufficient quality training for their employees. Local manufacturers, however, do not; this lack of training opportunities by LOC's may affect the employees' ability to appreciate quality tools and techniques.

Q24b. Regular in-house training sessions are arranged in the company for employees at all levels.

The entire 75 FOC's reported positively to this question, but more than half local companies responded negatively.

Table 4.35 Training

24. Training		SA	Agree	Uncertain	Disagree	SD	Total
a. Company provides sufficient quality training opportunities to its employees.	FOC'S	39 (52.0%)	36 (48.0%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	44 (22.7%)	98 (50.5%)	19 (9.8%)	30 (15.5%)	3 (1.5%)	194 (100%)
Total		83 (30.9%)	134 (49.8%)	19 (7.1%)	30 (11.2%)	3 (1.1%)	269 (100%)
b. Regular in-house training sessions are arranged in the company for employees at all levels.	FOC'S	22 (29.3%)	53 (70.7%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	21 (10.8%)	68 (35.1%)	53 (27.3%)	42 (21.6%)	10 (5.2%)	194 (100%)
Total		43 (16.0%)	121 (45.0%)	53 (19.7%)	42 (15.6%)	10 (3.7%)	269 (100%)
c. Company has an active training department that provides training to all level.	FOC'S	35 (46.7%)	39 (52.0%)	1 (1.3%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	10 (5.2%)	42 (21.6%)	56 (28.9%)	77 (39.7%)	9 (4.6%)	194 (100%)
Total		45 (16.7%)	81 (30.1%)	57 (21.2%)	77 (28.6%)	9 (3.3%)	269 (100.0%)
d. Training needs are assessed periodically.	FOC'S	29 (38.7%)	45 (60.0%)	1 (1.3%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	16 (8.2%)	56 (28.9%)	60 (30.9%)	50 (25.8%)	12 (6.2%)	194 (100%)
Total		45 (16.7%)	101 (37.5%)	61 (22.7%)	50 (18.6%)	12 (4.5%)	269 (100%)
e. Training plans are developed, and training budgets are allocated in the company.	FOC'S	29 (38.7%)	45 (60.8%)	1 (1.3%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	11 (5.7%)	55 (28.5%)	59 (30.6%)	54 (28.0%)	14 (7.3%)	193 (100%)
Total		40 (14.9%)	100 (37.3%)	60 (22.4%)	54 (20.1%)	14 (5.2%)	268 (100%)
f. Top management of the company believes that training of employees have positive impact on quality and productivity.	FOC'S	30 (40.0%)	44 (58.7%)	1 (1.3%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	20 (10.3%)	48 (24.7%)	59 (30.4%)	58 (29.9%)	9 (4.6%)	194 (100%)
Total		50 (18.6%)	92 (34.2%)	60 (22.3%)	58 (21.6%)	9 (3.3%)	269 (100%)
g. QM group trainings (brainstorming, quality circles, etc) are regularly held in the company.	FOC'S	20 (26.6%)	33 (44.0%)	17 (22.6%)	4 (5.4%)	1 (1.4%)	75 (100%)
	LOC'S	13 (6.7%)	35 (18.0%)	49 (25.3%)	80 (41.2%)	17 (8.8)	194 (100%)
Total		33 (12.2%)	68 (25.3%)	66 (24.6%)	84 (31.2%)	18 (6.7%)	269 (100%)

The reason for this massive difference may suggest that human resource policies of FOC's are more focused and inclined towards quality. It is also noteworthy that the

policies of foreign companies reflect values and culture that will be fruitful in enhancing quality and productivity.

Moreover, foreign companies have greater capital resources, they are better equipped with technology, or may make better use of QM programmes than LOC's. This evidence is in line with Fatima and Ahmed's (2006) report on training of employees by Pakistani manufacturing companies.

Q24c. Company has an active training department that provides training to all levels.

Evidence generated from the response of FOC's may mean that the foreign companies have a firm belief that training of employees has a significant impact on quality and productivity (Talib *et al.,* 2010). On the other hand, about two-thirds of local respondents replied negatively. This evidence may suggest that the local Pakistani manufacturing companies lack separate training departments for improving their employee skills, and mechanisms for training are not in place to encourage improvement in quality and productivity.

Q24d. Training needs are assessed periodically.

In terms of whether training needs are periodically assessed, almost 98% of FOC's agreed. The statistics generated from the data suggest that the majority of local Pakistani manufacturers are still relying on conventional tools and techniques of QM which focus on traditional inspection-based quality control techniques, as identified by Ahmed and Fatima (2006). The evidence also suggests that local entrepreneurs are uncertain whether training may have a significant impact on quality and productivity. This fear may prevent them from adopting and planning human resource activities like training.

Q24e. Training plans are developed, and training budgets are allocated in the company.

Similarly, the trend here shows results in the same proportion between FOC's and LOC's. The local companies who replied positively to this question were almost the same in number as for Q24d. Again, one of the main reasons for the positive answer to this question by FOC's may be that they have better quality awareness and intense leadership than LOC's.

Q24f. Top management of the company believes that training of employees have positive impact on quality and productivity.

Again, almost all foreign manufacturers certainly agreed with this statement. More than half of the LOC's answered negatively. As previously discussed in question 20 c, most of the local companies are not using techniques like benchmarking, focus groups or surveys, had little knowledge about the impact of training on quality and productivity. Additionally, because they are not benchmarking, they are limiting their ability to identify best practice and to learn from others. It appears that initiatives are owned by the managers, but lack of "trust" and "awareness" is inhibiting them from implementation.

Q24g. QM group training (brainstorming, quality circles, etc.) are regularly held in the company.

Although the response to this question may show weaker relationships than other factors in this particular QM barrier of training, foreign companies outperform local manufacturing companies by answering comprehensively and positively.

Q25a. Top management always welcomes innovative ideas from employees.

All 75 FOC's responded either "strongly agree" or "agree". Similarly, more than 68% LOC's replied either "strongly agree" or "agree", although over 25% of the local companies were unsure about their position. The remaining 7% of LOC's disagreed with the statement. Again, there is evidence from this research that in companies which have adopted QM programmes, management trusts employees to act in the customers' best interests; they have a participative culture where employees are at liberty to discuss work problems with each other(Islam & Karim,2011). However, in the case of local companies, that culture is hard to find.

Table 4.36 Empowerment

25. Empowerment		SA	Agree	Uncertain	disagree	SD	Total
a. Top management always welcomes innovative ideas from employees.	FOC'S	32 (42.7%)	43 (57.3%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	23 (11.9%)	110 (56.7%)	47 (24.2%)	14 (7.2%)	0 (0%)	194 (100%)
Total		55 (20.4%)	153 (56.9%)	47 (17.5%)	14 (5.2%)	0 (100%)	269 (100%)
b. In the company productivity is improved by decentralising authority and responsibility at lower levels.	FOC'S	29 (38.7%)	46 (61.3%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	13 (6.7%)	75 (38.9%)	90 (46.6%)	15 (7.8%)	0 (0%)	193 (100%)
Total		42 (15.7%)	121 (45.1%)	90 (33.6%)	15 (5.6%)	0 (100%)	268 (100%)
c. Employees have access to customer satisfaction data/reports.	FOC'S	25 (33.4%)	28 (37.3%)	22 (29.3%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	9 (4.6%)	32 (16.5%)	62 (32.0%)	88 (45.4%)	3 (1.5%)	194 (100%)
Total		34 (12.6%)	60 (22.3%)	84 (31.2%)	88 (32.8%)	3 (1.1%)	269 (100.0%)
d. Employees are empowered to correct defects to certain extent on their own during process improvement.	FOC'S	18 (24.0%)	57 (76.0%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	12 (6.2%)	100 (51.5%)	53 (27.3%)	27 (13.9%)	2 (1.0%)	194 (100%)
Total		30 (11.2%)	157 (58.4%)	53 (19.7%)	27 (10.0%)	2 (0.7%)	269 (100%)
e. Employees participate not only in decision making but also in creative thinking processes that precede decision making.	FOC'S	37 (49.3%)	36 (48.0%)	2 (2.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	11 (5.7%)	65 (33.5%)	75 (38.7%)	40 (20.6%)	3 (1.5%)	194 (100%)
Total		48 (17.8%)	101 (37.5%)	77 (28.6%)	40 (14.9%)	3 (1.1%)	268 (100%)

Q25b. In the company productivity is improved by decentralizing authority and responsibility at lower levels.

All the 75 foreign owned companies replied positively, while only 88 of the 193 LOC's responded either "strongly agree" or "agree". Again, more than half the respondents from the LOC's group were between "unsure" and "strongly disagreed". The answer to this question may suggest that there is a huge difference between both types of companies, most of the FOC's believing that productivity may be improved by decentralizing authority and responsibility at lower levels; however, local manufacturers showed a lack of understanding about this fact. It may be concluded from responses to this question that FOC's demonstrate the participative style of leadership, whereas among LOC's it appears to be authoritarian.

Q25c. Employees have access to customer satisfaction data/reports.

Approximately two-thirds of the FOC's responded positively to this question. On the other hand, more than two-thirds of LOC's responded negatively, although this still this has a question mark over whether it is a matter of confidentiality or a degree of confidence in the employees.

Q25d. Employees are empowered to correct defects to a certain extent on their own during process improvement.

Once again foreign manufacturers have an edge over their local competitors in terms of the degree of empowerment in their respective companies. The reason for this massive difference may be due to FOC's having better training opportunities, or they may be better at using QM practices than local companies.

Q25e. Employees participate not only in decision making but also in creative thinking processes that precede decision making.

It may be concluded from the results that the foreign companies have tried to build a participative culture in their companies in order to improve quality and productivity. However, in the case of local companies, the majority still tend to focus on the authoritative style of management. The absence of empowerment fosters an environment in which employees are afraid to take part in decision-making and are discouraged from making contributions (Jackson, 1994).

Table 4.37 Employee motivation

26. Employee motivation		SA	Agree	Uncertain	disagree	SD	Total
a. Working conditions at the company are excellent.	FOC'S	32 (42.7%)	41 (54.7%)	2 (2.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	31 (16.0%)	148 (76.3%)	12 (6.2%)	3 (1.5%)	0 (0%)	194 (100%)
Total		63 (23.4%)	189 (70.3%)	14 (5.2%)	3 (1.1%)	0 (100%)	269 (100%)
b. Management believes that "Quality improvement is the responsibility of each employee in the company".	FOC'S	27 (36.0%)	46 (61.3%)	2 (2.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	34 (17.6%)	123 (63.7%)	31 (16.1%)	5 (2.6%)	0 (0%)	193 (100%)
Total		61 (22.8%)	169 (63.1%)	33 (12.3%)	5 (1.9%)	0 (100%)	268 (100%)
c. Management has long-term relationship of loyalty and trust with employees.	FOC'S	24 (32.0%)	49 (65.3%)	2 (2.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	24 (12.4%)	149 (77.2%)	13 (6.7%)	7 (3.6%)	0 (0%)	193 (100%)
Total		48 (17.9%)	198 (73.9%)	15 (5.6%)	7 (2.6%)	0 (100%)	268 (100.0%)
d. Generally motivation and morale of employees are high in the company.	FOC'S	19 (25.3%)	56 (74.7%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	12 (6.2%)	150 (77.3%)	25 (12.9%)	6 (3.1%)	1 (0.5%)	194 (100%)
Total		31 (11.5%)	206 (76.6%)	25 (9.3%)	6 (2.2%)	1 (0.4%)	269 (100%)
e. The company takes frequent steps to increase the level of employee's quality of work life.	FOC'S	42 (56.0%)	31 (41.3%)	2 (2.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	8 (4.1%)	41 (21.1%)	60 (30.9%)	72 (37.1%)	13 (6.7%)	194 (100%)
Total		50 (18.6%)	72 (26.8%)	62 (23.0%)	72 (26.8%)	13 (4.8%)	269 (100%)

Q26a. Working conditions at the company are excellent.

The answer to this question indicated that the working environment of Pakistani companies is excellent and employees are satisfied to be working in such

companies. However, it was shown in *Table 6.29* that the local manufacturing companies has high rate of employee turnover.

Q26b. Company management believes that quality improvement is the responsibility of each employee in the company.

Most respondents in both groups were positive, suggesting that they believe in quality culture. However, the statistics generated from this research suggest that top management of local manufacturing companies have failed to deliver quality consciousness at all levels.

Q26c. Management has long-term relationship of loyalty and trust with employees.

Although most of the respondents from both groups of companies replied positively to this question, this answer contradicts the response to question 25c for FOC's. Again, despite the high rate of positive response by both types of companies, respondent from FOC's indicated low rate of employee turnover. However, the scenario in the LOC's was different. There was high rate of employee turnover in the LOC's (See table 6.29). Provides enough evidence to suggest that LOC's are not able to retain their employees perhaps due to poor working conditions.

Q26d. Generally motivation and morale of employees are high in the company.

Similar to the above response, more than 80% of the respondents were positive response to this question. The evidence from the study confirms that whereas FOC's have high motivation and morale for their employees, LOC's were not. This may also confirms that LOC's working conditions are not attractive to employees (see table 6.29).

Table 4.38 Teamwork

27. Teamwork		SA	Agree	Uncertain	disagree	SD	Total
a. Team building and group dynamics is high at the company.	FOC'S	22 (29.3%)	51 (68.0%)	2 (2.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	15 (7.7%)	111 (57.2%)	54 (27.8%)	13 (6.7%)	1 (0.5%)	194 (100%)
Total		37 (13.8%)	162 (60.2%)	56 (20.8%)	13 (4.8%)	1 (0.4%)	269 (100%)
b. An effective communication system exists between departments.	FOC'S	25 (33.3%)	47 (62.7%)	3 (4.0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	17 (8.8%)	68 (35.1%)	80 (41.2%)	27 (13.9%)	2 (1.0%)	194 (100%)
Total		42 (15.6%)	115 (42.8%)	83 (30.9%)	27 (10.0%)	2 (0.7%)	269 (100%)
c. Plans and ideas are jointly developed by teams based on general consensus.	FOC'S	35 (46.7%)	37 (49.3%)	3 (4.0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	15 (7.7%)	49 (25.3%)	99 (51.0%)	30 (15.5%)	1 (0.5%)	194 (100%)
Total		50 (18.6%)	86 (32.0%)	102 (37.9%)	30 (11.2%)	1 (0.4%)	269 (100.0%)
d. Quality circles and quality teams get support from management for diagnosing problems and developing solutions.	FOC'S	35 (46.7%)	38 (50.7%)	2 (2.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	21 (10.9%)	38 (19.7%)	70 (36.3%)	59 (30.6%)	5 (2.6%)	193 (100%)
Total		56 (20.9%)	76 (28.4%)	72 (26.9%)	59 (22.0%)	5 (1.9%)	268 (100%)
e. An active supplier suggestion system is in place.	FOC'S	13 (17.3%)	59 (78.7%)	2 (2.7%)	1 (1.3%)	0 (0%)	75 (100%)
	LOC'S	13 (6.7%)	65 (33.5%)	54 (27.8%)	56 (28.9%)	6 (3.1%)	194 (100%)
Total		26 (9.7%)	124 (46.1%)	56 (20.8%)	57 (21.2%)	6 (2.2%)	269 (100%)
f. Employees of the company work together and help each other in cooperative team efforts to achieve company goals and objectives.	FOC'S	25 (33.3%)	49 (65.3%)	1 (1.3%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	25 (12.9%)	84 (43.3%)	45 (23.2%)	36 (18.6%)	4 (2.1%)	194 (100%)
Total		50 (18.6%)	133 (49.4%)	46 (17.1%)	36 (13.4%)	4 (1.5%)	269 (100%)
g. Managers and employees in the company always support each other on individual achievements.	FOC'S	32 (42.7%)	42 (56.0%)	1 (1.3%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	24 (12.4%)	114 (58.8%)	33 (17%)	22 (11.3%)	1 (0.5)	194 (100%)
Total		56 (20.8%)	156 (58.0%)	34 (12.6%)	22 (8.2%)	1 (0.4%)	269 (100%)

Q26e. The company takes frequent steps to increase the level of employees' quality of Work life.

There is a huge difference between both groups (FOC's and LOC's), most of the foreign owned companies believes that productivity may improves by increasing the level of employees' working conditions. On the other hand, most of the local manufacturers have a high rate of employee turnover and low employee satisfaction (see table 6.29), further confirming that the local manufacturers does not take appropriate and concrete measures to improve the level of employees' working conditions

Q27a. Team building and group dynamics is high at the company.

The research suggests that most of the local manufacturers adopt few human resource policies such as training programmes and team activities; therefore, team building and group dynamics are poorer than in foreign companies. The QM literature also affirms that teamwork plays a vital role in improving quality and productivity.

Q27b. An effective communication system exists between departments.

Again, FOC's outperform LOC's for this question. The high rates of negative response from local manufacturing companies suggest that they are deficient in cross-functional areas. Effective communication sets the foundation for QM implementation and demonstrates top management commitment and dedication to quality.

Q27c. Plans and ideas are jointly developed by teams based on general consensus.

The high rate of negative responses from local companies affirms that most of the local companies have failed to adopt collaborative approaches or a participative culture within their companies. The adoption of QM strategies requires a shift from

the traditional style of management, to empowering lower level employees to make decisions as part of a team.

Q27d. Quality circles and quality teams get support from management for diagnosing Problems and developing solutions.

Again, the results of this question found a lack of coordination between management and employees in local companies. On the other hand, foreign companies give management a free hand to improve quality and productively by utilizing their resources efficiently and effectively (Yong &Wilkinson, 2001).

Q27e. An active supplier suggestion system is in place.

Almost all FOC's responded positively. However, more than half the population of local companies responded either "unsure" or negatively. Refer to Q23f, which is similar to this question; the response confirms that the FOC's give more importance to suppliers than do local ones. This may suggest a lack of willingness on the part of LOC's to adopting collaborative approaches with suppliers, which have had adverse effects on quality and productivity in the local companies.

Q27f. Employees of the company work together and help each other in cooperative team Efforts to achieve company goals and objectives.

Of the 75 foreign owned companies, 74 replied either "strongly agree" or "agree", while only 109 out of the 194 LOC's responded "strongly agree" or "agree". Again, more than 44% of local manufacturers were between "unsure" and "strongly disagree". Again, this is evidence of lack of support for collaborative activities by local manufacturers.

Q27g. Managers and employees in the company always support each other on Individual achievements.

The majority of respondents overall replied positively. However, the evidence from *Table 6.29* suggests that most of the LOC's have high rate of employee turnover and low employee satisfaction (see table 6.29).

Q28a. Company maintains a competitive pay scale.

Of the 269 total respondents, the majority replied positively to this question. Again, this statement show contradictory in the case of LOC's.

Table 4.39 Award reward procedures

28. Award reward/ incentives procedures		SA	Agree	Uncertain	disagree	SD	Total
a. Company maintains a competitive pay scale.	FOC'S	30 (40.0%)	44 (58.7%)	1 (1.3%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	22 (11.3%)	137 (70.6%)	24 (12.4%)	10 (5.2%)	1 (0.5%)	194 (100%)
Total		52 (19.3%)	181 (67.3%)	25 (9.3%)	10 (3.7%)	1 (0.4%)	269 (100%)
b. Company offers benefit package that meets employee's needs.	FOC'S	26 (34.7%)	46 (61.3%)	3 (4.0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	13 (6.7%)	84 (43.3%)	68 (35.1%)	26 (13.4%)	3 (1.5%)	194 (100%)
Total		39 (14.5%)	130 (48.3%)	71 (26.4%)	26 (9.7%)	3 (1.1%)	269 (100%)
c. Employees are being recognized on quality performances.	FOC'S	21 (28.0%)	54 (72.0%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	7 (3.6%)	74 (38.1%)	70 (36.1%)	40 (20.6%)	3 (1.5%)	194 (100%)
Total		28 (10.4%)	128 (47.6%)	70 (26.0%)	40 (14.9%)	3 (1.1%)	269 (100.0%)
d. Employees are being awarded on superior quality performances.	FOC'S	24 (32.0%)	51 (68.0%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	12 (6.2%)	48 (24.7%)	78 (40.2%)	45 (23.2%)	11 (5.7%)	194 (100%)
Total		36 (13.4%)	99 (36.8%)	78 (29.0%)	45 (16.7%)	11 (4.1%)	269 (100%)
e. Company provides cash awards/increment in salary/vacation, etc. On superior performances.	FOC'S	33 (44.0%)	40 (53.3%)	2 (2.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	10 (5.2%)	25 (12.9%)	64 (33.0%)	74 (38.1%)	21 (10.8%)	194 (100%)
Total		43 (16.0%)	65 (24.2%)	66 (24.5%)	74 (27.5%)	21 (7.8%)	269 (100%)

Q28b. Company offers benefit packages that meets employees' needs.

Again, almost all the foreign participants replied positively. However, half of the local respondents replied negatively. The QM literature stresses the direct link between employee satisfaction and productivity, which has positive effects on quality. The

negligence of this factor may influence the productivity and quality of the local companies.

Q28c. Employees are being recognized on quality performances.

Foreign manufactures have an edge on local competitors, all 75 reporting positively on this question. However, only 81 local companies out of 194 fell into the category of “strongly agree” or “agree”, the remaining 113 being between “unsure” and “strongly disagree”. Again foreign companies outperformed local manufactures in terms of acknowledging outstanding performance, as proposed by Jackson (1994).

Q28d. Employees are being awarded for superior quality performances.

All 75 foreign companies replied entirely positively. On the other hand, it may be assumed from the statistics that the locally owned Pakistani manufacturing units do not rely on award-based performance techniques in order to improve quality and productivity.

Q28e. Company provides cash awards/increment in salary/vacation, etc. on superior performances.

Again, analysis shows the same trend between FOC’s and LOC’s. The local companies who replied positively to this question were almost the same as in the Q28d. One of the biggest reasons for the FOC’s answering this question positively may be that they believe that giving awards and incentives on better performance creates a competitive and challenging environment within the organizations that will improve quality and productivity.

Q29a. Company supports continuous improvement programmes.

Of the 269 respondents overall, 213 replied positively; the remaining 56 were all local companies that replied either “unsure” or negatively. Modern QM literature

addresses continuous improvement as a vital tool for improving quality and productivity; however, the data suggest that some of the local companies might overlook the concept of continuous improvement in their companies.

Table 4.40 Technology/innovation

29. Technology/innovation		SA	Agree	Uncertain	Disagreed	SD	Total
a. Company supports continuous improvement programmes.	FOC'S	31 (41.3%)	44 (58.7%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	22 (11.3%)	116 (59.8%)	41 (21.1%)	14 (7.2%)	1 (0.5%)	194 (100%)
Total		53 (19.7%)	160 (59.5%)	41 (15.2%)	14 (5.2%)	1 (0.4%)	269 (100%)
b. Management regularly updates its technical benchmarks.	FOC'S	34 (45.3%)	40 (53.3%)	1 (1.3%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	12 (6.2%)	84 (43.3%)	80 (41.2%)	16 (8.2%)	2 (1.0%)	194 (100%)
Total		46 (17.1%)	124 (46.1%)	81 (30.1%)	16 (5.9%)	2 (0.7%)	269 (100%)
C. For making reliable and innovative products R & D, design, manufacturing, and other related departments work together.	FOC'S	26 (34.7%)	49 (65.3%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	10 (5.2%)	72 (37.1%)	90 (46.4%)	21 (10.8%)	1 (0.5%)	194 (100%)
Total		36 (13.4%)	121 (45.0%)	90 (33.5%)	21 (7.8%)	1 (0.4%)	269 (100.0%)
d. Benchmarking techniques are used after getting updates about technology.	FOC'S	33 (44.0%)	42 (56.0%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	8 (4.1%)	51 (26.3%)	110 (56.7%)	24 (12.4%)	1 (0.5%)	194 (100%)
Total		41 (15.2%)	93 (34.6%)	110 (40.9%)	24 (8.9%)	1 (0.4%)	269 (100%)
e. Investment in new equipment and technology is a regular feature of the company.	FOC'S	33 (44.0%)	42 (56.0%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	20 (10.3%)	44 (22.7%)	88 (45.4%)	36 (18.6%)	6 (3.1%)	194 (100%)
Total		53 (19.7%)	86 (32.0%)	88 (32.7%)	36 (13.4%)	6 (2.2%)	269 (100%)
f. Company upgrades available equipments and technology regularly.	FOC'S	31 (41.3%)	43 (57.3%)	1 (1.3%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	25 (12.9%)	98 (50.5%)	41 (21.1%)	22 (11.3%)	8 (4.1%)	194 (100%)
Total		56 (20.8%)	141 (52.4%)	42 (15.6%)	22 (8.2%)	8 (3.0%)	269 (100%)
g. Management information system (MIS) is actively used in the company to collect, store, and process information.	FOC'S	25 (33.3%)	47 (62.7%)	3 (4.0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	11 (5.7%)	44 (22.8%)	113 (58.5%)	23 (11.9%)	2 (1.0%)	193 (100%)
Total		36 (13.4%)	91 (34.0%)	116 (43.3%)	23 (8.6%)	2 (0.7%)	268 (100%)

Q29b. Management regularly updates its technical benchmarks.

Again, half of the local manufacturers replied “unsure” to “strongly disagree”. The evidence generated from table 6.29 suggests that a majority of the locally owned companies were low efficiency of operations . One of the main causes of poor operations in local companies is inability to improve technical benchmarks on a regular basis. Additionally, because they are not benchmarking they are limiting their ability to identify best practice and to learn from others.

Q29c. For making reliable and innovative products R & D, design, manufacturing, and Other related departments work together.

All foreign companies replied positively, while in the case of LOC’s, more than half replied negatively. It was also found from the study data that most of the local manufacturing companies have adopted weak collaborative approaches, and lack of communication and planning within their departments.

Q29d. Benchmarking techniques are used after getting updates about technology.

Almost all FOC’s responded positively. More than half the population of local companies responded either “unsure” or negatively. Refer to Q20d, which is almost similar to this question; the responses confirms that the FOC’s are using techniques like benchmarking, surveys and focus groups to get full knowledge about their competitors’ level of quality. However, the results from the LOC’s show difficulty in encouraging contributions to quality.

Q29e. Investment in new equipment and technology is a regular feature of the company.

Foreign companies have an edge over their local competitors, all 75 respondents responded positively to this question. The reason for the massive difference may be

that FOC's have better capital funds, markets access, buyers and better usage of QM practices.

