QUALITY OF SERVICE (QoS) AND CUSTOMER SATISFACTION IN MOBILE TELECOMMUNICATION SECTOR OF PAKISTAN

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CHAPTER 1

INTRODUCTION

1.1 Mobile Communication Background

World has become a global village and this is due to prompt, easy and accessible communication. Telecom segment has changed the shape of communication everywhere and this is a hot issue in Pakistan now a days. Telecom sector has emerged as a fast growing industry during past few years and now Pakistan is promising as one of the most progressive countries where the number of mobile phone subscribers has increased to 93.04 million and landlines connection grew to 4.8 million and consequently tele-density reached 58.8% [1]. For these reasons companies are being attracted to invest heavily in this sector.

Due to the enormous competition among different companies of both service providers and mobile set providers, mobile phone is almost in reach of every common man in Pakistan and as a result of this brisk demand, companies are investing seriously in this sector. Currently there are five major companies operating in Pakistan, Mobilink, Zong, Ufone, Telenor, and Warid Tel. According to PTA (Pakistan Telecom Authority) telecom companies are going to invest more than USD 2.4 billion just in infrastructure. Mobilink alone is investing around USD 831 million during next three years. Similarly Telenor and Warid, has invested around USD 495 million and USD 325 million respectively during 2005-07 in addition to license fees. Telenor in next 5 years is going to invest approximately USD 1 billion in Pakistan [2]. Telecom sector was in the midst of a revolution with the overall mobile phone subscriber base already hitting 90 million marks and registering a tenfold increase in the customer base which only few years back stood at 85.5 million [3].

Every one from top business executives to daily wagers looks busy on mobile phones in offices, on roads and in market places in the Pakistan. India might be world's fastest growing telecom market but the growth is deeper in Pakistan where a larger percentage of population has a mobile connection. In contrast of a lower per head income

and almost equal prices of handsets as well as call tariffs as in India, Pakistan has much higher mobile penetration of about 30 percent, more than double of 14.3 percent in India.

Mobile communication market is one of the most important service markets in Pakistan. The Government has tried to introduce competition and promote private and foreign ownership through deregulation policy 2003. The policy towards fixed line services has been conservative, while towards the mobile services has been open and free. Since the admittance of new cellular technology and new operators, mobile telephony has grown rapidly in Pakistan [4].

Telecommunication has shown an immense rapid growth in Pakistan and it has become a sizzling concern in different perspectives like economic growth, foreign investments, a large number well paid new jobs and new businesses there has been a great research on all these areas. But a very important thing which we see that this telecom segment and especially cellular one has become an essential part of one's life and people who are using these services cannot even imagine living without these technologies. Telecom sector has changes ways of communication for people around the world and it has shown vigorous growth in Pakistan during past few years.

1.2 Problem Statement

Cellular mobile services in Pakistan have grown rapidly during the last few years. The number of operators increased in Pakistan from 3 in 1999 to 7 in 2005/6. "Cellular mobile customer's increased to 90.04 million and landlines connection grew to 4.8 million and consequently the Tele-density reached 58.8% [5]". The number of subscriber increased due to the increase in population coverage, and area coverage. The competitive pressure has compelled the operators to rollout the network in Pakistan at an accelerated pace. Because of this speedy implementation and network rollout to increase the market share; absence of detailing in technical, administrative and financial plans has caused the quality of service problems. The operators struggle to increase the market share by offering new and innovative products without thorough research and preparation has also caused quality problems.

This thesis research intends to study the quality of service issues including voice, data, network congestion and customer satisfaction in mobile telecom sector. This investigation will lead into the identification of causes of deterioration of QoS in Pakistan. The quality of service of all mobile operators will be compared. With the rapidly changing technologies, increasing customer need and increased customer awareness about the available options, it has become imperative to review the quality of service (QoS) parameters for cellular mobile communication periodically. An important objective of this study is to develop a model of service quality and a set of dimensions for comparative evaluation, which could provide useful framework for service providers and regulators alike.

In order to investigate the objectives of this study through the descriptive research method was employed. The questionnaire survey technique was used to collect data and the questions were self constructed. The choices of questions for this investigation include questions on personal background; age(lowest range was 16-25 and highest was 66-75); gender(male/female); employment type(employed-public, private and self), student and unemployed; and area of residence (Islamabad, Rawalpindi, Lahore, Karachi). The questionnaire is placed on web site, communities, Interviews and discussion with Mobile operators CEO, CTO and managers, PTA personnel's, street interviews and group discussion forum.

1.3 Objectives of Research

The objective of this research work is:

- To study overall customer satisfaction of the Pakistani mobile telecoms industry;
- To identify the factors influencing customer satisfaction;
- To investigate the link between certain demographic variables (age, gender, type of employment and location) and customer satisfaction in the Pakistan mobile telephone industry;
- To develop the strategies to improve QoS in mobile telecom industry;

The following measures of merit have been identified to determine the level of QoS.

- Call drop rate

- SMS and MMS (Multi Media Messaging)
- Network Congestion
- Signal Quality
- GPRS (Internet browsing on Mobile)
- Prepaid and Post paid connections cost
- Value added service and their charges
- Voice and data quality

1.4 Research Methodology

This study was to investigate the level of Quality of service and customer satisfaction of the mobile telecoms services and also to explore the relationship between customer satisfaction and specific demographic variables in Pakistan. The research looks at two aspects of the cellular industry. At first tried to establish the consumer psyche and the factors that effect the decisions of the consumers. Factors such as price, quality of service, network coverage etc was looked at. The methodology used to test these relationships was user surveys and performing statistical tests to find empirical evidences.

Data set emerged from 400 questionnaires entertaining information about consumers and their preferences. The data set was gathered through primary research conducted in various companies, colleges and houses in Islamabad, Karachi, Lahore and Rawalpindi. The data set is representative of mobile consumers in Pakistan. The second part of the research focused on the cellular companies themselves. In-dept interviews of key personnel at the cellular companies were conducted to gather information such as the future trends in call charges, introduction of new value added services etc. The results of these interviews were subjective and were achieved through qualitative judgmental methods such as expert opinion and past experience.

The other questions were on variables used to assess mobile service performance; network quality, availability, innovativeness of services, user friendliness of services, technical support of services in GPRS and VAS, service support, service personnel, call hidden charges and expense, call rates & billing, CSSR, network coverage, validity period and customer care services. The Likert rating scale varied from

"very satisfied" to "no opinion". Please see the Annexure for full details of the questionnaire. The questionnaires were administered on the streets and websites (e.g. Internet forums) and the choice of this method of data collection was of high priority because the residents of Lahore & Karachi are mostly very busy people, who leave their homes for work or trade very early in the morning (7.00am) and return late (some people return as late between 10.00-11.00pm). There will probably be little or no available time to attend to the questionnaires if dropped at their homes and failure of power supply (electricity) is very common at nights. Additionally, the street interviews presented better chance of having high representation of the sampling population, cheaper cost and rapid speed of data collection.

The procedure followed in this regard is as follows. After formulating the research objectives and hypothesis, the next step was secondary data collection.

The research methodology is summarized as follows:

1. A comprehensive review of literature on QoS in the telecom sector was reviewed and documented;
2. The QoS plans, procedures and methodology of the mobile operators were studied and documented;
3. The regulators requirement of QoS was also being reviewed and documented.
4. A questionnaire to get the views of the customers of mobile services was developed and pilot tested.
5. The finalized questionnaire was used to collect the data and their satisfactions from the services received from the operators were being measured.
6. The data was analyzed and results were being documented.
7. Recommendations to improve the quality of services are being made.
8. Future directions of research in Telecom service quality were then suggested.

The Statistical Package for Social Sciences (SPSS) 12.0 was used to test the hypothesis and analysis of data collected. The descriptive statistics (frequencies statistics) were applied to assess the level of customer satisfaction and quality of service while the relationship between the mobile services attributes, specific demographic variables and customer satisfaction were analyzed with the linear regression model. The daily stats for

all quality of service parameters were being obtained and a comparison of all service providers was also done.

According to the SPSS package [6], the linear regression is used to model the value of a dependent scale variable based on its linear relationship to one or more predictors. The Model summary table reports the strength of the relationship between the model and the dependent variable. "R" value indicates the strength of relationship with larger values indicating stronger relationship and "R^2" is the proportion of the variation in the dependent variable explained by the regression. Both R and R^2 the regression procedure values range from 0 to 1.

According to Hair et al. [7], independent variables can be classified as ordinal or nominal variable. Ordinal variable allows distinction and the distinction can quantify the differences between the variables. Example includes age. In this study to perform the data analysis, the age variable were ranked from 1 to 5 with the least age group 16-25 as 1 and the highest group 66-75 ranked 5.

Nominal variable allows distinction but the distinction can not quantify the differences between the variables. Examples include gender, location and employment, etc. To be able to analyze this variable, dummy variable were used. Dummy variable is variable representing nominal data encoded numerically, using the 0 and 1 values. For this study, gender variable used 1 dummy variable: male is 1 and female is 0. Location had 4 dummy variables and employment having 5 dummy variables. The answers to questions rated "very satisfied", "satisfied", "dissatisfied", "and very dissatisfied" and "no opinion" was valued from 1 to 5 respectively.

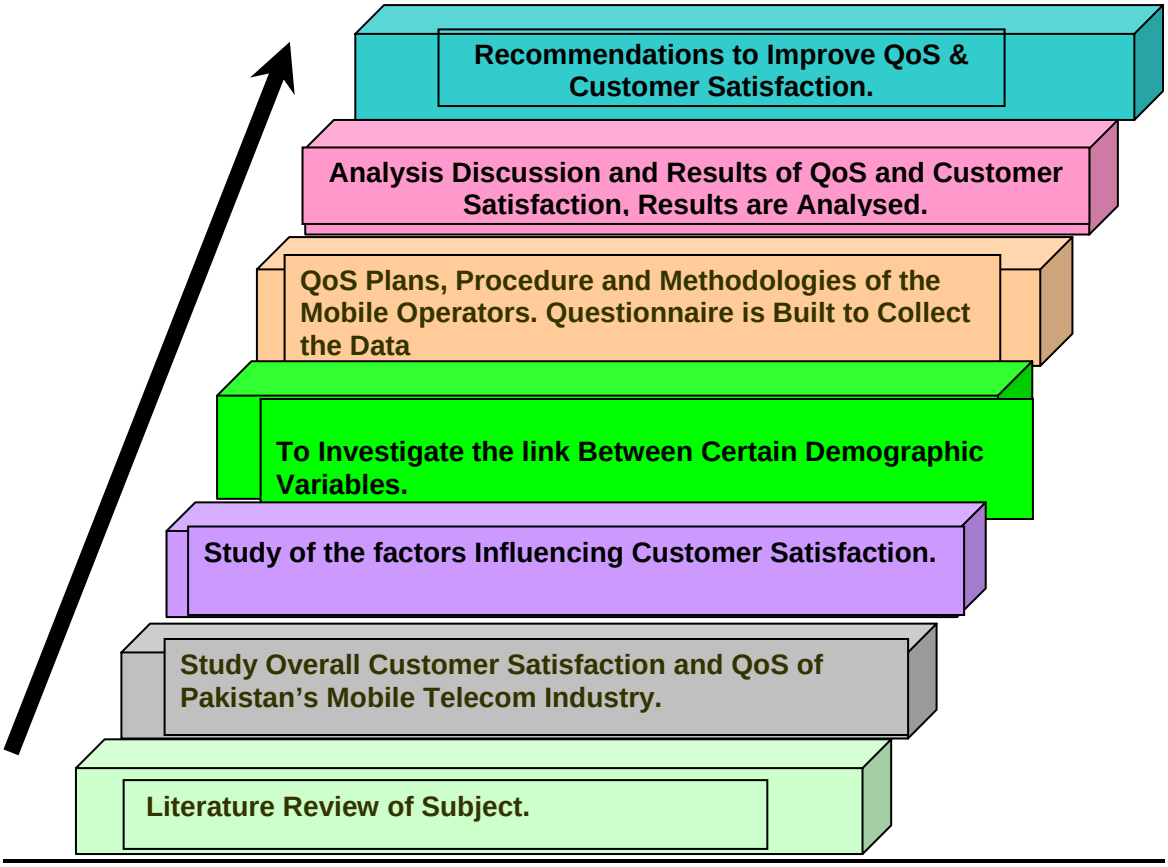

Figure 1.1. The Research Methodology

1.5 Sampling and Survey Instrument

Questionnaires are the best method to collect data because it was very convenient for the respondents. Interviews were also conducted. The questionnaire formation was done keeping in view the problem definition, research objectives and research hypothesis.

1.6 Field Work

Then fieldwork was conducted, questionnaires were randomly distributed out to respondents by visiting school, colleges and universities, offices, households and streets to collect information. Questionnaires were also placed on the web.

Hence; this study employed these variables in this investigation. Figure 1.2 presents the conceptual structure of research framework.

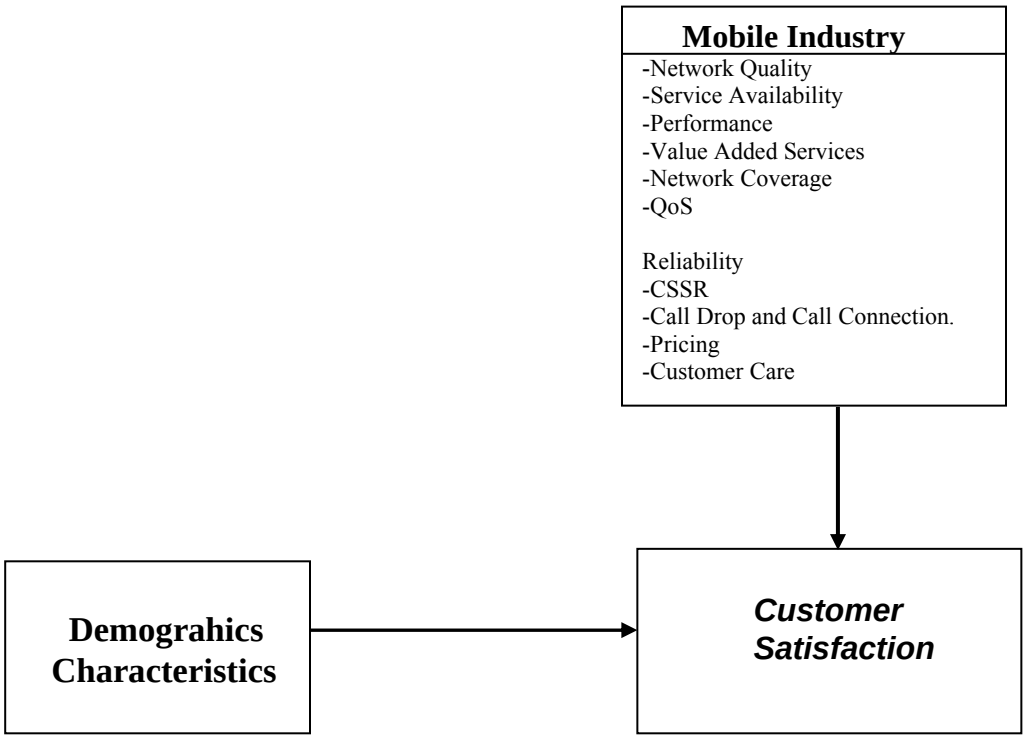

Figure 1.2 Research Frameworks

This diagram illustrates the objective of this study, which is to investigate the Pakistan's Mobile Telecommunication Industry. It is the study of Quality of service & customer satisfaction with the mobile telecoms industry. Other factors influencing satisfaction

along with the relationship between satisfaction and demographics were studied in this research.

1.7 Selection of Interviews

Four people assisted in conducting the interviews. They include two recent graduates and two undergraduates, all males. No formal training was done apart from explaining briefly what the research is all about and the locations to collect the data. This was due to the fact that I was not physically available in Karachi (resident in Rawalpindi) to conduct the training and communications were basically done on the phone. These different locations of the researcher and interviewers made supervision impossible. No compensation was given to the interviewers (the interviewers are my friends residing not too far from the locations of data collection). The data was collected for fifteen days, January 15- 31st, 2009 between 9am-7pm at each location.

After that data was analyzed by merging some of questions so as to conform the data to my hypothesis. This was done by conducting various types of statistical tests in order to interrogate my problem definition and to find solutions. Once all this was done a final conclusion comment was added to the written document.

1.8 Selection of Respondents

Questionnaires were administered in four different cities. Since no list of customer was used, the residential locations were used as quota segment. These residential locations may relate to the level of income of the inhabitants and as well as to the level of use of the mobile services. The residential locations are in Islamabad, Lahore, Rawalpindi and Karachi were divided according to the level of income.

The breakdown of these locations was based firstly researcher's experience of these areas and secondly, based on the history of economic condition and real estate value of these places. Karachi has got beach and shores (from the Arabian Sea and Indian Ocean) and has been choice of residence for top federal officers and diplomats since the colonial administration. The residences of the Defense and Clifton location's are for elite class, diplomatic communities and rich individual.

City	High Income Class (147)	Middle Class (132)	Middle-Low Class (127)
Islamabad	F-8,F-10&F-11 (33)	I-10 & I-9 (33)	I-11, G-9 Flats (34)
Lahore	Model Town (33)	Satellite town (34)	Shalimar (33)
Karachi	Defence Phase (40)	Wapda Town. (30)	Muslim Town (30)
Rawalpindi	Westridge Area (35)	North Nazimabad (35)	Churangi & Liyari (30)

Table1.1 Respondents Resident and Income Level

Lahore being a historical city is the choice of residence for corporate bodies, top state officers, civil officers, businessmen and averagely rich people. It is a choice of residence for civil officers, business people, etc. Islamabad is the federal capital and commercial center of the state. It is the choice of residence for corporate bodies (mostly headquarters), big markets, traders, business people, civil officers, etc, and has poorer housing structures.

Rawalpindi is the choice of residence for traders, low ranked employees, etc. Most location has problems of overcrowding, inadequate housing and poor sanitation.

A total number of 400 people were interviewed for this study. This number is in accordance with the views of Dillman (2000) and Hill et al. (2003)[8], who reported that a sample size of 100 and above is sufficient to present good concise research findings and also, provide good representation of the population or organization or any subject investigated. Selection is by convenience sampling (Non-probability sampling); interception of mobile users (questionnaires were handled out to every passerby and interested people waited to fill the forms) on streets in the central areas of the chosen locations on their way to work, lunch, school and shopping centers, etc. The points of data collection were changed within the chosen central locations to minimize bias. 100 respondents were administered the questionnaires at each location.

1.9 Research Instrument

A questionnaire was used in this study to collect data. The questionnaire employed the typical form of fixed-response alternative questions that required the respondent to select from a predetermined set of answers to every question. According to Malhotra and

Birks (2003, pp. 224) [9], this survey approach is the most common method of primary data collection in marketing research and the advantages are simple administration and data consistency.

1.10 Data Collection

The data was collected through primary surveys of around 400 consumers across 4 major cities of Pakistan. Quantitative Sampling was done to ensure that the sample is representative of the consumers of Pakistan. The data was analyzed on the basis of the research objectives. Two types of research objectives were addressed in the research; the first caters for the consumer perception and their psyche and looked at factor such as price sensitivity, quality, billing accuracy etc. Statistical tests and hypothesis testing has been done in this regard.

The second type of research objectives are those that relate to corporate side i.e. focused on the development and the future targets of the cellular companies, and quality, network congestion and performance issues were being focused. Data for these hypotheses was collected through in-depth interviews of key personnel at the cellular companies.

The survey questionnaires were administered on the streets (mode of data collection) and web communities: the questionnaires were filled out mostly by the people themselves or through the interviewers for few people who could not understand English. About thirty interviews are conducted through web and more than 30 people had responded to web questionnaires. Malhotra and Birks (2003) [10], showed in their evaluation of comparative survey techniques that street interviews have high flexibility of data collection, high degree of diversity of questions due to interaction and high response rate, moderate sample control, moderate quantity of data, moderate to high great potential to probe respondents, moderate to high potential to build rapport, moderate to high speed and cost of data collection. These qualities were responsible for the choice of this survey technique for this study.

The questionnaires employed the Likert non-comparative scaling technique. It is a widely used rating scale which requires the respondents to indicate a degree of agreement or disagreement with each of a series of statements or questions. This rating scale is easy

to construct and administer and respondents readily understand how to use the scale (Malhotra and Birks, 2003, pp. 305) [11].

The Likert scale used in this study as; balanced (the number of favorable and unfavorable categories is equal). This view is proposed by Watson (1992) [12], who reported the balanced state helps to obtain an objective data; has non-forced choices "no opinion" to improve the accuracy of the data (as proposed by Hasnich, 1992) [13]; and 5-scaled categories which conforms to the traditional guidelines reported by Aaker (1997) [14], who proposed that the categories scale should be between 5 and 9.