Table 4.41 Customer focus

30. Customer focus		SA	Agree	Uncertain	disagree	SD	Total
a. Customer satisfaction is the utmost precedence in the company.	FOC'S	44 (58.7%)	31 (41.3%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	59 (30.6%)	125 (64.8%)	9 (4.7%)	0 (0%)	0 (0%)	193 (100%)
Total		103 (38.4%)	156 (58.2%)	9 (3.4%)	0 (0%)	0 (0%)	268 (100%)
b. Customer satisfaction is achieved by producing low cost high quality products that meet or exceed customer expectations.	FOC'S	35 (46.7%)	40 (53.3%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	44 (22.8%)	124 (64.2%)	21 (10.9%)	4 (2.1%)	0 (0%)	193 (100%)
Total		79 (29.5%)	164 (61.2%)	21 (7.8%)	4 (1.5%)	0 (100%)	268 (100%)
c. Due to continuous changing in needs and desires of customers company conducts customer surveys, sales calls, focus groups etc. on regular basis.	FOC'S	10 (13.3%)	35 (46.7%)	29 (38.7%)	1 (1.3%)	0 (0%)	75 (100%)
	LOC'S	8 (4.2%)	39 (20.3%)	122 (63.5%)	22 (11.5%)	1 (0.5%)	192 (100%)
Total		18 (6.7%)	74 (27.7%)	151 (56.6%)	23 (8.6%)	1 (0.4%)	267 (100.0%)
d. Customer feedback systems are in place to monitor customer satisfaction.	FOC'S	22 (29.3%)	53 (70.7%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	13 (6.7%)	77 (39.9%)	74 (38.3%)	28 (14.5%)	1 (0.5%)	193 (100%)
Total		35 (13.1%)	130 (48.5%)	74 (27.6%)	28 (10.4%)	1 (0.4%)	268 (100%)
e. Company has a process in place to find and resolve customer complaints.	FOC'S	35 (46.7%)	40 (53.3%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	26 (13.5%)	64 (33.2%)	71 (36.8%)	32 (16.6%)	0 (0%)	193 (72.0%)
Total		61 (22.8%)	104 (38.8%)	71 (26.5%)	32 (11.9%)	0 (100%)	268 (100%)
f. Most of the time our customers receive expected quality performance.	FOC'S	53 (70.7%)	22 (29.3%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	80 (41.5%)	105 (54.4%)	5 (2.6%)	1 (0.5%)	2 (1.0%)	193 (100%)
Total		133 (49.6%)	127 (47.4%)	5 (1.9%)	1 (0.4%)	2 (0.7%)	268 (100%)

Q29f. Company upgrades available equipment and technology regularly.

The answers to this question suggest a consensus between both types of company. However, the evidence from this study suggests that most of the LOC's have a high rate of scraps, rework and defects.

Q29g. Management information system (MIS) is actively used in the company to collect , Store and process information.

The statistics of the answer to this question suggest that foreign companies in Pakistan are predominantly using information technology and other scientific methods to improve quality and productivity.

Q30a. Customer satisfaction is the utmost precedence in the company.

The response to this question reveals that the focus of almost all participating companies is to maximize customer satisfaction.

Q30b. Customer satisfaction is achieved by producing low cost high quality products that meet or exceed customer expectations.

Although more than 90% of overall respondents replied positively to this question, evidence from the study data analysis has found a high rate of product variability in local manufacturing companies, as illustrated in *Table 6.14*. This means that local companies are reluctant to adopt quality initiatives.

Q30c. Due to continuous changing in needs and desires of Customers Company conducts Customer surveys, sales calls, focus groups etc. on regular basis.

Again, the majority of local companies replied negatively, suggesting that they do not believe that surveys, sales calls and focus groups necessarily have an impact on their quality and productivity. However, QM literature shows a positive impact on

performance from those companies who regularly conduct customer surveys and focus groups (Agus &Abdullah, 2000).

Q30d. Customer feedback systems are in place to monitor customer satisfaction.

As identified previously, local manufacturing companies show a lack of planning and communication, and the results confirm that the majority of local manufacturers do not have a proper customer feedback system, which is the core element in QM philosophy.

Q30e. Company has a process in place to find and resolve customer complaints.

Again, responses to this particular statement show that some locally owned companies have adopted weaker strategies for sorting out customer complaints than have foreign companies, who confidently replied either “strongly agree” or “agree”.

Q30f. Most of the time our customers receive expected quality performance.

Of the 268 companies, 260 companies claimed that their customers received desirable products from them. This statement is challenged by the findings from local companies because they are producing much more scrap, rework and defects compared to foreign companies (see table 6.5).

4.6.1 Comparing QM dimension on the basis of ownership

After completing the descriptive analyses (frequencies, percentages, and crosstabs), further analysis was conducted to compare the two types of company, FOC’s and LOC’s. Specifically, this section assesses the statistical significance of the differences between the means of the two sets of scores. At this point the objective is to compare means of all Likert scale items (QM dimensions) on the basis of

ownership. The expected outcome is to find which QM items are significantly different between both groups. The Likert scale used here was measured arrange representing (1) strongly agree up to (5) strongly disagree, with (3) representing neutral.

4.6.2 Purpose of using T-test

An independent sample t-test was used. It is appropriate as it tells the researcher whether there is a statistically significant difference in the mean scores for the two groups (i.e. whether FOC's and LOC's differ significantly in terms of their QM dimension scores).

The purpose of running the t-test was to validate whether the research objective achieved:

- To assess if there is a difference between locally owned companies and FOC's in relationship to quality management and productivity.

In order to achieve this research objective, the research question below was used:

- What relationship exists between quality initiatives and the productivity of FOC's and Locally owned companies?

It was necessary to validate the results of the t-test and also to check whether differences exist between FOC's and LOC's in terms of the following: leadership, management commitment, organizational communication, management style, training, empowerment, motivation, teamwork, award/reward, innovation and customer focus.

The outcome of the t-tests is illustrated in *Table 4.42*. The result suggest that, there are significant differences between all selected QM dimensions and type of

ownership. For example, in terms of leadership the t-test result produced t-value=9.734, mean difference=2.457, Eta=0.26 and a significance level of 0.000. Since the p-value (0.000) is less than alpha, 0.05, we conclude that there is a significant difference in leadership style between FOC's and LOC's, although the eta value 0.26 suggests that there is a small size effect between both groups.

Table 4.42 Association between elements of QM and ownership status

Variable Name	Sig.value	Sig.(2tailed)	t.value	Mean diff	Eta squared	Effect of size
Leadership	0.000	0.000	9.734	2.457	0.26	Small
Management commitment	0.000	0.000	10.290	2.600	0.28	Small
Organisation communication	0.003	0.000	8.811	2.039	0.22	Small
Management style	0.001	0.000	12.131	4.271	0.35	Medium
Training	*0.000*	*0.000*	*18.330*	*9.217*	*0.55*	*Large*
Empowerment	*0.000*	*0.000*	*14.497*	*4.429*	*0.44*	*Large*
Motivation	0.047	0.000	12.477	3.167	0.37	Medium
Teamwork	*0.000*	*0.000*	*16.440*	*6.694*	*0.50*	*Large*
Award/reward	*0.000*	*0.000*	*18.865*	*5.557*	*0.57*	*Large*
Innovation	*0.000*	*0.000*	*17.833*	*7.058*	*0.54*	*Large*
Customer focus	0.000	0.000	11.588	3.594	0.33	Medium

Notes: *The practices in bold & italics represent those practices where there is a big difference between FOC's & LOC's in terms of QM elements.*

The t-test was similarly used for management commitments, producing a t-value=10.290, mean difference=2.600, Eta=0.28 and significance level of 0.000. Since the p-value (0.000) is less than alpha 0.05, we conclude there is a significant difference in management commitment between FOC's and LOC's, although the eta value 0.28 suggests that there is small size effect between both groups.

The results of the t-test for organizational communication produced t-value =8.811, mean difference=2.039, Eta=0.22 and significance level of 0.000. Since p-value (0.000) is less than alpha 0.05, we conclude there is significant difference in organizational communication between FOC's and LOC's, although the eta value 0.22 suggests that there is small size effect between both groups.

A statistical test was also done to ascertain the significance difference between the management style of FOCs and LOCs. The outcome of the test produced t-value =12.131, mean difference=4.271, Eta=0.35 and significance level of 0.000. Since p-value (0.000) is less than (<) alpha 0.05, we conclude there is significant difference in management commitment between FOC's and LOC's. Although the eta value 0.35 suggests that there is medium size effect between both groups.

In terms of QM training of FOC's and LOC's, the t-test was used to ascertain the significance difference in terms of its efficiency. The results of the t-test also produced t-value =18.330, mean difference=9.217, Eta=0.55 and significance level of 0.000. Since p-value (0.000) is less than (<) alpha 0.05, we conclude, there is significant difference in terms of QM element training between FOC's and LOC's. Although the eta value 0.55 suggests that, there is large size effect between both groups in terms of QM training

To investigate the level of empowerment in the sample manufacturing companies, the study used t-test. The results of the t-test also produced t-value =14.497 mean difference=4.429, Eta=0.44 and significance level of 0.000. Since p-value (0.000) is less than (<) alpha 0.05, we conclude there is significant difference between FOC's and LOC's in terms of QM element empowerment. Similarly, the eta value 0.44 suggests that there is relatively large size effect between both groups in terms of empowerment between FOCs and LOCs.

In addition, the t-test was also used to find out how far each group of companies is meeting the motivational needs of their employees. The evidence that was gathered suggests that FOC's have higher motivational incentives than LOC's. The results of the t-test produced t-value=12.477, mean difference=3.167, Eta=0.37 and

significance level of 0.000. Since p-value (0.000) is less than alpha 0.05, we conclude there is a significant difference in motivation between FOC's and LOC's, although the eta value 0.37 suggests that there is medium size effect between both groups of companies.

To explore the level of teamwork in both FOCs and LOCs, the study used t-test. The results of the t-test provided evidence which tend to suggest that FOC's have greater team work than LOC's. The t-test produced t-value =16.440 mean difference=6.694, Eta=0.50 and significance level of 0.000. Since p-value (0.000) is less than (<) alpha 0.05, we conclude there is significant difference in teamwork between FOC's and LOC's. The eta value 0.50 suggests that there is large size effect between both groups in terms of teamwork between FOC's and LOC's.

For award/reward, innovation and customer focus the t-test produced t-values 18.865, 17.833 and 11.588 respectively. For the mean difference for award/reward, innovation and customer focus the data produce 5.557, 7.058 and 3.594 respectively. The Eta was also given as 0.57, 0.54 and 0.33 respectively with all having p-value of 0.000. Since the p value (0.000) is less than (<) alpha (0.05) we conclude that there is significance difference between the two groups. The evidence in the data suggests that there is significance difference between FOC's and LOC's in terms of their award/reward scheme, innovation and customer focus. Although the eta value suggests that there are large size effects for award/reward and innovation, however, in terms of customer focus the size effect can be classified as medium.

The above size effect statistics further suggest that each element of QM has a significant size effect on the study companies (see table 4.42). It may be concluded that there is a positive relationship between the elements of QM and foreign owned

companies, specifically in areas such as training, empowerment, teamwork, award incentives and innovation. The reason may be that FOC's are resource rich and have been practising QM for a long time in their parent companies.

4.7 Chapter Summary

This chapter presented the initial results from the questionnaire survey. The discussion was tailored to the study aims and objectives. It first considered the profiles of the responding companies and then shed light on their level of adoption of QM by applying descriptive statistics and statistical tests. It also focused on barriers to the adoption of QM by applying various statistical tools and techniques in the analysis of the data.

The evidence from the analysis suggests that the study companies are using different QM practices, such as Six sigma, Lean, Reengineering, Kaizen, Quality Circles, TQM, 5S, SPC, JIT, and ISO 900. However, ISO 9000 seems to be the most highly used QM practice, although the evidence also indicates that FOC's have a higher percentage of ISO 9000 usage than local companies. This evidence contradicts the belief that in the developed world ISO 9000 has become old fashioned and is rarely used (Chapman & Khawaldeh, 2002). However, the situation in Pakistan is quite different; ISO 9000 continues to dominate QM practices in the country's manufacturing sector as is evident from this finding. Again, the statistical investigation suggests that although awareness of adoption of QM is slightly better than previous studies indicated, about 68% of sample companies are ISO 9000 certified. It is further revealed that in real terms the level of adoption of QM practices by locally owned Pakistani companies is still weak. Except for local auto companies, most of the local manufacturers are still lagging behind foreign owned companies. The results of the t- test also showed a strong significant relationship for all selected

QM practices between FOC's and LOC's. The results of correlation analysis confirm that all QM practices have a positive relationship with financial indicators. The pictorial representation through box plots further revealed that foreign owned manufacturing companies outperformed the locally owned companies in every selected financial performance indicator.

The evidence in the analysis has provided sufficient information to suggest that various QM elements such as training, empowerment, award/reward, teamwork, innovation, and customer focus and management style can be a barrier to adoption of quality management for LOC's. However, the evidence that was gathered from the field and study data analysis shows that both FOC's and LOC's apply the element of quality management in their companies with different success levels. The study data suggests that FOC's make more efficient use of these elements than do LOC's. Additionally, in order to investigate the barriers to adoption of QM, selected QM elements were suggested as barriers. The results indicate that all foreign owned manufacturers have a strong association with these elements in particular, they are better equipped to offer training, empowerment, team work, award incentive, technology and innovation than are local companies. On the other hand, most of the locally owned companies have a negative approach towards these elements of QM, and we therefore called these elements barriers to adoption. It may be assumed that these elements of QM represent the best way to give the employees information, knowledge, power and rewards to encourage them to become more skilled, committed and more productive. QM is an approach to doing business that involves continuous improvement of the quality of products, services, people, processes, and environment in order to enhance the company's competitive advantage.

Chapter 5 Analysis of Productivity

5.1 Introduction

This chapter analysis the productivity of the companies studied. First, the productivity of all 269 manufacturing companies was calculated based on the production performance function. Various statistical tests were then applied to these summated scale values. The analysis began with simple descriptive statistics, cross tabulations were also explored, enabling further statistical analysis to determine the relationships between the variables under study. Specifically, the statistical significance was determined between the productivity score of the sample companies and their type of ownership, size, and business sector. The section that follows begins with the calculation of the companies' productivity.

5.2 Calculation of productivity for responding companies

The focus of this study is to calculate productivity from a range of companies across multiple sectors, including automobile, chemicals, engineering, food, pharmaceuticals and textiles. As identified by Aggarwal (1980) different industries use different productivity measures. He proposes that the labour-dominated industries should solely be measured by the productivity of direct labour. He also pointed out that capital-intensive industries should also solely use capital productivity measures while materials-dominated companies should be measured by materials productivity alone.

In order to overcome these differences, a proxy measure of productivity was used.

In this study, production machinery downtime, average manufacturing lead time, worker-machine idle time, timely delivery of customer orders, over production, and excessive inventory level are considered as production performance functions. The

final score for each respondent is the sum of their ratings for all six items, treated as sum total productivity. The extract from the questionnaire, shown below, is about the production performance function, showing how the calculation of productivity was made.

Q40. Please rate the overall productivity performance of your company in the areas listed below. (Please tick (✔) the most appropriate response).

Production Performance functions	Very Short	Short	Moderate	Long	Very Long
Value assigned (Productivity score)	5	4	3	2	1
a. Production machinery downtime	✔				
b.Average manufacturing lead time (time taken from receiving an order to production and shipment).		✔			
c.Worker/machine idle time			✔		
d.On-time delivery of customer orders				✔	
e.Over production					✔
f. Excessive inventory				✔	

For Q40, every answer has an assigned value, and in this example 40 a ✔=5, q40 b ✔=4, q40 c ✔=3, q40 d ✔=2, q40 e ✔=1 and q40 f ✔ = 2 respectively. The calculation of productivity from this example can be shown as (5+4+3+2+1+2) =17, i.e. the sum of productivity is 17 out of 30.

5.3 Productivity of Study Companies

Prior to the advanced statistical analysis it is important to check the distribution of the data, to ensure that the data does not deviate from any of the assumptions made by the individual tests. These assumptions usually involve obtaining descriptive statistics such as mean, standard deviation, minimum and maximum, range, percentages and graphs.

The mean productivity measurement for all the 269 responding companies is shown in table 5.1 below. The mean productivity value is 17.23 and the standard deviation

5.45. The minimum value of average productivity is 6 and the maximum 30, giving a range of 24.

Variable	N	% of total N	Mean	Std. Dev	Min	Max	Range
Responding companies	269	100%	17.23	5.45	6	30	24
Total	269	100%	17.23	5.45	6	30	24

Table 5.1: Descriptive statistics for all responding companies

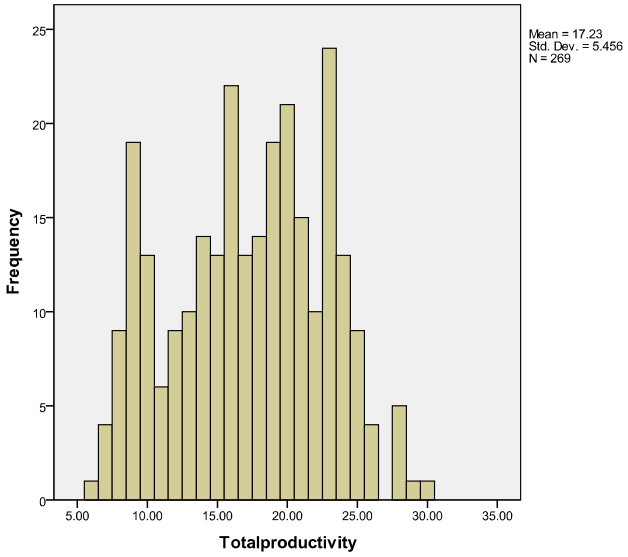


Figure 5.1 Frequency distribution of the responding companies

Figure 5.1 depicts the frequency distribution of the responding companies. The highest frequency value for respondents is 24 generated for productivity score 23.

5.3.1 Productivity of the responding companies based on ownership

This section reports the distribution of the companies in terms of type of ownership. This analysis provides an insight for further empirical analysis. The 269 sample companies were divided into two groups: foreign owned companies (FOC's) and locally owned companies (LOC's) (see table 5.2).

The mean productivity for both groups is shown in *Table 5.2*. It is clear that the foreign owned companies are well in advance of the locally owned ones. The mean

productivity value for FOC's is 22.42 and the standard deviation 3.08. On the other hand, the mean value for LOC's is only 15.22 and the standard deviation, 4.82, is higher than the FOCs'. The range of values for FOC's is smaller than that for LOC's, suggesting that the former are more consistent in getting higher productivity scores.

Type of Companies	N	% of total N	Mean	Std. Dev	Min	Max	Range
Foreign	75	27.9%	22.42	3.08	17	30	13
Local	194	72.1%	15.22	4.82	6	26	20
Total	269	100%	17.23	5.45	6	30	24

Table 5.2: Descriptive statistics for responding companies based on ownership

Figure 5.2 show that the most frequent productivity value for FOC's is 23, occurring 20 times. For LOC's, the productivity value of 16 occurred 22 times. This confirms that FOC's are continuously obtaining high productivity scores.

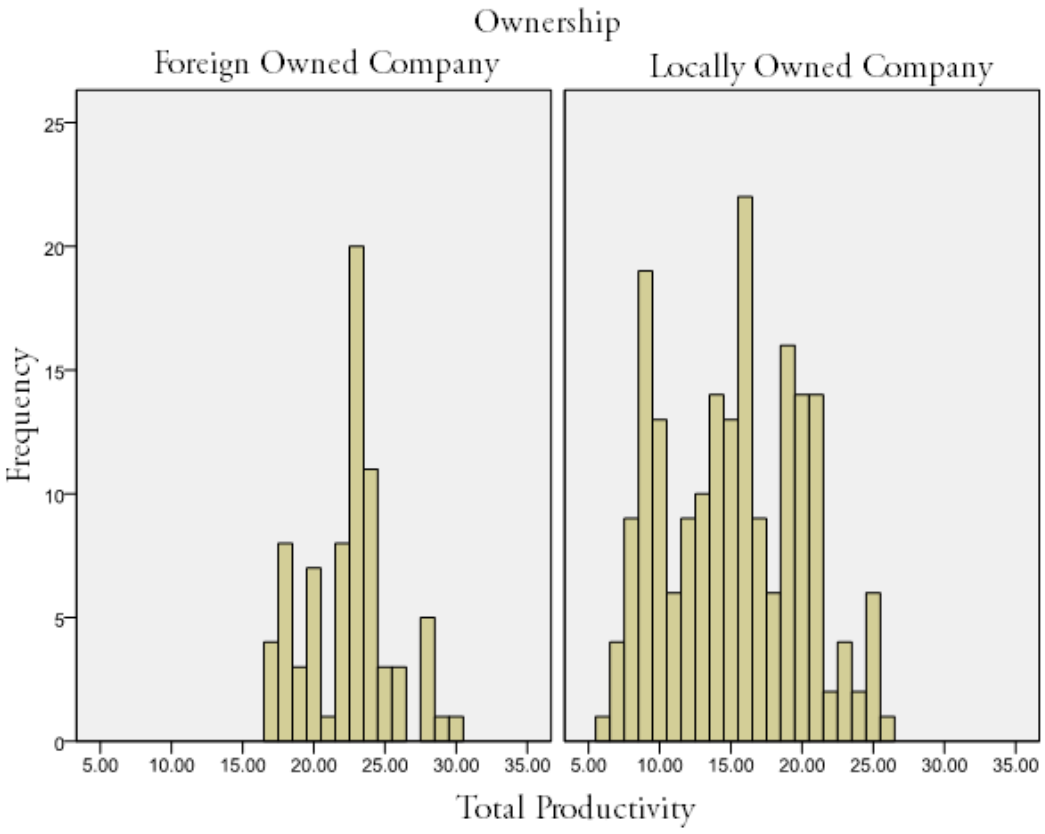


Figure 5.2 Frequency distribution of the companies based on ownership

The low performance of LOC's further strengthens the results described in chapter four, which indicated that the level of adoption of QM practices by FOC's is higher

than LOC's. Therefore, it could be asserted that the adoption of QM practices increases productivity. However, in Pakistan it is difficult to relate quality management to productivity because of the lack of high level of commitment and active involvement of top management. The FOC's have more educated and better trained managers, more access to capital resources and advanced technologies. Hence, it could be argued that this is the reason for their higher productivity levels. Therefore, further analysis is made in section 5.10. The next section follows the analysis of productivity based on the size of the sample companies.

5.3.2 Productivity of the responding companies based on size

The comparison between productivity scores and the size of the sample companies for foreign owned companies (75) and locally owned companies (194) is shown in the data set. In order to analyse the relationship between productivity score and the size of the companies, the sample companies were divided into three groups by number of employees (less than 100, 100-300 and 300 or more; respectively small, medium and large), as shown in *Table 5.3*.

The mean productivity value for the 85 small companies is 12.45 and the standard deviation (SD) 4.52; the value range is 6 to 23. For the 89 medium-sized companies, the mean value is 17.12, SD 3.95 and the productivity score range 9 to 26. However, large companies have a significantly higher mean productivity score, 21.60, whilst their SD is significantly lower; the range of 13 to 30 is also significantly different from the other groups. This evidence, illustrated in table 5.3, suggests a direct relationship between a high productivity score and the large size of companies. This result may validate the findings of Yong and Wilkinson (2001), that there is a positive link between productivity performance and the size of manufacturing companies in Singapore. On the other hand, Fening and Amaria (2008) ascertained that the quality

and productivity improvement efforts of small companies usually failed because of ineffective leadership and lack of QM resources. The larger companies are better acquainted with QM practices than the small and medium companies, as they tend to have more resources for management innovations, including corporate staff departments to support the changes, and also the financial means (Yong and Wilkinson, 2001). Similarly, the findings described in chapter four suggest that most of the local owned companies lacked planning and management commitment; the companies' vision and mission are not understood at lower levels, there are limited training opportunities for employees, inadequate use of benchmarking techniques, lack of empowerment and teamwork. All these factors affect the quality and productivity of such companies. These issues are discussed further in chapter 7.

No. Of employees	N	% of total N	Mean	Std. Dev	Min	Max	Range
Less than 100	85	31.6%	12.45	4.52	6	23	17
100-300	89	33.1%	17.12	3.95	9	26	17
300 or above	95	35.3%	21.60	3.47	13	30	17
Total	269	100%	17.23	5.45	6	30	24

Table 5.3: Descriptive statistics distribution of productivity for all responding companies based on size

5.3.2.1 Productivity comparison between FOC's and LOC's based on size

Table 5.4 and *Figure 5.3* present the productivity comparison between sample companies based on size. As shown in table 5.4, out of the 75 foreign manufacturing companies, 9 companies are small, 18 medium and 48 large sizes. Similarly, out of the 194 LOC's, 76 are small, 71 are medium and 47 are large. The mean for the 9 small foreign companies is 18.44, SD 1.01; the respective productivity figures for small LOC's are 11.75 4.24. Similarly, the range for FOC's is 17 to 20 and for LOC' it is much wider at 6 to 23. A few LOC's achieved the maximum productivity score of 23; nevertheless, the high range value (17) suggests that the LOC's are constantly

delivering poorer productivity. For medium companies, too, FOC's have a better productivity mean, lower SD and a relatively small range value of 9, against the 17 for the locally owned manufacturing companies. Finally, the higher mean productivity along with low SD of 2.45 for large FOC's also verifies that, in Pakistan, FOC's are more consistent, reliable and productive than LOC's. The histogram in figure 5.3 illustrates the frequency distribution and productivity score for both the groups on the basis of size. The modal value for small foreign companies is 18, whilst for small local companies it is exactly half that figure. The modal values for medium and large foreign owned companies are 20 and 23 respectively; the corresponding figures for LOC's are 16 and 21.

No. Of employee		N	% of total N	Mean	Std. Dev	Min	Max	Range
Less than 100	FOC'S	9	10.58%	18.44	1.01	17	20	3
	LOC'S	76	89.42%	11.75	4.24	6	23	17
Total		85	100%	-	-	6	23	-
100-300	FOC'S	18	20.22%	20.88	2.88	17	26	9
	LOC'S	71	79.78%	16.16	3.61	9	26	17
Total		89	100%	-	-	9	26	-
300 or above	FOC'S	48	50.52%	23.75	2.45	18	30	12
	LOC'S	47	49.48%	19.40	2.95	13	25	12
Total		95	100%	-	-	13	30	-

Table 5.4: Descriptive statistics for FOC's and LOC's based on size

Again, this analysis of trends in the frequency distribution for both types of company further strengthens the results discussed in chapter four.

5.3.3 Productivity of the companies based on industrial categorization

In this section the productivity scores by industrial categorisation are discussed the six industrial sectors are automobile, chemicals, engineering, food, pharmaceuticals and textiles (see table 5.5).

As shown in *Table 5.5*, textile is the biggest sector, with 129 companies of which 34 are FOC's and 95 are LOC's. The food sector is the smallest, with only 15 companies 6 FOC's 9 LOC's. According to table 5.5, the mean productivity value for foreign automobile companies is 27.60, with SD1.50, and a range of 25 to 30.The

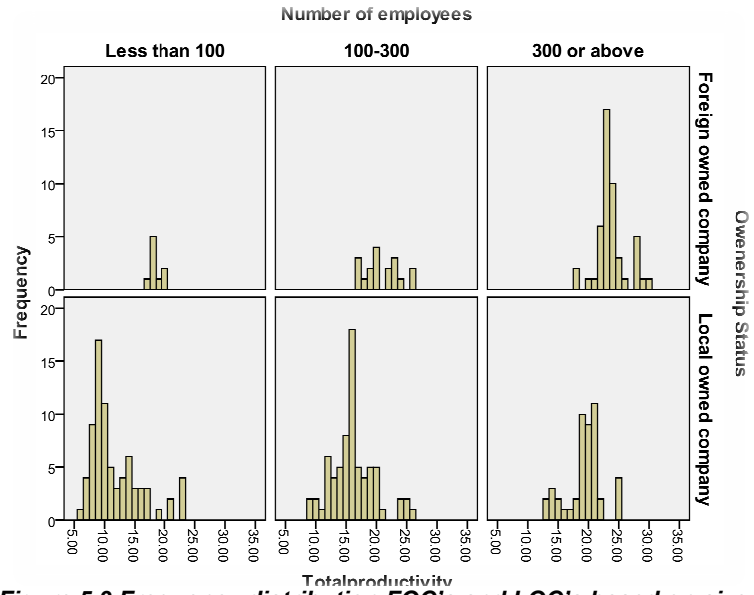


Figure 5.3 Frequency distribution FOC's and LOC's based on size

case of local auto companies is similar mean 23.86, SD 1.50, and range 21 to 26. However, there is a difference in terms of productivity mean and minimum and maximum values, although SD and range are similar it may therefore be concluded that, in general, local auto manufacturing companies in Pakistan are performing better. This assumption is also supported by the findings from chapter 4, where the researcher found a high rate of adoption of QM practices for all automobile companies.

Evidence generated from *Table 5.5* and *Figure 5.4* below, chemicals is one of the weaker sectors for LOC's in terms of productivity, with a mean value of 13 and SD 3.98 for the 17 local respondents. On the other hand, the 3 FOC's have a higher mean score of 19.66 and a lower SD at 2.88. Although the sample size for foreign

companies is very small, again the trend in productivity score is aligned with previous findings of this research.

The statistics in *Table 5.5* further highlight that the pattern of difference between local and foreign owned manufacturers is almost the same for the four remaining sectors. More specifically, the largest sector, textiles, showed a huge difference between both forms of company. The mean productivity value for foreign textile manufacturing companies is 21.79 and SD 2.04; whilst the corresponding values for locally owned textile companies are 12.92 and 3.84. *Tables 4.7 to 4.26* in chapter four showed that the local textile manufacturing sector was one of the lowest adopters of QM practices among all six sectors. Similarly, the high rate of adoption of QM practices by foreign owned companies and their high mean productivity score suggests that implementing QM practices increases productivity. However, locally owned textile companies have demonstrated lowest rate of adopting QM practises and have a low rate of productivity with a very high SD. This suggest that poor quality is impacted negatively on productivity.

The histogram in *Figure 5.4* depicts the frequency distribution and productivity score for both FOC's and LOC's, on the basis of industrial categorisation. The modal value for foreign auto companies is 28; however, for local auto companies it is 25. Similarly, the modal value for chemical companies is 18 for FOC's and 15 for LOC's for engineering companies 24 and 21 respectively and for textile manufacturing 23 and 9. This huge difference between foreign and locally owned manufacturing companies further validates the findings of Fatima and Ahmed (2006) about the textile sector. They argued that, local Pakistani companies have a low adoption rate for QM. Similarly, they found that most of the textile manufacturing companies in

Pakistan, *"view quality as a means for quick profitability only in the short run, but quality as a means to accomplish organisational mission"*.

The high rate of variation among productivity scores of LOC's (see table 5.5) prompted the researcher to inspect the raw data. It was observed from the data that the majority of low scoring textile and chemical LOC's had not adopted any form of QM practice. Similarly, most of the low productivity companies are small in size. It was also observed from the data that the high productivity score is associated with practices like TQM, Six sigma, and Lean. The pattern of QM implementation by medium productivity companies showed association with practices like ISO 9000, SPC, JIT, 5S, etc. It was also noticeable that most of the low productivity LOC's suffered from a high turnover rate of employees (see details in section 6.29 in chapter six). On the other hand FOC's have higher pay, better working conditions, participatory styles and stability.

Yong and Wilkinson (2000) also found the same situation in local Singaporean companies. They further argued that the leadership styles of local manufacturing companies are usually characterised as authoritarian, and these companies also have fewer resources for training, or adopting advanced technologies and management practices.

Again, this analysis of the trend in the frequency distribution for both types of companies further verified that there is a difference in productivity between them. The evidence deduced from *Figure 5.4* suggests that, overall, the automobile sector performs better than all the other sectors because of its high mean productivity score.

Name of sector		N	% of total N	Mean	Std. Dev	Min	Max	Range
Automobile	FOC'S	10	40%	27.60	1.50	25	30	5
	LOC'S	15	60%	23.86	1.50	21	26	5
Total		25	100%	-	-	21	30	-
Chemical	FOC'S	3	15%	19.66	2.88	18	23	5
	LOC'S	17	85%	13.00	3.98	6	19	13
Total		20	100%	-	-	6	23	-
Engineering	FOC'S	13	30.24%	21.07	2.90	17	25	8
	LOC'S	30	69.76	15.70	3.97	9	21	12
Total		43	100%	-	-	9	25	-
Food	FOC'S	6	40%	20.50	2.81	17	23	6
	LOC'S	9	60%	17.55	2.29	14	21	7
Total		15	100%	-	-	14	23	-
Pharmaceutical	FOC'S	9	24.32%	23.22	1.98	19	26	7
	LOC'S	28	75.68%	18.46	2.97	11	22	11
Total		37	100%	-	-	11	26	-
Textile	FOC'S	34	26.35	21.79	2.04	17	24	7
	LOC'S	95	73.65	12.92	3.84	7	21	14
Total		129	100%	-	-	7	24	-

Table 5.5: Descriptive statistics for FOC's and LOC's based on industrial categorisation

This is supported by the findings in chapter four, which suggested that the automobile sector is the highest adopter of QM practices, indicating that this practice has positive effects on productivity. However, FOC's have higher productivity scores than LOC's in all the sectors.

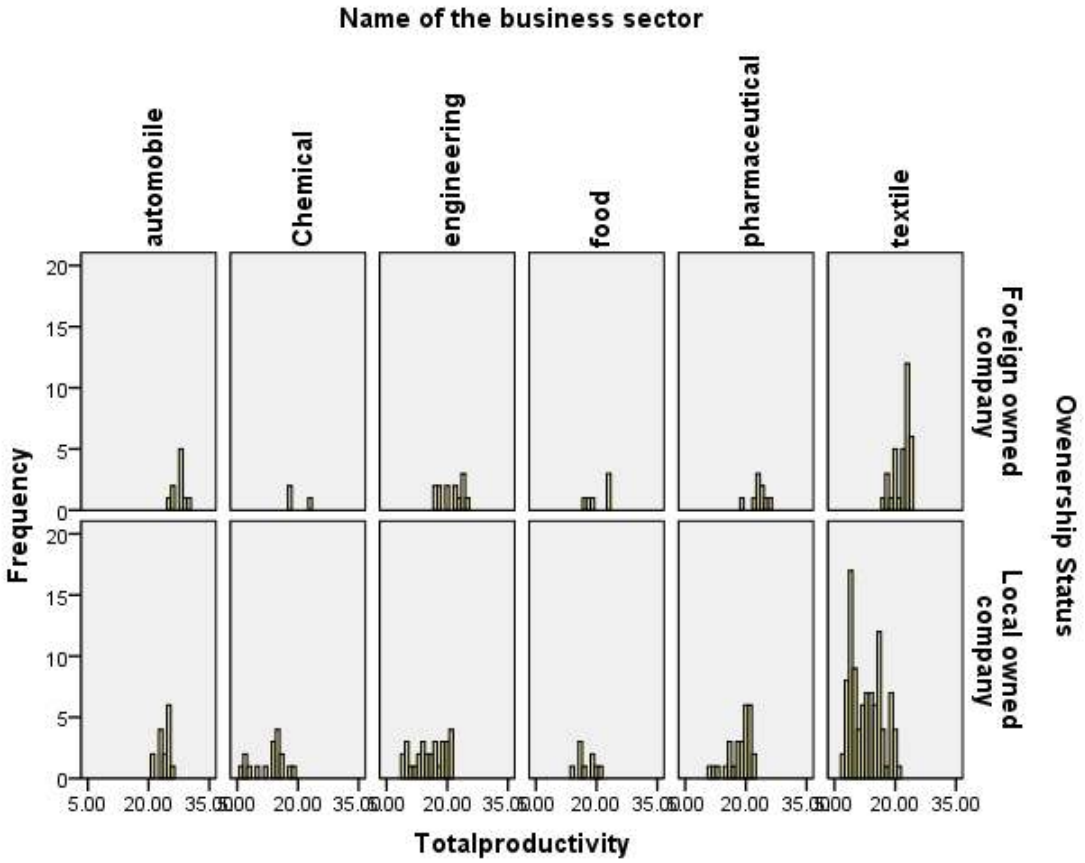


Figure 5.4 frequency of the companies based on industrial categorisation

5.4 Summary

The evidence from the analysis of the descriptive statistics suggests that, a large number of local manufacturing companies have low productivity score. This low performance by LOC's could possibly be explained by the evidence from chapter four indicating lower take-up of QM practices and poor implementation policies which in turn are leading to low productivity. The results from chapter four indicated that the level of adoption of QM practices by FOC's is higher than that of LOC's. Moreover, top management of foreign companies exercise leadership by effective planning, active management involvement, visible commitment and open communication they provide more training in quality awareness, teamwork and group problem-solving skills, benchmarking and statistical analysis, better technology and customer focus than do their local counterparts (see section 4.5). This may indicate that, the use of various QM tools and techniques by most FOC's has a positive effect on productivity

performance. The result of descriptive analysis also suggests that there is a direct link between productivity and company size. A large company has better capital resources, better educated and skilled workforce, and effective leadership capabilities to deploy quality management tools and techniques in an efficient and effective manner. On the other hand, most of the Pakistani companies suffer from a lack of planning and lack of communication across companies. Nevertheless, evidence shows management awareness about quality and productivity, although their authoritative style of management results in failure to deliver this knowledge to lower levels. The limited capital resources of locally owned companies also prevent these companies from adopting such practices and as a result the productivity of small companies suffers.

5.5 Is Productivity dependent on ownership?

Research question 4 considers what relationship exists between quality initiatives and the productivity of FOC's and LOC's.

The t-test was used to identify whether significant differences exists between foreign owned and local companies the results are shown in table 5.6, that FOC's out performed LOC's. The results of the t-test further indicate that mean productivity for FOC's is significantly higher than for LOC's since sig. (2-tailed) values <0.05. This means that there is a statistically significant difference between FOC's and LOC's (see table 5.6). The effect of size is also significant (see table 5.6).

Variable	t.test	Df	Sig.(2tailed)	Mean diff	Eta squared	Effect of size
Productivity	***14.537***	***209***	***0.000***	***7.19***	***0.44***	***Large***

Table 5.6: t-test between productivity and type of ownership

5.5.1 Boxplots

Boxplots were used to compare the productivity scores of responding companies based on ownership. *Figure 5.5* is a graphical representation of the distribution of productivity scores by mean of boxplots. It can easily be seen that the productivity score for FOC's is higher than for LOC's. The middle line in each box represents the

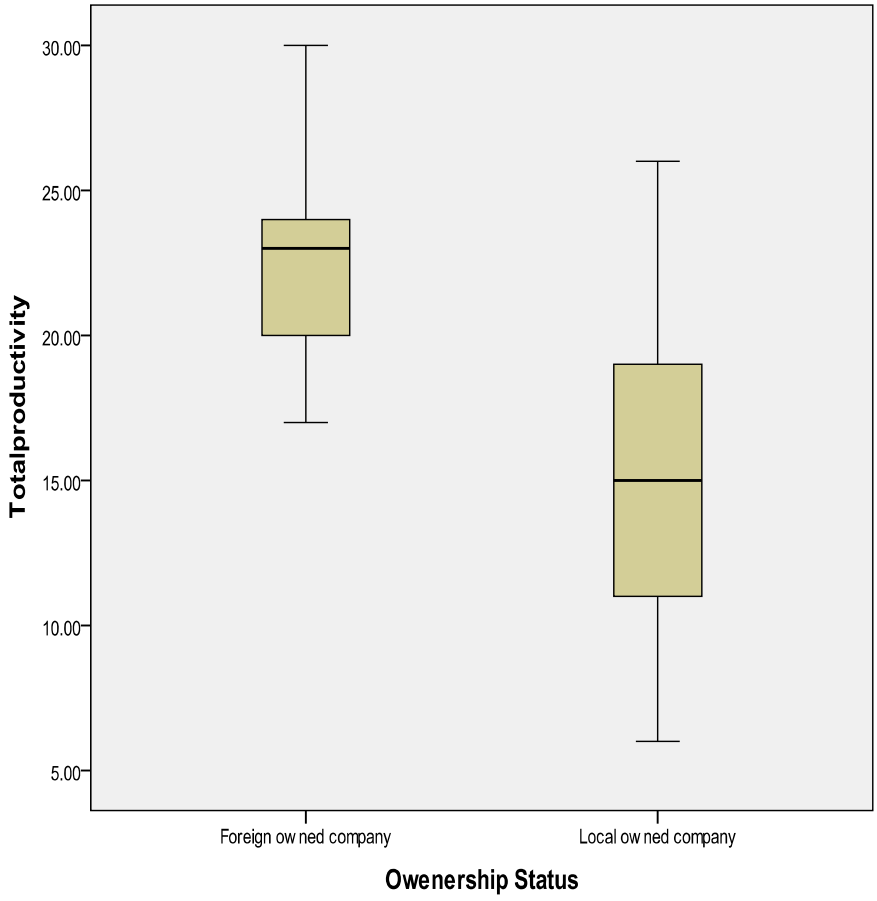


Figure 5.5 comparison of productivity based on owner ship

median value for each group's productivity: 23 for FOC's, and about 15 for LOC's. Similarly, the bottom quarter of the boxplot for FOC's shows productivity scores 17 to 20, and for LOC's 6 to 11. The lower productivity score of LOC's further validates that FOC's performed better in Pakistan than did LOC's. This result indeed confirms the positive association between productivity and foreign owned companies. The next section follows analyses of productivity based on the size of the sample companies.

5.6 Relationship between productivity and size of the sample companies

This section compares mean productivity scores based on the size of the companies, that is small, medium or large, using an analysis of variance (ANOVA) test. The mean productivity score is chosen as the dependent variable, while company size is selected as the independent factor. The result of the test shows that $F(2, 266) = 117.981$, $P < 0.05$. We therefore accept the alternative hypothesis that there is a significant difference between the means of sizes and productivity scores, as shown in table 5.7.

Table 5.7: ANOVA Productivity and Size of sample companies

Source of variation	Sum of Squares	Df	Mean square	F	p-Value
Between Groups	3750.164	2	1875.082	117.981	.000
Within Groups	4227.546	266	15.813		
Total	7977.710	268			

Source: Survey data, 2011

Figure 5.6 illustrates mean productivity based on the size of the company, i.e. less than 100, 100-299, and 300 or above. It is evident from figure 5.6 that the mean total productivity for all three groups significantly differs. Large companies have the highest mean productivity value, 21, medium companies have a moderate mean productivity value of 17, and small companies only 12. This suggests that the productivity of a company is influenced by its size. Again, evidence from ANOVA analysis proved that the productivity of the companies relies heavily on the size of the company. However, the larger companies have better capital resources, better trained human resources, greater training opportunities, and superior technology. Similarly, in this study more than 50% of the large companies are owned by foreign manufacturers (see table 5.4).

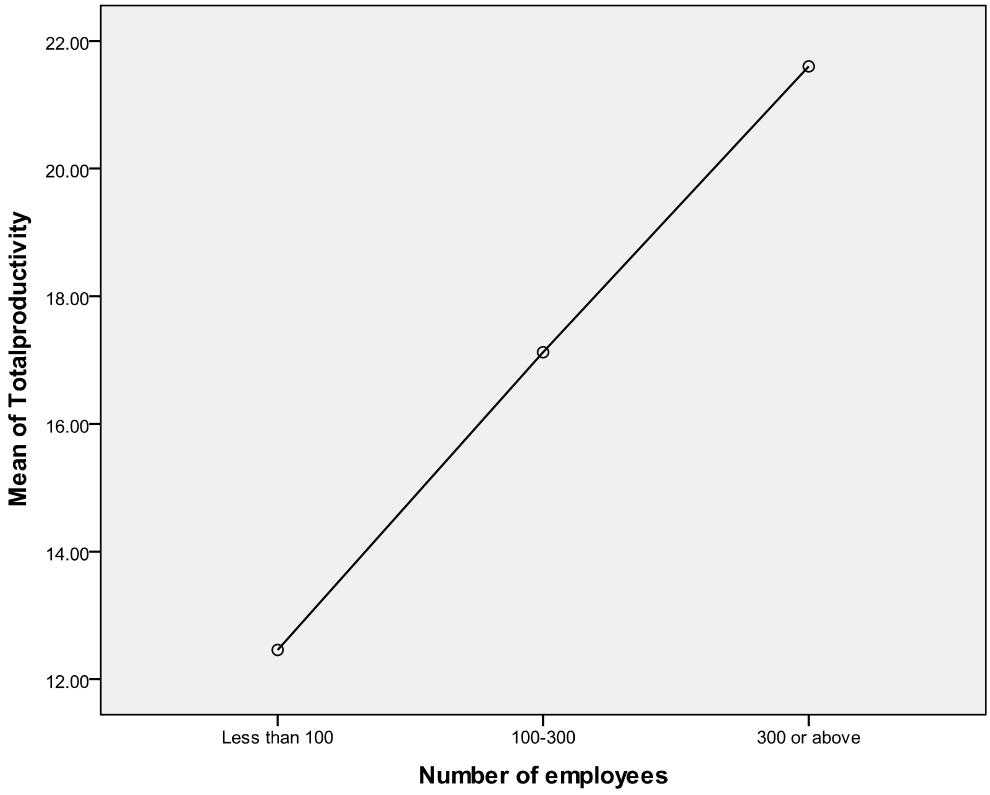


Figure 5.6 Relationship between the productivity and size of the companies

5.7 Combined effect of size and ownership on productivity

In the previous section, the researcher found a significant difference in mean productivity by size of company. The next question to investigate is: is this the case for both foreign and locally owned companies?

To examine the combined effect of ownership (FOC's and LOC's) and size of companies (small, medium, and large) and their productivity scores, an analysis of variance (ANOVA) test was employed. The result shows that $p<0.05$ in both of the cases, i.e. on the basis of ownership and size of the companies, meaning that there is a strong main effect of type of ownership and size of company on productivity. We therefore accept the alternative hypothesis that there is a significant difference between the means for owner ship and size and their productivity scores, as shown in table 5.8. However, to find out whether the relationship between size and

ownership status is significant, we need to check the p.value associated with q4*q7. As shown in *Table 5.8*, the interaction effect is not significant (q4*q7 is .242 >0.05). This indicates that there is no significant difference in the effect of size on productivity for FOC's and LOC's.

Source of variation	Sum of Squares	Df	Mean square	F	p-Value	Partial Eta Squared
Corrected model	4879.169a	5	975.834	82.827	.000	.612
Intercept	51646.766	1	51646.766	4383.708	.000	.943
q4	1087.940	2	543.970	46.171	.000	.260
q7	1052.371	1	1052.371	89.324	.000	.254
q4*q7	33.636	2	16.818	1.427	.242	.011
Error	3098.541	263	11.782			
Total	87841.000	269				
Corrected Total	7977.710	268				

Table 5.8: ANOVA Productivity and Ownership and Size of Sample Companies

Source: Survey data, 2011

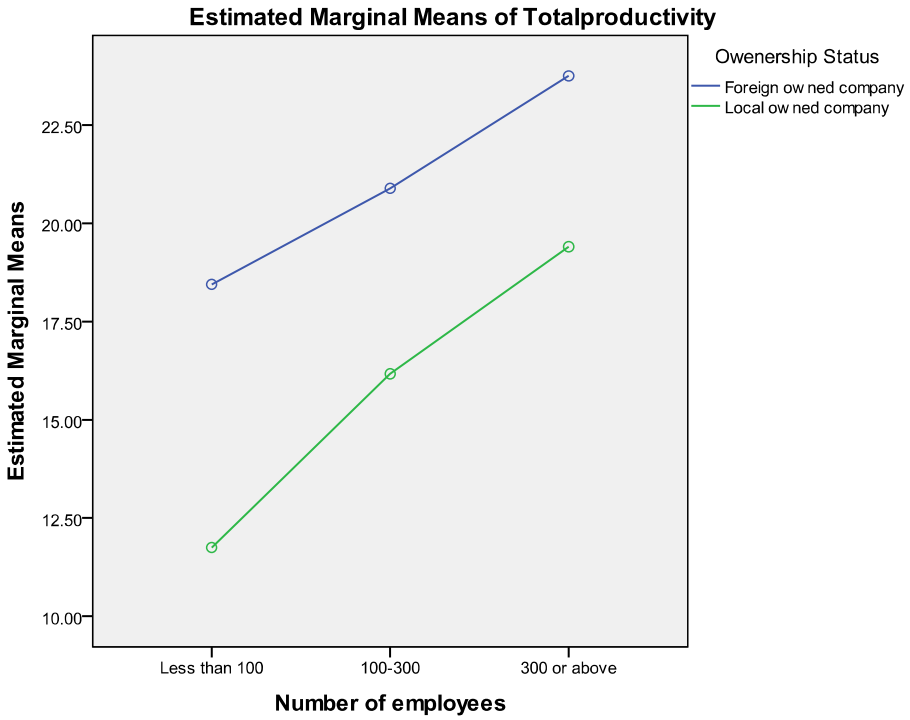


Figure 5.7 Relationship between the productivity, ownership and size of the companies

Figure 5.7 illustrates the mean productivity for FOC's and LOCs. The former has the higher mean productivity score both by size and, particularly, ownership status. However, the result generated from this interaction effect shows less impact on productivity for size and ownership, although overall evidence generated from ANOVA statistics suggests that all three sizes of FOC's are well ahead of LOC's in terms of productivity performance.

5.8 Relationship between productivity and industrial categorization

In this section the productivity scores are compared to the type of business sector, for both FOC's and LOC's, using an ANOVA test. The result of the test shows that $p<0.05$ in both cases, i.e. on the basis of ownership and type of industry. It means there is strong main effect of type of ownership and type of industry on productivity. We therefore accept the alternative hypothesis that there is a significant difference between the means of the ownership and type of industry, and their productivity scores, as shown in table 5.9. However, to find out whether the interaction between type of industry and ownership status is significant, we need to check the p.value associated with q1*q7. As shown in *Table 5.9*, the interaction effect is significant (q4*q7 is .000<0.05). This indicates that there is a significant difference in the effect of industrial categorisation on productivity for both FOC's and LOC's.

Figure 5.8 illustrates the mean productivity of the companies based on ownership status (FOC's and LOC's) and type of industry (automobile, chemicals, engineering, food, pharmaceuticals and textiles respectively). FOC's have a higher mean productivity score than LOC's in all six industrial sectors. However, automobiles is the only sector in which LOC's have relatively better productivity performance, although the gap between both groups is rather narrow (see figure 5.8). The better productivity performance of locally owned automotive companies could be explained

by the supply chain practices implemented by the large foreign owned automotive companies. These practices would include a strong focus on supplier development and demand for high quality products. This could be an area of further research.

Source of variation	Sum of Squares	Df	Mean square	F	p-Value	Partial Eta squared
Corrected model	5198.759	11	472.614	43.970	.000	.653
Intercept	48828.717	1	48828.717	4542.768	.000	.946
q1	1519.954	5	303.991	28.282	.000	.355
q7	917.305	1	917.305	85.341	.000	.249
q4*q7	266.271	5	53.254	4.954	.000	.088
Error	2762.408	257	10.749			
Total	87790.000	269				
Corrected Total	7961.167	268				

Table 5.9: ANOVA Productivity and Ownership and industrial categorisation

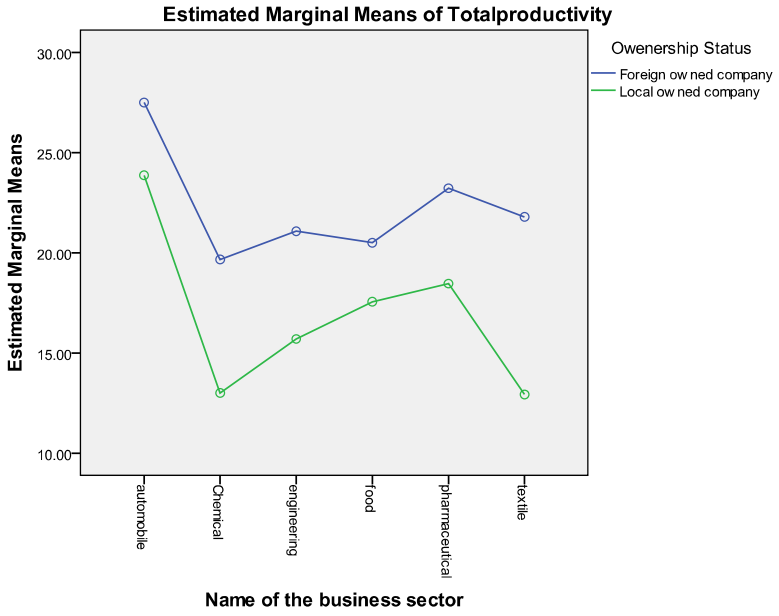


Figure 5.8 Relationship between the productivity, ownership and industrial categorisation

5.9 ANOVA Results

The results derived from the ANOVA analyses proved that there is a significant difference between foreign owned companies and locally owned companies in terms of productivity. Similarly, an ANOVA test further validated that there is a significant

relationship between company size and productivity performance. Large companies performed better than small companies did in particular, the large foreign companies consistently delivered good manufacturing output. Finally, ANOVA tests ascertained that all six types of FOC's performed better than LOC's.

5.10 Relationship between productivity and QM practices

This section sheds light on the relationship between productivity and selected QM practices (ISO 9000, SPC, TQM, QC circle's, JIT, 5S, Six sigma, Kaizen, Lean, and Reengineering). The correlations between the QM practices and productivity for each of the responding companies are displayed in *Table 5.10 and 5.11* below that is for FOC's and LOC's. *Table 5.10* shows the relationship between QM practices and the productivity of FOC's. As shown in table 5.10, all QM practices were found to be positively correlated with productivity performance. The correlations ranged from 0.009 to 0.562 are significant at the 0.01 level. In sum, the result indeed confirms the positive association between QM practices and productivity performance.

The strongest correlation between productivity and QM practice was with Lean (average $r=0.562$; $p<0.01$), then Six sigma (average $r=0.526$; $p<0.01$) and TQM (average $r=0.502$; $p<0.01$). The results in table 5.11 suggest that FOC's in Pakistan, which have implemented advanced QM techniques, such as TQM, Six sigma, and Lean, may enhance their quality and productivity.

However, overall, FOC's have an edge on every single selected QM practice (see evidence in cross tables 4.7 - 4.26). The reason for the high rate of correlation of these above practices is due to exclusive use by foreign companies. Moreover, the evidence from this study already confirmed that all FOC's has achieved clearly higher productivity compared to LOC's (see evidence in section 5.5).

Table 5.10: Correlation between QM practices and productivity performance (FOC's)

	Name of item correlated against productivity for (75foreign owned companies)	" r_{pb}"	Sig. (2tailed)
75	Correlations b/w ISO9000 and productivity	.071	.000
75	Correlations b/w SPC and productivity	.452	.000
75	***Correlations b/w TQM and productivity***	***.502***	***.000***
75	Correlations b/w quality circle and productivity	.009	.000
75	Correlations b/w JIT and productivity	.209	.000
75	Correlations b/w 5S and productivity	.357	.000
75	***Correlations b/w Six sigma and productivity***	***.526***	***.000***
75	Correlations b/w Kaizen and productivity	.218	.000
75	***Correlations b/w Lean and productivity***	***.562***	***.000***
75	Correlations b/w Reengineering and productivity	.421	.000

Notes: *The practices in bold & italics represent those practices where there is strong relationship between QM practices and productivity performance.*

Table 5.11 depicts the relationship between productivity and QM practices for LOC's. The only strong association was found between ISO 9000 and productivity (average r=0.721; p<0.01), whilst moderate correlation was found between productivity and JIT (average r=0.469; p<0.01), 5S (average r=0.459; p<0.01), and SPC (average r=0.452; p<0.01) for LOC's. As pointed out by many authors, ISO 9000 provides transition only to the quality assurance level. Similarly, the result of correlation analyses confirms the positive association between QM practices and productivity performance.