The questionnaire contained two sections; A and B. Section A had questions on demography (age, gender, employment and location) and the section B included questions on mobile provider, rating of service quality (network availability, CSSR, Value added services, cost, past experiences, call connection time, signal issues, network coverage and quality, voice and date issues and billing and validity period), post paid and pre-paid connections, customer care service (promptness, attitude and competence), and the rating of the service performance. In all, the questionnaire contained eight questions and the answers were "very satisfied", "satisfied", "dissatisfied", "very dissatisfied" and "no opinion". The questionnaire was constructed entirely in English.

S.No	Description/Question Type	Respondents Type
1	Quality of service.	consumer
2	Improvement in quality of service	corporate
3	Increase in number of subscribers	corporate
4	Reduction in call charges.	consumer
5	Trend of call charges	Corporate
6	Impact of new companies on the industry	Corporate
7	New value added services introduced	Corporate
8	Increase in network coverage	Corporate
9	Trend of increase in network coverage	Corporate
10	Consumers are price sensitive	Corporate
11	Consumers prefer better quality	consumer
12	Consumers prefer value added services	consumer
13	Consumer want wide network coverage	consumer
14	Consumer want billing accuracy	consumer
15	Consumer want the detail about hidden charges	consumer

Table 1.2 Questionnaire Descriptions (Consumer & Corporate Sector)

Features/Contents	Operational Definition
Network availability	Call quality as perceived by customers and this include: - Call clarity when calling and receiving - Coverage - Voice and data quality. - Call connection and drop rate. - Network performance and congestion. - Signal quality. - GPRS (Internet browsing on Mobile) - Pre-paid and Post paid connection cost and quality. - Value added services and their charges.
Billing	The cost of refilling credit (pricing): - Variety of refill card - Affordability of the refill card - Freedom of choosing refill cards - Speed of refilling - Billing accuracy.
Validity period	The period in which you can make calls and or receive calls after every refill
Customer Care	Customer support and complaint management systems: - Promptness (ability to get attendant quickly) - Attitude (response of the attendant) - Competence (ability to provide a solution)
Customer satisfaction	An experience-based assessment made by the customer of how far his own expectations about the individual characteristics or the overall functionality of the services obtained from the provider have been fulfilled

Table 1.3 Operational Definitions of the Content of the Questionnaire

1.11 Significance of Research

The Quality of Service (QoS) and Customer Satisfaction level's are very helpful to create customers awareness and for protection of users rights along with a good quality service. Lack of quality of service is a prime factor for poor and degraded service and hence results in poor satisfaction level.

Mobile companies are getting heavy revenue from their customers and if they don't provide service up to optimum expected level or customer's desire level, the customer's will be in loss. Hidden charges, wrong billing, poor service, call dropping, signal issues are often witnessed by many customers. This research study has great impact on national interest as such companies should be heavily fined, thus it can help to improve the service and quality standards. For creating competitive environment in market and to face future technology challenges, there are some recommendations keeping in view the customer's desire and their approach. As the service should be according to the standard quality parameters and cost should be reduced with no hidden charges. This research work is applicable as a generic solution to all the Mobile companies having their own set up for reducing their costs with no hidden charges, no call dropping and signal issues, no voice issue, no wrong billing, and other quality issues which are described in this research.

At national level the research work will help to provide Quality of Service to all Pakistani's with low cost and no hidden charges. It will also help to fulfill customer satisfaction level. The overall reduced calling costs with good quality and thereby resulting into the reduced customer complaints and quality issues.

1.12 Limitations of Research

Limited access to companies' reports, as these reports are generated for company internal consumption was a major limitation. All companies have restricted their employees that don't provide any information or data regarding the business or technical network diagrams and sheets to any outsider. PTA also provided limited information which was available on website or annual reports. Financial reports and detailing of each parameters and its value was not provided by PTA. There was difficulty in interviewing managers and CTO's of mobile companies because of appointment and their busy

schedule issue, and hesitation to shave their technical and business plans for research purpose.

1.13 Structure of Thesis

Chapter- one covers the background, structure of thesis, problem statement, objectives and the limitations of the study.

In **chapter-two** the Quality Management system, Quality Dimensions, Continual improvement and QoS in Telecommunication sector is thoroughly discussed.

In **chapter-three** the introduction to the Pakistan mobile telecommunication sector, mobile communication background, deregulation of telecom sector, cell-phone industry, mobile telecommunication service and telecom consumer awareness in Pakistan, PTA (Pakistan Telecommunication Authority) and mobile sector financials are discussed in this chapter.

In **chapter-four** covers the analysis of the QoS(Quality of Service) and its parameters, grade of service, voice quality, group access delay, customer perception regarding the services, Quality of services surveys, QoS issues in international roaming, benchmarks and performance indicators and CSSR issues towards partner networks are discussed in detail.

In **chapter-five** the customer satisfaction, service quality, customer loyalty, customer retention, customer profitability and demographics and customer satisfaction are discussed in this unit.

In **chapter-six** the data analysis, relations of the factors influencing the customer satisfaction are discussed.

In **chapter-seven** the recommendations and conclusion are being documented.

CHAPTER 2

INTRODUCTION TO QUALITY MANAGEMENT SYSTEM, QUALITY DIMENSTIONS AND QoS IN TELECOMMUNICATION

2.1 Quality

When the expression "quality" is used, we usually think in terms of an excellent product or service that fulfills or exceeds our expectations. These expectations are based on the intended use and the selling price [15].

Quality can be quantified as follows;

$$Q=P/E$$

Where Q= quality

P= performance

E= expectations

A more definitive definition of quality is given in ISO 9000:2000[16]. It is defined as the degree to which a set of inherent characteristics fulfills requirements. Degree means that quality can be used with adjectives such as poor, good and excellent. Inherent is defined as existing in something, especially as permanent characteristics. Characteristics can be quantitative or qualitative. Requirement is a need or expectation that is stated; generally implied by the organization, its customers, and other interested parties; or obligatory.

2.2 Quality Dimensions

Quality has nine dimensions. These dimensions are somewhat independent; therefore, a product can be excellent in one dimension and average or poor in another. These are as follows;

- Performance
- Features
- Conformance
- Reliability
- Durability
- Service
- Response
- Aesthetics
- Reputation

Marketing has the responsibility of identifying the relative importance of each dimensions of quality. These dimensions are then translated into the requirements for the development of a new product or the improvement of an existing one. The quest to maximize customer satisfaction led some firms to adopt total quality management principles.

2.3 Total Quality Management

Total Quality Management is an enhancement to the traditional way of doing business. It is a proven technique to guarantee survival in world-class competition. Quality is a degree of excellence a product or services provides. The purpose of TQM is to provide a quality product or service to customers. The key to an effective TQM program is its focus on the customer. There is continual striving to improve all business and production processes. Quality improvement such as on-time delivery, order entry efficiency, billing error rate, customer satisfaction, cycle time, scrap reduction, and supplier management, are good places to begin. The purpose of TQM is to provide a quality product and services to customers, which will, in turn, increase productivity and lower cost [17].

Besterfield [18] has observed “The word "quality" is used more and more often in companies, whether in the food, industrial or services sectors, and especially in the IT sector. The term "company" independently refers to any company, organization or association in the public or private sector. In the same way, the term "client" must be

taken generally to mean "beneficiary" and the term "product" the provision of a material or immaterial (service) deliverable. Many concepts hide behind the term "quality. Quality is the set of characteristics of an entity that give that entity the ability to satisfy expressed and implicit needs. The ISO 9000:2000 standard defines as: “The ability of a set of intrinsic characteristics to satisfy requirements.” As such satisfaction of the person or user depends on product and service quality. Quality is the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs. A company that satisfies most of its customer’s needs most of the time is called a quality company, but it is important to distinguish between conformance quality to and performance quality. Total quality is the key to value creation and customer satisfaction. The quest to maximize customer satisfaction led some firms to adopt quality management principles.

Hazier [19] has also observed, “Product and service quality, customer satisfaction, and company profitability are intimately connected. Higher levels of quality results in higher levels of customer satisfaction which support higher prices and often lower costs. Studies have shown a high correlation between relative product and service quality and company profitability.”

From the discussion we may conclude, if performance matches the expectations, the customer is highly satisfied and delighted.

In practice, there are two types of quality:

2.3.1 External Quality

It corresponds to the satisfaction of clients. Achieving external quality requires providing a product or services that meet client expectations in order to establish customer loyalty and therefore improve market share. The beneficiaries of external quality are a company's clients and external partners. This type of procedure therefore requires listening to clients but also must allow implicit needs that are not expressed by clients to be taken into account.

2.3.2 Internal Quality

It corresponds to the improvement of a company's internal operation. The purpose of internal quality is to implement the means that make it possible to best describe the organization and to spot and limited function. The beneficiaries of internal quality are the company's management and employees. Internal quality generally goes through a participative step in which internal processes are identified and formalized. The purpose of quality is therefore to provide the client with a suitable offer with controlled processes while ensuring that this improvement does not translate into additional costs. It is possible to improve a large number of problems at a low cost. However, the closer you get to perfection, the higher the costs reach. In the absolute, for private sector companies it is not really a question of exhaustively meeting client expectations ("zero defects") but rather of meeting them better than the competition. In the public sector, quality reveals whether or not public funds are being used expertly in providing a service that is adapted to citizens' expectations.

The opposite of quality or **quality defect** also has a cost. Indeed, it is generally more costly to correct defects or errors than to "do it right" from the beginning. In addition, the cost of a quality defect is greater the later it is detected. For example, making a defective Product will in the end cost more than double the production price that the initial product would have cost if it had been produced correctly the first time. Moreover, the price difference will be less if the defect is detected during production than if it is detected by the end user. Bester field has also shown the relationship of quality and cost function as presented in Fig 2.1. As the acceptable quality level can be attained by minimizing the cost.

It is a question of finding the right balance that eliminates quality defects as much as possible, in order to earn a good degree of customer satisfaction and customer loyalty and make profits, all with a reasonable budget.

2.4 Continual Improvement

One of the basic principles of quality is prevention and continual improvement. This means that quality is a never-ending project whose goal is to spot dysfunction as quickly as possible after it occurs. Thus, quality can be represented by a cycle of corrective and preventative actions called a "**Deming cycle**".

This cycle, represented in the Deming cycle, is called the **PDCA model**. PDCA refers to the four steps as follows:

- "**Plan**: define the goals to be reached and plan how to implement the actions.
- "**Do**: implement the corrective actions.
- "**Check**: verify that the set goals are achieved.
- "**Act**: depending on the results that occurred in the previous step, take preventative measures.

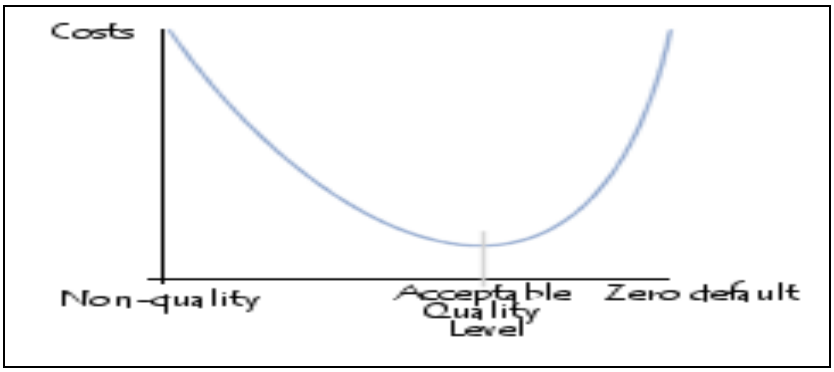

Figure 2.1. Cost and Quality Function Relationship

Source: TQM by Besterfield 3rd, Edition

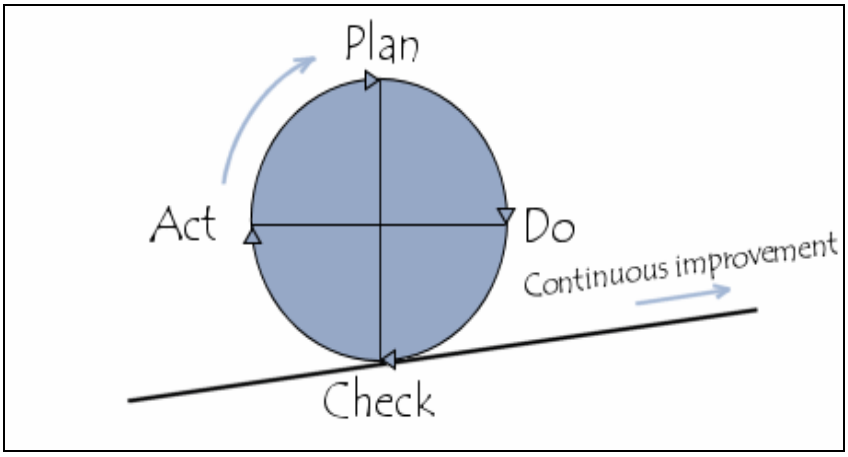

Figure 2.2. Deming Cycle or PDCA cycle

Source: TQM by Besterfields 3rd Edition, low price edition.

2.5 QoS in Telecommunication

In the field of computer networking and other packet-switched telecommunication networks, the traffic engineering term quality of service (QoS) refers to resource reservation control mechanisms rather than the achieved service quality. Quality of service is the ability to provide different priority to different applications, users, or data flows, or to guarantee a certain level of performance to a data flow. For example, a required bit rate, delay, jitter, packet dropping probability or bit error rate may be guaranteed. Quality of service guarantees are important if the network capacity is insufficient, especially for real-time streaming multimedia applications such as voice over IP, online games and IP-TV. A network or protocol that supports QoS may agree on a traffic contract with the application software and reserve capacity in the network nodes, for example during a session establishment phase. During the session it may monitor the achieved level of performance, for example the data rate and delay, and dynamically control scheduling priorities in the network nodes. It may release the reserved capacity during a tear down phase.

A best-effort network or service does not support quality of service. An alternative to complex QoS control mechanisms is to provide high quality communication over a best-effort network by over-provisioning the capacity so that it is sufficient for the expected peak traffic load. In the field of telephony, **Quality of Service** was defined in the ITU standard X.902 [20] as "A set of quality requirements on the collective behavior of one or more objects." Quality of Service comprises requirements on all the aspects of a connection, such as service response time, loss, signal-to-noise ratio, cross-talk, echo, interrupts, frequency response, loudness levels, and so on. A subset of telephony QoS is Grade of Service (GOS) requirements, which comprises aspects of a connection relating to capacity and coverage of a network, for example guaranteed maximum blocking probability and outage probability.

QoS is sometimes used as a quality measure, with many alternative definitions, rather than referring to the ability to reserve resources. Quality of service sometimes refers to the level of quality of service, i.e. the guaranteed service quality. High QoS is often confused with a high level of performance or achieved service quality, for example high bit rate, low latency and low bit error probability.

CHAPTER 3

Pakistan Mobile Telecommunication Sector

3.1 History of Pakistan Telecommunication

Pakistan's telecom sector inherited the British Post, Telegraph & Telephone [PTT] Departments. This entity worked with its analogue telephone lines for thirty years. This PTT Department was split up into the Telephone & Telegraph Department and the Postal Departments in 1962. In 1991 this was further re-organized through the PTC Act 1991 opening this public sector to private sector companies. Licenses were granted for non-basic services where the PTT had no experience base. These were Data Network Services, Paging, and Manufacturing of small telephone exchanges [23].

Then GOP took many steps for restructuring the Telecommunication sector to improve its performance. First of all Government privatized the PTC by redefining its own role from operator to sector policy maker. According to PTC act 1991, T&T department was changed into Pakistan Telecommunication Corporation to provide basic telecommunication services. At the same time, Government of Pakistan continued to encourage private sector and awarded licenses for cellular, paging, pay phones services. The PTC act of 1991 provided facilities to new comers to run their business in telecom sector. Since 1991 the Ministry of Communication started granting operating licenses also for data and Internet services and removed controls on telecom terminal equipment manufacturing. One of the major milestones was achieved by introducing the new legal framework in the form of Pakistan Telecommunication Ordinance in October 1996. Today, this new law is governing the telecommunication sector in Pakistan. This was done under Pakistan Telecommunication Reorganization Act 1996 [24].

PTA was assigned the responsibility of regulating the telecom sector.

- FAB was assigned the responsibility for allocating frequency spectrum and monitoring.

- NTC was assigned the responsibility of providing telecom services to public sector organizations.
- PTET was created as a trust to take care the problems of the employees of the PTCL.
- PTCL was created as public sector Company for providing domestic and international telecommunication services and 95% of the assets and liabilities of PTC were transferred to PTCL and the rest 5% were divided in other four divisions.

3.2 PTCL Creative Destruction (1995-2003)

In 1997, PTF was formed in order to defend the Data Network sector against private sector data network operators. By 1999 PakNet/Pak Data Comm. was split of from Pakistan Telecom Foundation to look after the pure Data Network sector. PTCL launched their private Mobile Network Company Ufone to compete with other private cellular operators like Mobilink, Instaphone and Paktel in 2001.Most recently PTCL is trying to enter the area of Hybrid Fiber Cable (HFC)-TV network after the initial launch of World Call's HFC networks in Lahore and Karachi. Afreen which started Instaphone Wireless and Super net Data Networks (Frame Relay Networks) has launched Telecard by Pay phone initially using land lines from PTCL. In 2000 it launched fixed wireless (using CDMA technologies) pay phones in Karachi under the name "Foree Fone & NA Taar Na Inttizzar". By December 2003 PTCL obtained an extension of the De-regulation of the Telecom sector deadline set by WTO and March 2003 was the new deadline [25].

3.3 Deregulation of Telecom Sector

In July 2003 government introduced a Telecommunications De-regulation Law. Milestones were established under Telecom Act 1996. The landmark Pakistan Telecommunications (reorganization) Act 1996 was turning point in the history of Pakistan Telecom. Under this Act, Pakistan Telecommunication Authority was established. PTC was transformed into Pakistan telecommunication Company Limited (PTCL), National Telecommunication Company (NTC), and Frequency Allocation Board (FAB) was also established. This Act had provisions that operator licenses would be

issued to PTCL, NTC and Special Communications Organization (SCO). Further the Act has the provision that the PTCL's monopoly on the basic telephony services would end on 31st December 2002 [26]

Some of the salient features of the Act of 1996 are [27]:

- Creation of Regulator
- Regulation of Telecommunication Industry and Services
- Transfer of telecommunication regime to private sector
- Powers of Federal Government to Issue Policy Directives
- Licensing
- Establishment of PTCL as Company under the Companies Ordinance, 1984
- Creation of National Telecommunication Corporation (NTC) to provide telecom services to armed forces, defense projects, federal government, provincial governments and local authorities etc.
- Formation of Frequency Allocation Board (FAB) with the responsibility of allotment and management of frequency spectrum. The FAB replaced the Pakistan Wireless Board established under "The Wireless Telegraphy Act, 1933" and took over the function of the Wireless Board.
- Creation of Pakistan Telecommunication Employees Trust with the object of to take care of the interests of the employees of the Company.

This Act was amongst the notable examples where telecom sector has undergone a successful restructuring and reform process. Despite criticism on the privatization of the PTCL, the reform and restructuring effort has shown very promising results. Introduction of competition in international telephony, basic telephony, fixed line local loop, wireless local loop, cellular mobile, interest service provision, and class value added services (CVAS) and others have been generally successful. Accelerated adaptation of technologies in fixed mobile, VAS: AMPS, DAMPS, CDMA, GSM, NGN, Broadband, WLL, WiMax, 3G etc have also been witnessed. Pakistan Telecom Authority has set successful examples of auctioning of service licenses and auctioning of various frequency blocks. In the beginning the CVAS and cellular operators were dissatisfied with the

PTCL and large number of complaints was lodged with PTA but subsequently PTCL and cellular operators, and other CVAS operators have gradually learned together, interconnection agreements signed and, making alliances are on the rise. Both local and foreign direct investments (FDI) in telecom sector have grown consistently. Improvements in teledensity, increased geographical coverage, increased penetration rates have been witnessed and direct and indirect benefits to the society and to the economy have been promising. This allowed and encouraged the foreign companies to come and compete. Pakistan provided them with highly productive and money-spinning market. The main purpose of the De-regulation Law is to establish the two new categories of basic services licenses: Local Loop (LL), for fixed line telecommunication within the fourteen PTCL regions. There are certain criteria for the operators to start operating set by the regulatory authorities. One is the issuance of license and other is the maintenance of QoS (Quality of Service) [28].

PTA started licensing value added services immediately after its creation in 1996. Since then the licensing activity consistently progressed. Because of PTCL's exclusivity on basic telephony till 31st of December 2002, the licensing was focused on value added service like, internet service providers, data communications, videotext, radio paging, and other services. The growth of telecom service licenses issued by PTA's are presented in the figure. PTA issued 696 licenses in various categories including fixed line local loop, wireless local loop, international, data communications, radio paging and payphone, internet service providers, cellular mobile service, and class value added services (CVAS) over a period of 1997-2005 [29].

Licenses for basic telephony could not be considered or issued before 2003 because of the PTCL's exclusivity till 31st of December 2002. Thereafter, licenses have been issued and the operators have gradually started rolling out their services portfolios. The CVAS operators have been offering services since 1997. The overwhelming interest of commercial enterprise in the basic telephony can also be linked with the business community's preparation and positioning during the years of exclusivity through CVAS and many companies in the CVAS businesses also competed for FLL and WLL while a few competed for mobile licenses as well.

In Pakistan, before the establishment of PTA, Ministry of Communication had issued mobile services licenses to Paktel, Mobilink and Instaphone. The issuance of license to PTML commonly known as U phone, and grant of two additional licenses through competitive bidding to Warid Telecom and Telenor were big steps forward. The FDI in telecom sector has a clear link with issuance of mobile service licenses and the launch of mobile service provision. From a negligible USD 6.04 million in 2002, it increased to USD 1905.06m in 2006 (over 50 percent of total FDI coming into the country) and USD 1824.25m in 2007 (close to 40 percent of the total). The major reforms in Pakistan took effect in 2004, with the adoption of the licensing framework developed with assistance from the Toronto law firm of McCarthy Tétrault and the conduct of mobile license auctions. Mobile growth rocketed up from that point, as did FDI [30].

Special Communications Organization is Government Organization operational under Ministry of Information and Technology Pakistan. SCO was established in 1976 to provide state-of-the-art telecommunication services for the people of Azad Jammu and Kashmir and Northern Areas of Pakistan and has become trend setter both in term of services and technology. We pride ourselves that we were the first to provide digital communications to the people of these far flung areas who were previously deprived of even common telecom services operational in rest of the country. This was the reason that SCO was tasked to bridge the gap [31].

SCO is a single largest telecommunication network provider in Azad Jammu and Kashmir and Northern Areas having extensive footprint of PSTN, GSM, CDMA and internet Provision. CO exclusively offers simple and exclusively designed packages to a diverse group of people from individuals to businessmen to corporate and multinationals

3.3.1 Deregulation Policy 2003

.In July 2003 the Government of Pakistan (GoP) announced “Deregulation Policy for the Telecommunication Sector”. The Policy sets out the following objectives [32]:

- To increase service choice for customers of telecommunication services at competitive and affordable rates;

• To promote infrastructure development, especially infrastructure that will increase teledensity and the spread of telecommunication services in all market segments.
• To increase private investment in private sector.
• To encourage local telecom manufacturing/service industry.
• Recognizing the challenge to incumbent, PTCL.
• Accelerate expansion of telecom infrastructure to extend services to un-served and under-served areas.
• Liberalize the telecommunication sector by encouraging fair competition amongst service provider.
• Maintain and effective well defined regulatory regime that is consistent with best international practice.
• Maintain consistency with Pakistan's IT and Interconnect promotion policy of low prices for bandwidth to make internet access affordable.
• Safeguard Pakistan's national and security interest.

3.3.2 Mobile Cellular Policy 2004

Government of Pakistan has announced it Cellular Policy. The policy objectives are [33]:

• Promotion of efficient use of radio spectrum;
• Increased choice for customers of cellular mobile services at competitive and affordable price;
• Private investment in the cellular mobile sector;
• Recognition of the rights and obligations of mobile cellular operators;
• Fair competition amongst mobile and fixed line operators;
• An effective and well defined regulatory regime that is consistent with international best practices;

In pursuance and compliance of the Cellular Policy, the Regulator has issued licenses to the foreign companies.

The foreign direct investment (FDI) which was less than 2% of total FDI in 2001-02 grew to over 35 percent in 2006-07 surpassing all other sectors like Oil and Gas as shown in the table. The analysis however; indicate that it was not the additional investment that entered in the country in fact it was the shifting of investment from other sectors as the investment in Oil and Gas which was 55.30% in 2001-02 reduced to 10.60% and similar reduction were seen in Power Sector and Financial Services.

The FDI in telecom sector has a clear link with issuance of mobile service licenses and the launch of mobile service provision. The table 3.2 below indicates the year of service launch by mobile operators before and after the establishment of PTA and introduction of competition in the cellular mobile markets.

The taxes, duties and other charges in the telecom sector were initially irrational and were subsequently rationalized in stages. Despite the reduction in the taxes, duties, and activation taxes the net contribution to the government exchequer grew consistently. And according to Delitte projection, even after further decrease in the SIM activation tax, the government revenues will continue to increase during the next 10 years. The historical contribution of telecom sector to the government is presented in table 3.3. The trend is consistent with other countries in the region, for example in Bangladesh GrameenPhones contribution to government budget increased from 521 million BDT in 1997 to 11,525 million BDT in 2004.

Sector	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Textile	3.8	3.3	3.7	2.6	1.3	1.2
Oil & Gas	55.3	23.4	21.3	12.7	8.9	10.6
Power	7.5	4.1	1.5	4.8	9.1	3.8
Telecommunication	1.2	1.7	21.8	32.4	54.1	35.6
IT services	0.5	0.5	0.6	0.6	0.7	1.2
Financial Services	0.7	26	25.5	17.7	9.3	18.2

Table 3.1. Growth in the FDI % Share of Telecom Sector in Pakistan

Source: State Bank of Pakistan

Operator	Mobile Owner	Launch Year	Technology	Market Share %
Paktel/Zong/China Mobile	Millicom/CM	1990/2008	GSM	8
Mobilink	Orascom	1994	GSM	31
Ufone	PTCL/Etisalat	2001	GSM	17
Telenor	Telenor Mobile	2005	GSM	24
Warid Telecom	Al-Warid Group	2005	GSM	17

Table 3.2. Entry of Mobile Companies in the Telecom Market

Source: Various Reports and Published Data

Year	PTA Deposits	Activation Tax	GST/CED	Income Tax	Custom Duty	Total
2001-02	38	1,200	8,810	NA	NA	10,048
2002-03	470	1,910	11,526	15,573	147	29,626
2003-04	694	4,020	12,119	21,009	555	38,397
2004-05	17,725	7,577	20,397	19,799	1,627	67,126
2005-06	15,034	10,510	25,178	20,854	696	72,272

Table 3.3. Contribution of Telecom Sector to the Exchequer 2001-02 to 2005-06.

Source: PTA, Annual Reports

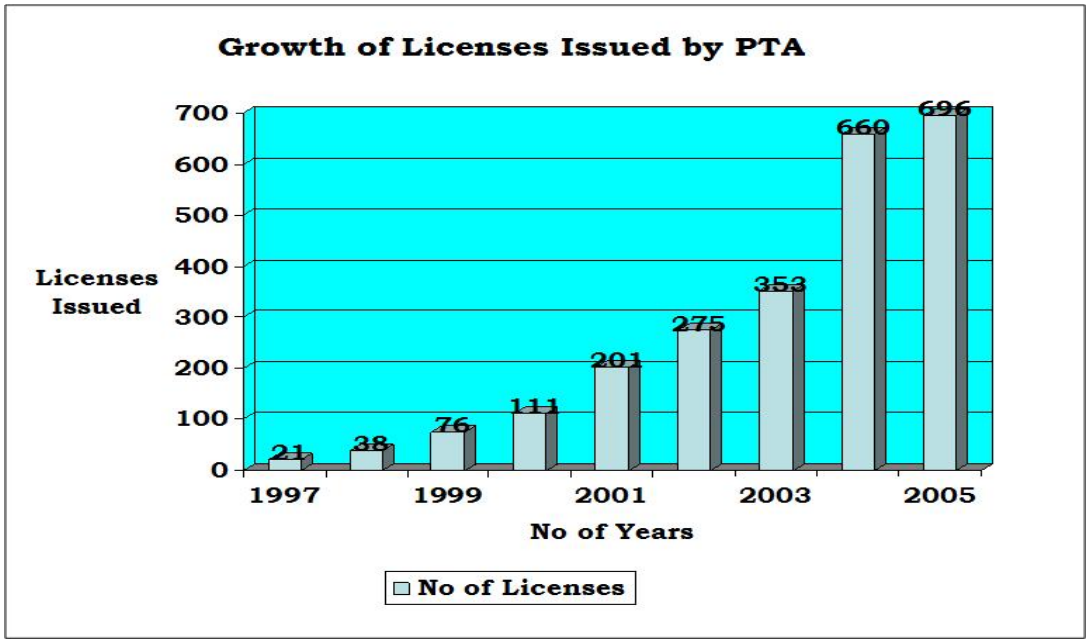

Figure 3.1. Growth of Licenses Issued by PTA (1997-2005)

Source: PTA data from Various Annual Reports.

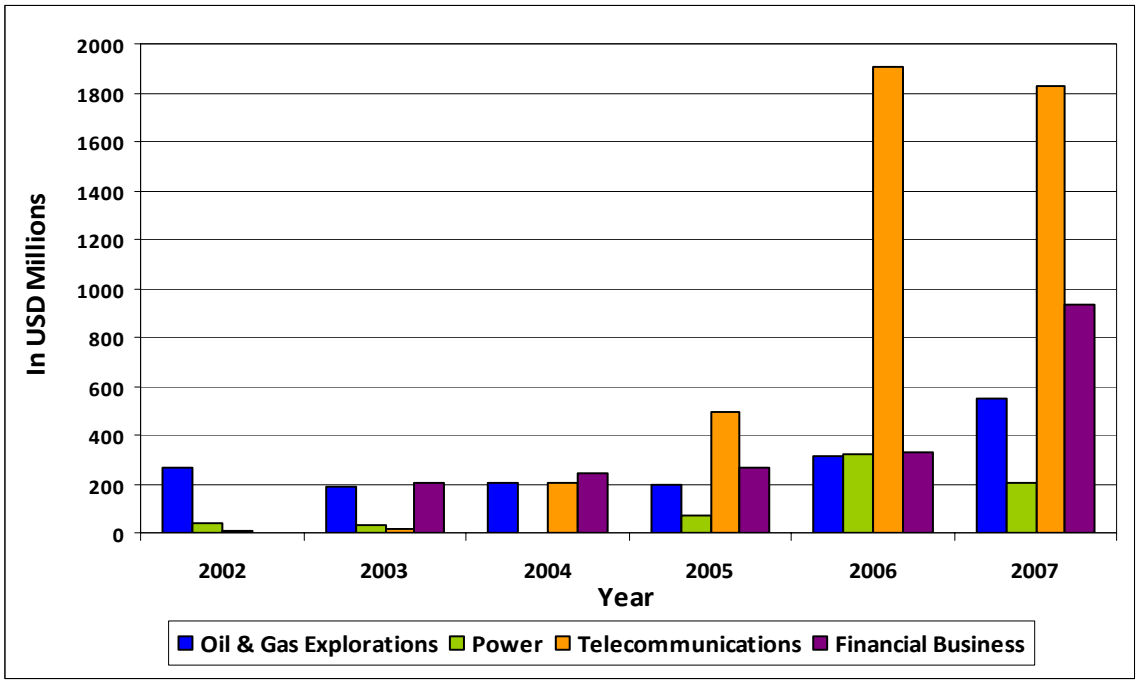

Figure 3.2 FDI in the Principal Sectors in Pakistan, 2002-07

Source: State Bank of Pakistan Report 2008.

Years	Developments
1989	Award of two mobile communication licenses to private companies.
1990	Conversion of T&T Department into Pakistan Telecom Corporation.
1992	Issue of third mobile communication license to private company.
1994	Sale of 12% share of PTCL in the market as vouchers.
1996	Pakistan Telecommunication (reorganization) Act 1996 was established. PTA, FAB, NTC were established.
1996	PTA started functioning as independent telecom sector regulator.
1996	PTA started issuing non-voice licenses to private companies.
2000	Introduction of Calling party pay (CPP) regime.
2000	Forth Cellular Mobile Licenses was given to PTCL.
2002	PTCL monopoly in Basic Telephony ends.
2004	New telecom policy was issued.
2004	Two new cellular mobile licenses were awarded by auction to Telenor and Warid Tel.
2004	WLL, FLL, LDI licenses were awarded to private companies.
2006	Management of PTCL transferred to M/s Etisalat.
2007	Universal Service Fund (Guarantee) Limited Company established.
2007	ICT R&D Fund (Guarantee) Limited Company established.

Table 3.4 TEACH Report Milestones in Pakistan Telecom Sector [34]
Source: Compiled from Various PTA Reports and Documents

The Pakistan Telecommunication Authority regulates the provision and establishment of new telecommunication services and also monitors the operations and maintenance of telecommunication systems in Pakistan. Under the new mobile policy, the PTA will grant new licenses for 15 years period allotted to Mobile sector; Telenor and Warid telecom

against an amount US$ 291 million each through an open auction. The Mobile operators Licensee will include a coverage obligation. In order to ensure this obligation, a Licensee will submit Performance Bond. The value of the bond is fixed at USD 15 million for new entrants. This bond will be redeemed after the achievement of coverage targets. Under the policy, a new entrant would be obliged to cover at least 70% of tehsil 5 headquarters in four years with a minimum of 10 % tehsil coverage in all provinces of Pakistan. The total numbers of tehsils in Pakistan are 402. A number of incentives have been promoted by PTA during the past three years, aiming to reduce mobile network operators input cost and to induce impetus of growth of the sector in Pakistan. Calling party pays (CPP) regime was introduced in year 2001. Foe new entrants, annual royalty has been cut from 1.5% to 0.5% of annual gross revenue minus inter operator's payments. This annual royalty reduction is also applicable to existing operators when they will renew their licenses [35].

Mobilink is the brand name created by the Pakistan Mobile Communications Limited, which commenced operations in August 1994, Ufone is the brand belongs to Pak Telecom Mobile, started in January 2001.Instaphone brand is owned by Pakcom Ltd. Instaphone. Paktel Ltd. Has the brand Paktel, which began in October 1990, and Telenor has come into the market in March 2004.In 2003, Pakistan opened the telecom market to private operators in the sector of fixed line and cellular as well. Telecom regulators also introduce wireless local loop technology in the country. Due to these regulatory policies, competition occurred in the all segments of the telecom sector and resulted in lower tariffs and cheaper handsets [36].

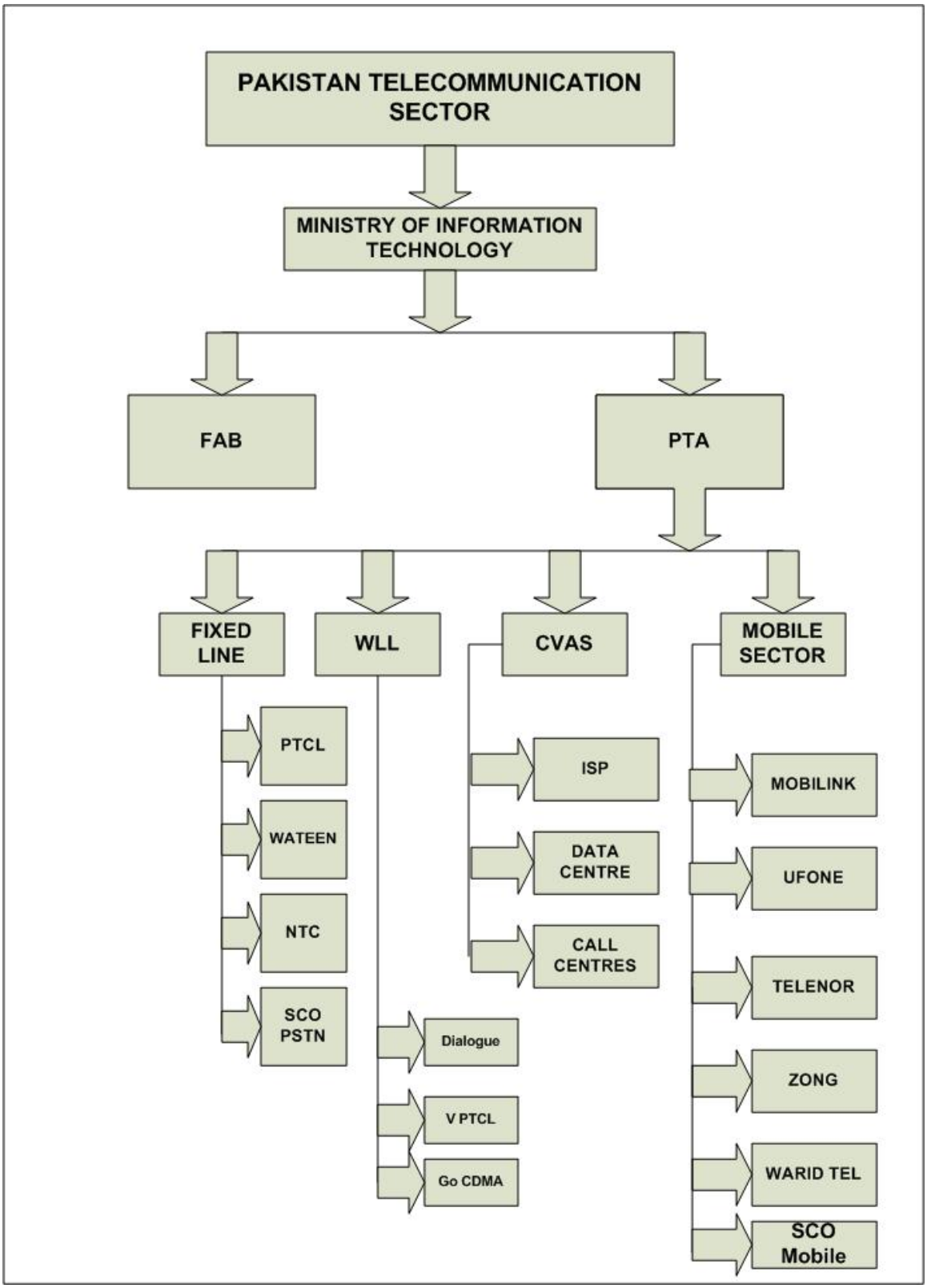

Figure 3.3 Flow chart of Pakistan Telecommunication Sector [37]

Source: Compiled from PTA Various Reports and Telecom Regulators Magazine

3.4 Cell- Phone Industries

As Al-Warid of UAE began its working in Pakistan, a new phase of development started in the cell phone industry in Pakistan. Although, Telenor has already revolutionized the outlook and functioning of cell phone industry in Pakistan. There were 9.732 million Cell- Phone subscribers in Pakistan in 2004. Pakistan has become one of the fastest growing mobile markets among the emerging telecom markets [38]. In 2007 the sector grew by 80% whereas average growth rate in last 4 years is more than 100 %. Today total subscriber base stands at 68.5 million (August 2007) whereas it was 34.5 million in 2006 and 12.7 million in 2005. This tremendous growth is attributed to many internal and external factors starting from deregulation down to implementation of Mobile Number Portability. The government and regulator are trying their best to facilitate the sector and are making every effort to provide mobile access to every corner of the country. While looking at the total subscriber base which is a mix of both pre/post paid services. In 2006 the net addition was more than 21 million in one year showing 1.75 million average addition per month whereas in 2007 the net addition was more than 27 million increasing average addition to 2.3 million per month. The subscriber of Mobilink grew by 50% only during this year however, Telenor added almost 7 million subscribers to its network during the reported year [39]. In fact the company has been focusing on attracting both low-end and high end users and high data-usage customers by offering its extensive data oriented services. As for Warid, the company attracted good over five million customers during 2007. Mobilink's new subscription during 2007 was only 9 million which is low as compared to last year's performance where the company had a new subscription of more than 10 million. Mobilink is still attracting and targeting high end users whereas everyone is now aware that most growth in the future will come from low-end segment. Ufone subscriber grew by 85% in 2007 as the company is maintaining satisfactory quality of service in addition to attractive consumer oriented schemes like free air time. Paktel and Instaphone's subscription growth remained stagnant during the year [40].

Ufone is the operator whose subscriber share more or less remained unchanged. Mobilink kept on loosing its share for another year in favor of Telenor and Warid mainly, whereas Paktel and Instaphone share in the market also dropped as both companies are struggling with traditional phase.

3.5 Mobile Telecommunication Service

After the invention of telephone, its technology, construction and use has been gradually developing till now. In this context, the latest development can be taken as the wireless technology. In the previous technology, it was necessary to use wires from telephone exchange to customer's premises due to which it was necessary to fix the telephone at certain place and the caller was obliged to go to that place for making a call. By the term mobile telephony it is meant that it is not necessary for a telephone set to be connected at any fixed location; telephone set can be carried by an individual at any time and calls can be made from anywhere. Mobile telecommunication service is based on different technologies of which GSM (Global System for Mobile Communication), is one that is currently being used in world. This technology is used in India as well as most countries of Asia and in almost all countries of Europe. Human desires have increased in pace with the technological development. Expectation of telecommunication service anywhere and at anytime has been the demand of today's time. Mobile telecommunication service has been proved to be very useful and practical since it does not need wires and the terminal for communications is small and can be carried everywhere [41].