However, the low productivity results of LOC's further strengthen the findings that LOC's are weak in effectively adopting and implementing QM practices as results the productivity level is generally below the average (see evidence in section 5.5).

Table 5.11: Correlation between QM practices and productivity performance (LOC's)

N	Name of item correlated against productivity for (194 local owned companies)	" r_{pb}"	Sig. (2tailed)
194	***Correlations b/w ISO9000 and productivity***	***.721***	***.000***
194	Correlations b/w SPC and productivity	.452	.000
194	Correlations b/w TQM and productivity	.310	.000
194	Correlations b/w quality circle and productivity	.297	.000
194	Correlations b/w JIT and productivity	.469	.000
194	Correlations b/w 5S and productivity	.459	.000
194	Correlations b/w Six sigma and productivity	.268	.000
194	Correlations b/w Kaizen and productivity	.321	.000
194	Correlations b/w Lean and productivity	.293	.000
194	Correlations b/w Reengineering and productivity	.362	.000

Notes: *The practices in bold & italics represent those practices where there is strong relationship between QM practices and productivity performance.*

This suggests that Pakistani companies essentially need to adopt an organisation-wide quality culture by implementing the different tools and techniques of QM to develop and enhance their quality and productivity.

5.11 Relationship between Productivity and financial performance indicators

The relationship between productivity and financial performance indicators (ROA, ROS, and sales per employee) was shown in *Table 5.12 and 5.13* for (FOC's and LOC's) respectively.

Table 5.12 highlights the relationship between productivity and financial performance indicators for foreign companies. Again, it shows a strong positive correlation between productivity and ROA (average r=0.553; p<0.01); and productivity and ROS (average r=0.534; p<0.01). However, moderate correlation is also found between productivity and sales per employee (average r=0.398; p<0.01), suggesting that all the FOC's have constant sales per employee.

Table 5.12: Correlation between productivity and financial performance (FOC's)

N	Name of item correlated against productivity for (75 companies)	Pearson Correlation	Sig. (2tailed)
75	***Correlations b/w ROA and productivity***	***.553*****	***.000***
75	***Correlations b/w ROS and productivity***	***.534*****	***.000***
75	Correlations b/w Sales and productivity	.398**	.000

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

The relationship between productivity performance and financial indicators of LOC's is shown in *Table 5.13*. All three financial indicators have a strong positive correlation with productivity.

Table 5.13: Correlation between productivity and financial performance (LOC's)

N	Name of item correlated against productivity for (194 companies)	Pearson Correlation	Sig. (2tailed)
194	***Correlations b/w ROA and productivity***	***.549*****	***.000***
194	***Correlations b/w ROS and productivity***	***.588*****	***.000***
194	***Correlations b/w Sales and productivity***	***.603*****	***.000***

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

Although, LOC's has shown high rate of correlation between productivity and all financial performance indicators (ROA, ROS, and sales per employee) compared to FOC's. However, it was found that all FOC's has achieved high productivity and high financial performance to that of LOC's (see figure 4.3, 4.4, & 4.5) respectively.

5.12 Conclusion

This chapter have analysed the productivity of the sample companies by comparing it with different data characteristics. First of all, productivity was calculated by using production performance functions as proxy measures of productivity. The total productivity scores for foreign owned and locally owned manufacturing companies were compared. The research evidence showed that there is a difference in the level of adoption of QM practices in the FOC's and LOC's (see section 4.3), and this difference also translated into the findings of this chapter's productivity performance analyses. FOC's achieved a high productivity level. Therefore, it may be concluded that effective adoption and implementation of QM increases productivity. Similarly,

productivity scores were analysed based on the size of the by companies for both local and foreign manufacturers. The types of business sectors were compared with productivity scores. Initial analyses of productivity provided some useful insights and information about FOC's and LOC's. Similarly, descriptive statistics complemented the analysis which shows that there is a relationship between size of the companies and productivity. The t-test results suggest that there is a significant difference between FOC's and LOC's. Analysis of variance (ANOVA) tests also indicated, that there is a relationship between average productivity scores and type of ownership, specifically, a positive relationship between high productivity and foreign owned companies. Similarly, the ANOVA test between productivity and size of company also shows a strong relationship between high productivity and large size. However, in the case of FOC's, the relationship between high productivity and large companies shows an even more direct and stronger relationship than with LOC's. Finally, the ANOVA test between productivity scores of FOC's and LOC's and type of industry also demonstrates wide differences. More specifically, foreign owned manufacturers outperformed the locally owned Pakistani companies in all of the six selected sectors for high productivity. The result of this ANOVA test suggests that FOC's have a strong relationship between high productivity and industrial category for all six types of company.

The results of correlation analysis between productivity and QM practices of foreign and locally owned manufacturing companies further suggests that there is a positive link between QM practices and the productivity performance of foreign owned manufacturers. Similarly, the level of adoption of different tools and techniques of QM is high for foreign companies (see chapter four). On the other hand, evidence from productivity analysis of locally owned companies suggest that they are

inconsistent in terms of productivity, specifically; this was shown clearly in figure (table 4.7 - 4.26), where the level of adoption of QM tools and techniques for local companies was very low. This means that the link between QM practices and productivity performance of local Pakistani companies is weak compared to foreign owned companies operating in Pakistan. The relationship between productivity and financial performance indicators (ROA, ROS, sales per employee) for responding companies also showed a significant strong positive correlation. Finally, the statistical findings of these productivity analyses suggests that, although locally owned manufacturers perceived the need for quality improvement, this did not necessarily improve the productivity of their products.

CHAPTER SIX: RELATIONSHIP BETWEEN QUALITY AND PRODUCTIVITY

6.1 Introduction

The previous chapter was devoted to an analysis of the productivity of the responding companies. This chapter is an extension of the discussion in chapters four and five. It focuses on measures of quality and their effects on productivity. It begins by discussing measures of quality (scrap, rework, defects and complaints) by applying frequencies and percentages in the data set for FOC's and LOC's, and then examines the differences between the two groups in terms of the relationship between measures of quality and the business sector, and between measures of quality and productivity. It investigates the relationship between selected QM practices and measures of quality, and explores the differences in using QC practices and quality performance functions separately for foreign owned and locally owned Pakistani manufacturers.

6.2 Rate of scrap during production

Table 6.1 represent the frequencies and percentages of scrap produced by the responding companies. The respondents were asked to give average percentages of the products they considered as scrap during the manufacturing processes.

Table 6.1: Percentage scrap in the companies

Percentage of Scrap in the responding companies	No. Of Companies	Percent (%)
Less than 1%	92	34.8
1-5%	69	26.1
5-10%	44	16.7
10-15%	36	13.6
15% or more	23	8.7
Total	264	100.0

Some 35% reported less than 1% scrap, 26% have scrap between 1-5%, 17% 5-10% scrap, 14%10-15% scrap, and 9% 15% scrap and more. The details of the

percentage of scrap based on ownership and type of industry are discussed in sections 6.6 and 6.7 respectively.

6.3 Rate of rework during production

Rework products are completed but do not meet specification or acceptance criteria and are redeemed for fresh work or repair and reprocessing. The companies were categorized by the same percentage groupings as for scrap: 1%, 1-5%, 5-10%, 10-15%, 15% or more, as shown in table 6.2.

Table 6.2: Percentage rework in the companies

Percentage of rework in the responding companies	No. Of Companies	Percent (%)
Less than 1%	63	23.6
1-5%	83	31.1
5-10%	42	15.7
10-15%	45	16.9
15% or more	34	12.7
Total	267	100.0

Sections 6.6 and 6.7 discuss the percentage of rework based on ownership and type of industry.

6.4 Rate of defects during production

This section analyses the rate of defects identified during production processes, as shown in *Table 6.3,* grouped as for scrap and rework.

Table 6.3: Percentage defects in the companies

Percentage of defects in the responding companies	No. Of Companies	Percent (%)
Less than 1%	90	34.2
1-5%	67	25.5
5-10%	53	20.2
10-15%	40	15.2
15% or more	13	4.9
Total	263	100.0

The details of percentage of defects based on ownership and industrial sector are given in sections 6.6 and 6.7 respectively.

6.5 Number of complaints received by the companies

The study considered the number of complaints received on monthly basis as less than 5, 5-10, 10-15 and more than 15 (see table 6.4).

Table 6.4: Number of complaints in the companies

No of complaints received every month by responding companies.	No. Of Companies	Percent (%)
<than 5	122	45.4
5-10	96	35.7
10-15	43	16.0
>than15	8	3.0
Total	269	100.0

Evidence from *Table 6.4* shows that 122 companies received fewer than 5 complaints a month; 96 reported 5-10 complaints, 43 companies' had10-15 complaints and 8 reported more than 15 complaints.

6.6 Measures of quality and type of ownership

This section examines the relationship between measures of quality and type of ownership of the sampled companies.

Table6.5: Cross tabulation of measures of quality (scrap, rework, & defects) with type of ownership

Measures	Companies	Less than 1%	1-5%	5-10%	10-15%	15% or more	Total
Scrap	FOC'S	49 (65.3%)	22 (29.3%)	4 (5.3%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	43 (22.8%)	47 (24.9%)	40 (21.2%)	36 (19.0%)	23 (12.2%)	189 (100%)
Total		92 (34.8%)	69 (26.1%)	44 (16.7%)	36 (13.6%)	23 (8.7%)	264 (100%)
Rework	FOC'S	36 (48.0%)	34 (45.3%)	5 (6.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	27 (14.1%)	49 (25.5%)	37 (19.3%)	45 (23.4%)	34 (17.7%)	192 (100%)
Total		63 (23.6%)	83 (31.1%)	42 (15.7%)	45 (16.9%)	34 (12.7%)	267 (100%)
Defects	FOC'S	46 (61.3%)	24 (32.0%)	5 (6.7%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	44 (23.4%)	43 (22.9%)	48 (25.5%)	40 (21.3%)	13 (6.9%)	188 (100%)
Total		90 (34.2%)	67 (25.5%)	53 (20.2%)	40 (15.2%)	13 (4.9%)	263 (100%)

Here cross tabulation is used to find out the relationship between the variables scrap, rework, complaints and defects on one hand and type of ownership (foreign or local) on the other, as shown in tables 6.5 and 6.6 respectively. As presented in *Table 6.5,* 65% of foreign companies reported the percentage of scrap as less than 1%, as against only 23% of local companies. No foreign company claimed scrap rate above 10%. At the other extreme, 31% of LOC's reported scrap rate of 10% or more.*Table 6.5* cross tabulates the percentage differences between measures of quality and the nature of ownership. The evidence clearly shows that FOC's have less scrap than do LOC's. It was indicated in chapter four that the majority of the FOC's had adopted QM practices, unlike locally owned companies (see section 4.3). Similarly, FOC's showed a higher level of commitment and active involvement in quality initiatives (see section 4.5), a more participative style of management and better training opportunities to employees (see section 4.5).That 31% of locally owned companies reported rates of scrap above 10% led the researcher to investigate the raw data for further analysis. Before this new analysis, the companies were divided into two group based on their percentage scrap rate: low scrap producing LOC's with less than 10% scrap, and high scrap producing LOC's of 10% or above. The researcher randomly picked six companies from the high scrap producing group: two from the chemicals sector and four from the textile sector (see table 6.6). For comparison purposes, the same types were selected from the low scrap producing group (see table 6.6).

HIGH SCRAP LOC's							LOW SCRAP LOC's						
Sector	Name of QM practice	Productivity	Leadership	Training	Mangement Style	Customer Focus	Sector	Name of QM practice	Productivity	Leadership	Training	Mangement Style	Customer Focus
Chem	N	6	12	12	12	14	Chem	ISO 9000,SPC	19	20	26	19	24
Chem	ISO 9000	8	11	10	13	13	Chem	ISO 9000, JIT, 5S,SPC	18	19	23	21	22
Text	ISO 9000	9	13	10	14	15	Text	ISO 9000, SPC, TQM, Kaizen	21	19	28	23	23
Text	N	7	12	11	12	14	Text	ISO 9000, SPC, JIT	20	21	27	21	21
Text	ISO 9000	7	11	12	12	16	Text	ISO 9000, JIT	20	19	26	22	22
Text	ISO 9000	8	12	12	12	14	Text	ISO 9000	20	20	28	20	23

Table 6.6: Comparison between high and low scrap producing LOC's

Table 6.6 shows that, of the six high scrap companies, four had adopted only ISO 9000 QM practice, whereas the low scrap producing companies are using multiple or a wide range of quality management practices; one exception is the last textile company, which claimed to have adopted only the ISO 9000 practice.

Table 6.6 further compares local companies in terms of high scrap and low scrap production, on the basis of QM practices, productivity, and QM implementation factors such as leadership, training, management style and customer focus. The calculation of scores for QM implementation factors were made by adopting the same approach as that used in calculating productivity (see section 5.2). From the table it can be stated that high scrap producing companies have lower scores for productivity, leadership, training, management style and customer focus than do low scrap producing companies. For example, the first chemical company from the table has high scrap with a low productivity score of 6, compared to the low scrap producing chemical company with a productivity score of 19. In the same manner, the productivity score for the first high scrap textile company is 9, compared to 21 for the low scrap textile companies shown in table 6.6.This result implies that those local

companies which effectively implemented QM elements such as leadership, training, management style and customer focus have achieved higher productivity and quality by reducing their rate of defects. Similarly, the one textile company, which adopted only ISO 9000, was in the low scrap producing group due to better implementation of QM elements. This suggests that the adoption of QM practices does not work unless the implementation process is appropriate.

In terms of cross tabulation between rework and type of ownership (see table 6.5), 48% respondents from foreign companies reported a rate of rework less than 1% as against only 14% of local manufacturing companies. Additionally, 45% foreign companies claimed rate of rework between 1-5%. The remaining five FOC's have rate of rework between 5 to 10% in their respective companies. Similarly, 26% local companies stated rework rate between 1 to 5%, 19% responding companies reported percentage of rework between 5 to 10%. In addition, 23% LOC's were between 10 to 15% rate of rework, and finally, 18% local companies reported rework rate of 15% or more.

Once again, the high rate of rework among most of the local companies led the researcher to look into the raw data, and the same criteria were used to categorize them according to high or low rework. The low rework producing local owned companies produces rework rate of less than 1 to 10% rework, while high rework producing local owned companies produces rework rate from 10 to more than 15% rework. The researcher randomly picked six local owned companies from high rework producing group, two (2) from engineering sector, one food manufacturing company, and three (3) from textile sector (see table 6.7).

HIGH REWORK LOC`s								LOW REWORK LOC`s							
Sector	Productivity	Leadership	Managment commitment	Organisation Communication	Training	Mangement Style	Team Work	Sector	Productivity	Leadership	Managment commitment	Organisation Communication	Training	Mangement Style	Team Work
Engg	9	14	12	10	12	12	13	Engg	19	20	19	18	28	22	28
Engg	10	14	13	11	13	11	15	Engg	18	19	18	17	26	24	27
Food	14	15	14	12	14	12	14	Food	16	22	22	18	28	21	29
Text	7	12	12	11	13	12	15	Text	15	19	18	18	26	20	28
Text	8	13	12	12	14	11	14	Text	17	18	19	18	28	22	27
Text	7	12	11	10	13	12	13	Text	17	20	18	17	25	21	26

Table 6.7: Comparison between high and low rate of rework LOC's

In addition, for comparison purpose, same type of companies was select from low rework producing group (see table 6.7). Evidence in *Table 6.7* depicts that, all high percentage rework companies, has low score in QM implementation factors such as leadership, management commitment, organisation communication, training, and teamwork. Similarly, all these companies have achieved low productivity level as shown in table 6.8 below. On the other hand, all low rate of rework LOC's achieved a high score in all the selected QM implementation factors. Moreover, their productivity level is noticeably higher than that of the high rate of rework LOC's. This further proved that effective adoption and implementation of QM tools and techniques reduces the rate of rework, improves quality and increases productivity.

During the analysis of the data, the high rate of rework was also found in some chemical companies that claimed to have adopted highly sophisticated practices like TQM and Six Sigma. Similarly, it was found in three textile companies that adopted SPC, JIT, and Kaizen (see table 6.8).

HIGH REWORK LOC`s							LOW REWORK LOC`s						
Sector	QM Practice	Operational Efficiency	Employee Satisfaction	Employee Turnover	Operational Flexibility	Stock-out Frequency	Sector	QM Practice	Operational Efficiency	Employee Satisfaction	Employee Turnover	Operational Flexibility	Stock-out Frequency
Chem	ISO 9000,SPC ,TQM, 6 Sigma	Low	Low	High	Low	High	Chem	ISO 9000,SPC ,JIT , 5S	High	High	Low	High	Low
Chem	ISO 9000,SPC , QC CIRCLE	Low	Low	High	Low	High	Chem	ISO 9000,SPC	High	High	Low	High	Low
Text	ISO 9000, SPC,QC CIRCLE	Low	Low	High	Low	High	Text	ISO 9000, SPC, JIT	High	High	Low	High	Low
Text	ISO 9000, SPC, , Kaizen	Low	Low	High	Low	High	Text	ISO 9000, SPC, , Kaizen	High	High	Low	High	Low
Text	ISO 9000, JIT, 5S ,QC CIRCLE	Low	Low	High	Low	High	Text	ISO 9000, JIT, 5S	High	High	Low	High	Low

Table 6.8: Comparison between high and low rate of rework LOC's based on quality performance functions

It became evident that some key differences exist between these five companies and other local companies that have less rework. These differences are as follows:

- These companies have a low rate of efficiency of operations.
- These companies have admitted a low employee satisfaction level.
- These companies have a high rate of employee turnover.
- These companies have reported low flexibility of operations.
- These companies have reported high frequency of stock-outs.

The low efficiency of operations means management has failed to play an effective role. It shows inability of leadership to develop and implement effective QM plans due to insufficient QM knowledge. A high level of management commitment and active involvement is required to increase the efficiency of operations, and this was absent in the case of these companies.

Again, the low employee satisfaction indicates that employees have less motivation to work, suggesting that top management have adopted an authoritarian style of management. The companies do not properly communicate effectively at all levels. Moreover, employees are not satisfied with their working conditions, remuneration,

or facilities. It is proposed that local companies should adopt a participative style of management, in which top-level management acts as a coach rather than a boss. It is further proposed that local companies should provide employees with competitive salaries and basic facilities like medical care, bonuses, awards and rewards as incentives for exceptional performance. This could be helpful in motivating and satisfying employees towards quality performance.

The high employee turnover rate suggests that companies have fewer resources for training, employees are less attracted by company policies, they are less empowered and possibly afraid to contribute to the decision-making process, and they may be discouraged from making contributions on quality initiatives. Again, as was found in chapter four, training employees is one of the key components in effective implementation of QM. It is proposed that local companies need to focus more on quality training of employees, and that they promote empowerment, job independence, control, and participatory decision-making within a given domain of authority.

Again, the flexibility of operations can be increased by decentralizing authority to lower levels. This could be achieved through effective training of the employees to make significant contributions to increasing the flexibility of their companies. An higher level of flexibility of operations fosters the chances of implementing.

The high frequency of stock-outs indicates lack of planning. This probably impacts on planning for quality as well. This issue can be resolved by effectively planning and improving inventory operations. In the case of local companies with a low rate of rework, the researcher found highly efficient operations, a higher level of employee satisfaction, and a low rate of employee turnover. Similarly, these companies have high flexibility of operations and low frequency of stock-outs. Based on this evidence,

it is proposed that those companies with a high rate of rework implement these quality performance issues by effective quality planning and strong management commitment; this should reduce the rate of rework and increase quality and productivity. In order to ascertain in-depth information about the effectiveness of implementation of QC practices adopted by the local companies, the same criteria were used to categorise the study companies according to high or low rework (see page191). The QC practices include statistical methods, supplier quality evaluations, quality audits and testing of product variability. The sectors are automobile, chemical, engineering, food, pharmaceutical and textile. Comparison was made of the average score of the four stated QC practices on the basis of sector. From table 6.9, it can be seen that no automobile company is in the high rework category. Furthermore, the average score for low reworks LOC's is clearly high for each of the selected QC practices

HIGH REWORK LOC`s					LOW REWORK LOC`s				
Sector	Statistical Methods	Supplier Quality Evaluation	Quality Audits	Variability Testing	Sector	Statistical Methods	Supplier Quality Evaluation	Quality Audits	Variability Testing
Auto					Auto	1.27	1.53	1.27	1.33
Chem	1.63	1.83	1.57	1.79	Chem	2.00	2.13	1.88	2.25
Engg	0.55	1.18	1.91	1.73	Engg	2.05	1.89	2.11	2.37
Food	0.00	2.00	1.00	3.00	Food	2.00	2.13	2.75	2.63
Pharma	1.43	2.43	1.86	2.14	Pharma	2.19	1.95	2.67	2.29
Tex	0.33	0.86	0.86	1.06	Tex	1.48	1.07	2.57	1.83

Table 6.9: Comparison between high and low rate of rework LOC's based on QC practices

. This may mean that effectively adopting and implementing these practices has a positive impact on quality and productivity while reducing the rate of rework.

Therefore, this study recommends that local companies adopt the above stated QC practices.

Moreover, the high rework companies that have already adopted these QC practices could be advised to improve their process of implementation in order to realize improved results by effective management planning.

It was also observed from the raw data that the majority of the selected textile companies, which have a high rate of rework lack effective mechanisms for adopting statistical tools and techniques. Again, these companies have put in place virtually no quality audit mechanisms, nor do they gauge variation in the production processes (see table 6.10). On the other hand, most of the selected textile companies with a lower rate of rework have applied statistical tools and techniques, adopted quality audit practices, and implemented product variability practices (see table 6.10). Similarly, a high level of productivity was observed in the case of low rework textile companies. This means adoption and implementation of these three QM practices is successful in reducing the rate of rework and consequently improving quality and productivity. This result further confirms the findings illustrated in the previous table (6.9), which suggest that these QC measures have a positive impact on the rate of rework.

HIGH REWORK LOC`s				LOW REWORK LOC`s			
Sector	Statistical Tools & Techniques	Quality Audits	Testing of Product Variability	Sector	Statistical Tools & Techniques	Quality Audits	Testing of Product Variability
Text	X	X	X	Text	✓	✓	✓
Text	X	X	X	Text	✓	✓	✓
Text	X	X	X	Text	✓	✓	✓
Text	X	X	X	Text	✓	✓	✓
Text	X	X	X	Text	✓	✓	✓

Table 6.10: Comparison between high and low rate of rework local owned textile companies based on QC practices

Therefore, based on evidence from *Table 6.10*, it is suggested that high rework producing LOCs adopt and implement statistical tools and techniques, adopt quality audits, and implement product variability practice. This is reflected in the final framework proposed in chapter seven.

Finally, in terms of defects, more than 61% of foreign companies acknowledged the rate of defects as less than 1%, as against only 23% of LOC's. Additionally, 32% of FOC's admitted rates of defects between 1-5%; the remaining 5 foreign companies reported 5-10%. Beside the 23% of LOC's claiming rate of defects between 1-5%, 26% reported 5-10%, 21% 10-15% and 7% 15% or more, as shown in table 6.5.

Once again, further in-depth analysis about the performance of high and low rate of defects producing companies based on productivity scores and quality performance functions was made (see table 6.11).The low defect producing LOC's were categorized by a rate of 1 to 10% defects, with the high defect producing LOC's at more than 10%. Five locally owned companies were randomly picked from the high defects group, and five from the low rate of defects LOC's (see table 6.11).The analyses were made on the basis of quality performance functions: frequency of

inspections, employee satisfaction, employee turnover, product variability, frequency of stock-out, efficiency of operations, and flexibility of operations.

It was also observed from the analyses of the raw data that high rate of defects LOC's rarely adopted tools and techniques of QM practices.

HIGH RATE OF DEFECTS LOC`s							
Productivity	Frequency of Inspections	Employee Satisfaction	Employee Turnover	Product Variability	Stock-out Frequency	Operational Efficiency	Operational Flexibility
6	High	Low	High	High	High	Low	Low
7	High	Low	High	High	High	Low	Low
8	High	Low	High	High	High	Low	Low
8	High	Low	High	High	High	Low	Low
10	High	Low	High	High	High	Low	Low
LOW RATE OF DEFECTS LOC`s							
Productivity	Frequency of Inspections	Employee Satisfaction	Employee Turnover	Product Variability	Stock-out Frequency	Operational Efficiency	Operational Flexibility
20	Low	High	Low	Low	Low	High	High
18	Low	High	Low	Low	Low	High	High
21	Low	High	Low	Low	Low	High	High
20	Low	High	Low	Low	Low	High	High
18	Low	High	Low	Low	Low	High	High

Table 6.11: Comparison between high and low scrap producing LOC's

Table 6.11 also shows that the productivity levels of these high defect producing LOC's are clearly lower than those of the low defect producing LOC's, which scored well on all the quality performance indicators.

The companies with the lower rate of defects have adopted different QM tools and techniques, as was evident from personal observation. In addition, these companies have frequent of inspections, achieved high level of employee satisfaction, and low

employee turnover rate. They have a low level of product variability, low frequency of stock-outs, and high efficiency of operations (see table 6.11). This may mean effective adoption and implementation of different QM tools and techniques reduces defects and increases quality and productivity. This result confirms the findings reported in chapter five's analysis of productivity, where a strong link was found between QM practices and productivity. Therefore, it may be assumed that effective implementation of QM tools and techniques reduces the defect level and significantly increases productivity. It was also found from the previous results that almost all foreign companies are using statistical tools and techniques, and so have less variation in their production processes, which might have resulted in fewer defects (see section 4.5). This may mean that effective use of QM practices positively reduces defect rates and increases productivity. However, adopting QM techniques would not necessarily work unless the implementation and management structure is appropriate.

6.6.1 Customer complaints and type of ownership

In order to find the relationship between customer complaints and type of ownership of the companies, cross tabulation was performed with the results shown in *Table 6.12.*

Table 6.12: Cross tabulation of measures of quality customer complaints and type of ownership

Measure	Companies	Less than 5	5-10	10-15	Greater than 15	Total
Customer Complaints	FOC'S	56 (74.7%)	15 (20.0%)	4 (5.3%)	0 (0%)	75 (100%)
	LOC's	66 (34.0%)	81 (41.8%)	39 (20.1%)	8 (4.1%)	194 (100%)
Total		122 (45.4%)	96 (35.7%)	43 (16.0%)	8 (3%)	269 (100%)

The table clearly shows that FOC's have fewer customer complaints than LOC's on a monthly basis. As stated in chapter four, the majority of the foreign companies have adopted QM practices like SPC, JIT, TQM, 5S, Kaizen, Six sigma and Lean. The evidence from chapter four, also suggests that FOC's has shown strong leadership, high management commitment; better training facilities, a high level of teamwork, empowerment, and a high degree of customer focus (see section 4.5). On the other hand, chapter 4 showed that the majority of LOC's have adopted weak statistical tools and QM techniques, show lack of management commitment, lack of training facilities, have a weak customer focus, and a low degree of empowerment and teamwork (see barriers to adoption of QM, section 4.5). This means the reasons for low complaint rates in the foreign owned companies could be due to their better adoption and implementation of QM tools and techniques.