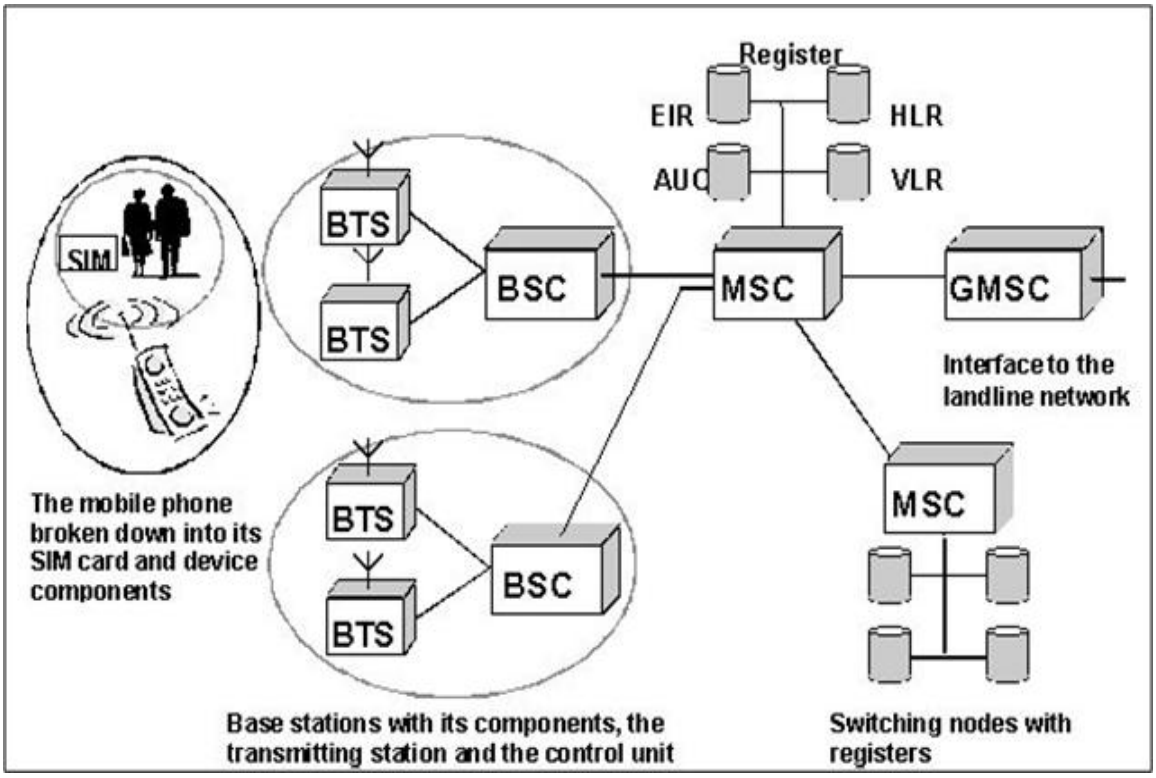

Figure 3.4 Cellular Communication Models [42]

Source: GSM model and working, by Bernard A Saklar.

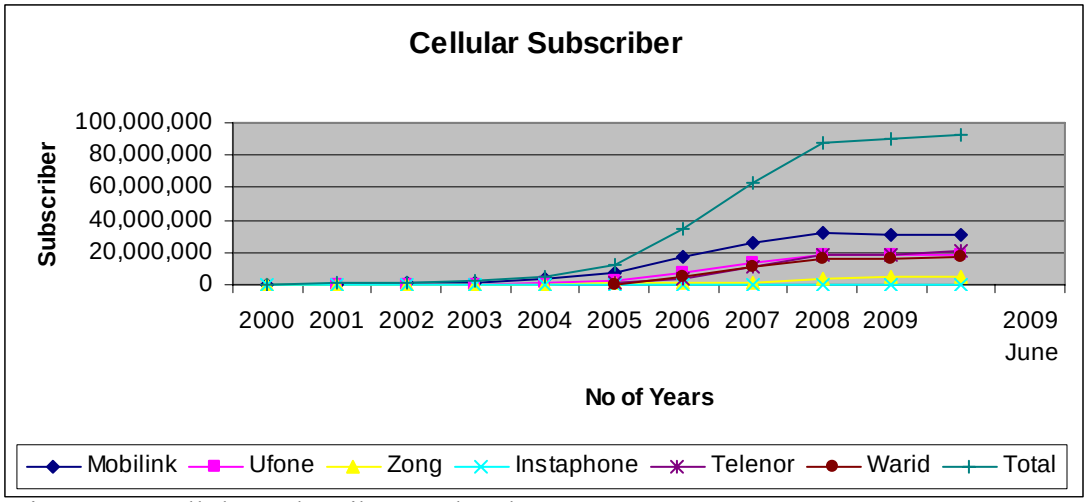

Figure 3.5 Cellular Subscriber Updated Report

Source: Telecom Industry Flare Magazine Updated Report Feb 2009.

Radio waves are used instead of wires in mobile telecommunication service to transmit information. Its importance has been highlighted because a single set and the same number can be used anywhere in a country. Roaming facility has been a special

feature of mobile telecommunication service. But this roaming facility can be accessed only after an agreement between two service operators using the same technology. The small hand-held set carried by a customer is equipped with a transmitter, a receiver and an antenna for both transmitting and receiving radio waves. Actually, apart from voice communication, different services like SMS (Short Message Service), MMS (Multimedia Messaging Service), voice mail, Internet etc. can be used through the mobile terminal. Because it need not be connected in a particular place and can be taken anywhere, its use has been continuously increasing in Pakistan where the mobile telecommunications service has been established since 6 years. More customers are seen to be attracted to mobile service in this period [43].

3.6 Telecommunication Consumer Awareness in Pakistan

Pakistan's telecom sector has seen phenomenal progress during past decade. It was deregulated in 1996. Since then, there has been no looking back. It has more than 48 million cell phone users, and nearly 1.5 million wireless users. Landline is an old story. Though this phenomenal growth has brought huge benefits to the people of Pakistan, yet it has its downside also. As Pakistan has nominal consumer protection laws, the consumers are being fleeced by every kind manufacturer, business including telecom operators. Wrong billing, deceptive price formulas, connectivity, clarity of voice, sale of used prepaid cards, deceptive advertisements, and lack of any compensation for damages incurred due to bad service of telecom operators are only a few.

3.7 Pakistan Telecommunication Authority (PTA)

Pakistan Telecommunication Authority established a complaint cell in 2002 to "facilitate and resolve the complaints made by an individual or a group against Telecommunication Services."

Complaints can be reported by a toll free number (0800-55055) or using an online form. However there is no public information about the volume of complaints or its rate of successful resolution of these complaints. Judging from the situation, PTA complaint cell performance has not been satisfactory. Consumer's lack of awareness about their rights compounds the problem. Most of the people do not know that they can sue a company for bad service. Their complaints are not resolved. Consumer complaint

cell being run by the network for consumer protection in Pakistan and know, first hand, that small problems are not resolved by the companies for which people have to turn to consumer complaint cell [44].

Two large companies (PTCL holding sway in wireless and landline service, and Mobilink having largest number of Mobile phone subscribers) are creating problems, which directly affect consumers. PTCL has refused to cut down bandwidth rates, while Mobilink is dragging its feet over Mobile Number Portability issue. Pakistan Telecommunication Authority has so far been unsuccessful in taming them.

3.8 Mobile Sector Financials

High investments, affordable handset and improvement in coverage are considered to be the stimulants of growth in mobile segments. Mobile sector of Pakistan attracted large foreign investments after the liberalization. The foreign telecom companies realized huge market potential in the country and thus invested not only in paying high license fees but also invested in the infrastructure. China mobile the largest mobile operator in Asia has just entered Pakistan mobile market by investing almost US$ 704 million and has bought Paktel limited. China Mobile's takeover of Paktel is promising move that is believed to bring the life back to the company. Similarly Sing-Tel who has been trying to enter Pakistan telecom sector has finally got successful by buying 30% shares of Warid Telecom and has invested almost US$ 758 million. Although Warid has been making good investments from its own resources (both local and foreign) however it was grappling with low ARPUs that could only be managed through big foreign backing. Similarly local operators have also been able to access funds from international capital markets and Mobilink has been fairly successful in this regards.

Mobile sector has alone invested US$ 6 billion in Pakistan in last four years where Telenor invested US$ 761 million (29%) while Mobilink has invested US$ 591 million (23%) in the year 2007. Mobilink planned to invest US$ 500 million in 2007-08 while Telenor plans to invest US$ 750 million in next two years [45].

Across the globe the prices of mobile calls are dropping down and key drivers behind the drop is increasing competition among mobile operators in local industries. With 78% increase in subscriber base and 95% increase in investments, mobile revenues grew by

48% only in 2006-07 [46]. The mobile industry was growing at an average rate of 80% for the last three years however this year the growth rate dropped. This drop is mainly due to reduced tariffs and increased taxes. Similarly the industry is now moving towards stability and cost of attracting and retaining subscriber is increasing. Telenor and Warid have witnessed huge growth in their total revenues that have grown by more than 200%. Revenues of Mobilink and Ufone grew at a proportional pace; however, Mobilink remained to be a major contributor in the total revenue of the industry due to its size. Instaphone revenues kept on falling for another consecutive year. It is also revealed that almost 5% of the total revenues of mobile industry came from data services and more than 90% revenues came from voice services in 2007. As for the market share, Mobilink is still having maximum share in the market in terms of revenue with almost 50% of industry revenue is generated by Mobilink. Telenor having market share of 17% is second highest revenue generator of mobile industry followed by Ufone and then Warid [47].

Total Revenue from Data/Voice Services Mobile Operator Wise			
Operators	**Data**	**voice**	**Total Rs. Million**
Mobilink	3,830	60,824	64,654
Ufone	1,559	20,308	21,867
Telenor	182	18,129	18,311
Warid	1,338	15,785	17,123
Paktel	1,338	2,749	4,087
Instaphone	NA	472	472
Total	7,057	118,267	125,324

Table 3.5 Total Revenue from Data/Voice Services Mobile Operator wise
Source: Pakistan Telecommunications Mobile Revenue Report 2008.

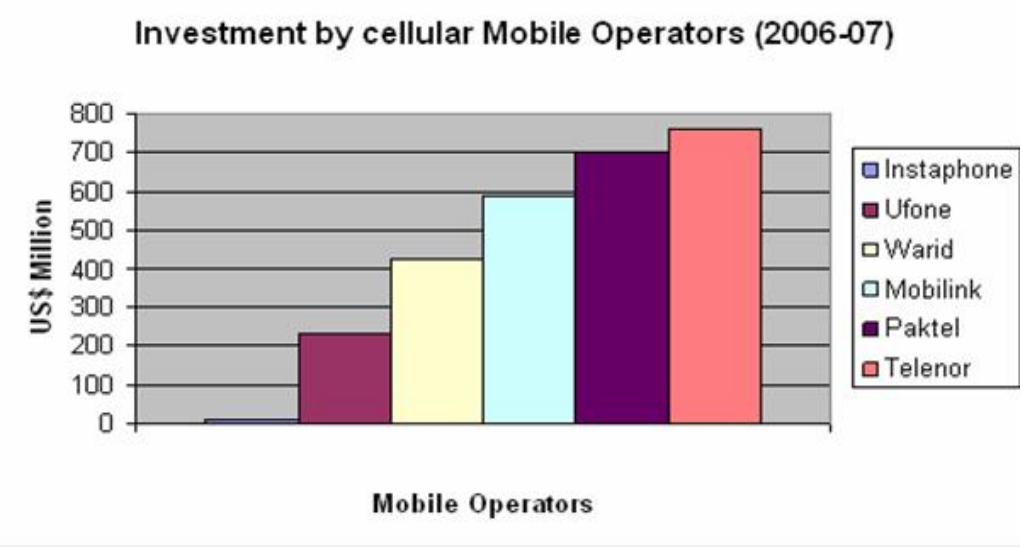

Figure 3.6 Investments by Cellular Mobile Operators (2006-07)
Source: Cellular Operators Financial Reports

3.9 Subscriber Growth

Pakistan has become one of the fastest growing mobile markets among the emerging telecom markets. This year the sector grew by 80% whereas average growth rate in last 4 years is more than 100%. Today total subscriber base stands at 68.5 million in (August 2007) whereas it was 34.5 million in 2006 and 12.7 million in 2005 [48]. This tremendous growth is attributed to many internal and external factors starting from deregulation down to implementation of Mobile Number portability. The government and regulators are trying their best to facilitate the sector and are making every effort to provide mobile access to every corner of the country. While looking at the total subscriber base which is a mix of pre/post paid service this year too ratio of post to prepaid connect remained to be 3.97 showing that post-paid subscription which is related to business use is still very low, resulting in low ARPUs currently prevailing in the industry.

Pakistan Mobile industry is witnessing increasing net addition to total subscriber base for last five years. In 2006 the net addition was more than 21 million in one year showing 1.75 million average addition per month whereas in 2007 the net addition was more than 27 million increasing average addition to 2.3 million per month [49].

The subscriber of Mobilink grew by 50% only during this year however, Telenor added almost 7 million subscribers to its network during the reported year. In fact the company has been focusing on attracting both low-end and high end users and high data-usage customers by offering its extensive data oriented services. As for Warid, the company attracted good over five million customers during 2007. Mobilink's new subscription during 2007 was only 9 million which is low as compared to last year's performance where the company had a new subscription of more than 10 million. Mobilink is still attracting and targeting high end users whereas everyone is now aware that most growth in the future will come from low-end segment. Ufone subscriber base grew by 85% in 2007 as the company is maintaining satisfactory quality of service in addition to attractive customer oriented schemes like free airtime. Paktel and Instaphone's subscription growth remained stagnant during the year [50].

Mobilink kept on loosing its share for another year in favor of Telenor and Warid mainly, whereas Paktel and Instaphone share in the market also dropped as both companies are struggling with transitional phase.

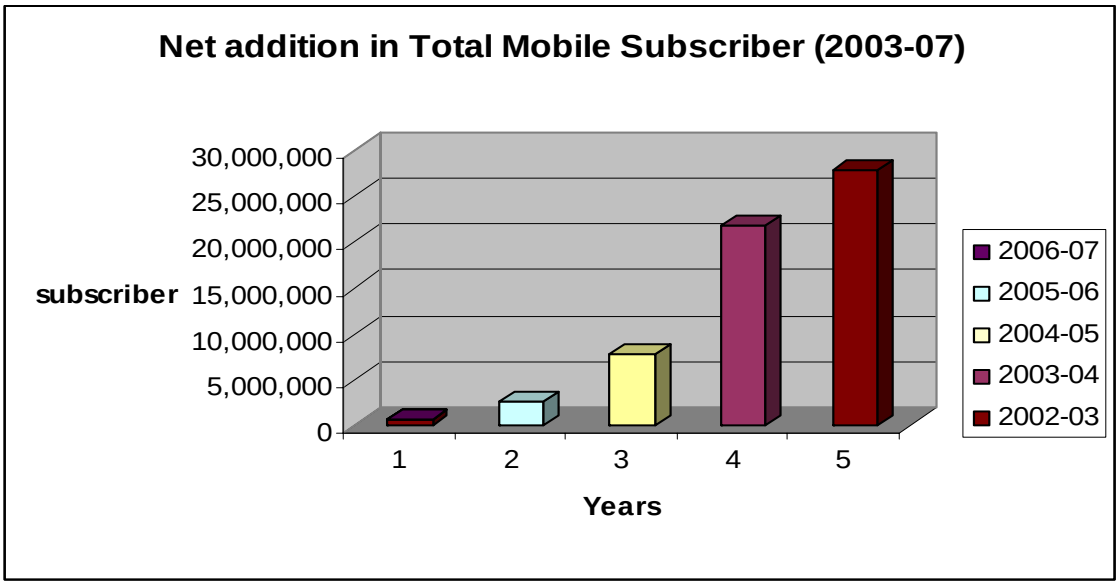

Figure 3.7. Net Addition in Total Mobile Subscriber (2003-07)
Source: Telecom Asia Report 2007.

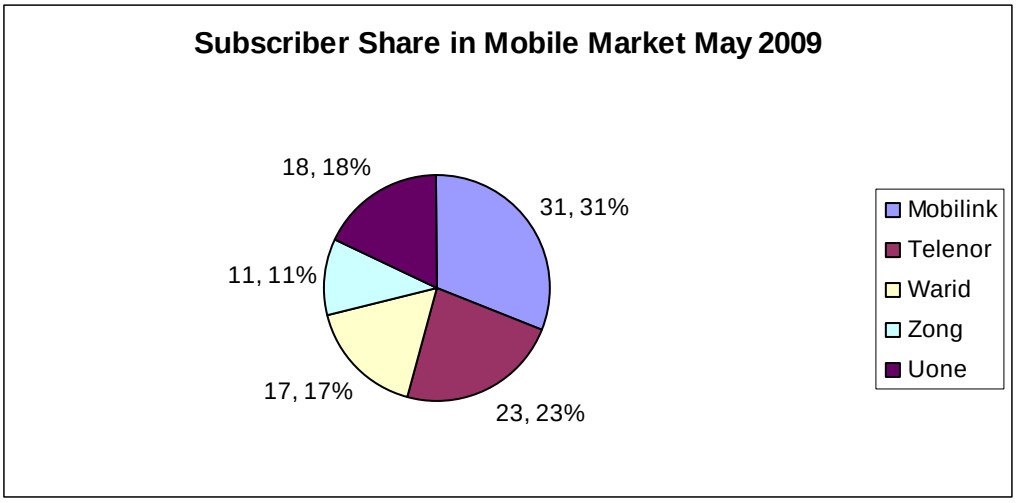

Figure 3.8 Subscriber Share in Mobile Market 2009
Source: Flare Telecom Magazine Report 2009.

3.10 Mobile Network Coverage

In a competitive and heated mobile market of Pakistan, operator's survival lies in getting into the new areas and providing better quality of services. For sustaining profitability levels coverage to maximum population is name of the game. Since deregulation all operators have been increasing their coverage areas by rolling out network to the areas with services in addition to enhancing the capacity of already covered areas. Today more than 6,000 cities/towns and villages have mobile networks by one or all operators. Maximum cities are covered by Mobilink which has the biggest cellular network in the country. The company just had less than 1,000 cities/town/villages on its network in 2006 but this year company intensely invested in increasing their network area and the number jumped to 6,000 destinations. Ufone also added new areas to its network however; the company has maximum coverage in Balochistan with 45 cities/towns/villages. Telenor has also increased its number of cities covered and this year concentrated. The cell sites are also increased by large number over the years. In 2004 there were less than 2,000 cell sites erected by all mobile operators for provision of services. Today cell sites of all mobile operators are more than 13,500. Today 1,619 franchises are working in Pakistan representing one or the other operator [51].

Growth patterns achieved by mobile industry crossed all the forecasts made by the independent consultant and even the Authority. According to International research companies including both Business Monitors International and Informa telecoms, the mobile subscribers would cross 110 million marks by 2010. The growth rate suggested by these research firms is on average between 20 to 25% per year. It is expected that most of the potential population would be covered by the next two years. Therefore, by the year 2009-10, the cellular subscribers would reach around 100 million making the cellular penetration 59 percent [52].

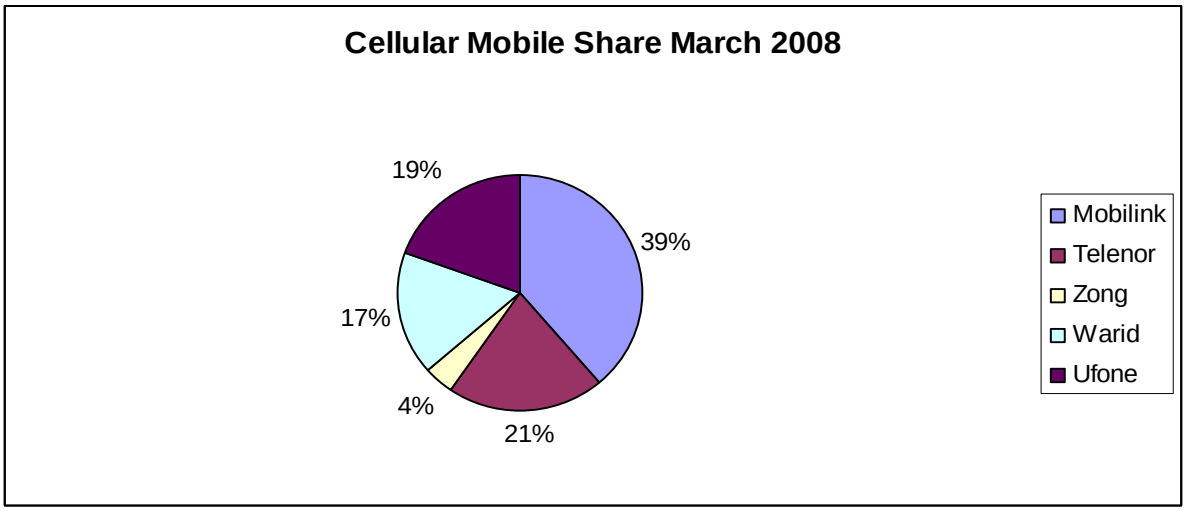

Figure 3.9 Cellular Mobile Shares March 2008
Source: Telecom Asia PTA Quarterly Report March 2008.

Cellular Subscriber								
Year	Mobilink	Ufone	Zong	Instaphone	Telenor	Warid	Total	Growth Rate%
2000	114,272		80,221	112,000			306,493	15
2001	309,272	116,711	96,623	220,000			742,806	142
2002	800,000	350,000	218,536	330,000			1,698,536	129
2003	1,115,000	550,000	319,400	420,000			2,404,400	42
2004	3,215,989	801,160	470,021	535,738			5,022,908	109
2005	7,469,085	2,579,103	924,486	454,147	835,727	508,655	12,771,203	154
2006	17,205,555	7,487,005	1,040,503	336,696	3,573,660	4,863,138	34,506,557	170
2007	26,466,451	14,014,044	1,024,563	333,081	10,701,332	10,620,386	63,159,857	81
2008	32,032,363	18,100,440	3,950,758	351,135	18,125,189	15,489,858	88,019,812	39
2009	31,359,049	18,801,402	5,092,476	321,134	18,472,445	16,157,778	90,204,284	1
2009 June	31,359,049	18,801,402	5,092,476	321,134	20,472,400	17,157,778	93,204,239	1

Table 3.6 Cellular Subscriber [62]
Source: Flare Telecom Magazine Edition Feb2009.

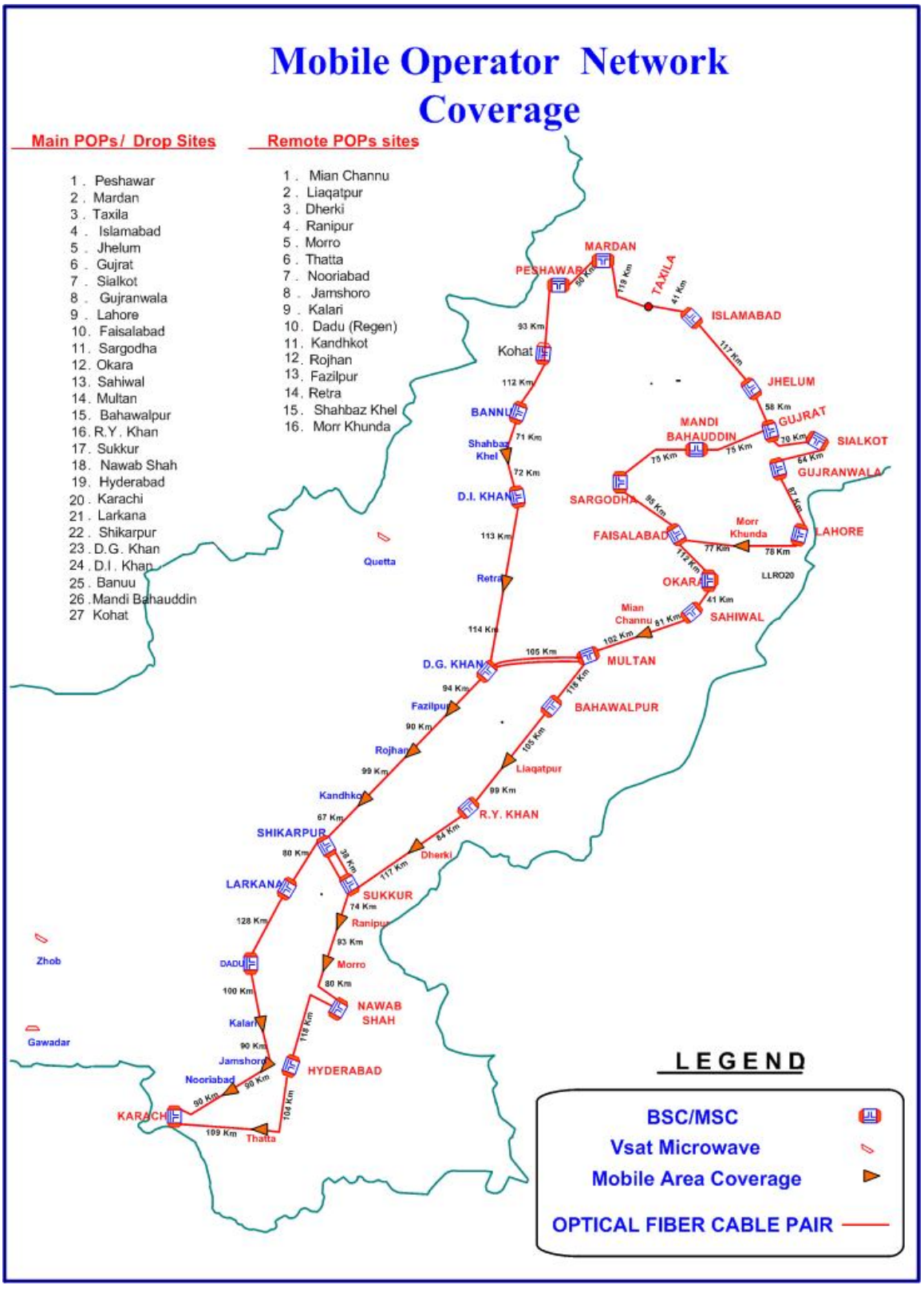

Figure 3.10 Mobile Operator Network Coverage

Source: Various Operators Technical and Annual Reports.

Mobilink subscriber deletions picked up with the giant losing 5.2% of its base or 1.6 million subscribers MoM, says a latest data released by the Pakistan Telecommunication Authority. Analysts said that this declined in subscription may be attributed to operator's substitution driven by intense competition in the industry, besides deletion of un-registered SIMs, causing a heavy loss to the company [53].

According to PTA data, Mobilink posted massive subscriber deletion to the tune of 2.7%. This has reduced its total subscriber base to 30.1million. On the other hand, subscriber addition fared particularly well for Telenor which added 513k subscriber, raising its base by 2.7% . This also bolstered its market share by 0.7%, hence propelling it past Ufone once again to capture the number two a lot, Zong, Warid and Ufone also posted subscription growth of 1.9%, 1.5% and 1.1%, respectively.
Mobilink's market share was dipped by 1.6% to reach 31.7% in Dec08 [54]. Telenor's significant addition bolstered its market share by 0.7% hence propelling it past Ufone once to capture the number two slot. Analyst observed that the two subscriber however, remain practically neck-to-neck with a difference of just 87k subscribers. Warid and Zong also improved their share by 0.4% and 0.1% respectively. Omair Chughtai, a telecom analyst with BMA Capital, in his report pointed out that Mobilink's subscriber attrition has persisted uninterrupted since Aug08 and the operator has seen its subscriber base decline 11.2% or 3.6million subscriber since then. At this rate, on average, if subscriber attrition persists, Mobilink's base could reduce to 25.5million subscriber by 2009 end [55].

The data depicted that overall subscriber addition which turned negative in Nov08, continued the trend into Dec08. Overall subscribers declined by 0.6% in Dec08 compared to negative growth of 0.1% in Nov08 and clocking in at 89.9mn. Net deletions registered 500k subs in Dec08 compared to 118k in the previous month. This has also pushed down the industry average addition rate for a rolling 12month period significantly to 1.1 million subscriber in Dec08, versus 1.3millionn in Nov08.

According to surveys and reports, Mobilink share in the market has declined from 44% in March 2007 to 39% in March 2008. Although the company has added 7.6 million new users during the last one year, the slowing market has negatively affected the company. Another eye opening fact is the market share of Mobilink which is declining sharply. According to PTA report, market share of any company is an important tool to gauge the level of competition in any sector of economy. It helps the regulatory authority to act as a leveler to promote investment friendly environment. It also gives a chance to fortify the weak areas of the sector. Market shares of the cellular mobile operators indicates that market is moving towards perfect competition, where the share of major operators are declining and new entrants are able to grab more shares in the market. Mobilink share in the market has declined from 44 percent in March 2007 to 39 percent in March 2008. Although the company has added 7.6 million new users during the last one year, the slowing market has negatively affected company. The good signs are only shown by Telenor Pakistan which is heading, while Ufone shares are still 20 percent as was in March 2007. Zong also has good prospects with expanding network coverage and market shares. In the last one year Zong has grown greatly from 1.9 percent market shares to 2.6 percent shares [56].

On the other side government and security agencies are pushing hard to stop the sale of illegal SIMs and on the other side business market are declining. This crisis will be worsening with the passage of time; it has badly disturbed the Orascom management to think again and again before moving ahead with other business solutions. As Ethislat has already entered in Pakistani market and have a big competition with Mobilink and is keen to buy the so called market leader to occupy the whole market.

Mobilink is losing its market share and competition in the telecom sector. Mobilink high officials are no more interested to invest in the sector. Sources told that not only Mobilink is losing its customers but also link-dot-net, which is not successful in fulfilling the expectation. High rates and overcharging with poor service quality was reported again and again, but all was in vain. In 2004 PTA fined Mobilink Rs60 million for poor service quality which was an eye wash. So they continued their network

expansion with illegal SIMs. Over three million SIMs were issued without proper documentation, and caused serious security threats to the national integrity [57].

A confidential report of Ufone leaked in June 2007 whexposed the fact that the company failed in many areas. The administration could not complete the target sites roll out in any of its phase which resulted poor coverage. The development work was also not up to the mark as slow work and low quality material was used. According to the report in Phase A total 151 sites were to be roll out but total 59 sites were rolled out whereas 23 sites are partially installed/ the situation in phase B is even worse. Total targeted sites were 137 to be rolled out in Jan 07 but no site was on ground in the targeted time. The quality of civil work was very poor. Though the quality of network and coverage matters but civil work is directly related with the safety of public. This poor standard of civil work was examined at many sites and common faults were improper mortar filling, use of poor quality bricks and masonry work etc [58].

According to confidential report due to low ratio of BTS (tower), Ufone was at number four position in terms of coverage. Even the relatively new operator, Telenor has crossed Ufone.

For Ufone all these factors count towards the market share loss from 21.7 percent in June 2006 to 20.7 percent in December 2006 [59]. Though Mobilink has also lost market share, but the customer base of Mobilink is increasing again after some slowing trend. Meanwhile, the market shares of Telenor and Warid have increased tremendously. According to PTA quality of service survey, Ufone was at the lowest position with service accessibility 97 percent and call completion ratio of 94.10 percent which was lowest among operators. Even SMS access was 10.14 percent delay as compared to other operators. Another factor which is also showing the Ufone lowering trend is the latest figures released by the PTA. The telecom growth of Ufone is stagnant for the last one year with the total customers hanging around the figures of 18,600,500 while Telenor group has just crossed this figure [60].

“This is another prove of Ufone’s failure as the other companies are heading with more pace then the Ufone. No one knows what happen next but in Ufone case, it

looks clear that this national asset is being destroyed with concerted conspiracies of the higher management. From advertising to civil work, no one is looking serious to face the challenge. It is common saying that umbrella companies always affect the sub companies and Ufone is no difference. As this company was gifted to Ethisalat with PTCL. Now its prime responsibility of government to take serious notice to save our national asset, which has damaged its image badly and there are no signs of revival" [61].

The mobile market added around 9.9 million new customers in the first half of 2008, expanding by 12.6 percent to reach 88.05 million mobile users. The Annual Report of PTA 2008 reflects that Telenor Pakistan emerged as the fastest growing telecom company as Telenor added around 7.4 million subscribers in the incumbent year as compared to 7.1 million in 2007 [61]. Mobilink comes second with the addition of 5.7 million subscribers during the same period. Warid Telecom added another 4.8 million subscribers while Ufone bagged 4 million subscribers as compared to 6.5 million in previous year. CM Pak entered the cellular market with aggressive marketing and infrastructure roll out. Its growth was negative in the previous year. However, it added 2.9 million subscribers October 2008 to March 2009. The cellular mobile penetration in Pakistan reached 54.7 percent at the end of year 2007-08 which is 15.3 percent higher than previous year.

By the end of June 2008, the mobile penetration in Pakistan had surpassed the 50 percent threshold. Mobilink continues to dominate Pakistan's mobile market, ending Q2008 with over 32 million subscribers, said a report.

3.11 Cellular Mobile Traffic

During 2007-08, substantial addition of new connections, and introduction of innovative tariff attractions have increased cellular mobile national and international traffic by many folds. "International outgoing traffic by cellular mobile companies has increased by 102% in 2007-08 compare to 2006-07 while the international incoming traffic of cellular mobile operators grew by 60% during 2007-08 [63]". In total cellular mobile international traffic has increased by 70%, which is an encouraging number. During the year 2006-07, cellular mobile operators terminated 549 million minutes on

foreign operators networks while foreign operators terminated 1.76 billion minutes on cellular mobile networks of Pakistani operators. In the year 2007-08, Pakistan cellular mobile industry terminated 1.109 billion minutes on foreign networks while foreign operators terminated 2.82 billion minutes in Pakistan. Last year total international traffic was reported 2.3 million while in the year 2007-08 this figure has raised to 3.92 billion minutes [64].

Though cellular mobile companies have offered low tariffs in domestic market, they could not succeed to increase domestic traffic significantly was the case in for of international traffic as shown in the table of Post paid and Prepaid connection. Total domestic outgoing traffic of cellular mobile operators grew by 28% in 2007-08 compare to 2006-07. Total outgoing traffic of mobile operators increased from 30.7 billion minutes. However, the domestic on-net outgoing traffic of mobile operators increased 31%. Domestic traffic of cellular mobile operators on fixed networks increased by 13%.

Telenor has presented the highest growth for international traffic among all cellular mobile operators where its growth was reported more than 300% in the year 2007-08 compare to previous year. “Telenor total international traffic was 98.3 million minutes which was jumped to 396.7 million minutes in 2007-08.”CM Pak comes second to Telenor for international traffic in terms of growth whose total international traffic has increased from 22.70 million minutes in 2006-07 to 66 million minutes in 2007-08 representing a growth of 191%. Ufone’s growth for international traffic remained 103% while Warid growth was 76% in 2007-08. Mobilink growth was 45% while Instaphone reported negative growth of 43% in international traffic in 2007-08 [65].

In terms of volume of international traffic, Mobilink remained leader in 2007-08 as per its previous year’s performance. In current year Mobilink total international traffic was 2.12 billion minutes (368.7 outgoing & 1,755.2 incoming) while previous year its international traffic was 1.48 billion minutes. Ufone succeeded to keep second position in terms of total international traffic volume where its total international traffic

was 783 million minutes (335.2 outgoing & 448.6 incoming) in 2007-08 compare to 384 million minutes in 2006-07 [66].

Operators	National outgoing traffic to fixed networks	National outgoing traffic to Mobile networks	International Outgoing	International Incoming traffic	Total
Mobilink	821.2	5,274.50	368.7	1,755.20	8,219.60
Ufone	1,942.10	3,699.20	335.2	448.6	6,425.10
Instaphone	3.4	67.5	1.9	4	76.7
CM Pak	1,451.60	1,598.80	27.4	38.6	1,749.30
Telenor	84.50	16,541.00	160.2	236.5	18,389.40
Warid	910.20	7,011.20	216.4	333.6	8,471,4
Total	5,213.00	34,192.20	1,109.80	2,816.50	43,331.50

Table 3.7 International Incoming & Outgoing Traffic
Source: Arora Cellular Mobile Traffic 2007-08

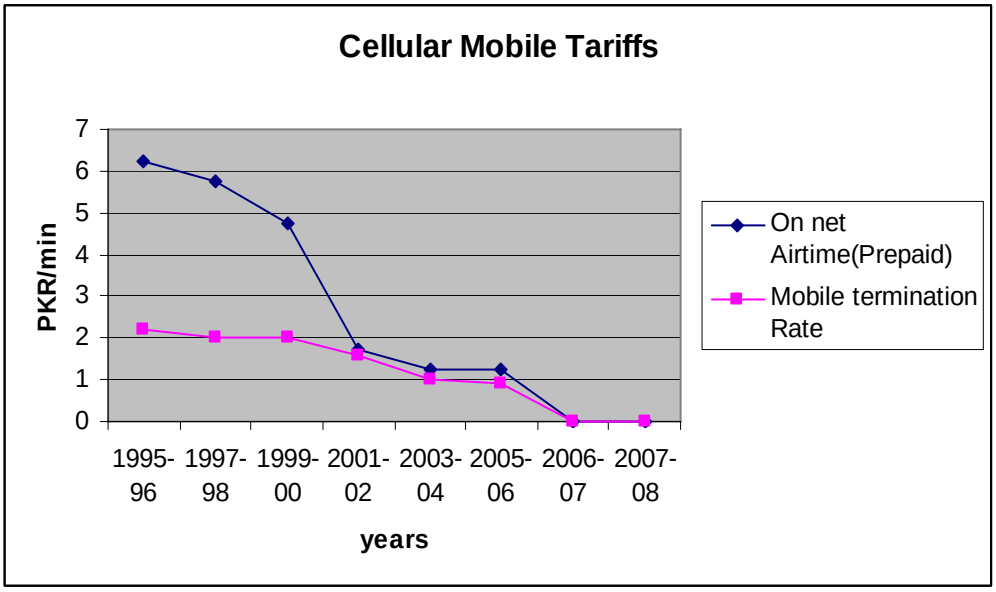

Figure 3.11 Cellular Mobile Tariff
Source: Telecom Asia Cellular Tariffs Annual Report 2008.