The comparison in terms of high and low numbers of complaints was also conducted for local owned companies (see table 6.13). The low number of complaints LOC's are those which have received fewer than 15 complaints, and the high number of complaints 15 or more. The researcher randomly picked five LOC's from each group (see table 6.13).The high rate of complaints companies were found to be those not adopting QC practices such as control chart and statistical methods, quality audits, testing of product variability, and their level of productivity was low (see table 6.13). On the other hand, the companies, which have a low rate of complaints, have applied statistical tools and techniques, adopted quality audit practice, and implemented product variability practice (see table 6.13); their level of productivity was observed to be high. This means implementation of these three QM practices reduces the rate of complaints and consequently improves quality and productivity. Therefore, it is recommended that local companies adopt and implement these three

practices to reduce the rate of complaints about their manufactured products. This recommendation is reflected in the proposed framework for the implementation of QM practices which is presented in chapter seven.

HIGH COMPLAINS LOC`s				LOW COMPLAINS LOC`s			
Productivity	Control chart & statistical Methods	Quality Audits	Testing of product variability	Productivity	Control chart & statistical Methods	Quality Audits	Testing of product variability
6	X	X	X	18	✓	✓	✓
8	X	X	X	19	✓	✓	✓
8	X	X	X	17	✓	✓	✓
9	X	X	X	19	✓	✓	✓
10	X	X	X	18	✓	✓	✓

Table 6.13: Comparison between high and low rate of complaints LOC's

Additionally, the analysis of the raw data also ascertained that of all the LOC's, those that had effectively adopted and implemented QM tools and techniques achieved higher quality and productivity by reducing the rate of scrap, rework, and defects (see table 6.5 - 6.13). This shows that there is a positive link between quality and productivity.

Therefore it is recommended that local companies adopt and implement QM tools and techniques, through strong management commitment, better planning and effective communication with employees, by adopting a participative style of management, by using competitive benchmarking techniques, and by putting more emphasis on training and educating their employees.

6.6.2 Comparison of Performance based on measures of quality

This sub-section compares measures of quality for foreign and local companies, as presented in *Table 6.14*. T-test statistics were employed to further validate the

results generated by cross tabulation, to identify whether significant differences exist between measures of quality on the basis of ownership.

Table 6.14: Comparison of performance between FOC's and LOC's based on measures of quality

Variable	t.test	Df	Sig.(2tailed)	Mean diff	Eta squared	Effect of size
Scrap	***-11.217***	***259***	***0.000***	***-1.330***	***0.32***	***Large***
Rework	***-12.262***	***258***	***0.000***	***-1.465***	***0.36`***	***Large***
Defects	***-10.391***	***248***	***0.000***	***-1.201***	***0.28***	***Large***
Complaints	***-7.137***	***198***	***0.000***	***-0.637***	***0.16***	***Large***

Notes: Level of significance is calculated by using t-test statistics for independent sample.

As shown in *Table 6.14*, significant difference within the means occurred between FOC's and LOC's for each measure of quality, as p.value<0.05. The reasons could be that foreign companies have not only adopted statistical tools and QM techniques, but have also effectively implemented these tools and techniques in their operations (see section 6.29). In addition, these companies have a smaller degree of variation in their products, high efficiency of operations, and their employees are satisfied with their jobs. Hence, it may be concluded that FOC's have performed better in terms of quality because they produce less scrap, rework and defects, and have fewer complaints than LOC's (see tables 6.5 and 6.12). Similarly, the magnitude of differences in the means of FOC's and LOC's suggests a large effect of size, putting foreign companies well ahead of local ones. The evidence from chapter five, further highlights that all foreign companies have higher productivity and a better financial performance (see section 5.11).

6.7 Relationship between scrap, ownership and business sector

The study also examined the relationship between scrap rate, ownership and business sector by cross tabulation. *Table 6.15* illustrates the percentage of scrap the relationship with ownership status and industrial categorization. As shown in *Table 4.1*, the automobile sector consists of 25 companies; 18 of these, equally

distributed between both groups, admitted scrap rates of less than 1%. The remaining seven automobile companies, reporting a scrap rate between 1 and 5% comprised six LOC's and one FOC. Evidence from chapters 4 and 5 suggests that automobile manufacturing companies in Pakistan are clearly performing better than the other five sectors.

Table6.15: Cross tabulation between percentage scrap`, type of ownership and business sector

		Sectors						
%Scrap	Ownership status	Automobile	Chemicals	Engg	Food	Pharma	Textile	Total
Less than 1%	FOC's	9 (18.4%)	3 (6.1%)	8 (16.3%)	4 (8.2%)	4 (8.2%)	21 (42.9%)	49 (100%)
	LOC's	9 (20.9%)	3 (7.0%)	9 (20.9%)	3 (7.0%)	7 (16.3%)	12 (27.9%)	43 (100%)
Total		18 (19.6%)	6 (6.5%)	17 (18.5%)	7 (7.6%)	11 (12.0%)	33 (35.9%)	92 (100%)
1 to 5%	FOC's	1 (4.5%)	0 (0%)	4 (18.2%)	2 (9.1%)	4 (18.2%)	11 (50.0%)	22 (100%)
	LOC's	6 (12.8%)	2 (4.3%)	9 (19.1%)	4 (8.5%)	9 (19.1%)	17 (36.2%)	47 (100%)
Total		7 (10.1%)	2 (2.9%)	13 (18.8%)	6 (8.7%)	13 (18.8%)	28 (40.6%)	69 (100%)
5 to 10%	FOC's	0 (0%)	0 (0%)	1 (25.0%)	0 (0%)	1 (25.0%)	2 (50.0%)	4 (100%)
	LOC's	0 (0%)	6 (15.0%)	5 (12.5%)	0 (0%)	10 (25.0%)	19 (47.5%)	40 (100%)
Total		0 (0%)	6 (13.6%)	6 (13.6%)	0 (0%)	11 (25.0%)	21 (47.7%)	44 (100%)
10 to 15%	FOC's	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (100%)
	LOC's	0 (0%)	5 (13.9%)	6 (16.7%)	1 (2.8%)	2 (5.6%)	22 (61.1%)	36 (100%)
Total		0 (0%)	5 (13.9%)	6 (16.7%)	1 (2.8%)	2 (5.6%)	22 (61.1%)	36 (100%)
More than 15%	FOC's	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (100%)
	LOC's	0 (0%)	1 (4.3%)	1 (4.3%)	1 (4.3%)	0 (0%)	20 (87.0%)	23 (100%)
Total		0 (0%)	1 (4.3%)	1 (4.3%)	1 (4.3%)	0 (0%)	20 (87.0%)	23 (100%)

It was also revealed from the study data that all auto companies have responded positively to the barriers encountered during adoption of QM (see section 4.5).

The high rate of productivity with the low percentage of scrap across all automobile companies may suggest that these companies have effectively adopted and implemented QM tools and techniques to reduce their scrap rate and increase

productivity. Analysis of the raw data for LOC's producing less than 5% of scrap revealed that both groups is rather narrow in terms of productivity score and implementation factors (see table 6.16).

This overall higher productivity and higher scores in QM implementation factors among local automobile manufacturers suggest that QM tools and techniques have effectively learnt from foreign companies. The automotive sector in Pakistan is heavily dominated by Japanese companies, which carry out assembly operations and are heavily dependent on the local auto parts vendors.

LESS THEN 1% SCRAP PRODUCING AUTOMOBILE COMPANIES											
Productivity	Leadership	Managment Commitment	Organisation Communication	Mangement Style	Training	Emppowerment	Employee Motivation	Teamwork	Award Reward System	Technology /Inovation	Customer Focus
25	22	21	18	30	31	21	20	29	22	24	26
26	21	22	18	29	30	20	21	29	22	25	25
24	22	22	17	30	29	22	20	28	21	23	27
25	22	22	18	31	30	21	19	27	20	24	27
24	23	21	18	32	30	19	19	26	23	25	28
1-5% SCRAP PRODUCING AUTOMOBILE COMPANIES											
Productivity	Leadership	Managment Commitment	Organisation Communication	Mangement Style	Training	Emppowerment	Employee Motivation	Teamwork	Award Reward System	Technology /Inovation	Customer Focus
21	19	20	14	22	26	20	17	24	20	20	24
22	20	19	15	22	28	19	18	22	12	19	25
23	18	18	16	21	31	18	20	23	13	19	23
21	19	20	15	23	30	17	19	24	13	20	24
22	20	19	14	22	27	18	18	25	14	20	24

Table: 6.16: Comparison between local automobile companies based on % of scrap

This result validate the findings of Punnakitikashem *et al.,* (2010), who found a positive supply chain relationship between OEM assemblers and component suppliers for ASEAN automobile manufacturers.

As illustrated in *Table 4.1,* the chemical sector comprises 20 companies:3 FOC's and17 LOC's. As shown in *Table 6.15*, all three foreign companies reported a scrap rate less than 1%. On the other hand, only 3 local chemical manufacturing companies claimed less than 1%. Of the remaining 14 local companies, only two had

a scrap rate of 1 to 5%, 6 reported 5 to 10%, 5 companies 10 to 15% and 1 greater than 15%.

This study found diverse results for local chemical companies (see tables 6.6 and 6.8), which suggest that adoption of QM does not work unless the infrastructure for implementation of QM factors is improved. Similarly, foreign chemicals companies have demonstrated that the effective adoption and implementation of elements of QM lead to high quality and high productivity. Therefore, it is recommended that local companies adopt a participative style of management, improve planning strategies, and focus on training and benchmarking techniques; it is specially recommended that they implement statistical tools and techniques like SPC and QFD, and later on six sigma or Lean, to systematically improve quality and productivity. These recommendations are reflected in the proposed framework for the implementation of QM practices which is presented in chapter seven and also the practices for adoption of QM practices presented in figure 7.2.

As shown in *Table 4.1*, there are 43 respondents from the engineering sectors: 30 local and 13 FOC's. Of the 13 foreign engineering companies, 8 reported scrap percentage less than 1%. Out of five of the remaining companies, four of them agreed scrap rate between 1 to 5%. Only one FOC has, admitted scrap rate of 5 to 10% (see table 6.15). Contrary, in the case of local engineering companies, only nine companies stated scrap rate below 1%. Of the remaining 21 LOC's, 9 reported scrap rate between 1 to 5%, five companies reported rate of scrap between 5 to 10%. Again, 6 local companies pointed out that their percentage scrap between 10 to 15%, while only one local manufacturer reported rate of scrap greater than 15% (see table 6.15).

It was observed from the study data that all nine of the less scrap producing local companies had adopted range of QM practices (see table 6.15), and that these companies have high productivity and higher score for QM implementation factors than other local companies. Although the pattern of differences between foreign and locally owned engineering companies is the same, as was identified in the previous chapters that FOC's are better implementers of QM tools and techniques which consequently affects their productivity and financial performance (see section 4.5 and 5.3).

Again, the high rate of scrap produced by the local companies, lead the researcher to investigate the raw data for further analysis. Before analyzing the data, the companies were categorized into two group based on scrap rate (in percentage). The low scrap producing local owned companies produces scrap rate of less than 1 to 10% scrap, while high scrap producing local owned companies produces scrap rate from 10 to more than 15% scrap. The researcher randomly picked six local owned companies from high scrap producing group, two (2) from engineering sector, one (1) food manufacturing company and three (3) from pharmaceutical sector (see table 6.17). In addition, for comparison purpose, same type of companies was selected from low scrap producing group (see table 6.17).

From the *Table 6.17* it can be seen that, of the six high scrap companies, two companies adopted only ISO 9000 QM practice. Whereas low scrap producing companies are using multiple or wide range of quality management practices. *Table 6.17* also compares local companies in terms of high scrap and low scrap production. This comparison is made on the basis of QM practices, productivity, and QM implementation factors such as management knowledge, management commitment, training, empowerment, employee motivation, teamwork, award/reward

system, technology, and customer focus. The calculation of scores for implementation factors of QM were made, by adopting the same approach that were used in calculating productivity (see section 5.2).From the table it can be stated that high scrap producing companies have low score for productivity, management knowledge, management commitment, training, empowerment, employee motivation, teamwork, award/reward system, technology, and customer focus (see table 6.17). For example, the first engineering company from high scrap LOC's have low productivity score nine (9) compared to the low scrap producing engineering company with twenty one (21) productivity score.

HIGH SCRAP PRODUCING LOCs											
Sector	QM Practices	Productivity	Management Knowledge	Management Commitment	Training	Empowerment	Employee Motivation	Teamwork	Award Reward System	Technology /Innovation	Customer Focus
Engg	NIL	9	18	19	12	10	13	12	9	13	14
Engg	NIL	9	17	18	13	12	12	14	9	14	13
Food	ISO 9000	14	18	17	14	10	14	13	9	13	14
Pharma	NIL	11	18	18	13	12	12	15	8	12	15
Pharma	ISO 9000	12	19	20	14	13	13	14	10	13	14
Pharma	NIL	11	20	20	15	12	14	13	9	14	14
LOW SCRAP PRODUCING LOCs											
Sector	QM Practices	Productivity	Management Knowledge	Management Commitment	Training	Empowerment	Employee Motivation	Teamwork	Award Reward System	Technology /Innovation	Customer Focus
Engg	ISO,SPC, Lean	21	23	20	28	18	18	24	16	26	24
Engg	ISO,SPC JIT,TQM	20	22	21	26	20	17	22	15	24	23
Food	ISO,SPC, JIT,TQM	21	22	20	25	18	16	24	14	25	21
Pharma	ISO,SPC,6 SIGMA	22	25	22	30	21	20	27	16	24	22
Pharma	ISO SPC JIT 5S Lean	21	22	21	28	20	18	25	15	26	20
Pharma	ISO,SPC KAIZEN ,Lean	22	22	22	27	19	19	26	16	27	21

Table: 6.17: Comparison between high and low scrap producing LOCs

In the same manner, in the case of pharmaceutical companies, productivity score for first high scrap pharmaceutical company is eleven (11), compared to twenty two (22) score for low scrap pharmaceutical company as shown in table 6.17. This proves

that effective adoption and implementation of tools and techniques of QM increases productivity and quality by bringing the rate of scrap down (see table 6.17). Additionally, high scrap producing companies have encountered various problems such as high employee turnover, a high degree of variability in production processes, low morale of employees, and a high frequency of inspections (see table 6.31).

Table 4.1 indicates that the textiles are the largest of the six sectors, with 129 responding companies. Of these, 33 reported scrap rate below 1%. Eleven(11) FOC's and seventeen (17) LOC's agreed scrap rate between 1 to 5%, only two(2) foreign companies and nineteen(19) local companies reported scrap between 5 to 10%. However, twenty two (22) LOC's reported scrap rate about 10 to 15% and finally, twenty (20) local companies reported scrap rate more than 15%.

It was revealed from the analyses of the raw data that, less scrap producing local textile companies have achieved better productivity level. Similarly, it was also found that these textile companies have adopted some form of QM practices (see table 6.6). It was also observed from the study data that, these companies have better implemented elements of QM in their companies (see table 6.6). However, the evidence from the data has also shown that textile sector is the weakest adopter of QM practices (see section 4.4). The investigation of the raw data further revealed that sole reliance on ISO 9000 does not necessarily impact positively on quality and productivity of the companies (see table 6.6), unless management pay particular attention to the implementation factors. Therefore, based on the evidence from the data, it is suggested to the local textile companies to adopt and implement tools and techniques of QM with strong management commitment and effective planning.

6.8 Relationship between rework, ownership and business sector

This section examines the effect of ownership (foreign or local) on the rate of rework and its relationship with industrial categorization; see *Table 6.18*.

Table 6.18: Cross tabulation between percentage rework, type of ownership and business sector

		Sectors						
%Rework	**Ownership status**	**Automobile**	**Chemicals**	**Engineering**	**Food**	**Pharma**	**Textile**	**Total**
Less than 1%	FOC's	8 (22.2%)	1 (2.8%)	6 (16.7%)	1 (2.8%)	5 (13.9%)	15 (41.7%)	36 (100%)
	LOC's	6 (22.2%)	2 (7.4%)	5 (18.5%)	1 (3.7%)	3 (11.1%)	10 (37.0%)	27 (100%)
Total		14 (22.2%)	3 (4.8%)	11 (17.5%)	2 (3.2%)	8 (12.7%)	25 (39.7%)	63 (100%)
1 to 5%	FOC's	2 (5.9%)	2 (5.9%)	5 (14.7%)	4 (11.8%)	3 (8.8%)	18 (52.9%)	34 (100%)
	LOC's	7 (14.3%)	2 (4.1%)	9 (18.4%)	4 (8.2%)	9 (18.4%)	18 (36.7%)	49 (100%)
Total		9 (10.8%)	4 (4.8%)	14 (16.9%)	8 (9.6%)	12 (14.5%)	36 (43.4%)	83 (100%)
5 to 10%	FOC's	0 (0%)	0 (0%)	2 (40.0%)	1 (20.0%)	1 (20.0%)	1 (20.0%)	5 (100%)
	LOC's	2 (5.4%)	4 (10.8%)	5 (13.5%)	3 (8.1%)	9 (24.3%)	14 (37.8%)	37 (100%)
Total		2 (4.8%)	4 (9.5%)	7 (16.7%)	4 (9.5%)	10 (23.8%)	15 (35.7%)	42 (100%)
10 to 15%	FOC's	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (100%)
	LOC's	0 (0%)	7 (15.6%)	8 (17.8%)	0 (0%)	6 (13.3%)	24 (53.3%)	45 (100%)
Total		0 (100.0%)	7 (15.6%)	8 (17.8%)	0 (100.0%)	6 (13.3%)	24 (53.3%)	45 (100%)
More than 15%	FOC's	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (100%)
	LOC's	0 (0%)	2 (5.9%)	3 (8.8%)	1 (2.9%)	1 (2.9%)	27 (79.4%)	34 (100%)
Total		0 (100.0%)	2 (5.9%)	3 (8.8%)	1 (2.9%)	1 (2.9%)	27 (79.4%)	34 (100%)

From *Table 6.18* the percentages of both groups (LOC's and FOC's) with rate of rework and business sector are shown on the basis of industrial categorisation of the sample companies. Of the 25 auto companies, 8 foreign companies stated rate of rework less than 1%. Similarly, in the case of local owned companies, only 6 reported rework below 1%. Of the remaining eleven auto companies, 2 FOC's reported rate of rework between 1 to 5%. Of the remaining seven local companies, 5 of them reported rate of rework between 1 to 5%, while 2 companies stated rate of rework between 5 to 10%. Once again, the evidence proves that overall automobile

sector produces less rework. This evidence of less rework in auto companies, further strengthen the results of chapter 4 and 5 which suggests that, there is a strong link between QM and productivity of the automobile sector. It was observed from the study data that, all automobile companies have adopted wide range of QM practices such as ISO 9000, SPC, JIT, TQM, Six sigma, Lean, Reengineering, 5S, and Kaizen. Furthermore, all automobile companies have better implemented QM factors (see section 4.5). Thus, it can be concluded that better adoption and implementation of tools and techniques of QM reduces negative quality (scrap, rework, defects, and complaints), increase quality and productivity of the companies.

Based on the criteria set in section 6.6, eight (8) local chemical manufacturing companies were identified as low rework chemical companies (see table 6.18). Similarly, nine (9) local chemical companies were found as high rework chemical companies (see table 6.18). The researcher randomly picked three (3) local owned companies from high rework producing group. In addition, for comparison purpose, (3) companies were also selected from low rework producing group (see table 6.19). From the *Table 6.19*, it can be seen that high rate of rework chemical manufacturing companies are using highly advanced QM practices such as SPC, TQM, and Six sigma, whereas low rework chemical manufacturing companies are using practices like ISO 9000, SPC, and JIT.

Table 6.19 also compares companies in terms of high rework and low rate of rework during the production. This comparison is made on the basis of QM practices, productivity, management commitment, training, management style and teamwork.

HIGH Rework LOC							HIGH Rework LOC						
Sector	QM Practices	Productivity	Managment Commitment	Training	Managment Style	Team work	Sector	QM Practices	Productivity	Managment Commitment	Training	Managment Style	Team work
Chem	ISO 9000 , TQM,SPC ,6 Sigma	11	11	13	13	13	Chem	ISO 9000 ,SPC ,5S, JIT	18	15	23	21	18
Chem	ISO 9000 , SPC,QC CIRCLE	12	12	14	12	13	Chem	ISO 9000 , SPC	19	16	26	19	16
Chem	ISO 9000	8	12	13	12	12	Chem	ISO 9000,Re-Eng	18	14	26	19	18

Table 6.19: Comparison between high and low rate of rework LOC's

From *Table 6.19*, it can be seen that high rework producing companies have lower scores for productivity, management commitment, training, management style and teamwork than low scrap producing companies. For example, the first company in the table has a high rate of rework with a low productivity score (11), compared to the corresponding low scrap producing company with a productivity score of 18. In the same manner, other QM elements such as management commitment, training, management style and teamwork were compared between high and low rework companies. In section 4.5, it was shown that, apart from adoption of QM practices, local Pakistani companies have faced issues of implementation of QM practices. The major reasons for poor implementation is the same as those identified in section 4.5. Most of the local companies lack planning, have an authoritarian style of management, inappropriate communication of vision and mission at all levels, unfavourable employee training opportunities, less employee motivation, low skills and a low education level of employees, and failure to adopt benchmarking tools and techniques. In order to overcome the implementation problems, it is recommended that the local companies adopt a participative style of management, and focus on training, planning, benchmarking and increasing employee commitment, which would be helpful in the effectively implementation of QM practices.

Similarly, the pattern of difference for reworks below 10% and above 10% for engineering, food and pharmaceutical companies is the same as found in section 6.7. Therefore, overall it may be concluded that foreign companies have a lower rate of rework with higher productivity level because of better adoption of QM tools and techniques (see table 6.18).

The evidence from *Table 6.18* implies that majority of the local textile companies have a high rate of rework. As was found in chapter 4, local textile companies are the weakest adopters of QM tools and techniques.

It was also revealed from the analysis of the data, that the high rework producing local textile companies have low productivity; they are weaker in implementing QM elements such as organizational communication, training, management style, empowerment, and motivation than are the low rework textile companies (see table 6.7). However, it was found from the analysis of the data that the top management of these companies have sufficient knowledge about the positive relationship between quality and productivity but have failed to transmit this knowledge across their companies (see section 4.5). However, foreign textile companies have not only achieved a higher productivity level but their rate of rework is very low compared to that of LOC's (see table 6.18). The reason could be that foreign manufacturers have effectively adopted and implemented QM tools and techniques, unlike the LOC's.

6.9 Relationship between defects, ownership and business sector

Table 6.20 represents the percentage defects by FOC's and LOC's and their relationship based on industrial categories. Again, it is clear from *Table 6.20* that more than 93% of foreign companies across all six manufacturing sectors produces low percentage of defects. This evidence further supports the previous finding of a strong link between quality and productivity of all foreign companies. On the other

hand, more than 28% of LOC's across all six manufacturing sectors have a high rate of defects, of more than 10%. This high percentage rate of defects led the researcher to investigate the raw data further.

Table 6.20: Cross tabulation between percentage defects, type of ownership and business sector

		Sectors						
%Defects	Ownership status	Automobile	Chemicals	Engineering	Food	Pharma	Textile	Total
Less than 1%	FOC's	8 (17.4%)	3 (6.5%)	8 (17.4%)	2 (4.3%)	3 (6.5%)	22 (47.8%)	46 (100%)
	LOC's	9 (20.5%)	4 (9.1%)	9 (20.5%)	4 (9.1%)	8 (18.2%)	10 (22.7%)	44 (100%)
Total		17 (18.9%)	7 (7.8%)	17 (18.9%)	6 (6.7%)	11 (12.2%)	32 (35.6%)	90 (100%)
1 to 5%	FOC's	2 (8.3%)	0 (0%)	4 (16.7%)	3 (12.5%)	6 (25.0%)	9 (37.5%)	24 (100%)
	LOC's	5 (11.6%)	1 (2.3%)	8 (18.6%)	4 (9.3%)	9 (20.9%)	16 (37.2%)	43 (100%)
Total		7 (10.4%)	1 (1.5%)	12 (17.9%)	7 (10.4%)	15 (22.4%)	25 (37.3%)	67 (100%)
5 to 10%	FOC's	0 (0%)	0 (0%)	1 (20.0%)	1 (20.0%)	0 (0%)	3 (60.0%)	5 (100%)
	LOC's	1 (2.1%)	5 (10.4%)	8 (16.7%)	0 (0%)	8 (16.7%)	26 (54.2%)	48 (100%)
Total		1 (1.9%)	5 (9.4%)	9 (17.0%)	1 (1.9%)	8 (15.1%)	29 (54.7%)	53 (100%)
10 to 15%	FOC's	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (100%)
	LOC's	0 (0%)	5 (12.5%)	5 (12.5%)	0 (0%)	3 (7.5%)	27 (67.5%)	40 (100%)
Total		0 (100.0%)	5 (12.5%)	5 (12.5%)	0 (100.0%)	3 (7.5%)	27 (67.5%)	40 (100%)
More than 15%	FOC's	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (100%)
	LOC's	0 (0%)	1 (7.7%)	0 (0%)	1 (7.7%)	0 (0%)	11 (84.6%)	13 (100%)
Total		0 (100.0%)	1 (7.7%)	0 (100.0%)	1 (7.7%)	0 (100.0%)	11 (84.6%)	13 (100%)

Table 6.21 compares low and high defect rates among local companies on the basis of productivity scores and elements of QM (leadership, management commitment, training, management style and customer focus).

The selection and comparison of high and low rate of defects LOC's were made by adopting the same approach used in section 6.6. Overall, five companies from different sectors (chemical, engineering, food, pharmaceutical and textiles) were considered in this analysis. Evidence from *Table 6.21* shows that companies with a high rate of defects achieved a low level of productivity, and similarly have low

scores for all selected elements of quality management: leadership, management commitment, training, management style and customers focus. On the other hand, companies, which have a low rate of defects, have better productivity scores as well as better scores for the selected elements of QM. The result of this analysis suggests that effective adoption and implementation of elements of QM increases quality and productivity by reducing the rate of defects.

High Rate of Defects LOC							Low Rate of Defects LOC						
Sector	Productivity	Leadership	Mangement Commitment	Training	Mangement Style	Customer Focus	Sector	Productivity	Leadership	Mangement Commitment	Training	Mangement Style	Customer Focus
Chem	6	12	12	11	10	13	Chem	18	18	17	22	21	24
Engg	7	13	14	14	13	15	Chem	20	21	22	25	24	26
Food	8	14	14	15	14	16	Text	17	21	21	26	25	27
Pharma	8	13	13	16	14	15	Text	18	20	20	28	24	28
Text	6	12	12	13	13	14	Text	20	17	17	22	22	23

Table 6.21: Comparison between high and low rate of defects LOC's

The evidence from the analysis of the raw data further suggests that the majority of LOC's are poor at implementing the tools and techniques of QM (see section 6.6). They also encounter various problems such as high employee turnover, a high degree of variability in production processes, low morale of employees, and high frequency of inspections (see table 6.11). However, those local companies that have effectively adopted and implemented various QM tools and techniques have achieved high quality and high productivity by reducing their rate of defects (see table 6.11).