Post Paid Comparison

Company/Package	Line Rent	Free Minutes on net	Free Minutes off net	Free Minutes Land Line	Call On Net	Call Off Net	Call LandLine	MMS	GPRS
Mobilink									
fifteen hundred	Rs. 1500	**1,500**	-	-	Rs. 0.50/min	**Rs. 1.25/min**	Rs. 1.25/min	**Rs. 5.00**	Rs. 15.00
four hundred	Rs. 400	**400**	-	-	Rs. 1.00/min	**Rs. 1.50/min**	Rs. 1.50/min	**Rs. 5.00**	Rs. 15.00
nine hundred	Rs. 900	**900**	-	-	Rs. 0.75/min	**Rs. 1.50/min**	Rs. 1.50/min	**Rs. 5.00**	Rs. 15.00
one hundred	Rs. 100	**100**	-	-	Rs. 1.25/min	**Rs. 1.50/min**	Rs. 1.50/min	**Rs. 5.00**	Rs. 15.00
unlimited basic	Rs. 5000	**2,800**	1,200	**1,000**	Rs. 0.30/min	**Rs. 1.05/min**	Rs. 1.05/min	**Rs. 5.00**	Rs. 15.00
unlimited premium	Rs. 6000	**2,800**	1,200	**1,000**	Rs. 0.30/min	**Rs. 1.05/min**	Rs. 1.05/min	**Rs. 5.00**	Rs. 15.00
Telenor									
Easy	Rs. 100	-	-	-	Rs. 0.50 /30 sec	**Rs. 0.75 /30 sec**	Rs. 0.75 /30 sec	**Rs. 5.00**	Rs. 15.00
Free	Rs. 1500	**Free Rs.2000/-**	-	-	Rs. 0.50 /30 sec	**Rs. 0.75 /30 sec**	Rs. 0.75 /30 sec	**Rs. 5.00**	Rs. 15.00
Karobar	Rs. 100	**50**	-	-	Rs. 1 / min	**Rs. 1.5 / min**	Rs. 1.5 / min	**Rs. 5.00**	Rs. 15.00
Simple	Rs. 500	**250**	250	-	Rs. 0.50 /30 sec	**Rs. 0.75 /30 sec**	Rs. 0.75 /30 sec	**Rs. 5.00**	Rs. 15.00
Ufone									
U1000	Rs. 1000	**600**	200	**200**	Rs. 0.8	**Rs. 1.4**	Rs. 1.4	**Rs. 5.00**	Rs. 15.00
U1600	Rs. 1600	**960**	320	**320**	Rs. 0.5	**Rs. 1.4**	Rs. 1.2	**Rs. 5.00**	Rs. 15.00
U250	Rs. 250	**150**	50	**50**	Rs. 1	**Rs. 1.6**	Rs. 1.5	**Rs. 5.00**	Rs. 15.00
U50	Rs. 50	**36**	12	**12**	Rs. 1	**Rs. 1.6**	Rs. 1.6	**Rs. 5.00**	Rs. 15.00
U5000	Rs. 5000	**3,000**	1,000	**1,000**	Rs. 0.3	**Rs. 1.3**	Rs. 0.85	**Rs. 5.00**	Rs. 15.00
U550	Rs. 550	**330**	110	**110**	Rs. 0.9	**Rs. 1.5**	Rs. 1.5	**Rs. 5.00**	Rs. 15.00
Unite A 6AM to 9PM	Rs. 499	-	-	-	Rs. 0.5	**Rs. 1.4**	Rs. 1.2	**Rs. 5.00**	Rs. 15.00
Unite B 9PM to 6AM	Rs. 499	-	-	-	Free	**Rs. 0.9**	Rs. 0.7	**Rs. 5.00**	Rs. 15.00
Warid									
unlimited	Rs. 4000	**unlimited**	1,000	-	Rs. 0	**Rs. 0.65**	Rs. 0.3	**Rs. 3**	Rs. 1/-
warid 1500	Rs. 1500	**900**	600	-	Rs. 0.3	**Rs. 0.7**	Rs. 0.45	**Rs. 3**	Rs. 1/-
warid 250	Rs. 250	**175**	75	-	Rs. 0.63	**Rs. 0.8**	Rs. 0.75	**Rs. 3**	Rs. 1/-
warid 2500	Rs. 2500	**1,700**	800	-	Rs. 0.13	**Rs. 0.68**	Rs. 0.38	**Rs. 3**	Rs. 1/-
warid 750	Rs.750	**450**	300	-	Rs. 0.5	**Rs. 0.75**	Rs. 0.7	**Rs. 3**	Rs. 1/-
Zong									
100	Rs. 100	**60**	20	**20**	Rs. 0.50/- min	**Rs. 0.50/- min**	Rs. 0.50/- min	**Rs. 5.00**	Rs. 15.00
300	Rs. 300	**180**	60	**60**	Rs. 0.45/- min	**Rs. 0.45/- min**	Rs. 0.45/- min	**Rs. 5.00**	Rs. 15.00
600	Rs. 600	**360**	120	**120**	Rs. 0.375/- min	**Rs. 0.375/- min**	Rs. 0.375/- min	**Rs. 5.00**	Rs. 15.00
1200	Rs. 1200	**720**	240	**240**	Rs. 0.3/- min	**Rs. 0.3/- min**	Rs. 0.3/- min	**Rs. 5.00**	Rs. 15.00
2000	Rs. 2000	**6,000**	400	**400**	Rs. 0.1/- min	**Rs. 0.2/- min**	Rs. 0.2/- min	**Rs. 5.00**	Rs. 15.00

Table 3.8 Post Paid Rates Comparison of All Mobile Companies.
Source: Various Mobile Companies Websites and Brochures

Pre Paid Comparison

Company/Package	Call On Net	Call Off Net	Call Landline	MMS	GPRS	FNF call	SMS ON NET	SMS OFF NET
Mobilink								
Jazz Budget	Rs. 0.68 / 30 se	Rs. 0.68 / 30 sec	Rs. 0.68 / 30 sec	Rs. 5.00	Rs. 15.00	-	Rs. 1.0 /	Rs. 1.0
Jazz Easy	Rs. 2.10 / min	Rs. 2.50 / min	Rs. 2.50 / min	Rs. 5.00	Rs. 15.00	Rs. 0.99 /	Rs. 1.0 /	Rs. 1.5 /
Jazz Ladies First A	Rs. 1.50 / min	Rs. 2.50 / min	Rs. 2.50 / min	Rs. 5.00	Rs. 15.00	-	Rs. 30 / month	Rs. 30 / month
Jazz Ladies First B	Rs. 1.50 / min	Rs. 2.50 / min	Rs. 2.50 / min	Rs. 5.00	Rs. 15.00	-	Rs. 30 / month	Rs. 30 / month
Jazz Octane	Rs. 2.40 / min	Rs. 2.50 / min	Rs. 2.50 / min	Rs. 5.00	Rs. 15.00	Rs. 0.99	20 paisas	20 paisas
Telenor								
Flat	Rs. 2	Rs. 2	Rs. 2	Rs. 5.00	Rs. 15.00	Rs. 1	Rs. 1.00	Rs. 1.00
talkshawk 63	Rs. 0.63 /30 sec	Rs. 0.63 /30 sec	Rs. 0.63 /30 sec	Rs. 5.00	Rs. 15.00	-	Rs. 1.00	Rs. 1.00
talkshawk A1	Rs. 1 / min	Rs. 1.4 / min	Rs. 1.4 / min	Rs. 5.00	Rs. 15.00	-	Rs. 1	Rs. 1
(Har Sec)	4 Paisa (per sec)	5 Paisa (per sec)	5 Paisa (per sec)	Rs. 5.00	Rs. 15.00	5 Paisa	Rs. 1.00	Rs. 1.00
(per 30 sec)	Rs. 0.75	Rs. 0.75	Rs. 0.75	Rs. 5.00	Rs. 15.00	Rs. 0.45	Rs. 1.00	Rs. 1.00
Ufone								
1 Number Free Package Tariff	Rs. 1.00 / min	Rs. 1.60 / min	Rs. 1.60 / min	Rs. 5.00	Rs. 15.00	-	Rs. 0.50 /SMS	Rs. 1.00 / SMS
Paanch Ka Pandrah	Rs. 1.125 / 30 sec	Rs. 1.25 / 30 sec	Rs. 1.25 / 30 sec	Rs. 5.00	Rs. 15.00	-	0.25/sms	0.25/sms
Ufone 3 Minute Package Tariff	Rs. 2.00 / 3 min	Rs. 3.20 / 3 min	Rs. 3.20 / 3 min	Rs. 5.00	Rs. 15.00	-	Rs. 0.50	Rs. 1.00
Uwon Tariff	Re. 1/min	Rs. 1.60/min	Rs. 1.60/min	Rs. 5.00	Rs. 15.00	-	Rs. 0.50/	Re. 1/sms
Warid								
zem 1 Sec	Rs. 0.03/-	Rs. 0.05/-	Rs. 0.04/-	Rs. 3	Rs. 1/- unit	Rs. 0.02/- min	Rs. 0.5	Rs. 1
zem 30 Sec	Rs. 0.75/-	Rs. 0.85/-	Rs. 0.85/-	Rs. 3	Rs. 1/- unit	Rs. 0.45/- min	Rs. 0.5	Rs. 1
zem 60 Sec	Rs. 1.25/-	Rs. 2.25/-	Rs. 1.75/-	Rs. 3	Rs. 1/- unit	Rs. 0.75/- min	Rs. 0.5	Rs. 1
12 Anay Package	Rs. 0.75/- min	Rs. 0.75/- min	Rs. 0.75/- min	Rs. 5.00	Rs. 15.00	-	-	-
Aik Second Package	Rs. 0.40/- sec	Rs. 0.40/- sec	Rs. 0.40/- sec	Rs. 5.00	Rs. 15.00	-	-	-
zong 65	Rs. 0.65/- min	Rs. 0.65/- min	Rs. 0.65/- min	Rs. 5.00	Rs. 15.00	-	-	-

Table 3.9 Prepaid Rates Comparison of All Mobile Companies [67]
Source: Various Mobile Companies Websites and Brochures

3.12 Emerging Markets: Telecom Market Review – Pakistan 2008

With annual growth around 100% for some years now, the mobile telephone market in Pakistan has been experiencing a period of strong and sustained development. However, Pakistan is suffering important economic turbulences which will have a direct impact on foreign operators in the country. Some of the reasons are [68]:

- The decline in Rupee value against the US Dollar, the decrease in the interconnect charges and lower priced tariffs have resulted in an overall decrease of ARPU in US Dollar terms.
- The ongoing economic and political turmoil along with the worsening of security conditions in Pakistan have caused an increased outflow of capital from the country, causing the Rupee value to decline a further 13% against US Dollar in the third quarter.
- In light of the worsening economic conditions and the lack of prudent policies, the international rating agencies like S&P and Moody's have recently downgraded Pakistan's sovereign rating.

In the period of 2007-2008 the mobile sector has been characterized by:

- Falling ARPU
- Steady subscriber and revenue growth although a slight decrease in growth has been appreciated from the previous year.
- Intense competition by new international players coming to the market recently.
- Network deployment in the regions to increase addressable market as a measure against falling ARPUs.

Mobile services, despite high costs, still grow rapidly. Subscriber numbers increased from 68,000 in 1996 to 3.3 million by end-2003; since then the subscriber base has surged to reach 80 million in early 2007 and surpass 95 million in 2008. Penetration had reached the 58% mark, but judging by the commercial activity in the market there was still room for expansion. While progress has been made in the regulatory area, some

rigidity in policies had been slowing growth. Some facts of the Pakistan's telecom industry are:

- PTA successfully liberalized the telecom sector of Pakistan in an efficient, transparent and fastest deregulation of telecom in the region. The Government of Pakistan gave the status of Industry to Pakistan Telecommunication Sector.

- With de-regulation of telecom sector, PTA awarded 14 Long Distance and International licenses, 38 fixed local loop licenses and 17 Wireless Local Loop licenses.
- Under the deregulation process PTA awarded two new Cellular Mobile Licenses to Warid Telecom and Telenor Pakistan for US$ 291 Million through open auction, while renewed other 2 licenses for Mobilink and Paktel against same value.
- In 2007 Azad Jammu and Kashmir council adopted the Pakistan Telecom Act 1996, and PTA's jurisdiction was expanded to reach AJK and NA.
- PTA awarded five Cellular Mobile Licenses for AJK and NA while 13 companies were awarded total of 24 licenses for Long Distance International, Fixed Local Loop, Wireless Local Loop and Class Value added services categories.
- Pakistan Telecom Authority is capable of tracking gray traffic (illegal traffic) thanks to a technical facility installed, after which PTA in collaboration with Police has raided and closed many illegal telecom businesses.
- PTA got implemented IMEI system to curb handset thefts, through this facility; customers can block their mobile phones if they provide IMEI and other details.
- Pakistan Telecom Sector successfully implemented the Mobile Number Portability (MNP) and became first country in South Asia to have MNP

- There is a Consumer Protection Directorate (CPD) at PTA to protect telecom consumer
- Almost 92 Percent of Pakistani Population has access to telecom services
- Total tele-density of Pakistan for Cellular, fixed, WLL is 60.4 percent – as of October 2008
- Total Mobile Subscribers in the country are 90.5 million with cellular teledensity of 56 percent – as of October 2008
- Total fixed line subscribers stand at 4.4 million
- PTCL share more than 90 percent share in Fixed line market
- There are total of 2.3 million Wireless Local Loop subscribers in Pakistan, WLL teledensity is 1.5 percent
- Total payphones working in the country, both fixed and wireless are 449,121
- Total broadband subscribers in Pakistan are 170,000
- Total dial-up users in Pakistan are 3.7 million
- Telecom sector of Pakistan has a share of almost 2 percent in National GDP
- In 2007/08 Telecom sector fetched total of US$ 1,438 million Foreign Direct investment, that counts 27 percent of total FDI coming in the country
- Total Investment made during 2007-08 in all segments of Telecom Sector was US$ 3,113 million
- Total Telecom revenues of Pakistan in 2007-08 reached Rs. 278 billion, which were 18 percent more than of previous year
- Mobile Cellular Companies share 56 percent of total telecom revenues
- Telecom sector is also a major contributor to national exchequer and deposited more than Rs. 111.63 billion only in year 2007-08
- Telecom sector submitted total of Rs. 44.61 billion as GST/CED to Federal Board of Revenue in 2007

CHAPTER 4

QUALITY OF SERVICE

4.1 Quality of Service

Quality of service is the main indicator of the performance of a telecom network and of the degree to which the network conforms to the stipulated norms and standards specified by the regulator or any other agency designated for the same. The subscriber's perception of the Quality of Service (QoS) is determined by a number of performance factors.

The aim to identify the quality of service parameters is to:

- Create conditions for the consumer satisfaction by making known the quality of service which the service provider is required to provide and the user has a right to expect. Thus, it protects the interests of consumers of telecommunication services [69].
- To measure time to time the quality of service provided by the service providers and to compare them with the norms so as to assess the level of performance.

It generally protects the interests of consumers of telecommunication services. Development of telecom technologies and reduction in the human dependence of the telecom networks and customer services calls for periodical review of the QoS parameters currently set, for redefining the benchmarks as well as deletion of some existing QoS parameters and addition of some new parameters based on the merits, world trends and experience.

The QoS parameters should be more objective than subjective. There is a requirement to clearly define method for measurement of the QoS parameters so that there is homogeneity in the values of QoS parameters being submitted by different operators to the regulator or published by the operators as per the license requirements.

This will make easy the evaluation of the services being provided by different operators by the regulator as well as the customers [70].

4.2 Quality of Service Parameters

Quality of service parameters such as delay may be used to describe the characteristics of the various applications and services.

4.2.1 Network Performance

Network performance is the most important QoS parameter for measurement of quality of a Telecom Operator. Poor performance of a telecom network would include customer complaints and faults, thereby leading to customer dissatisfaction towards the operator. The network performance parameter can be further subdivided into the following [71];

- Service Access Delay
- Call set-up Success Rate
- Call Drop Ratio
- Point of Interconnection (PoI) congestion
- Service Coverage
- Blocked Call rate:

4.2.2 Service Access Delay

Service Access Delay is defined as the time between the pressing of send button and getting ring back tone.

4.2.3 Call setup Success Ration(CSSR)

Call setup Success Ratio (CSSR) is defined as the ratio of established calls to call attempts. Established calls means the following events have happened in call setup.

- Attempt is made.
- The TCH is allocated &
- The call is routed to the outwards path of the concern MSC.

Thus this includes complete signaling in the call setup process and does not aim to measure the performance of the called exchange or that of the point of Interconnection (PoI) [72].

- CSSR calculation should be measured using OMC generated data only.
- Measurement should be only in Time Consistent Busy Hour for all days of week.

Call attempt is made within the service area and call is routed to the onwards path from the concern switch (MSC in case of wireless networks).

4.2.4 Call Drop Ratio

"Call Drop Ratio is defined as "the ratio of calls lost after establishment to all established calls. This includes calls dropped due to failure of handover, radio loss and network congestion [73]".

4.2.5 Point of Interconnection (PoI) Congestion

"PoI congestion is defined as "the ratio of calls failed over the PoI (between two operators/licensees) due to unavailability of free circuits to the total call requests for seizure of PoI circuit [74]".

It is to be noted that all the measurements of performance parameters should be carried out during the Time Consistent Busy Hour (TCBH). TCBH is defined as the one hour period starting at the same time each day for which the average traffic of resource group is greatest over the days under consideration. ITU recommends analysis of 90 days to establish TBCH.

4.2.6 Billing Complaints

Billing complaints are categorized into:

- Billing complaints per 100 bills issued.
- Percentage of billing complaints cleared within a month.

4.2.7 Service Coverage

This parameter will be measured through drive test on a sample basis for assessing the network coverage in cities where the service of operator is available. This parameter is not to be reported to TRAI by the service providers. However, the assessment of the network coverage will be done by TRAI during drive test of the mobile network. The coverage strength shown as benchmark is a measurement at street level [75].

4.2.8 Blocked Call Rate

Blocked call means a call that is not connected because there is no free channel to serve a call attempt. Numbers of blocked calls are those times where there is no free channel to serve a call attempt. Hence this parameter represents congestion in the network. The congestion may be at SDCCH level or TCH level. This objective parameter is an accepted engineering level for determining the hardware and software requirements in any network. Hence, this parameter has been included in the regulation. This parameter should be measured using OMC generated data only in Time Consistent Busy Hour (TCBH). In case of the CDMA networks, in place of SDCCH congestion, it is proposed to measure paging channel congestion with the same benchmark [76].

4.3 Grade of Service

Grade of Service is defined as "ratio of lost calls to total calls attempts offered to a group of junctions". The smaller the value of grade of service, the better is the service. 0.002 grades of service means that two calls in one thousand calls or one call in every five hundred calls may be lost. These all parameters are measured during the Time Consistent Busy Hour (TCBH). The fault incidence and repair parameters have been deleted, as these parameters are not relevant to mobile services [77].

The customer help line includes parameters, which reflects the sped with which a call to customer care center is answered by either an IVR system or by an operator.
Billing complaints deals with the percentage of complaints received related to billing, time taken for the resolution of the complaints and also time for making the refund to the

customer. The customer perception regarding the service has the above mentioned parameters, which lays down the benchmarks for the customer satisfaction about different aspects of the service being provided. All the measurements of engineering standards such as Grade of Service (GOS) are to be carried out in the Time Consistent Busy Hour (TCBH) as specify by ITU-T [78].

4.4 Voice Quality

"The quality of voice in cellular mobile telecom services (GSM) is measured on a scale from 0 to 7 [79]". As the quality deteriorates, this value increases. The quality of voice is considered to be good, if this value remains between 0 and 4. However, this value may be between 0 to 5 for the network where Frequency hopping phenomenon is used.

In case of CDMA, the fundamental performance measure for voice quality is the Frame Error Rate (FER). It is the probability that a transmitted frame will be received incorrectly. The frame includes signaling information and error detection bits as well as user data/voice. This metric includes the error detection/correction coding inherent in the system.

4.5 Group Access Delay

It comprises of the following.

Time to Connect Call: Telecom engineering Centre (TEC) test schedule has specified this time as the time between "Pressing the send button" and "getting ring back tone". This should not exceed four seconds [80].

Time to Confirm Instruction to Connect: This will be defined as the maximum time from initiating the call set up command to when this acknowledged to the user.

Time to Release Call: The maximum time from initiating the disconnect command is passed on to the called network. This should not exceed 2 seconds.

Time to Alert Mobile Set: The maximum time from when the PLMN receives a call for a Mobile Set (assumed to be within the coverage area) to when the alert is energized. This time period is 4-15 seconds, depending upon the number of paging attempts.
The value of Group Access Delay should be between 9-20 seconds.

Accumulated Downtime of Community Isolation: This shall be defined as the accumulated downtime due to community isolation lasting for more than one hour i.e. failure of entire exchange area resulting from trunk failure, switch failure, Base station failure. Handover means the action of switching the call in progress from one radio channel to another radio channel and is used to allow established calls to continue by switching them to another radio source, e.g. when mobile station moves from one base station area to another [81].

4.6 Customer Perception Regarding the Services

Customer satisfaction can be measured by considering the factors as;

- Perception of customers satisfied with the network performance, reliability and availability.
- Percentage of customers satisfied with billing performance.
- Percentage of customers satisfied with the help/enquiry services.
- Percentage of customers satisfied with the maintainability.
- Percentage of customers satisfied with the offered supplementary services.
- Overall Customer Satisfaction.

All sectors of the telecommunications industry in Pakistan have been opened to competition and consumers have benefited from significantly lowered prices and expanded choices. In principle, effective competition should also promote quality of services as consumers have choices and service providers failing to meet consumer's requirements and expectations in term of quality of services would lose out to their competitors. However, in order to ensure that market forces do work effectively to safeguard and promote quality of service in the face of intense competition, sometimes
In the area of prices which are more visible to the potential customers prior to subscribing to a service, there is a need to implement a system for monitoring and reporting Quality

of Services ("QoS") of public telecommunications services so that consumers can be provided with sufficient information to make informed choices in the market [82].

4.7 Quality of Services Surveys

Pakistan Telecommunication Authority comprises of five zonal offices across the country (Karachi, Lahore, Rawalpindi, Peshawar, and Quetta) and Regional office at Multan. These offices monitor and enforce quality standards for telecommunication services by conducting QoS surveys and inspection. Resultantly, punitive actions are taken against operators who provide low quality services the masses. In this regard, PTA conducted a quality of service survey of GSM operators, quality of service surveys/inspections of ISPs, PTCL exchanges and CPP operators. In addition to the above, inspection of installations of LL and LDI operators for commencement of their services were also carried out in various cities [83].

Regulators inspections and surveys are carried out to assess the quality of service and PTA campaigned for awareness among the telecom users and to educate consumers about misleading advertisements, hidden charges and comparison of tariffs of different operators.

With a view to ensure provision of quality services to end users, quality of service surveys were planned to be conducted by all zonal offices at district level. Five surveys were conducted at Gujrat, Hyderabad, Peshawar, Sialkot, and Rawalpindi/Islamabad from February to April 2007 [84]

Quality of service parameters checked were Network Accessibility, Service Access, Access Delay (Set up time in seconds), Voice Quality and SMS.