6.10 Relationship between rate of complaints, ownership and business sector

The relationship between customers' complaints, type of ownership and business sector were also analysed (see table 6.22). It is shown from *Table 6.22*, all 10

foreign auto manufacturing companies has received less than five complaints normally on monthly basis. Similarly, in the case of 15 local auto companies, 9 of them reported to receive less than 5 complaints on monthly basis.

Table6.22: Cross tabulation between No of complaints, type of ownership and business sector

		Sectors						
No of complaints	Ownership status	Automobile	Chemicals	Engg	Food	Pharma	Textile	Total
Less than 5	FOC's	10 (17.9%)	1 (1.8%)	9 (16.1%)	2 (3.6%)	8 (14.3%)	26 (46.4%)	56 (100%)
	LOC's	9 (13.6%)	3 (4.5%)	10 (15.2%)	5 (7.6%)	11 (16.7%)	28 (42.4%)	66 (100%)
Total		19 (15.6%)	4 (3.3%)	19 (15.6%)	7 (5.7%)	19 (15.6%)	54 (44.3%)	122 (100%)
5-10	FOC's	0 (0%)	2 (13.3%)	4 (26.7%)	2 (13.3)	1 (6.7%)	6 (40.0%)	15 (100%)
	LOC's	6 (7.4%)	4 (4.9%)	12 (14.8%)	2 (2.5%)	11 (13.6%)	46 (56.8%)	81 (100%)
Total		6 (6.3%)	6 (6.3%)	16 (16.7%)	4 (4.2%)	12 (12.5%)	52 (54.2%)	96 (100%)
10-15	FOC's	0 (0%)	0 (0%)	0 (0%)	2 (50.0)	0 (0%)	2 (50.0%)	4 (100%)
	LOC's	0 (0%)	9 (23.1%)	7 (17.9%)	1 (2.6%)	5 (12.8%)	17 (43.6%)	39 (100%)
Total		0 (100.0%)	9 (20.9%)	7 (16.3%)	3 (7.0%)	5 (11.6%)	19 (44.2%)	43 (100%)
Greater than 15	FOC's	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (100%)
	LOC's	0 (0%)	1 (12.5%)	1 (12.5%)	1 (12.5)	1 (12.5%)	4 (50.0%)	8 (100%)
Total		0 (100.0%)	1 (12.5%)	1 (12.5%)	1 (12.5)	1 (12.5%)	4 (50.0%)	8 (100%)

However, 6 remaining local auto manufacturers have reported 5-10 complaints each month. This indicates that, overall auto companies have received less customer complaints compare to other type of companies. Apart from auto sector, foreign companies surpassed the local owned companies in every single sector by receiving very few complaints from customers (see table 6.22).

Moreover, it was also found from the analyses of the data that the high rate of complaints are associated with the local companies that were not adopting QC practices like control chart and statistical methods, quality audits, and testing of product variability (see table 6.13). The level of productivity for such companies was also found to be low (see table 6.13). On the other hand, the companies, which have

low rate of complaints, have applied statistical tools and techniques, adopted quality audits practice, and implemented product variability practice (see table 6.13). Similarly, the high level of productivity was observed in the case of low rate of complaints local companies. This means implementation of tools and techniques of QM practices ultimately reduces rate of complaints and consequently improves quality and productivity. Therefore, it is recommended to the local companies to adopt and implement statistical tools and techniques of QM, quality audits, testing of product variability techniques by mean of strong management commitment, effective planning, educating and training of employees.

6.11 Summary

The focus of sections 6.1 to 6.22 was to shed light on the internal and external measures of quality (scrap, rework, defects and complaints) by comparing them with different data characteristics. First it indicated the average percentage of total products considered as scrap, rework, and defective by the responding companies during the manufacturing processes, and number of complaints received on a monthly basis.

The in-depth investigation into the performance of responding companies against selected measures of quality used cross tabulation to draw relationships on the basis of ownership. The results of cross tabulation between ownership status and measures of quality suggest that foreign owned companies outperformed the locally owned companies on every measure of quality. From the results of the crosstabs, it was observed that, the, majority of FOC's generated less scrap, rework, defects and complaints than the LOC's.

Additionally, t-test statistics were used to strengthen the results by describing and analyzing the statistics to ascertain the differences within the data. The result

showed a significant difference between FOC's and LOC's. Furthermore, the statistics indicated a large effect of size for scrap, rework, defects and complaints. During the analysis of the data for local Pakistani companies, the researcher found that some of the companies that claimed to have adopted highly sophisticated practices like SPC, TQM and Six Sigma were producing high levels of scrap, rework, defects and complaints. These companies were found to have poorly implemented QM elements; their productivity levels were also low. This means that the adoption of QM practices does not work unless the implementation structure is appropriate.

It was also confirmed from the study data that the companies which produce high scrap, rework, defects and complaints are the same companies which answered negatively to the barriers to adoption of QM practices (see section 4.5). These companies have been facing various challenges like, authoritarian style of management, weak planning, ineffective communication, weak implementation of QM programmes, inadequate training facilities, high employee turnover issues, limited role of suppliers on quality issues, low morale of employees, low education and low employee skills. These issues need to be resolved by effective planning and visionary leadership.

The results of crosstabs on the basis of ownership and type of industry proved that the companies that had effectively adopted and implemented QM tools and techniques achieved high quality and high productivity. It was revealed from the study of the raw data that most of the local manufacturing companies which have a low percentage of scrap, rework, defects and a low rate of complaints have adopted a range of QM practices, the most common being ISO 9000, SPC, TQM, JIT, QC circles, 5S, Reengineering and Kaizen. It was also found from inspection of the raw data that these companies have relatively better productivity and better financial

performance than those other local companies with high rates of scrap, rework, defects and complaints, suggesting effective implementation of QM tools and techniques by the former. However, it was found from the study data that the poor performance of the local companies in quality initiatives was due to poor implementation of QM practices.

It is recommended that such companies improve strategic planning, create a participative environment, improve communication through a top-down approach, encourage employees through education and training, empower employees, fix competitive pay and build a relationship of trust and equality with their employees and suppliers. It was also observed from analysis of the raw data that the majority of LOC's which rely solely on ISO 9000 practices were in the category of high scrap, rework and defects producing companies. This suggests that even though ISO standards provide a good platform to quality starter companies, their role are limited to QA. Over-dependency on ISO certification by locally owned manufacturing companies appears to be inadequate in offering an effective remedy to quality and productivity issues. It is imperative that Pakistani manufacturing companies focus on other QM practices.

Finally, the results of the cross tabulations based on ownership and type of business sector provided further information suggesting that foreign owned companies have noticeably lower rates of scrap, rework defects and complaints. However, the level of adoption of QM practices by foreign manufacturing is visibly high (see table 4.7 to 4.26), and the productivity level of all types of foreign company is noticeably high (see table 5.5).

6.12 Relationship between quality and productivity

The previous section summarized the results for measures of quality (internal and external) scrap, reworks, defects and complaints, and cross tabulated them with ownership, and industrial sector.

This section discusses two further objectives of the research:

- To examine the relationship between QM and productivity in manufacturing companies in Pakistan.
- To assess if there is a difference between foreign and locally owned companies in relationship to quality management and productivity.

Subsequently, for the purpose of answering the above objectives, the research questions below was used:

- What is the relationship between quality and productivity of manufacturing companies in Pakistan?
- What relationship exists between quality initiatives and productivity of FOC's and locally owned companies?

6.12.1 Relationship between measures of quality and productivity

The relationship between measures of quality (scrap, rework, defects and complaints) and productivity are examined by applying Pearson correlations. Essentially, particular attention was given to measures of quality related to FOC's and LOC's in each category of the data. The correlation analyses show strength and direction of relationship (positive or negative, strong or weak) between variables under study. Finally, the correlation test was useful in informing which measures of quality have a strong relationship with productivity.

Table 6.23 presents the results of correlation analyses for foreign owned companies between each measure of quality and productivity. From *Table 6.23*, all selected internal and external measures of quality show negative correlations with productivity. The correlations ranged from -.311 to -.415 and were significant at the 0.01. McCracken and Kaynak (1996) contributing to measures of quality by referred them as negative quality. They further argued that a decreases in negative quality will result in increased productivity. Thus, as quality increases, productivity increases.

Table 6.23: Relationship between measures of quality and productivity for FOC's

N	Internal & external measures of quality against productivity	Pearson Correlation	Sig. (2tailed)
75	Scrap & productivity	-.398**	.000
75	Rework & productivity	-.311**	.000
75	Defects & productivity	-.321**	.000
75	Complaints & productivity	-.415**	.000

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

However, the strength of correlation in the case of FOC's is relatively weak compared to locally owned companies (see table 6.24). The major reasons for this moderate negative correlation for foreign companies are:

(c) The sample of FOC's is much smaller than the sample of LOC's.

(d) All FOC's have a constantly high productivity score (see table 5.5).

(e) All FOC's have a low percentage of scrap, rework, defects and complaints (see tables 6.15, 6.18, 6.20, and 6.22 respectively).

The influence of the above factors dampens down the rate of correlation between measures of quality and productivity. Therefore, it shows only a moderate negative correlation between the variables under study.

Table 6.24 presents the results of correlation analysis for locally owned companies between each measure of quality and productivity.

Table 6.24: Relationship between measures of quality and productivity for LOC's

N	Internal & external measures of quality against productivity	Pearson Correlation	Sig. (2tailed)
194	*Scrap & productivity*	*-.710***	*.000*
194	*Rework & productivity*	*-.652***	*.000*
194	*Defects &productivity*	*-.654***	*.000*
194	*Complaints & productivity*	*-.421***	*.000*

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

As shown in *Table 6.24*, each measure of quality was found to have a significant negative correlation with productivity, ranging from -.421 to -.710 and significant at the 0.01 level. The reason for this high rate of correlation is that there are distinct differences in terms of quality and productivity across the local companies. Similarly, it was proved in section 6.6 and 6.8 that local companies that effectively adopted and implemented different QM tools and techniques are better in terms of quality and productivity. This means better implementation of QM practices leads to improvement in productivity and quality by reducing the rate of scrap, rework, defects and complaints.

6.13 Summary

A significant negative correlation was found between internal and external measures of quality and productivity scores. This means that productivity tends to increase with improved quality because of reduced scrap, rework, defects and complaints.

It follows from the above results that the companies need to run their operations correctly instead of wasting labour hours on reworking. Similarly, purchasing the right materials at the right time, delivered to the right place at minimum cost, is imperative in order to produce good quality defect-free output. It was proved in sections 6.6, 6.8, 6.11 that effective implementation of QM tools and techniques reduces rates of scrap, rework, defects and complaints. Finally, evidence from section 4.5 suggests that effective planning; a participative style of management, open communication, training and education of employees, effective use of benchmarking techniques,

innovation and advances in the use of technology could be the factors that increase quality and productivity.

6.14 Relationship between measures of quality and QM practices

The correlations between QM practices and measures of quality are displayed for LOC's and FOC's in *Tables 6.25* and *6.26* below.

Table 6.25 presents the relationship between measures of quality and QM practices for foreign owned companies. Again, evidence from *Table 6.25* suggests that the strength of the average correlation between measures of quality and QM practices for FOC's is relatively weak. However, evidence from chapters four and five pointed out that FOC's outperformed LOC's in terms of adoption of QM practices and productivity scores. Similarly, it can be seen from section 4.5 that FOC's are better in terms of implementation of elements of QM such as management style, planning, communication, benchmarking, training, empowerment, innovation and technology. Additionally, all responding foreign companies are producing a constantly low percentage of scrap, rework, defects and complaints (see tables 6.15, 6.18, 6.20, and 6.22 respectively).

Table 6.25: Relationship between measures of quality and QM practices for FOC's

QM Practices	Scrap	Rework	Defects	Complaints	Avg "r_{pb}"
ISO 9000	-0.182	-0.180	-0.237	-0.328	-0.231
SPC	-0.350	-0.389	-0.436	-0.215	-0.347
TQM	-0.311	-0.518	-0.284	-0.420	-0.383
QC circle's	-0.057	-0.043	-0.043	-0.212	-0.088
JIT	-0.324	-0.195	-0.071	-0.183	-0.193
5S	-0.243	-0.109	-0.031	-0.224	-0.151
Six sigma	-0.173	-0.240	-0.144	-0.172	-0.182
Kaizen	-0.171	-0.130	-0.023	-0.082	-0.101
Lean	-0.191	-0.208	-0.165	-0.186	-0.187
Reengineering	-0.188	-0.180	-0.224	-0.167	-0.189

Hence, it may be concluded that, based on the evidence from previous chapters, there is a strong link between quality and productivity in the foreign companies.

Table 6.26: Relationship between measures of quality and QM practices for LOC's

QM Practices	Scrap	Rework	Defects	Complaints	Avg "rpb"
ISO 9000	***-0.705***	***-0.646***	***-0.632***	***-0.406***	***-0.597***
SPC	***-0.512***	***-0.433***	***-0.526***	***-0.341***	***-0.453***
TQM	-0.339	-0.325	-0.330	-0.270	-0.316
QC circle's	-0.367	-0.379	-0.366	-0.316	-0.357
JIT	***-0.498***	***-0.530***	***-0.482***	***-0.393***	***-0.475***
5S	***-0.413***	***-0.399***	***-0.427***	***-0.373***	***-0.403***
Six sigma	-0.234	-0.238	-0.240	-0.218	-0.232
Kaizen	-0.316	-0.289	-0.318	-0.309	-0.308
Lean	-0.234	-0.185	-0.239	-0.141	-0.199
Reengineering	-0.345	-0.219	-0.349	-0.280	-0.298

Table 6.26 depicts the average correlation of each measure of quality with the respective QM practices for LOC's. All the quality measures were found to be significantly negatively correlated with each of the selected QM practices. The average correlations ranged from -.0.199 to -0.597 and are significant at 0.01 levels. The result of the correlation analysis suggests that the effective implementation of QM tools and techniques plays a vital role in improving quality by reducing the negative qualities (scrap, rework, defects, and complaints) to increase overall quality and productivity. However, evidence from section 6.6 suggests that some LOC's rely heavily on ISO 9000, which does not necessarily have a strong effect on the quality measures. It was also found that the majority of the LOC's have failed in effectively implementing QC practices. Hence, it may be concluded from this result that the local companies that have effectively implemented QM practices have achieved high quality and productivity (see section 6.6).

6.15 Summary

The results of the correlation analysis between QM practices and measures of quality indicate that there is a significant negative correlation between all selected QM practices and measures of quality. However, LOC's show a statistically strong negative correlation. This may be due to the fact that LOC's have partially adopted and implemented QM practices. However, the FOC's have largely adopted and implemented QM practices and achieved higher productivity levels than LOC's. This

means that better implementation of QM practices leads to improvement in productivity and quality.

6.16 Relationship between QA/QC practices and type of ownership

Table 6.27 below shows the Likert-scale questions on different QA/QC practices, from (1) frequently used, up to (5) not used, with (3) uncertain. The table provides the percentage breakdown of responses including the frequency distribution for each question.

Q36a.*"Control charts and other statistical methods".*

The foreign companies have a clear edge in using statistical charts and methods. Hence, the low rate of scrap, rework, defects and complaints by FOC's identified in the previous sections confirms that they are performing better than local companies. Therefore, based on the evidence from the analysis of the data, it is recommended that LOC's effectively adopt and implement different statistical tools and QM techniques to improve quality and productivity.

Q36b.*"Preventive maintenance on schedule basis".*

Again, the majority of foreign respondents replied positively to this question. Scheduled preventative maintenance means identification of potential faults before they occur. This is generally assumed to be a worthwhile practice as it reduces the risk of failure of equipment and systems.

Table 6.27: Percentages of Quality Control Practices based on Ownership

36. Name of QA/QC practices		Frequently used	Moderately used	Uncertain	Rarely used	Not used	Total
a. Control charts and other statistical methods.	FOC'S	50 (66.7%)	16 (21.3%)	0(0%)	6(8.0%)	3(4.0%)	75(100%)
	LOC'S	53 (27.3%)	36 (18.6%)	13(6.7%)	27 (13.9%)	65(33.5%)	194 (100%)
Total		103 (38.3%)	52(19.3%)	13 (4.8%)	33 (12.3%)	68(25.3%)	269 (100%)
b. Preventive maintenance on Schedule basis.	FOC'S	35 (46.7%)	20(26.7%)	0 (0%)	16 (21.3%)	4(5.3%)	75 (100%)
	LOC'S	45 (23.2%)	33 (17.0%)	16 (8.2%)	42 (21.6%)	58(29.9%)	194 (100%)
Total		80 (29.7%)	53 (19.7%)	16 (5.9%)	58 (21.6%)	62 (23.0%)	269 (100%)
c. Process capability studies.	FOC'S	15 (20.0%)	22 (29.3%)	0 (0%)	28 (37.3%)	10(13.3%)	75 (100%)
	LOC'S	13 (6.7%)	38 (19.6%)	22 (11.3%)	38(19.6%)	83(42.8%)	194 (100%)
Total		28 (10.4%)	60 (22.3%)	22(8.2%)	66 (24.5%)	93 (34.6%)	269 (100.0%)
d. Product testing and inspection	FOC'S	70 (93.3%)	3 (4.0%)	0 (0%)	1 (1.3%)	1 (1.3%)	75 (100%)
	LOC'S	167 (86.1%)	21 (10.8%)	0 (0%)	3 (1.5%)	3 (1.5%)	194 (100%)
Total		237 (88.1%)	24 (8.9%)	0 (100%)	4 (1.5%)	4 (1.5%)	269 (100%)
e. Workers quality orientation program.	FOC'S	16 (21.3%)	27 (36.0%)	2 (2.7%)	24 (32.0%)	6 (8.0%)	75 (100%)
	LOC'S	13 (6.7%)	31 (16.0%)	36 (18.6%)	33 (17.0%)	81 (41.8%)	194 (100%)
Total		29 (10.8%)	58 (21.6%)	38(14.1%)	57 (21.2%)	87 (32.3%)	269 (100%)
f. Supplier quality evaluations.	FOC'S	35 (47.3%)	25 (33.8%)	2 (2.7%)	11 (14.9%)	1 (1.4%)	74 (100%)
	LOC'S	54 (27.8%)	43 (22.2%)	24 (12.4%)	37 (19.1%)	36 (18.6%)	194 (100%)
Total		89 (33.2%)	68 (25.4%)	26(9.7%)	48 (17.9%)	37 (13.8%)	268 (100%)
g. Incoming inventory testing and inspection.	FOC'S	63 (84.0%)	12 (16.0%)	0 (0%)	0 (0%)	0 (0%)	75 (100%)
	LOC'S	160 (82.5%)	25 (12.9%)	0 (0%)	2 (1.0%)	7 (3.6%)	194 (100%)
Total		223 (82.9%)	37 (13.8%)	0(100%)	2 (0.7%)	7 (2.6%)	269 (100%)
h. Quality audits	FOC'S	50 (66.7%)	23 (30.7%)	0(0%)	1 (1.3%)	1 (1.3%)	75 (100%)
	LOC'S	91 (46.9%)	41 (21.1%)	18 (9.3%)	21 (10.8%)	23 (11.9%)	194 (100%)
Total		141 (52.4%)	64 (23.8%)	18(6.7%)	22 (8.2%)	24 (8.9%)	269 (100%)
i. Engineering design and specification review.	FOC'S	47 (62.7%)	22 (29.3%)	0(0%)	5 (6.7%)	1 (1.3%)	75 (100%)
	LOC'S	113 (58.5%)	39 (20.2%)	10 (5.2%)	15 (7.8%)	16 (8.3%)	193 (100%)
Total		160 (59.7%)	61 (22.8%)	10(3.7%)	20 (7.5%)	17 (6.3%)	268 (100%)
j. Testing of work-in-process.	FOC'S	50 (66.7%)	21 (28.0%)	0(0%)	4 (5.3%)	0 (0%)	75 (100%)
	LOC'S	102 (52.8%)	53 (27.5%)	8 (4.1%)	11 (5.7%)	19 (9.8%)	193 (100%)
		152 (56.7%)	74 (27.6%)	8 (3.0%)	15 (5.6%)	19 (7.1%)	268 (100%)
k. Recording of employee's opinion on quality problems.	FOC'S	27 (36.0%)	23 (30.7%)	0 (0%)	25(33.3%)	0 (0%)	75 (100%)
	LOC'S	20 (10.3%)	22 (11.3%)	32 (16.5%)	21 (10.8%)	99 (51.0%)	194 (100%)
Total		47 (17.5%)	45 (16.7%)	32 (11.9%)	46 (17.1%)	99(36.8%)	269 (100%)
l. Inspection and testing of finished goods	FOC'S	62 (82.7%)	12 (16.0%)	0 (0%)	1 (1.3%)	0 (0%)	75 (100%)
	LOC'S	174 (89.7%)	13 (6.7%)	2(1.0%)	3 (1.5%)	2 (1.0%)	194 (100%)
Total		236 (87.7%)	25(9.3%)	2 (0.7%)	4 (1.5%)	2(0.7%)	269 (100%)
m. Testing of product variability.	FOC'S	52(69.3%)	19(25.3%)	0 (0%)	3 (4.0%)	1 (1.3%)	75 (100%)
	LOC'S	74(38.1%)	60(30.9%)	19(9.8%)	13(6.7%)	28 (14.4%)	194 (100%)
Total		126 (46.8%)	79(29.4%)	19 (7.1%)	16 (5.9%)	29 (10.8%)	269 (100%)

Q36c.*"Process capability studies".*

The purpose of process capability studies is to reduce variability in processing by systematically applying statistical tools and techniques. Fifty foreign respondents replied positively to this question. However, the majority of local respondents denied adopting this practice. It was observed from analysis of the raw data that all automobile companies agreed about using this practice.

Q36d.*"Product testing and inspection".*

Although, almost all respondents from both groups agreed that they used this practice, the high rate of customer complaints among locally owned companies suggests that they have not adequately implemented the practice, so it is recommended that they adopt it effectively in order to reduce the rate of complaints for their products.

Q36e.*"Workers quality orientation programme".*

The evidence showed more than 50% of foreign companies claimed to be using this practice. However, most LOC's ignore it. The literature of QM signifies that the training and improving of human resources always has positive effects on quality and productivity.

Q36f.*"Supplier quality evaluations".*

Foreign companies outperform local companies in terms of supplier quality evaluations. About 80% of the FOC's responded positively, whilst only 50% of the LOC's reported positively about using this important practice. Again, current QM literature proves that suppliers are major stakeholder in a company. The quality of the manufactured products is heavily influenced by the raw materials. Organizations always need to focus on supplier quality. It is highly recommended that the local

companies adopt and implement this important practice in order to improve quality and productivity.

Q36g.*"Incoming inventory testing and inspection".*

Once again, this is a highly regarded QA/QC practice; 97% of the total companies sampled responded positively.

Q36h.*"Quality audits".*

All foreign companies admitted that they implemented quality audits. On the other side, 30% of locally owned companies neglect this crucial practice. Similarly, the use of quality audits by local manufacturers were not reflected significantly in the internal and external measures of quality.

Q36i.*"Engineering design and specification review".*

Again, more than 82% of companies claimed that they were implementing this basic practice normally. However, the high percentage of measures of quality in the case of local companies suggests that these companies need improvement, by rectifying errors through the adoption of such techniques.

Q36j.*"Testing of work-in-process".*

Of the 269 responding companies, 226 admitted to testing work in process, frequently or moderately.

Q36k.*"Recording of employee's opinion on quality problems".*

A large number of foreign companies replied positively to this question. However, the practice is rare among local companies. It was also evident from chapter four that most of the foreign companies have an employee suggestion system, and management of these companies has adopted collaborative strategies for improving quality and productivity.

Q36l.*"Inspection and testing of finished goods."*

The data shows that almost 100% of companies believe in the conventional QA/QC practice.

Q36m.*"Testing of product variability."*

The high rate of productivity by foreign companies, along with their good performance with quality measures, suggests that these companies are effectively applying this practice. On the other hand, the low rate of productivity along with relatively poor measures of quality suggests that local companies need to focus more on testing variability. Again, the literature points out that variation of the product commonly affects the quality of the products adversely. Organizations need to focus on product variability by applying different QM tools and techniques.

6.17 Comparison between FOC's and LOC's based on QM/QA practices

Having completed the descriptive analysis of QM/QA practices used by the sample companies, a further analysis was conducted to assess the statistical significance of the differences between the means of the two types of ownership, in order to find which of the QM/QA practices are significantly different between the two types. The independent sample t-test was chosen because the test serves to compare mean scores between two different groups (Pallant, 2007). In this case, the researcher collected information on one occasion, but from two different sets of companies; then these scores were compared.

The majority of QC practices showed significant differences between both the type of companies, $p<0.05$, except for product testing and inspection, incoming inventory testing and inspection, and inspection and testing of finished goods (see "Small" in the effect of size column in table 6.28). A noticeable difference was found in control charts/other statistical methods, quality audits, recording of employees' opinions on

quality problems, and testing of product variability (see table 6.28), so further investigation was carried out.

Table 6.28: Relationship between ownership and QA/QC practices used by the responding companies

Name of practice	t-value	df	Sig.(2 tailed)	Mean diff	Eta squared	Effect of size
Control charts and other statistical methods.	***8.392***	***267***	***.000***	***1.464***	***0.20***	***Large***
Preventive maintenance on schedule basis.	5.515	267	.000	1.060	0.10	Moderate
Process capability studies	4.129	267	.000	.775	0.06	Moderate
Product testing and inspection	.938	267	.349	.083	0.003	Small
Workers quality orientation program.	5.620	267	.000	1.018	0.10	Moderate
Supplier quality evaluations.	5.328	266	.000	.892	0.096	Moderate
Incoming inventory testing and inspection.	1.947	267	.053	.144	0.014	Small
Quality audits	***6.109***	***266***	***.000***	***.796***	***0.12***	***Large***
Engineering design and specification review.	2.310	267	.022	.324	0.01	Small
Testing of work-in-process.	3.767	266	.000	.482	0.05	Small
Recording of employee's opinion on quality problems.	***7.981***	***266***	***.000***	***1.503***	***0.19***	***Large***
Inspection and testing of finished goods	.310	266	.757	.025	0.0003	Small
Testing of product variability.	***6.233***	***267***	***.000***	***.857***	***0.12***	***Large***

Notes: *Level of significance is calculated by using t-test statistics for independent sample. The practices in bold & italics represent those practices where there are significant statistical differences between FOC's and LOC's.*

It was observed from the analysis of the LOC data that all these practices are positively associated with companies having high productivity (see table 6.9).

This means that these four practices have a strong relationship with productivity. Therefore, based on the evidence about the effectiveness of these four QC practices, it is strongly recommended that companies who want to improve quality and productivity should adopt the four QC practices.

6.18 Summary

The analyses and comparisons of the responding companies based on QA/QC practices were shown in table 6.27 and 6.28. Based on the evidence from *Table 6.28*, the majority of local companies seem not to have adopted QC practices such

as control charts and the other statistical methods. It is recommended to those local companies that adopting these practices that could have a significant impact on quality and productivity by reducing the rate of scrap, rework, defects and complaints. Similarly, it was also observed from the analysis of the data, that although some local manufacturers adopted most of the QC practices, they failed to benefit from them. This means adoption and implementation of QM is not worthwhile unless accompanied by strong management commitment and support. Therefore, it is suggested that local companies adopt a participative style of management, improve communication, make effective plans before implementation, educate and enhance the skills of employees by effective training, and build trust by empowering employees at appropriate levels.

6.19 Relationship between quality performance and ownership

Table 6.29 exhibits the Likert scoring for different quality performance functions, measured from (1) very low to (5) very high. The table provides a percentage breakdown of the responses including the frequency distribution for each question.

Q37a.*"Conformance to customer requirements".*

All 75 foreign owned companies replied positively. However, more than 40% of LOC's replied negatively. The QM literature stresses that the companies must manufacture high quality goods which have value for their customers.

Q37b.*"Customer satisfaction".*

Although more than 90% of companies admitted that the level of customer satisfaction with their goods and services was high, evidence from *Tables 6.5 and 6.6* contradicts this, as the majority of local manufacturers perform poorly on quality measures.

Table 6.29: Quality Performance of sampled companies in Percentage

37Quality Performance		Very low	Low	Uncertain	High	Very high	Total
a. Conformance to customer requirements	FOC'S	0(0%)	0 (0%)	0 (0%)	51(68.0%)	24 (32.0%)	75 (100%)
	LOC'S	0(0%)	8 (4.1%)	78(40.2%)	88(45.4%)	20 (10.3%)	194 (100%)
Total		0(100%)	8 (3.0%)	78(29.0%)	139(51.7%)	44 (16.4%)	269 (100%)
b. Customer satisfaction	FOC'S	0(0%)	0 (0%)	0 (0%)	48(64.0%)	27 (36.0%)	75 (100%)
	LOC'S	0(0%)	7 (3.6%)	17(8.8%)	146(75.6%)	23(11.9%)	193 (100%)
Total		0(100%)	7(2.6%)	17(6.3%)	194(72.4%)	50(18.7%)	268 (100%)
c. Ease and speed of product repair	FOC'S	0 (0%)	1(1.3%)	0 (0%)	64(85.3%)	10(13.3%)	75 (100%)
	LOC'S	3 (1.6%)	14 (7.3%)	96 (49.7%)	75(38.9%)	5 (2.6%)	193 (100%)
Total		3 (1.1%)	15 (5.6%)	96(35.8%)	139(51.9%)	15 (5.6%)	268 (100.0%)
d. Efficiency of operations	FOC'S	0 (0%)	1 (1.3%)	0 (0%)	60 (80.0%)	14 (18.7%)	75 (100%)
	LOC'S	2 (1.0%)	20 (10.3%)	90 (46.4%)	75(38.7%)	7(3.6%)	194 (100%)
Total		2 (0.7%)	21 (7.8%)	90 (33.5%)	135(50.2%)	21 (7.8%)	269 (100%)
e. Employee satisfaction	FOC'S	0 (0%)	3(4.0%)	0 (0%)	55(73.3%)	17 (22.7%)	75 (100%)
	LOC'S	4 (2.1%)	24 (12.4%)	24 (12.4%)	132 (68.0%)	10 (5.2%)	194 (100%)
Total		4 (1.5%)	27 (10.0%)	24(8.9%)	187 (69.5%)	27 (10.0%)	269 (100%)
f. Employee turnover	FOC'S	40 (53.3%)	32 (42.7%)	0 (0%)	3 (4.0%)	0 (0%)	75 (100%)
	LOC'S	23 (11.9%)	58 (30.1%)	55 (28.5%)	54 (28.0%)	3 (1.6%)	193 (100%)
Total		63(23.5 %)	90 (33.6%)	55(20.5%)	57 (21.3%)	3 (1.1%)	268 (100%)
g. Flexibility of operations	FOC'S	0 (0%)	5 (6.7%)	0 (0%)	59 (78.7%)	11 (14.7%)	75 (100%)
	LOC'S	6 (3.1%)	28 (14.4%)	66 (34.0%)	92 (47.4%)	2 (1.0%)	194 (100%)
Total		6 (2.2%)	33 (12.3%)	66(24.5%)	151 (56.1%)	13 (4.8%)	269 (100%)
h. Frequency of customer complaints	FOC'S	34 (45.3%)	40 (53.3%)	0 (0%)	1(1.3%)	0(0%)	75 (100%)
	LOC'S	34 (17.6%)	100 (51.8%)	29 (15.0%)	30 (15.5%)	0(0%)	193 (100%)
Total		68(25.4 %)	140(52.2%)	29(10.8%)	31 (11.6%)	0 (100%)	268 (100%)
i. Frequency of inspections	FOC'S	21 (28.0%)	48 (64.0%)	0 (0%)	5(6.7%)	1 (1.3%)	75 (100%)
	LOC'S	6 (3.1%)	50 (25.8%)	15 (7.7%)	111 (57.2%)	12 (6.2%)	194 (100%)
Total		27(10.0 %)	98 (36.4%)	15(5.6%)	116 (43.1%)	13 (4.8%)	269 (100%)
j. Frequency of stock-outs	FOC'S	30 (40.0%)	42 (56.0%)	0(0%)	3(4.0%)	0 (0%)	75 (100%)
	LOC'S	11 (5.7%)	68 (35.1%)	41 (21.1%)	71 (36.6%)	3 (1.5%)	194 (100%)
		41(15.2 %)	110(40.9%)	41(15.2%)	74 (27.5%)	3 (1.1%)	269 (100%)
k. Loyalty of customers	FOC'S	0(0%)	1 (1.3%)	0 (0%)	47(62.7%)	27 (36.0%)	75 (100%)
	LOC'S	2 (1.0%)	7 (3.6%)	17 (8.8%)	150 (77.3%)	18 (9.3%)	194 (100%)
Total		2(0.7%)	8 (3.0%)	17(6.3%)	197 (73.2%)	45 (16.7%)	269 (100%)
l. Morale of employees	FOC'S	0(0%)	0 (0%)	0 (0%)	50(66.7%)	25 (33.3%)	75 (100%)
	LOC'S	3 (1.5%)	15 (7.7%)	28 (14.4%)	141 (72.7%)	7 (3.6%)	194 (100%)
Total		3(1.1%)	15(5.6%)	28(10.4%)	191 (71.0%)	32 (11.9%)	269 (100%)
m. Variability of product/ service quality	FOC'S	23 (30.7%)	49 (65.3%)	0 (0%)	3(4.0%)	0(0%)	75 (100%)
	LOC'S	10 (5.2%)	50 (25.8%)	67 (34.5%)	61 (31.4%)	6 (3.1%)	194 (100%)
Total		33(12.3 %)	99 (36.8%)	67(24.9%)	64 (23.8%)	6 (2.2%)	269 (100%)

Q37c.*"Ease and speed of product repair".*

This is related to the serviceability of the products manufactured by the sample companies. Almost all foreign owned manufacturers reported high serviceability. On other hand, only 80 local companies rated a high degree of service facilities, and the remaining 113 LOC's responded negatively.

Another important reason why LOC's answered "unsure" is the nature of their business. Many are associated with textiles and garments manufacture, where very little need for repair and maintenance is required.

Q37d.*"Efficiency of operations".*

Again foreign companies have a clear edge over local companies. Almost 100% of FOC's registered either "high" or "very high", but only 83 local companies, with a further 90 being "unsure" about the efficiency of their operations and 22 reporting low efficiency. The large numbers of local companies who are not sure about their position suggests unsatisfactory operation. The literature suggests that effective operations create positive effects on company processes, resulting in good quality products.

Similarly, it was identified in chapter four that local companies lacked planning, empowerment, training, and communication, which could be the reason for low efficiency of operations.

Q37e.*"Employee satisfaction".*

Almost all foreign companies stated that they have high employee satisfaction. 27% of LOC's claimed unsatisfactory or low employee satisfaction. Satisfaction of employees is one of the most important functions in quality performance, and the literature suggests that happy and satisfied human capital is directly linked to quality and productivity.

Q37f.*"Employee turnover".*

Again, evidence from table 6.20 suggests that almost all foreign companies have low employee turnover. However, in the case of local companies, only 42% reported low employee turnover, with 20% local uncertain and 30% reporting high employee turnover. The high rate of employee turnover restricts training by local companies as they view training as a waste of time and money. However, training plays a vital role in reducing scrap, rework, and defects, and thus improves quality and productivity. Similarly, as discussed above in Q37 (e) employee satisfaction has a significant impact on quality and productivity, the high rate of employee turnover among local companies signifying that they are not satisfied with working conditions, remuneration, awards rewards, empowerment, and teamwork.

Q37g.*"Flexibility of operations".*

Again, high flexibility means organizations can more readily transform their operations in the case of variations in the processes. Of the 75 FOC's, 70 reported high flexibility of operations. In the case of LOC's, only 94 companies considered they were flexible in altering their operations;100 reported "unsure" to "very low", indicating that most of the local companies have a low capacity for flexibility of operations.

Q37h.*"Frequency of customer complaints".*

Almost 100% of the foreign companies reported a low frequency of customer complaints. More than 30% of LOC's claimed to be "unsure" or had a "high" frequency of customer complaints. FOC's therefore outperform LOC's in terms of customer complaints.

Q37i.*"Frequency of inspections".*

Again almost all foreign companies reported low frequency of inspection.123 of the 194 local companies reported high frequency. Again, current QM literature suggests that low frequency of inspection means that an organization's production processes have performed adequately, and a high frequency of inspection means that they are not performed smoothly or have room for improvement.

Q37j.*"Frequency of stock-outs".*

All foreign companies stated a low frequency of stock-out, while more than 38% of LOC's reported a high frequency rate. Again, the reason for this high frequency of stock-outs in local companies means these companies have weak planning, inefficient operations, and variation in the production processes.

Q37k.*"Loyalty of customers".*

About 90% of total respondents reported a high rate of customer loyalty for their products.

Q37l.*"Morale of employees".*

All 75 FOC's claimed high morale among their employees. Coming back to Q37f, employee turnover, LOC's have a much higher rate than FOC's. Nevertheless, 76% of LOC's reported high morale of employees.

Q37l.*"Variability of product/ service quality".*

Finally, foreign companies again surpass the locally owned companies, with 96% reporting a low rate of variability for their goods and services. Only 30% of the LOC's reported a low rate, while 35% were uncertain and another 35% reported high product variability. Evidence from figure 4.1 suggests that 68% of foreign companies are using SPC.

6.20 Comparison of performance based on quality functions

In order to validate the descriptive analysis results on quality performance functions of responding companies, t-test statistics was used to identify significant differences between the two types (see table 6.30).

Results of t-tests indicate that the mean of each quality performance function differs significantly, with p<.05. A relatively high significant difference was found in quality performance practices' conformance to customer requirements, ease and speed of product repair, efficiency of operations, employee turnover, flexibility of operations, frequency of customer complaints, frequency of inspections, frequency of stock-outs, morale of employees and variability of product/ service quality (see large in table 6.30).

Table 6.30:Summary of statistics ownership and quality performance functions

Name of function	t-value	Df	Sig. (2tailed)	Mean diff	Eta squared	Effect of size
Conformance to customer requirement	***9.325***	***267***	***.000***	***.701***	***0.24***	***Large***
Customer satisfaction	5.712	267	.000	.401	0.10	Moderate
Ease and speed of product repair	***10.841***	***267***	***.000***	***.770***	***0.30***	***Large***
Efficiency of operations	***10.819***	***266***	***.000***	***.825***	***0.30***	***Large***
Employee satisfaction	5.690	267	.000	.528	0.10	Moderate
Employee turnover	***-11.116***	***266***	***.000***	***-1.225***	***0.31***	***Large***
Flexibility of operations	***7.551***	***267***	***.000***	***.725***	***0.17***	***Large***
Frequency of customer complaints	***-7.542***	***266***	***.000***	***-.712***	***0.17***	***Large***
Frequency of inspections	***-12.382***	***266***	***.000***	***-1.483***	***0.36***	***Large***
Frequency of stock-outs	***-11.752***	***266***	***.000***	***-1.253***	***0.34***	***Large***
Loyalty of customers	5.137	267	.000	.431	0.09	Moderate
Morale of employees	***7.046***	***267***	***.000***	***.643***	***0.15***	***Large***
Variability of product/ service quality	***-12.248***	***267***	***.000***	***-1.242***	***0.36***	***Large***

Notes: *Level of significance is calculated by using t-test statistics for independent sample. The practices in bold & italics represent those practices where there are large significant differences between FOC's and LOC's.*

These significant differences in quality performance between FOC's and LOC's further validate the findings in section 4.5 concerning barriers to adoption of QM practices.

6.21 Summary

The analysis and comparison based on quality performance functions are made in sections 6.29 and 6.30. The result of this analysis indicates that FOC's outperformed LOC's in every single quality performance function. However, large differences were found on the basis of morale of employees, employee turnover, efficiency and flexibility of operations, and customer complaints. It is proposed that LOC's make effective plans before implementing any QM strategies. Similarly, a high level of management commitment and active involvement is required to increase efficiency of operations, which was found to be absent in LOC's. It is proposed that local companies should improve communication across the organization at all levels, and improve working conditions and job satisfaction. It is also suggested that local companies need to focus more on quality training of employees, and that they foster empowerment, job independence, control, and independent decision making within a given domain of authority.

6.22 Chapter summary

This chapter investigated the relationship between quality and productivity of the sample companies, by focusing on internal and external measures of quality (scrap, rework, defects and complaints). Analysis of the data revealed that the companies which effectively adopted and implemented different QM tools and techniques recorded high quality and high productivity, resulting from a reduction in the negative elements of quality. Therefore, based on the evidence from the data, we can say that the link between quality and productivity in the manufacturing companies of Pakistan

is positive. However, the level of adoption and implementation of QM practices among local Pakistani manufacturing companies is weak compared to foreign owned companies.

It was also found from the analysis of the data that some of the local companies claimed to have adopted advanced QM practices such as SPC, TQM and Six sigma, but their level of productivity is low. It was also found that, these companies show low management commitment, weak communication across the organization, fewer training opportunities, less employee motivation and teamwork, and weak customer focus. Similarly, these companies have low efficiency of operations, low employee satisfaction, a high rate of employee turnover, less flexibility of operations, and a high frequency of stock-outs. This means that the adoption of QM practices does not succeed unless the management structure is appropriate.

In addition, some of the local Pakistani companies are still relying solely on ISO 9000 certification. It may also be concluded that ISO certification provides only a transition to quality assurance, which is insufficient to provide a vital solution to quality and productivity issues. This suggests that manufacturing companies in Pakistan needs to focus on other QM practices as well.

The evidence from the data analysis may further prove that the level of implementation of QA/QC practices such as control charts and other statistical methods, quality audits, recording of employees' opinions on quality problems, and testing of product variability, are found to be unsatisfactory among most of the local companies (see table 6.27). Therefore, it is recommended that the local companies adopt and implement these practices with true spirit that could have a significant impact on quality and productivity. Similarly, this study found inadequate performance by most of the LOC's in the quality performance functions (see table

6.29).These companies have poor planning, ineffective leadership, and lack of expertise in their field, a high employee turnover and a less skilled workforce. However, a positive attitude, high level of commitment, and active involvement of top management in QM activities could have a positive impact on performance.

Finally, this study has also identified encouraging results for motivating local manufacturing companies. For instance, the overall local auto manufacturing industry has achieved relatively high quality and high productivity along with reasonably high financial performance (see table 5.5). Similarly, some other large local manufacturing companies from other sectors have effectively adopted and implemented a range of QM practices and achieved high quality and high productivity levels.

Chapter 7: Discussion of results

7.1 Introduction

This chapter discusses the empirical data presented in the previous chapters. The discussion focuses on the study aims and objectives with particular emphasis on the objectives. The study investigates the relationship between QM practices and productivity of manufacturing companies in Pakistan. Several studies have been conducted on the QM practices and productivity in the Pakistani manufacturing sector, but most of their findings are limited. For example, in the studies by Fatima and Ahmed (2005, 2006a, 2006b) on the textile industry in Pakistan, they attempted to determine the level of quality management and productivity. However, their study was limited to one particular sector (textiles), and their sample size was restricted to a maximum of 32 responding companies. Similarly, Moosa (2000) gathered data on quality management and productivity in Pakistan from four different sectors but again his sample size was limited, to only 20 companies. This suggests that their overall findings were limited.

This study has analysed the relationship between QM practices and productivity in selected manufacturing companies in Pakistan, as presented in *Table 4.1*, 269 companies from a wide range of industrial sectors (automobile, chemicals, general engineering, food, pharmaceutical, and textiles) are represented. Similarly, as shown in *Table 4.3*, the size of the companies are bigger than those in the previous research: the smallest company in terms of workforce is 68, and the largest 7480. The annual turnover of the responding companies ranges from less than one million to more than 1000 million (PKR, as illustrated in *Figure 4.1*.

As stated in chapter one, one of the main purposes of this research was to identify the best QM practices that have been adopted by local manufacturers, so the study adopted the approach used by Yong and Wilkinson (2001) and Davis (2005). These researchers identified best practices for manufacturing companies by classifying sample companies as foreign owned or locally owned. *Table 4.4* lists the sample companies and categorized them on the basis of ownership such as foreign owned companies (FOC's) or locally owned companies (LOC's).The ensuing sections systematically presents the discussion of the results of the data generated and analysed, with a focus on the research aim and objectives.

7.2 Re-visiting Research Aim and Objectives

This discussion is focused on how the study meets the research aim and objectives.

Research aim

The aim of this research is to make a contribution to manufacturing companies in Pakistan by investigating the relationship between quality management practices and productivity. If, as may be expected, a positive relation is found then to recommend the best QM practice necessary for adoption by Pakistani manufacturing companies.

7.2.1 Restating the Research Objectives of the study

To achieve the research aim, the following research objectives were set:

1. To identify the level of adoption of QM practices in manufacturing companies in Pakistan.
2. To explore any barriers to the adoption of QM practices for manufacturing companies in Pakistan.
3. To examine the relationship between QM and productivity in the manufacturing companies in Pakistan.

4. To assess if there is a difference between LOC's and FOC's in relationship to quality management and productivity.
5. To identify best practice for adoption of QM by companies in Pakistan particularly locally owned companies.

7.3 The Research Objectives

This section discusses how the various research objectives met the research aim; it offers policy recommendations for the effective adoption and implementation of quality management practices by Pakistani manufacturing companies.

7.3.1 Status of QM in Pakistani manufacturing companies

This section focuses on the first research objective which lays emphasis on the status of QM in Pakistani manufacturing companies. It is evident from the field survey that

the study companies have adopted some form of quality initiatives. Almost 90% reported having a separate department responsible for quality (see table 4.5). This high rate of response indicates that almost all are aware of quality initiatives. This study found 68% have ISO 9000 certification (see figure 4.2), corroborating the findings of Agus and Abdullah (2000), Chapman and Khawaldeh (2002), Fatima and Ahmed (2005, 2006a, 2006b), (Hua et al., (2000) and Lee et al., (2001) that indicated a high rate of ISO 9000 certification. Based on the above findings, it may be concluded that the Pakistani manufacturing companies have recognized the importance of ISO 9000 and have made progress in achieving ISO certification.

Although these figures demonstrate that ISO 9000 standards have been accepted by most of the responding companies, some local companies did not have any ISO standard certification (see table 4.7). It is recommended that these local

manufacturing companies start their journey towards quality by acquiring ISO certification that will lead them to a higher level of QM practice. The principal benefit of ISO 9000 is to give companies a formalized system structure, and a good foundation for continuous improvement (Agus &Abdullah, 2000).

However, it was also found (section 6.6) that some companies in Pakistan rely solely on ISO 9000 certification, and that the there is no significant relationship between ISO 9000 and the scrap, rework, and defects rate of less than 1%. This result may signify that sole reliance on ISO certification is insufficient to offer a critical answer to quality and productivity issues. This suggests that manufacturing companies in Pakistan needs to focus on other QM practices as an important business strategy. The wide level of adoption of ISO 9000 is comparatively meaningless, because it was shown that many companies that had adopted ISO 9000 alone had not benefited from it. This was demonstrated at least in part by implementation issues (see able 6.6).

As illustrated in *Figure 4.2*, statistical associations were found between the responding companies and QM practices like ISO 9000, JIT, SPC, 5S, and TQM. However, the gap between FOC's and LOC's is much wider in terms of using these practices, except that ISO 9000 is used by both FOC's (93%) and LOC's (51%) (See table 4.7). This means that manufacturing companies in Pakistan make extensive use of international quality standards like the ISO 9000 series. This result also confirms the finding of Yong and Wilkinson's (2001) study, that most of the manufacturing companies in Singapore saw ISO 9000 as an ideal means to improve quality performance. Besides quality improvements, it appears that many companies see ISO 9000 as a competitive marketing tool. Furthermore, Punbnakitikashem, Adebanjo and McLean (2010) demonstrated in their study of quality management

practices in TQM and non-TQM firms in the ASEAN automotive industry that firms that adopted ISO certification tended to implement TQM as the next step in quality management. Their findings corroborate this study that foreign and large local companies that have adopted ISO certification employ further QM practices and achieve higher quality and productivity (see section 5.7).

The second QM practices widely accepted by the sample companies were SPC and JIT, adopted by over 22% and 21% local companies respectively (see tables 4.8 and 4.11). 5S and TQM were also found to be relatively higher in percentage terms, at 23% and 18% respectively (see figure 4.2), although QC circles, Kaizen and Reengineering were relatively unpopular in terms of its adoption by the sample companies (see figure 4.2). However, the majority of users of Six sigma and Lean were foreign ones, with only a few local companies with weak adoption and ineffective implementation (see table 6.19). The reason, as pointed out by Ahmed and Fatima (2006), could be that most Pakistani companies are just starting to shift their focus from QA to QM by adopting different tools and techniques. This result may suggest that mere adoption of QM practices is not necessarily the ultimate solution, unless its implementation and management structure are appropriate. Similarly, in the words of Professor T.N. Goh of the National University of Singapore,

> *"The application of both lean principles and six sigma thinking in real World require learning of various tools and techniques and their applications, not by will power or simple attitudes changes".*
> *Cited by Antony (2011).*

This may mean that both practices need strong management support for success, especially in terms of creating a quality infrastructure, allocation of the required budget, and time for changing the business culture. Additionally, statistical tests

generated from the study data point out that foreign owned companies have a higher rate of adoption of selected QM practices than do locally owned companies (see section 4.3). This study also found a strong positive relationship between foreign owned manufacturing companies and all selected elements of QM implementation, such as leadership, top management commitment, organizational communication, management style, training, empowerment, employee motivation, teamwork, award/reward procedure, technology/innovation, and customer focus (see section 4.5).This means that FOC's are stronger and focus on improving quality and productivity. The t-test between all selected QM practices and type of ownership also shows that FOC's have positive relationship with all selected QM practices (see table 4.28). In addition, graphical representation of the responding companies by means of box plots revealed that FOC's are far better in all selected financial performance indicators than LOC's.

This research study also ascertained that all local automobile companies have adopted and implemented a range of QM practices. The evidence from the study data proved that these companies have achieved high quality and high productivity, by improved and efficient adoption and implementation of different tools of quality management (see table 5.11). It is also evident from this research that some of the local companies are beginning to adopt advanced QM practices like SPC, TQM, and Six sigma (see section 4.3), but they have failed to improve quality and productivity due to ineffective implementation of these quality management techniques (see table 6.8). Other reasons for the immense differences between the groups may be that foreign companies have more resources and a better pool of internal expertise than locally owned companies. Again, 5S, Kaizen and Reengineering were predominantly adopted only by the automobile and engineering sectors.

The result suggests that Pakistani manufacturing companies do adopt quality management practices. However, the outcome of this research study suggests that foreign manufacturing companies outperformed the local Pakistani manufacturing companies in adopting and implementing QM practices (see cross tables 4.7 to 4.16). Nevertheless it may be argued that, overall, the level of adoption of QM practices by local Pakistani manufacturing companies is relatively better than the previous studies on QM conducted by Moosa (2001), Fatima and Ahmed (2006). Secondly, from *Table 4.27*, 70% of the responding companies are export oriented, and therefore need to maintain quality and productivity on a long-term basis in order to compete in global markets and make good returns to their investment. This may be the reason why they tend to increase their focus on the adoption of best QM practices.

7.3.1.1 Section Summary

The study found that Pakistani manufacturing companies have practised QM programmes extensively in recent years, and that the majority claimed to have separate departments for quality purposes. It was also revealed from the analysis of the data that some of the responding companies have adopted certain kinds of quality systems and programmes, the most popular being ISO 9000, JIT, SPC, 5S and TQM (see figure 4.2). Despite the high rate of ISO 9000 certification, it was evident that most of the locally owned manufacturing companies are relying only on ISO 9000 practices, which restricts their level of quality assurance. In fact, the relationship between ISO 9000 and the rate of scrap/rework/defects and complaints is insignificant in most cases (see table 6.6).

The research evidence shows that more foreign owned companies have adopted QM practices than locally owned ones (see table 7.1). The study data also shows

significant differences in all selected QM practices, but significantly greater use of practices like ISO 9000, SPC, JIT, 5S and TQM by FOC's (see highlighted data in table 4.28). It is evident from the research that almost all the foreign owned companies have implemented QM initiatives, unlike the locally owned companies. This research also found that the foreign owned and joint venture companies made greater use of practices like ISO 9000, SPC, JIT, TQM, 5S, Kaizen and Reengineering, even though Six sigma and Lean production appears not to be widely implemented even by foreign companies (see figure 4.2). Although evidence from the analysis of the data shows that both FOC's and LOC's have adopted QM practices, FOC's show a higher and more effective level of adoption and implementation of the different QM practices than do LOC's.

7.3.2 Barriers to adoption of QM

One of the objectives of this research was to improve understanding of the barriers to adoption of QM practices. The QM literature suggested different sets of elements for measuring performance. This study used the QM elements previously demonstrated by Feigenbaum (1986), Saraph *et al., (*1989), and Chapman and Khawaldeh (2002): leadership, management knowledge, top management commitment, organizational communication, management style, training, empowerment, employee motivation, teamwork, award and reward, technology/innovation, and customer focus. These elements were discussed in detailed in chapter four, separately for FOC's and LOC's (see section 4.5). The researcher found enormous differences between these types in the adoption and implementation of QM elements (see tables 4.20 to 4.29). Therefore, it may be concluded that there is a positive relationship between all selected elements of QM among foreign owned companies. In particular, there was a larger difference in the

QM elements of style of management, training, empowerment, teamwork, award incentives and technology/innovation (see table 4.30). There are many reasons for the better application of these elements of QM in the foreign companies. One may be that FOC's are resource rich and have also been practising QM for long time in their parent companies. Secondly, foreign companies have an adequate expertise in the field of QM. FOC's may also be using more advanced technology than local companies. Although it was also evident from the study data that the top management of most of the locally owned companies had some awareness of the tools and techniques of QM, but overall low employee commitment to quality shows their inability to motivate employees toward quality improvement. On the other hand, the higher quality and higher productivity level of foreign companies revealed that foreign companies encourage employees to become involved in QM activities and as a result they achieve better quality and productivity. It is proposed that Pakistani companies need to utilize the experience and expertise of foreign companies by adopting collaborative strategies with FOC's. Similarly, it may be useful for local companies to adopt competitive benchmarking techniques. The value of benchmarking was highlighted in the study of adoption and implementation of benchmarking by Adebanjo, Abbas and Mann (2010). Efficient and effective use of benchmarking techniques would give local companies valuable information about implementation and adoption of QM practices.