4.8 QoS Issues in International Roaming

A limited study was assigned to cover a few important aspects of International Roaming with a limited set of countries with the aim to identify any critical issues with the offered services for Pakistani cellular subscribers using 'International Roaming' services abroad. Although limited in scope, the consultancy identified areas of immediate attention of the Regulator and will help to steer the cellular operators in the right direction. Most of all, the consultancy highlighted discrepancies in the bills of the

international roamers and the minutes charged for some countries, specifically. PTA has taken the issue very seriously and directed all operators to resolve the issue within 30 days, following which a more extensive survey shall be conducted [85]

Regulator is always vigilant about the individual complaints lodged by consumers against the operators. The complaints lodged are utilized by the authority to regularly review the issued raised by the consumers and to initiate necessary actions for rectifications of the problems faced by the telecom users. “There was an overall 27% increase in the number of complaints lodged with the authority compared to previous year. The maximum numbers of complaints are still for the fixed sector followed by 20% complainants of mobile sector.

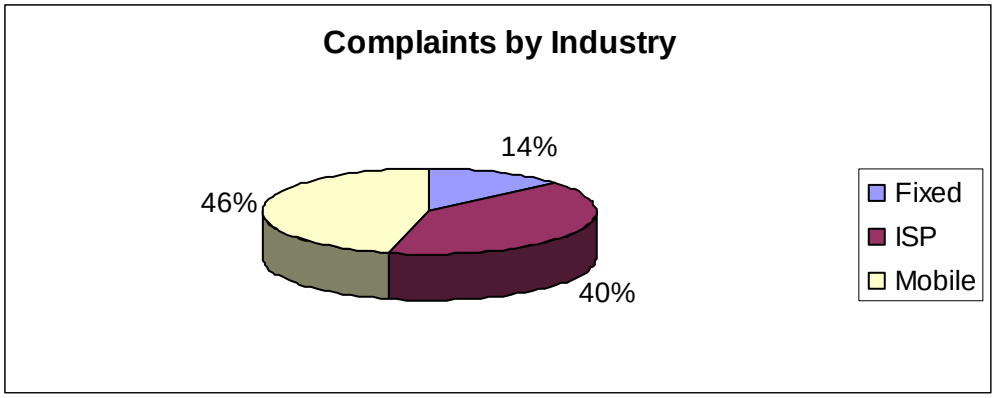

Figure 4.1 Complaints by Industry
Source: Pasha & Cellular Report 2008 by Aro

4.9 Quality of Service Parameters and BenchMark (Asian)

The QoS Parameters used by Asian Countries are as follow [86].

S NO.	Parameters	Bench marks	Averaged over a period of
A	**Network performance**		
(i)	Accumulated down time of community Isolation.	<24 hours	One quarter.
(ii)	Call set-up Success Rate (within licensee own network)	>95%	One quarter.
(iii)	Service Access Delay	Between 9 to 20 seconds depending upon number of paging attempts(Average of 100 calls =<15 sec)	One quarter.
(iv)	Blocked call Rate	i)SDCCH congestion<1% ii) TCH congestion <2%	One month.
(v)	Call Drop rate	<3%	One quarter.
(vi)	Percentage of connections with good voice quality	>95%	One quarter.
(vii)	Service Coverage	Indoor>=-75dBm; In-vehicle>=-85dBm; Out door-in city>=-95 dBm	One quarter
(viii)	POI Congestion	<0.5%	One quarter
S NO.	**Parameters**	**Bench marks**	**Averaged over a period of**
B	**Customer Help Lines:**		
(i)	Response time to the customer for assistance	(i) % age of calls answered (electronically): within 20 sec=80%; within 40 sec=95% (ii) % age of calls answered by operators Within 60 sec=80%; within 90 sec=95%	
C	**Billing Complaints**		
(i)	Billing complaints per 100 bills issued	<0.1%	
(ii)	% of billing complaints resolved within 4 weeks	100%	
(D)	Customer Perception of Service		
(i)	% satisfied with the provision of service	>95	One quarter.
(ii)	% satisfied with billing performance.	>90	One quarter.

Table 4.1 Quality of Service Asian Parameters
Source: OFTA/ Nepal Telecommunication Authority/Indian Telecommunication Authority.

4.10 PTA Standard (Pakistan Telecommunication Authority) [87]

The PTA standards used in Pakistan are on short term and long term basis.

For Short term

Parameters	BenchMark
Network Down Time	Less than 2%for one Month
Call Drop	=<2%
Call Connection Time	=<7%
Call Completion Ratio	=>96%
Grade of Service(End to End Blocking)	=<4% in Busy hr

Table 4.2. QoS Parameters of PTA for Short Term.
Source: End to End Quality Department of Mobile Companies.

For Long term

Parameters	BenchMark
Network Down Time	=<1% for a year.
Call Drop	=2%
Call Connection Time	5sec
Call Completion Ratio	=>98%
Grade of Service(End to End Blocking)	= 2% in Busy hr.

Table 4.3. QoS Parameters of PTA for Long Term.
Source: End to End Quality Department of Mobile Companies

4.11 Quality Standards in United Kingdom

The QoS parameters for Mobile Telecommunication according to European standards are as follow. The overall standards are listed below in table 4.4[88];

Parameter	**BenchMark**
OTS1 Unreported (by customer) faults	Faults cleared within 24, 48 and 72 + hours should be >60%>80% and 90% respectively.
OTS2 Reported faults cleared	Faults cleared within 24, 48 and 72 + hours should be >80%>98% and 100% respectively
OTS3 Working pays phones	On average >95% of telephones should be in working order daily
OTS4 Repair of Pay Phones	On average >90% of faulty phones should be repaired within one working day and >98% within two working days.
OTS5 Peak Traffic calls, International.	On average>75% of calls completed during peak periods.
OTS6 Peak traffic completed calls, domestic long distance.	On average >95% of calls completed during peak periods.
OTS7 Peak traffic completed calls, local calls.	On average >98% of calls completed during peak periods.
OTS8 Dial tone delay	On average >98% of all calls should experience delay of <3 seconds.
OTS9 Operator services, domestic.	>80% and >90% of calls answered within 10 seconds and 20 seconds respectively.
OTS10 Operators service, international	>95% of calls answered within 10 seconds.
OTS11 Repair service answering.	>95% of calls answered within 20 seconds
OTS12 Billing accuracy.	<5 bills with error per 1.000 bills, It should be minimized.
OTS13 Provisioning interval	>80 %(rural) and >90 %(urban) within 48 hrs of customer application.

Table 4.4 QoS Parameters and Bench Marks
Source: British Telecommunication Annual Report 2008.

4.12 Performance Indicators for Measuring QoS

The performance indicators should provide meaningful information to the customers, but at the same time, should not consume the operators a disproportionate amount of resources when they have to report the statistics [89].

Performance indicators should in general be divided into two categories:

- Service performance indicators.
- Technical performance indicator

The following general principles are adopted while formulating the schemes for monitoring QoS of public telecommunication and mobile services.

- In a market with effective competition, the regulator should not set minimum standard of QoS. The QoS should be determined by the market.
- Operators should make pledges of the QoS standard of their services and make these pledges known to the regulator and potential customers.
- QoS achieved by operators in the market should be monitored and reported such that users can make informed choices in the market.
- Customer perception regarding telecom services should be measured through customer survey conducted by the Authority through an independent agency. The result of this survey may be made public for the information of the customers to generate healthy competition amongst service providers to improve service.

4.13 CSSR Issues Towards Partner Networks

CSSR or call success rate is calculated on number of outgoing call attempt versus calls rejected due to any abnormality like congestion/abnormality in any node etc. During busy hour, a large percent of our outgoing calls are OFFNET calls (Other Mobile Operators or OMO/PTCL).It has an impact of mobile network. For example, outgoing calls re-

attempts for our subscribers increase and this has a negative impact on different nodes (IN/HLR/MSC/radio congestion) [90].

A major challenge is that most partner networks do not easily accept that any given abnormality is at their end. Complete details of the problem like traces, captures, problematic numbers, call testing results, stats; start times are provided to solidify the case. It is also a challenge for operators to capture all things in a timely and accurate manner. Some time partner networks require extensive testing & dedicated routing etc and Operators operation team has to provide the details.

In the light of all above explanation it is amply clear services vary with time and place. Customers opt for those service providers whom they perceive as meeting their expectations. Quality as may be understood has to do with customers alone, as there is no other way that we can define service quality. Services are always work in progress. The quality of service evolves over a period of time. Customers become mature and expect more from the service providers. One of the reasons is that as more and more service providers. One of the reasons is that as more and more service providers enter the fray, the services provided become standardized [91].

S.No	Parameter	Benchmarks	Averaged over a period of
Network Performance			
1	Service Access Delay	<15 Sec	One Quarter
2	Call Set-up Success Rate	>90%	One Quarter
3	Call Drop Ratio	<3%	
4	Point of interconnection Congestion	<1%	
5	Response time to customer		
	i)% of calls answered electronically	80%	One Quarter
	with in 30 sec	95%	
	with in 60 sec		
	ii) % of calls answered by operators		
	with in 60 sec	80%	
	with in 90 sec	90%	
Customer Care:			
6	Promptness in attending customer request		One Quarter
	95% of requests	By next working day	
	service disconnection	By next working day	
	Additional Facility	By next working day	
Billing complaints			
7	Billing complaints	>99%	One Quarter
8	% of billing complaints cleared		
Customer Perception regarding the services			
9	% of customer satisfied		One Quarter
	i)Network performance	>90%	
	ii)Reliability		
	iii)Availability		
10	% of customer satisfaction with provision of services	>90%	
11	% of customer satisfied with billing performance	>85%	
12	% of customer satisfied with the help/Enquiry services	>90%	
13	% of customer satisfied with the maintainability	>90%	
14	% of customer satisfied with supplementary services	>90%	
15	Overall Customer Satisfaction	>90%	

Table 4.5 Quality of Service USA Parameters. [92]
Source: Federal Communication Commission (FCC)

4.14 Measurement for Wireless Cellular Carriers in Australia [93]

The quality parameters for Australia are measured by keeping the following information updated;
For each six month measurement period, each wireless cellular service subject is reported to the Authority the values of the following performance measurements:

A. The number of faults reported by the customer per cellular telephone numbers.

B. The fraction of faults that were repaired within the carrier's stated target time;

C. The fraction of instances in which service interruptions were restored within the carrier's stated target time;

D. The country is divided into geographic regions as specified by authority. Within each region served by a cellular carrier, at least test calls will be generated during each test call period (which is to occur during the six month measurement period). For the each region
and each test call period, the carrier will report:
1. The percent of test calls successfully connected.
2. The percent of test calls successfully held (i.e. held for two minutes); and
3. The percent of test calls successfully connected and held.

E. For operator service, the choice of the time consistent busy hour for this six month measurement period and the percentage of calls answered within 10 seconds and within 20 seconds during this busy hour; and

F. The number of errors per 1,000 bills.

For each six month the authority is publishing selected performance measurements classified by carrier. The purpose of such publication is to help consumers make informed choices among carriers. Such publication will be in

consumer-friendly form and will be made available both in print form and in electronic form [94].

4.15 TL 9000

TL 9000 Quality Management System is a Telecom Quality Standard [95]. It is an integrated set of policies processes, resources, requirements, measures, tools & methodologies that provide capability to achieve objectives & execute strategy.

TL 9000 specific measurements: 19 indicators covering the after release phases of the Product Life Cycle. TL 9000 comes from Quality Excellence for Suppliers of Telecommunications.

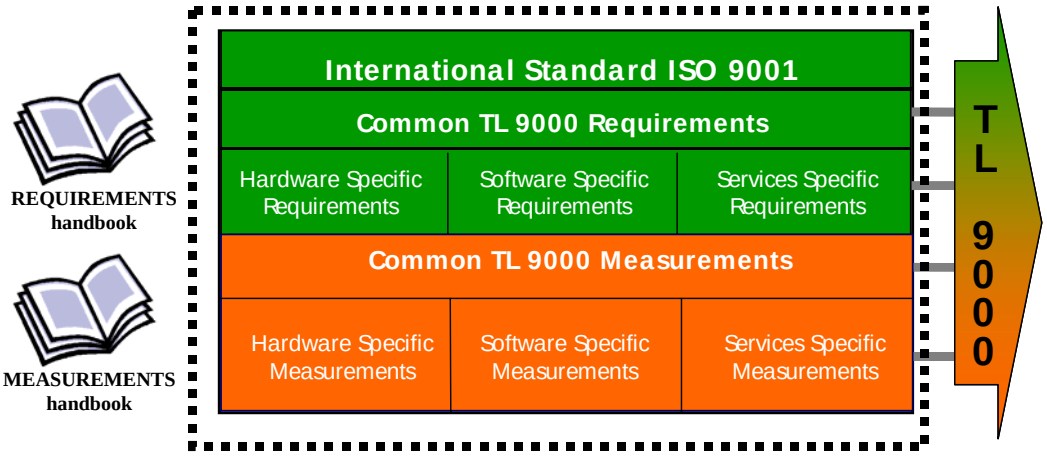

Figure 4.2. Structure of TL 9000 [88]

Source: TL9000 Booklet 2004

4.15.1 QUEST Forum

In April 1996, a core group of telecommunications service providers including Bell Atlantic, Bell South, Pacific Bell, and Southwestern Bell, initiated the idea of established better quality requirements for the industry. From this meeting, the QUEST Forum was formed in October 1997 [96].

1. QUEST Forum consists of service providers & suppliers
2. Ongoing efforts to expand membership domestically and internationally
3.

4.15.2 TL 9000 advantages

We have a standard dedicated to our specific market needs. For the first time, we are going to compare ourselves with the competition with the same measures and have comparative measures within our company and use normalized metrics. (Benchmark data are based on a data reported by TL 9000 registered companies) [97].

TL 9000 requirements are very close to ISO 9001 ones, the 81 adders are mainly enhancing the following topics.

- Customer relationship development,
- Customer communication procedure,
- Quality objectives including targets for TL indicators,
- Long & short term planning for Quality Management System,
- Internal communication: organizational performance feedback,
- Competence, awareness & training including Quality Concept & advanced training,
- Planning of product realization: Product Life Cycle, New product introduction, Disaster recovery, end of life, configuration management, estimation, computer resources, support tools & service delivery,
- Product development requirements close to Capability Maturity Level ones.
- Trends analysis of results including field, data & service performance.

The Customer Satisfaction & Quality Dept. has a flexible structure to be your mentor to lead you to the company's integrated vision on Quality as One Company:

- Continually improving the quality culture which is a mixture of shared values, customs and implicit rules.
- Facilitating implementation, adaptation and deployment of Quality.
- Achieving significantly high levels of awareness and understanding for scope and role.

4.16 TL9000 measurements Structure

4.16.1 Common measurements (H, S, V)

NPR: Number of Problem Report

FRT: Problem report Fix Response Tim

OFR: Overdue problem report Fix Responsiveness

OTD: On Time Delivery

Outage Measurements

SO: System Outage

EIO: Engineering or Installation caused outages.

Evaluate the number of customer originated problem reports. Identify total problem reports by severity level (critical, major, and minor) per year. These complaints are indicative of the quality of the product delivered during the operating life cycle of that product [98].

Hardware Specific Measurements (H)	**Software Specific Measurements (S)**	**Services Specific Measurements (V)**
FR: Field Replaceable Unit Returns	SWU: SoftWare Update RAA: Release Application Aborts RAP: Release Application Problem CPQ: Corrective Patch Quality FPQ: Feature Patch Quality PPD: Patch Propagation Delay MIP: Manual Intervention Patch	SQ: Service Quality SQ1: installation SQ2: Maintenance SQ3: Repair SQ4: Customer support service SQ5: Support service

Table 4.6 TL9000 Measurement Structure

Source: TL9000, the bigger picture.

4.17 TL 9000 Implementation in Pakistan

For the very first time in the history of mobile telecommunication, Telenor Pakistan is implementing TL9000 QMS on its all processes and projects. As the Technical Division becomes TL9000 compliant, it is mandatory for all projects to follow the Telenor Group Project Management Methodology. This includes all Technical Division Projects, including Six Sigma Projects. Therefore Six Sigma and Project Management

Methodology are the steps in the ladder towards TL9000 QMS [99]. Telenor Group Project Management Methodology is an adaptation of the stage gate Project Management Model. It's a generic model that can be applied on all types of projects in an organization. All Telenor Companies are using this methodology for running projects. The methodology is owned by Telenor Group Project Management Office. Local PMOs are being set up in each operation for implementing this methodology across all Telenor Companies.

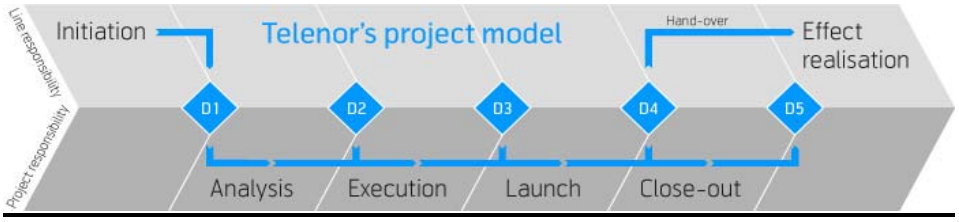

Figure 4.3 Telenor Project Model

Source: Telenor TL9000, PMM, 6Sigma, the bigger picture.

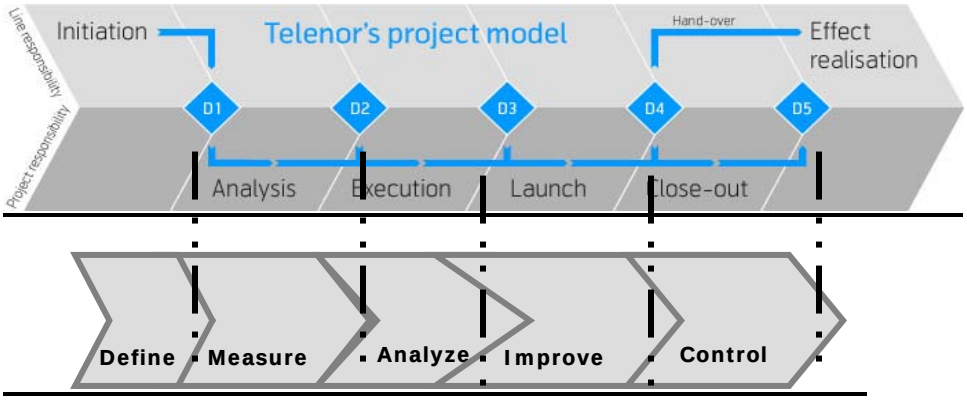

Figure 4.4 Mapping 6sigma Model to the PM Methodology

Source: Telenor TL9000, PMM, 6Sigma, the bigger picture.

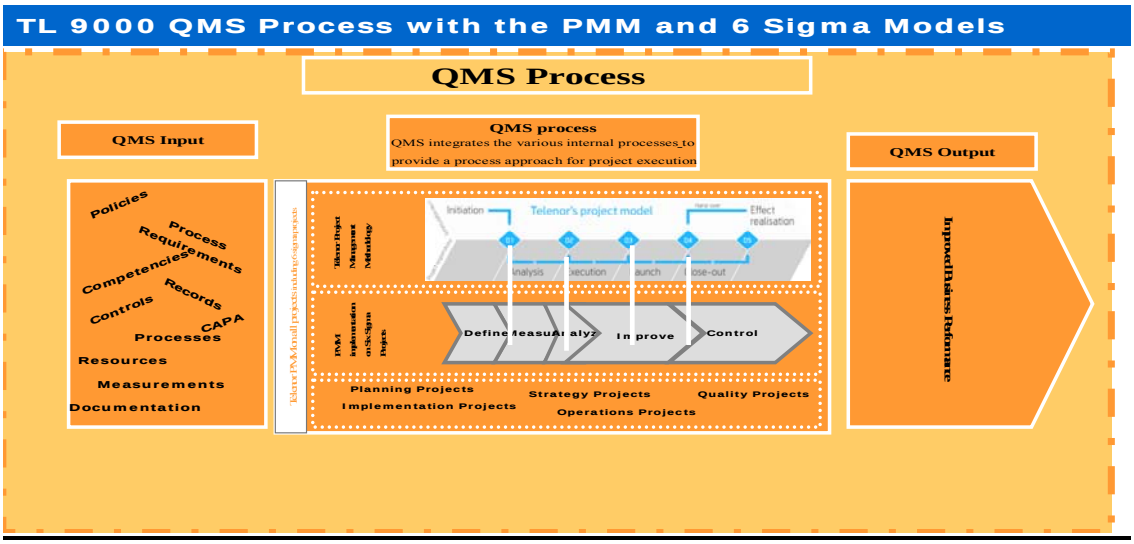

Figure 4.5 TL 9000 QMS Process with the PMM and 6 Sigma Models [100]
Source: Telenor TL9000, PMM, 6Sigma, the bigger picture.