The analysis of barriers also found that most of the local firms still believe in a conventional authoritarian approach to management. This result supports Fatima and Ahmed's (2006 b) studies of the readymade garments industry in Pakistan. the authoritarian style of management results in employees not being able to make timely decisions in crucial circumstances. Another disadvantage of the authoritarian

management style, argued by Jackson (1994), is that it restrains employees from satisfying customers. It is proposed that Pakistani management adopts a participative style of management instead of the traditional authoritarian style. Moreover, the implementation of QM is not possible in a vacuum, and must be supported by strategic planning and management. It is evident from section 4.5 that many Pakistani companies lack planning. On the other hand, FOC's are good in planning and executing of QM programmes. It is proposed that top management of Pakistani companies rethink quality initiatives than implement QM practices that would gives fruitful results.

In chapter six, the researcher identified some local companies that have effectively adopted and implemented different QM tools and techniques (see section 6.6). It was found during the analysis of the data that these companies have a low rate of scrap, rework, defects and complaints. Similarly, these companies have demonstrated not only high productivity, but also show a higher score in QM implementation factors (see section 6.6). However, during the study of the data, some local companies that claimed to have adopted advanced QM practices like SPC, TQM, and Six sigma were in the category of high scrap, rework, and defects producing companies (see table 6.8 and 6.18). Additionally, these local companies have low productivity and inadequate performance for QM implementation factors (see section 6.6). This means adoption of QM does not work unless management adopts and implements effective planning strategies.

It was also found that most of the local companies show a lack of commitment and active involvement in QM activities (see table 6.7). Therefore, it is suggested that local companies build relationships of trust and loyalty with their employees and create systems for gathering feedback on the issues of quality and productivity.

Training of employees is one of the key elements in exercising QM practices. However, evidence from this research (see sections 4.5 and 6.6) suggests that most of the local manufacturing companies do not put enough emphasis on employee education and training. Therefore, it is proposed that Pakistani management allocate separate budgets for the grooming and training of employees, which could have significant effects on quality and productivity.

This evidence may further prove that the level of implementation of QA/QC practices, such as control charts and other statistical methods, quality audits, supplier quality evaluations, recording of employees' opinions on quality problems, and testing of product variability, is unsatisfactory among most of the LOC's (see tables 6.9 and 6.10). Therefore, it is recommended that they adopt and implement these practices with a true spirit that could have a significant impact on quality and productivity by reducing the rates of scrap, rework, defects and complaints. Similarly, this study found inadequate performance of most of the locally owned companies against quality performance functions (see table 6.29). These companies have poor planning, ineffective leadership, lack of expertise, a high employee turnover and a less skilled workforce. However, a positive attitude, a high level of commitment and active involvement of top management in QM activities could have a positive impact on the overall improvement of performance.

7.3.2.1 Section Summary

This study found that all the selected elements of QM have been effectively adopted and implemented by the majority of the foreign owned companies (see sections 4.5, 5.11, and 6.6). The evidence from the data also proved that all foreign owned companies have achieved high quality and productivity. In the case of locally owned companies, all automobile firms and a few other companies have also effectively

adopted and implemented these elements, and as a result have achieved higher quality and higher productivity. This confirms that the effective implementation of QM practices is the route to improving quality and productivity. However, it was found that the authoritarian style of management, weak communication, ineffective planning, and weak evidence of using benchmarking techniques is a barrier to effective quality management (see section 4.5). It was also ascertained from the research that most of the 'LOC's lack teamwork, empowerment, and training facilities (see section 6.6). These factors inhibit them in their efforts to adopt and implement sound quality management practices. The data further provided evidence that the level of implementation of QA/QC practices, such as control charts and other statistical methods and audits, are found to be inadequate among the majority of locally owned companies (see section 6.6).

7.3.3. Relationship between quality and productivity

In order to identify the relationship between quality and productivity, the researcher first calculated the productivity of all the 269 sample companies, using production performance functions as proxy measures of productivity. The categorization of the companies based on ownership against productivity is shown in *Table 5.2*. The researcher found significant differences between the productivity scores of the two groups, and it was evident that FOC's performed better than LOC's. The productivity distribution of the sample companies based on size (small, medium and large) is presented in *Table 5.3*. It was found that there is a positive relationship between the size of the responding companies and productivity. This result confirms the work of Yong and Wilkinson (2001), who found a positive link between productivity performance and size in the manufacturing companies of Singapore.

Again, there is a significant difference between FOC's and LOC's based on size and productivity (see table 5.4). The analysis of productivity based on industrial categorization showed a difference in the levels of productivity with FOC's having higher productivity scores than LOC's in all six industrial sectors. However, the study also found that the local automobile companies in Pakistan performed well, achieving higher quality and productivity (see figure 5.8). The reason could be attributed to better adoption and implementation of QM tools and techniques. The evidence gathered from this study also identifies that some large companies which have adopted and implemented different QM tools and techniques effectively have high quality and high productivity (see figure 5.3).

This research found a positive relationship between all selected QM practices and productivity. Although the researcher found moderate correlations for highly sophisticated practices like Six sigma and Lean. The reasons for moderate correlation for these practices among Pakistani companies is that the companies are not mature enough in terms of QM, so most of the locally owned companies have just began to shift emphasis from QA to QM. Similarly, this research found that most of the locally owned companies are still relying solely on ISO 9000, which limits their effort in quality initiatives and productivity; they are more oriented towards repetitive processes, and not geared towards critical quality issues (Riemann &Hertz, 1993). This suggests that even though ISO standards provide a good platform for quality starter companies, their role is limited to QA.

Additionally, most of the local companies still believe in the conventional view that a gain in quality does not necessarily increase productivity. On the other hand, foreign owned companies have been practising QM for a longer period of time. Equally, they have better capital resources, better expertise of QM and more skilful and educated

human resources than local companies. The relationship between productivity and financial performance indicators (ROA, ROS, and sales per employee) is shown in *Table 5.13*. It was found that all three financial performance indicators were highly correlated with productivity, i.e. the relationship between productivity and financial performance indicators is positive.

In chapter six, the study shed light on internal and external measures of quality (scrap, rework, defects and complaints). *Table 6.5* showed measures of quality for FOC's and LOC's. It was also found that a huge difference exists between measures of quality and productivity for FOC's and LOC's (see tables 6.5 and 6.6). The major contributor to this difference is effective adoption and implementation of QM practices. It is evident from this research that FOC's have adopted and implemented many more QM practices than have LOC's, who have a low adoption rate and poor implementation of QM practices (see sections 4.3, 4.5 and 5.8). It was also found during the data analysis that quality initiatives are strongly influenced by company size (see section 5.7). The larger companies are more likely to adopt and implement QM practices than the small companies, as they tend to have more capital resources, which allow them to hire better educated and more skilled staff. Similarly, these companies have a greater opportunity to use better technology, provide better training and hire expertise.

It was also found from the analysis of the data that some of the local companies claimed to have adopted advanced QM practices such as SPC, TQM and Six sigma, but that their level of productivity is low. These companies have low management commitment, weak communication across the organization, fewer training opportunities, less employee motivation and teamwork, and weak customer focus

(see section 6.5). They also have low efficiency of operations, low employee satisfaction, a high rate of employee turnover, less flexibility of operations, and high frequency of stock-outs. This means adoption of QM practices does not work unless the management structure is appropriate.

The evidence from chapter six (see section 6.5) revealed that small locally owned companies, specifically textiles and chemicals, produce more scrap, rework, defects and complaints, along with a lower level of productivity. Further investigation reveals that most of these local companies rarely adopt QM practices. It was also observed from the research that these companies have a high employee turnover rate, high level of variability in their manufactured products, high percentage of stock-outs, high frequency of inspection, and low morale of employees (see table 6.11). It was also revealed from the analysis of the data that the companies which effectively adopted and implemented different QM tools and techniques recorded high quality and high productivity. This means effective adoption and implementation of these tools and techniques reduces elements of negative quality and increases quality and productivity. Based on the evidence from the data, we can say that the link between quality and productivity in the manufacturing companies of Pakistan is positive. However, the level of adoption and implementation of QM practices among LOC's is weak compared to that of foreign owned companies.

7.3.3.1 Summary

Section 7.3.3 discussed research objectives 3 and 4, shedding light on productivity scores. The outcome of the discussion was that the productivity level of all foreign owned companies is higher than locally owned Pakistani companies. The study found a strong association between productivity and size of company. More

specifically, large companies recorded high quality and productivity. The analysis of productivity based on industrial categorization showed that the automobile sector surpassed all the other five sectors (chemical, food, engineering, pharmaceutical, and textiles) in terms of productivity. However, foreign owned companies registered remarkably higher productivity scores than locally owned companies in all the six sectors. It was also evident from the data that some locally owned manufacturers who had effectively adopted and implemented various QM tools and techniques also achieved high quality and productivity, so it can be said that effective implementation of QM practices improves quality and productivity. This study also found a positive correlation between all the selected QM practices and productivity. However, it is evident that most local companies adopted fewer QM tools and techniques and implemented them ineffectively. This suggests that the majority of local companies in Pakistan still believe in the traditional approach to improving quality, which negatively impacts their productivity.

This study also investigated the relationship between internal and external measures of quality and quality and productivity. The evidence gathered revealed a wide difference between FOC's and LOC's in terms of their approach to measures of quality and productivity. The evidence clearly demonstrates that foreign companies are better in terms of adoption and implementation of QM practices. Most of the LOC's, however, have failed in effectively adopting and implementing QM practices. Therefore, it can be concluded that there is a weak relationship between QM on the one hand, and quality and productivity on the other hand, among local companies.

Although this study found a strong positive link between quality and the productivity of manufacturing companies in Pakistan, the evidence from this research suggests that the majority of LOC's lagged behind foreign companies in terms of quality and

productivity due to poor implementation of QM practices. This means adoption of QM practices does not work if the management structure is not appropriate.

7.3.4 Identification of Best Practice (BP)

This section highlights the Best Practice (BP) that should be adopted by the study companies in order to increase quality and productivity. The BP is identified as a series of procedures and strategies adopted by companies to systematically enhance competitiveness, improve quality and productivity of their goods and services and maximize organizational goals and objectives on a continual basis (Asrofahet *al.,* 2010; Beaumont, 2000; Pineda & Gazo, 2007; Ketokivi & Schroeder, 2004). Davies and Kochhar (2002) claim that the utilization of BP varies from one industry to another. They further argued that:

> *"There are certain practices that are relevant to companies at particular points in their development, and thus for some companies individual best practices may not be appropriate at any particular point in time"*
> (Davies and Kochhar, 2002).

Based on this, it is suggested that BP involves more than just gathering data on how well a company performs against its competitors. It is a technique to identify new ideas and new ways to improve processes and, as a result, to better meet customers' expectations. BP in general is not industry specific so, special consideration was given to statistical data, which helped to generate concrete and meaningful results. The recommendation for adoption of selected QM practices is presented in the ensuing paragraphs.

The selection of BP was made from the following QM practices: ISO 9000, JIT, SPC, 5S, TQM, Quality circles, Kaizen, Reengineering, Lean, and Six sigma. In order to

select most appropriate BP the selection was made on the basis of relationship between QM practices with three different performance characteristics that is:

- The relationship between QM practices with financial performance indicators (ROA, ROS, and sales per employee) see Table 4.29.
- The relationship between QM practices with productivity performance see Table 5.11.
- The relationship between QM practices with internal and external measures of quality (scrap, rework, defects and complaints) see Table 6.26.

Based on the evidence from these above tables, it is recommended that locally owned Pakistani manufacturing companies adopt and implement QM practices, in the sequence shown in *Figure 7.1.*

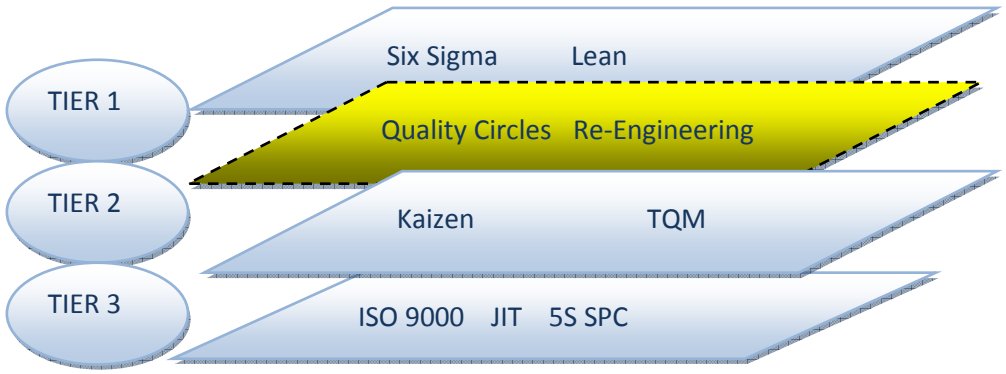


Figure 7.1: Framework for adoption of QM practices for Pakistani manufacturing companies

The figure depicts three levels of QM practice. Tier 3 comprises of QM practices which have highest correlation against three study characteristics i.e. (financial, internal and external measures of quality, and productivity performance). The tier 3 practices are ISO 9000, JIT, 5S, and SPC. Tier 2 represents the QM practices which have intermediate level of relationship against three study characteristics these practices are Kaizen and TQM.

Finally, tier 1 QM practices are six sigma and lean which are the least effective techniques adopted. The lack of effectiveness of six sigma and lean is probably due to the complexity of implementation and the fact that they have mainly been adopted only in the automotive industry and a few companies in the supply chain soothe sample size may have affected this. Also these companies are already producing high quality products so the scope for improvement is starting to diminish by the time companies are ready to attempt to implement these techniques. The techniques of quality circles and re-engineering are shown in yellow between Tiers 2 & 3 because the analysis showed both techniques in Tier 2 or 3 so it was difficult to assign them with confidence to one particular tier. This study therefore recommends that Pakistani manufacturing companies adopt BP for the three levels of QM proposed in *Figure 7.1*. Tier 3 is the bottom or initial level of the QM framework, but this research study found that most of the local companies have not yet adopted and implemented any QM practices beyond ISO 9000. It has already been observed that the principal benefit of ISO 9000 is to provide a system structure and formality, which is a good foundation for continuous improvement. It is recommended that LOC's start their journey towards quality by adopting BP from the proposed framework, sequentially from tier 3 to tier1. This is expected to lead them to a higher level of QM practice, resulting in higher quality and productivity.

7.4 Implementation factors for adoption of QM practices

In order to improve the efficiency of adopting QM practices an implementation and communication model has been developed based on evidence from the data (see table 4.42).

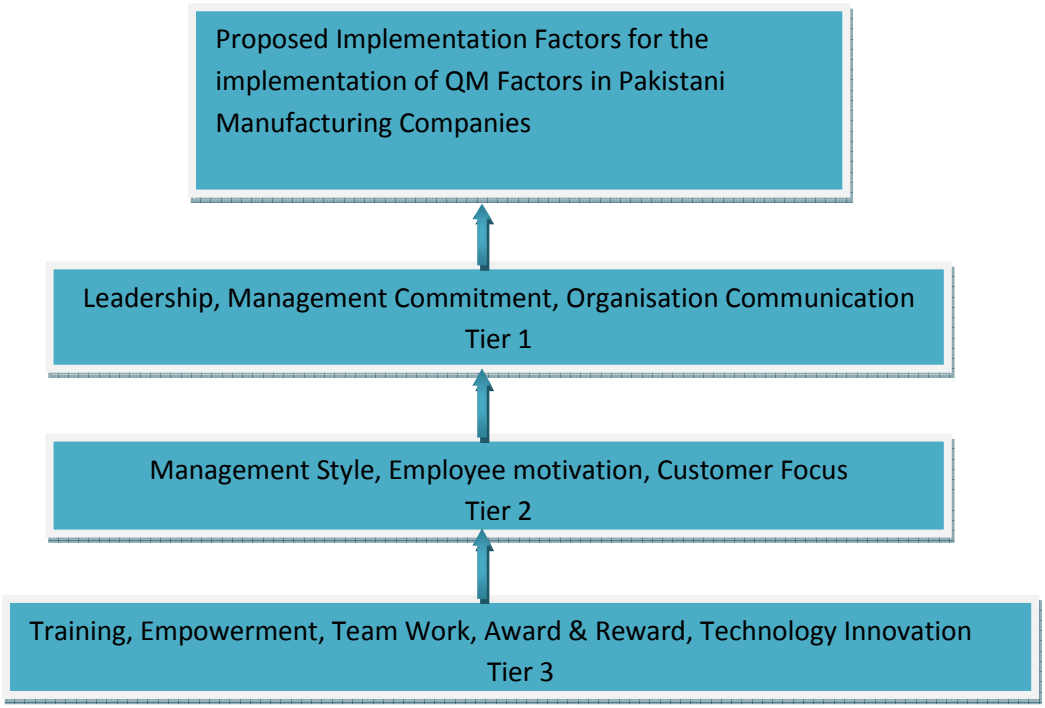


Figure 7.2: Factors for consideration during the adoption of QM practices

The figure 7.2 illustrates three levels of implementation factors. These factors were selected based on difference in mean between FOC's & LOC's. Tier 3 is the bottom part of model comprises of factors which have large difference in mean between FOC's & LOC's. The large difference of mean indicates that LOC's have inadequately adopted and implemented these factors. Tier 3 factors are training, empowerment, teamwork, award & reward procedures, technology & innovation. Tier 2 are management style, employee motivation, and customer focus. Tier 1 factors are leadership, management commitment, and organization communication. Leadership and management commitment are normally highlighted as prerequisites for success in implementing any quality systems but in this project they are in tier three. This may be because the pre-requisite of commitment is not sufficient unless it is focussed on key areas such as training, empowerment and teamwork. These can be very difficult areas for some Pakistani managers due to their autocratic style so it is essential that commitment is accompanied by culture change if necessary.

It is recommended for Pakistani manufacturing companies to adopt these implementation factors sequentially from Tier 3 to Tier1 in order to enhance their efficiency. This is expected to lead them to a higher level of quality and productivity.

7.5 Conclusion

This chapter has discussed the research aim and objectives, with detailed consideration of how the research objectives have addressed the research aim. The discussion highlighted the status of QM in the manufacturing companies of Pakistan, barriers to adoption of QM, the relationship between QM and productivity, differences between FOC's and LOC's in terms of the QM and productivity relationship, and identification of BP for adoption by locally owned companies.

In all, a summary of all the objectives discussed was made. The evidence from the study indicates that Pakistani manufacturing companies have, to some extent, adopted and implemented QM practices, although the level of adoption by LOC's is weak compared to that of FOC's. Most of the local manufacturing companies are still relying solely on ISO 9000. It is also clear from the analysis of the data that, although some of the local companies claimed to have adopted advanced QM practices such as SPC, TQM and Six sigma, their level of quality and productivity is low. This means that adoption of QM practices is not necessarily worthwhile, unless the management structure is appropriate.

There is also evidence of barriers to the adoption of QM practices, such as authoritarian style of management, lack of planning, inadequate adoption of benchmarking techniques, low employee commitment, weak communication across the organization, fewer training opportunities, less employee motivation and teamwork, and weak customer focus. These companies have low efficiency of

operations, low employee satisfaction, a high rate of employee turnover, less flexibility of operations and high frequency of stock-outs. Similarly, the level of productivity and quality was found to be low in these local companies.

The evidence from the research also revealed that companies that have effectively adopted and implemented different QM tools and techniques, show a strong relationship between QM and productivity. Foreign owned companies have adopted and implemented QM practices for a longer period of time, having the advantage of a sound financial capital base and expertise. These have motivated them to implement QM practices more effectively. Hence, the relationship between quality and productivity is strong among foreign companies, compared to locally owned companies. Additionally, this study found higher quality and productivity among most of the large companies, reflecting their capital support, skilled employees, training facilities and efficient management skills, which have a positive influence on the implementation of QM practices. There is sufficient evidence from the study to suggest that most of the locally owned companies have poor planning, ineffective leadership, lack of expertise, high employee turnover and a less skilled workforce. However, if the local companies adopt a positive attitude, high level of commitment, and active involvement of top management in QM activities, these may have a positive impact on the overall improvements in company performance.

The evidence from the data analysis suggests that all the selected QM practices have been adopted by the sample companies. This study has proposed a three-tier framework for their systematic implementation, to improve quality and productivity, as shown in *Figure 7.1*. Additionally, based on the study data, some QM implementation factors are recommended (see figure 7.2), to be adopted in the corresponding tiers.

The researcher believes that effective adoption and implementation of these QM tools and techniques would have a significant impact on the quality and productivity of manufacturing companies in Pakistan.

Chapter Eight: Conclusions, Limitations and Suggestions for future research

8.1 Introduction

This chapter discusses the conclusions and limitations of the study. It also considers suggestions for future research.

8.2 Conclusions

This study investigated the relationship between QM practices and productivity in selected manufacturing companies in Pakistan. 269 responding companies representing a wide range of industrial sectors were used for the investigation.

This thesis has contributed to knowledge in the area of quality management by adding to previous work of Moosa (2000) and Fatima and Ahmed (2005, 2006a, 2006, b). These previous studies were limited in scope and sample size, but this study has a wider scope. For example, Fatima and Ahmed's work on the textile industry in Pakistan attempted to determine the level of quality management and productivity, but was limited to one particular sector (textiles), while their sample size was only 32 companies. Similarly, Moosa gathered data on quality management and productivity in Pakistan from four different sectors but again his sample size was limited to 20 companies. This suggests that their findings were limited in scope. Additionally, unlike this study, none of these researchers presented a framework for adoption of QM practices in order to improve quality and productivity of the manufacturing companies.

In addition, this study covered a wider range of companies than those previously investigated, ranging from 68 to 7,480 workers. Whereas the previous studies constitutes 10 to 3000 range of companies in size (Moosa, 2000 & Fatima & Ahmed 2006). The thesis also compared locally owned manufacturing companies with their foreign counterparts in order to get in-depth information about selected

manufacturing sectors. This information serves as a benchmark for local companies to improve their quality management practices. Similarly, based on the information and statistical data, the researcher proposes a framework for adoption and implementation of QM practices for Pakistani manufacturing companies.

The study found that Pakistani manufacturing companies have adopted quality management practices. Therefore, it may be argued that, overall, the level of adoption of QM practices by local Pakistani manufacturing companies is beginning to improve on what the previous research studies indicated. However, the findings suggest that foreign manufacturing companies outperformed the local Pakistani companies in adopting and implementing QM practices.

This study also ascertained that all local automobile companies have adopted and implemented a range of QM practices. The evidence from the study data proved that these companies have achieved high quality and high productivity, due to relatively improved and efficient adoption and implementation of different tools of quality management (see table 5.11). The evidence of this study also corroborate with the finding of Punbnakitikashem *et al.,* (2010) about QM practices in TQM and non-TQM firms. In their study, they found positive link between QM practices and productivity among TQM companies. This evidence also support the study of Asrofah *et al.,* (2010) about Indonesian manufacturing companies who concluded that effective implementation of QM practices improves productivity and quality.

It is also evident from this research that some of the local companies are beginning to adopt advanced QM practices like SPC, TQM, and Six sigma (see section 4.4), but they have failed to improve their quality and productivity due to ineffective implementation of these quality management techniques (see table 6.8).This means that that the implementation of tools and techniques of QM practices does not

succeed unless the management structure is appropriate. The evidence from this research proved that policies of foreign companies are more focused and inclined towards quality, therefore based on evidence from the data we can say undoubtedly that the FOC's are "better implementer" of QM practices in Pakistan. It is also noteworthy that the policies of foreign companies reflect values and culture that will be fruitful in enhancing quality and productivity. But certainly, there may be other reasons for the immense differences between both groups, for example foreign companies have adequate resources and a better pool of internal expertise compared to locally owned companies. Similarly, it was evident from the study that most of the LOC's are relying solely on ISO 9000 practices, which restricts them to the level of quality assurance. It was also found that the relationship between ISO 9000 and the rate of scrap/rework/defects and complaints is insignificant in most of the cases (see table 6.6).

This study identified an authoritarian style of management, lack of planning and benchmarking, weak communication across the companies, lack of training facilities, ineffective management commitment, lack of employee empowerment and motivation, lack of award/reward incentives and weak teamwork as barriers to the adoption and implementation of QM practices. This evidence validates the findings of Mann *et al.,*(2011), who ascertained that factors such as low educational level of employees, lack of training, low employee satisfaction and ineffective implementation of QM practices as barriers for wining business excellence awards for manufacturing companies. The study has proposed an implementation model to systematically overcoming these QM barriers.

This research study found a strong positive link between the quality and productivity of manufacturing companies in Pakistan. However, evidence from the research

suggests that locally owned manufacturing companies lag behind foreign owned companies in terms of quality and productivity, due to poor implementation of QM tools and techniques. This means adoption of QM practices does not work unless the management structure is appropriate. This findings support the study of Zu *et al.*, (2011) about quality management in Chinese manufacturing companies. They also found in-effective level of adoption and implementation of practices like TQM and Six sigma in Chinese manufacturing companies.

Finally, based on the evidence from this study's statistical data, this thesis recommends a three-stage sequential framework for effective adoption and implementation of QM practices. The proposed framework can be used to identify best practices with the strongest effect on the area to be improved and the sequence in which the desired practices should be implemented. The key contributions of this research can be summarised as:

1. Development of 3 tier framework for adoption and implementation of QM practices for Pakistani manufacturing companies. This framework is based upon the effectiveness of QM practices as demonstrated by the statistical analysis of the data gathered for this research.
2. The adoption of the QM practices alone is insufficient to guarantee the effectiveness and that a number of implementation and methods are required in order for these to be effective. This has been represented as a further framework which needs to be implemented alongside each QM practices. This is based on the statistical analysis shown in table 4.42 and table 6.26 respectively.

3. This study has demonstrated a positive link between increase quality and productivity in companies of all sizes and all sectors in Pakistan both foreign owned and locally owned.
4. This is the first large scale survey linking quality and productivity in Pakistani companies, previous studies have either been restricted to one sector or have only had small survey samples.

8.3 Limitations

This study is one of the more comprehensive QM studies in the context of Pakistan. Nevertheless, it does have some limitations, as explained below:

The first limitation is that the study relied solely on the questionnaire surveys for data collection and analysis. Interviews could not be conducted because of the time, logistical and financial constraints imposed on the researcher. Moreover, during the pilot study the researcher observed that conducting interviews could be a daunting task because of the limited time at the disposal of the respondents themselves, who were in managerial or supervisory roles.

The researcher asked single respondents from each company to complete the questionnaire; these included Quality Managers, Production Managers, Managing Directors, Plant Managers, Operation Managers and Planning Managers. It would have been more appropriate to question several respondents from the same company, to collect accurate data, but the researcher was cautious.

8.4 Recommendation for future research

The limitations examined are a careful reflection of the research potentials which can guide future researchers in interesting directions.

The evidence from this research clearly shows that there is an association between effective adoption and implementation of quality management and productivity. However, it focused on six industrial sectors and hence prompts the need for similar studies of different sectors of the Pakistani economy, for instance services or the public sector.

Secondly, potential researchers should use multiple methods for collecting and analyzing data, with triangulation as the basic methodology for the investigation that is by combining a questionnaire survey and interviews with multiple respondents from the study companies, in order to improve the reliability of the research findings.

Thirdly, this study used proxy measures for the calculation of productivity, and it is recommended that future researchers use actual measures of productivity, such as labour, material and capital productivity measures, in order to overcome any discrepancies in calculating productivity.

Finally, conduct research using in-depth interview to gain better understanding of the cultural and organizational barriers to effective implementation of QC techniques.

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Appendix A: LETTER OF SUPPORT FROM SUPERVISOR

Appendix B: LETTER OF SUPPORT FROM KATI

Appendix C: Questionnaire