4.18 QoS and Cellular Mobile Service Providers (CMSP)

The liberalization of telecommunication industry has provided the necessary push to provide continuously superior customer services. The entry of global players has further added to the competitive pressure in Pakistan. This Liberalization and globalization have led a challenge to the telecom operators as how to create differentiation with almost the same network technology with all the cellular operators. Improving the quality of service delivery can enable the cellular mobile operators to create differentiation in order to gain profitability and competitive advantage.

The pressure of global competition and privatization in telecom industry are driving the service providers to improve their products and services. Earlier in the monopolistic environment, quality of services was not the priority for the incumbent service provider and customer had no choice but to accept what ever was delivered to them. With the introduction of full competition in cellular mobile services, quality improvement has become vital to telecom companies trying to thrive in an increasing competitive environment. In this emerging scenario of stiff competition, cellular mobile service providers (CMSP) are forced to deliver enhanced customer services in order to build customer loyalty and gain competitive advantage. Service quality has become an

important competitive tool in the telecom service industry. Tariff rates and value added services can easily duplicate while quality is differentiable. The positive relationship of service quality with customer satisfaction (Dabholkar, 1995 [101]: Danaher and Mattsson [102] 1994; Kim et al., 2004), customer retention (Ranaweera and Neely, 2003) [103], profitability (Nelson et.al, 1992; Fornell, 1992; Danaher and Rust, 1996), competitiveness (Rapert and Wren, 1998) [104], is well proven in the academic literature. Therefore, the pursuit of strategy based on enhancing service quality can enable the cellular mobile service providers (CMSP) to survive in this competitive milieu in telecommunication. Information technology can enable the service providers to spend more time with customers, better understand their needs and deliver what they require, quickly and effectively. Thus, helping the organizations to achieve the high levels of customer satisfaction.

The entry of global players has further added to the competitive pressure in Pakistan. The biggest challenge for service providers is how to utilize information systems to respond customer service needs.

Research in service quality dimensions and measurement is dominated with the works of Parasuraman er al.(1985) [105]. They measured service quality with ten attributes namely Access, Communication, Competence, Courtesy, Credibility, Reliability, Responsiveness, Security, Tangible, and Understanding. Gronroos (1984) [106], came up with three quality attributes namely Technical quality, Functional quality and Reputation quality. According to Lehtinen and Lehtinen (1991) [107], service quality attributes namely Technical quality, Integrative quality, Functional quality and Outcome quality. It is observed that service quality is a multidimensional construct and considerable debate exists regarding the number and type of dimensions.

According to Zhu et al., (2002) [108], the service quality dimensions identified by Parasuraman et al. (1985) [109] are based on traditional service delivery channels (viz., Telephone Company securities brokerage, insurance company, banks and repair and maintenance). Thus it seems appropriate to include the attributes associated with IT based service delivery system. Cox and Dale (2001) [110], in their study, highlighted various quality attributes that are relevant to web enabled service delivery. These include

Accessibility, Responsiveness, Communication, Credibility, Understanding, Availability, Functionality and integrity.

In telecommunication industry, Dye and Schaaf (2002) [111] established the feasibility and suitability of applying a near-miss event reporting system, known as Prevention and recovery information system for monitoring and analysis, as a tool for managing risks to customer satisfaction. In order to retain customers in cellular mobile, various researchers (Berson et al., 2000; Wei and Chiu, 2002) [112] have proposed techniques based on data mining system for churn prediction and management.

Cellular operators can improve their operational efficiency, enhance customer service and gain competitive advantage using the archival and interactive IT tools. Various researcher have emphasized service quality improvement in interacting with suppliers (Walker &Samuel, 1998), network maintenance and management, (Peacock & Rabie, 1988; Johnson & Sirikit, 2002); internal processes (Hsu and Su, 2002) and customer service delivery (Leisen, and Vance, 2001) [113].

E-service delivery can impact the internal processes, the quality attributes, which may impact the customer perceived service quality, customer satisfaction and thus competitiveness of an organization.

This customer-focused framework can benefit the organization in the following ways:

- Improvement in the customer perceived service quality and customer satisfaction.
- Increased operational efficiency in terms of throughput.
- Reduction in cost.
- Increased return on investment.
- Enhancement in the overall competitive position.

S. No	Select Service Quality Attributes	Usage of IT and Quality Improvement techniques in Cellular Mobile Industry	Typical Technology needed
1	Reliability	Ensuring accuracy in billing; Keeping the customer records correctly	Storage area networks (SAN); Content based billing; Expert system.
2	Responsiveness	Enabling prompt response to Customer complaints	Local area networks; Email(ERM) response management system; Customer resource Management
3	Accessibility	Providing online service; online bill payment.	Electronic bill payment & presentation system.
4	Competence	Skills and knowledge of Customer care personnel to Answer their queries.	CRM; data mining Management; decision Support systems; Expert system
5	Communication	Explaining various features of services and tariff rates in languages customers can understand; complaints redressal system	Internet/Telephonic connectivity; Customer resource management.
6	Security	Online security assurance	Authentication, encryption; Digital signature certification
7	Convenience	Bill payement convenience	Unified billing system
8	Flexibility	Ability to deploy and expand new services	Convergent mediation Systems; CRM
9	Understanding	Understanding the over and under used services.	Convergent mediation system
10	Efficient service restoration process	Ability to rectify incorrectly delivered bills	Customer resource management (CRM)

Table 4.7 Service Attribute and Quality of Service delivery in Cellular Mobile Communication

Source: Derived from Authors Service Quality Dimensions by Lehtinen and Lehtinen (1991) [114]

CHAPTER 5

CUSTOMER SATISFACTION IN MOBILE TELECOMMUNICATION SECTOR

5.1 QoS and Customer Satisfaction in Mobile Telecommunication Sector

The Global System of Mobile Communications (GSM) is a second-generation digital technology, which was originally developed in Europe and in less than ten years after the commercial launch, it developed into world's leading and fastest growing mobile standard (GSM Assoc., 2006). Lonergan et al. (2004) reported that at the beginning of 2004, there were over 1.3 billion mobile phone users worldwide and by 2007, the demand for mobile services would have grown at an average annual rate of 9.1%. The GSM Association estimates that the GSM technology is used by more than one in five people of the world's population, representing approximately 77% of the world's cellular market and is estimated to account for 73% of the world's digital market and 72% of the world's wireless market (GSM Assoc., 2006). This growth principally results from the establishment of new networks in developing countries rather than from an increase in mobile access lines in developed countries (Serenko and Turel, 2006). Developing countries are actively involved in the establishment of the mobile services and specifically, Pakistan is the focus of this study [115].

Gerpott et al. (2001) wrote that since 1990s, the telecommunications sector has become an important key in the development of the economy of developed countries. This results from the saturated markets, de-regulation of telecommunications industry (removal of monopoly rights, especially enjoyed by state-owned telecoms networks), and increasing number of mobile service providers, enormous technical development and intense market competition. Szyperski & Loebbecke (1999) [116] wrote that this increasing economic importance and benefits of telecommunications firms motivated many management scholars (especially marketing experts) to devote attention to this sector Wilfert (1999), Gerpott (1998), and Booz [117]. Allen and Hamilton (1995),[118] pointed out that marketing strategies are very important in telecommunications services

because once customers have subscribed to a particular telecommunications service provider, their long-term link with this provider is of greater importance to the success of the company than they are in other industry sectors. Hence, service providers need to form a continuous lasting relationship with their customers to know them better and satisfy their needs adequately.

Studies conducted to explore factors affecting satisfaction, loyalty and retention in mobile telecommunications industry include: Gerpott et al. (2001) investigated customer satisfaction, loyalty and retention in the German mobile telecommunications among 684 respondents and reported that customer retention can not be equated with customer loyalty and customer satisfaction, rather a two-stage causal link can be assumed in which customer satisfaction drives customer loyalty which in turn has impacts on customer retention. However, these three factors are important for superior economic success among telecommunication service providers [119]. Kim et al. (2004) investigated the effects of customer satisfaction and switching barrier on customer loyalty among 350 respondents in Korea and reported that call quality, value-added services and customer support have significant impact on customer satisfaction. Thus, to maximize customer satisfaction, focus should be on service quality and customer-oriented services. Switching barrier on the other hand is affected by switching costs (e.g. loss cost, move-in cost, and interpersonal relationships) and was revealed to have an adjustment effect on customer satisfaction and customer loyalty. Serenko and Turel (2006) investigated customer satisfaction with mobiles services in Canada and reported that perceived quality and perceived value are the key factors influencing satisfaction with mobile services. Customer care is reported to be negatively related to customer satisfaction, which means that a more satisfied customer is less prone to complain. Hence, they concluded that customer satisfaction is the only single measure that better capture the range of services, prices and quality, this measure is an important performance indicator useful for both regulators and mobile service providers. In summary, these studies support the theory that highly satisfied customers stay longer, buy more, less sensitive to price increases from their providers or price decreases from competitors [120].

5.2 Customer Satisfaction

Customer satisfaction is a fundamental marketing construct in the last three decades. In the past, it was unpopular and unaccepted concept because companies thought it was more important to gain new customers than retain the existing ones. However, in this present decade, companies have gained better understanding of the importance of customer satisfaction (especially service producing companies) and adopted it as a high priority operational goal [121].

Customer satisfaction, as a construct, has been fundamental to marketing for over three decades. As early as 1960, Keith (1960) defined marketing as "satisfying the needs and desires of the consumer". Hunt (1982) reported that by the 1970s, interest in customer satisfaction had increase to such an extent that over 500 studies were published. This trend continued and by 1992, Peterson and Wilson estimated the amount of academic and trade articles on customer satisfaction to be over 15,000 [122].

Several studies have shown that it costs about five times to gain a new customer as it does to keep an existing customer (Naumann, 1995) and this result into more interest in customer relationships. Thus, several companies are adopting customer satisfaction as their operational goal with a carefully designed framework. Hill and Alexander (2000) wrote in their book that "companies now have big investment in database marketing, relationship management and customer planning to move closer to their customers". Jones and Sasser (1995) wrote that "achieving customer satisfaction is the main goal for most service firms today [123]".

Increasing customer satisfaction has been shown to directly affect companies' market share, which leads to improved profits, positive recommendation, lower marketing expenditures (Reichheld, 1996; Heskett et al., 1997), and greatly impact the corporate image and survival (Pizam and Ellis, 1999) [124].

5.3 Definition

Parker and Mathew (2001) expressed that there are two basic definitional approaches of the concept of customer satisfaction. The first approach defines satisfaction

as a process and the second approach defines satisfaction as an outcome of a consumption experience. These two approaches are complementary, as often one depends on the other.

Customer satisfaction as a process is defined as an evaluation between what was received and what was expected (Oliver, 1977, 1981; Olson and Dover, 1979; Tse and Wilton, 1988), emphasizing the perceptual, evaluative and psychological processes that contribute to customer satisfaction (Vavra, 1997, p. 4) [125].

Parker and Mathews (2001) however noted that the process of satisfaction definitions concentrates on the antecedents to satisfaction rather than satisfaction itself. Satisfaction as a process is the most widely adopted description of customer satisfaction and a lot of research efforts have been directed at understanding the process approach of satisfaction evaluations (Parker and Mathews, 2001). This approach has its origin in the discrepancy theory (Porter, 1961), which argued that satisfaction is determined by the perception of a difference between some standard and actual performance [126].

Customers buy products or services with pre-purchase expectations about anticipated performance, once the bought product or service has been used, outcomes are compared against expectations. If the outcome matches expectations, the result is confirmation. When there are differences between expectations and outcomes, disconfirmation occurs. Positive disconfirmation occurs when product or service performance exceeds expectations. Therefore, satisfaction is caused by positive disconfirmation or confirmation of customer expectations, and dissatisfaction is the negative disconfirmation of customer expectations (Yi, 1990). While several studies support the disconfirmation paradigm, others do not. For instance, Churchill and Surprenant (1982) found that neither disconfirmation nor expectations had any effect on customer satisfaction with durable products [127].

Weiner (1980, and 1985); and Folkes (1984) proposed the attribution theory, which stated that when a customer purchases a product or service, if the consumption is below expectation, the customer is convinced that the supplier causes the dissatisfaction [128] The complaining customer is focused on restoring justice and the satisfaction outcome is driven by perceived fairness of the outcome of complaining. Westbrook and Reilly (1983) proposed the value-percept theory, which defines satisfaction as an emotional

response caused by a cognitive-evaluative process, which is the comparison of the product or service to one's values rather than an expectation. So, satisfaction is a discrepancy between the observed and the desired [129].

Fisk and Young (1985); Swan and Oliver (1985) proposed the equity theory, which stated that individuals compare their input and output ratios with those of others and feel equitable treated. Equity judgment is based on two steps; first, the customer compares the outcome to the input and secondly, performs a relative comparison of the outcome to the other party [130].

Pizam and Ellis (1999) reported that there are two additional distinct theories of customer satisfaction apart from the seven aforementioned ones and these include:

1. Comparison-level
2. Generalized negativity; and

The outcome approach of the customer satisfaction is defined as the end-state satisfaction resulting from the experience of consumption. This post- consumption state can be an outcome that occurs without comparing expectations (Oliver, 1996); or may be a cognitive state of reward, an emotional response that may occur as the result of comparing expected and actual performance or a comparison of rewards and costs to the anticipated consequences (Vavra, 1997, p. 4) [131]

The relevance of this definition to this study is that it indicates that customers assess the mobile services based on experience of use and the rating is done in accordance with the mobile services attributes. In this study, customer satisfaction with the Pakistani mobile services will be evaluated based on customer's experience of network quality, billing, validity period and customer care support.

5.4 Service Quality

Another factor that contributes to satisfaction is service quality. Service quality is defined as "the difference between customer expectations and perceptions of service" or "as the customers' satisfaction or dissatisfaction formed by their experience of purchase and use of the service" (Gronroos, 1984 and Parasuraman et al.1988) [132].

Oliver (1993) reported that service quality is a casual antecedent of customer satisfaction, due to the fact that service quality is viewed at transactional level and satisfaction is viewed to be an attitude. Dabholkar et al. (1996) and Zeithaml et al. (1996) reported that the service quality divisions are related to overall service quality and or customer satisfaction. Fornell et al., (1996) expressed that satisfaction is a consequence of service quality. Hurley and Estelami (1998) argued that there is causal relationship between service quality and satisfaction, and that the perceptions of service quality affect the feelings of satisfaction [133].

There are various classifications of the components of service quality in marketing science. Gronroos (1984) stated that "in service environments, customer satisfaction will be built on a combination of two kinds of quality aspects; technical and functional. [134]". Technical quality or quality of the output corresponds to traditional quality of control in manufacturing. It is a matter of properly producing the core benefit of the service. Functional quality or process quality is the way the service is delivered. It is the process in which a customer is a participant and co-producer, and in which the relationship between service provider and customer plays an important role (Wiele et al., 2002) [135].

Technical quality is related to what customer gets (transaction satisfaction); functional quality is related to how the customer gets the result of the interaction (relationship satisfaction). Lewis (1987) [136] suggested that service quality can be classified as essential and subsidiary. Essential refers to the service offered and subsidiary includes factors such as accessibility, convenience of location, availability, timing and flexibility, as well as interactions with the service provider and other customers.

The classification can also be the core (contractual) of the service, and the relational (customer- employee relationship) of the service. The core or the outcome quality, which refers to what is delivered and the relational or process quality, which refers to how it is delivered are the basic elements for most services. (Grönroos, 1985; McDougall and Levesque, 1992; Parasuraman et al., 1991b; Dabholkar et al., 1996) [137]

McDougall and Levesque (2000) [138] in their direct approach investigation on four service firms (dentist clinic, automobile shop, restaurant, and haircut salon) demonstrated that both core and relational service quality classes have significant impact on customer satisfaction. Heskett et al. (1997) [139] conducted studies on several service firms, such as airline, restaurants, etc and reported that service quality, solely defined as relational quality, has consistent effect on satisfaction and is regarded as key factor in delivering customer satisfaction.

Parasuraman et al. (1988) [140] identified five dimensions of service quality (SERVQUAL) that must be present in any service delivery. SERVQUAL helps to identify clearly the impact of quality dimensions on the development of customer perceptions and the resulting customer satisfaction. SERVQUAL include:

- Reliability - the ability to perform the promised services dependably and accurately.
- Responsiveness - the willingness to help customers and provide prompt service.
- Assurance - the knowledge and courtesy of employees as well as their ability to convey trust and confidence.
- Empathy - the provision of caring, individualized attention to customers, and
- Tangibles - the appearance of physical facilities, equipment, personnel and communication materials.
-

The model conceptualizes service quality as a gap between customer's expectations (E) and the perception of the service providers' performance (P). According to Parasuraman et al. (1985), [141] “service quality should be measured by subtracting customer's perception scores from customer expectation scores (Q = P - E)”. The greater the positive score mark means the greater the positive amount of service quality or the greater the negative score mark, the greater the negative amount of the service quality.
Zeithaml et al. (1990) [142] proposed a comprehensive perception of quality assessment and claimed that they are other factors apart from the dimensions of Parasuraman et al. (1988):

- Access – how easy it is to come into contact with the supplier. This is where position, opening hours, supplier availability, and other technical facilities belong.
- Communication – the ability to communicate in an understandable way that is natural to customer.
- Credibility – referring to being able to trust the supplier
- Courtesy – refers to the supplier's behavior, e.g. politeness and kindness

Parasuraman et al. (1988), assurance dimension is a combination of the credibility and courtesy dimensions of Zeithaml et al. (1990).

Pizam and Ellis (1999) [143] stated that the gap that may exist between the customers' expected and perceived service quality is a vital determinant of customer satisfaction or dissatisfaction, and not just only a measure of the quality of the service. Previous studies on mobile telecommunication services, measured services quality by call quality, pricing structure, mobile devices, value-added services, convenience in procedures, and customer support (Kim, 2000; Gerpott et al., 2001; Lee, Lee, & Freick, 2001)[144].

Customers determine satisfaction level of any purchased service by the perceptions of quality received. Therefore, customer satisfaction assessment captures service quality and in this study, the previous factors used to measure service quality (call quality, billing, customer support, etc) of mobile telecoms will be used to assess customer satisfaction.

5.5 Internal Satisfaction

Research works have shown the importance and the link of internal (employee) satisfaction to the external (customer) satisfaction. Hill and Alexander (2000) [145] stated that there is a positive relationship between employee satisfaction and customer satisfaction and this is achieved in companies that practice employee motivation and loyalty. They reported that "employees that are more motivated to achieve customer satisfaction tend to be more flexible in their approach to their work,

make fewer mistakes and use more initiative". Fečiková (2004) [146] conducted studies on the index method for customer satisfaction measurement with chairs in Slovakia and reported that the satisfaction of internal customers is one of the basic factors to satisfy the external customer. Thus, she suggested that employee motivation and loyalty can be achieved through:

- Daily leadership – Top management officials motivate others through their performance.
- Top management communicates their expectations to the employees.
- Development of competencies – feedback on employee's performance, work efforts, opportunity for development and improvement of competencies.
- Corporation and employee retention, and
- Good working conditions

Better understanding that customers assess service performance based on their past experiences, benefits received, service quality and how well queries and complaints are treated. Thus, customer satisfaction with the mobile services in Pakistan will be assessed on the basis of network quality, billing, validity period and customer care support and the correlation among the following was measured.

- Pakistani customers are satisfied with the mobile telecoms industry
- There is a strong relationship between network quality and customer satisfaction
- There is a strong relationship between billing and customer satisfaction
- There is a strong relationship between validity period and customer satisfaction
- There is a strong relationship between customer care support and customer satisfaction
- There is a strong relationship between network quality, billing, validity period, customer care support and customer satisfaction

5.6 Assessments and Benefits

Naumann (1995) [147] expressed that the reasons for measuring customer satisfaction may vary among companies, and the success of the measurement depends on if the measurement is incorporated into the firm's corporate culture or not. However, he suggested five reasons for measuring customer satisfaction or five important roles of customer satisfaction measurement:

- To get close to the customer – this will help to understand customers more, their needs, the attributes that are most important, and their effect on the customer's decision making, the relative importance of the attributes and the performance evaluation of the firm delivery of each attribute. This process helps to provide enabling communication with customers.
- Measure continuous improvement - the important attributes of customers can be incorporated into the internal measurement to evaluate the value-added process in the company. This process involves comparing performance against internal standards (process control and improvement), and comparing performance against external standards (benchmarking).
- To achieve customer-driven improvement – the data collected from customers can be developed into sources of innovations and this can help to achieve customer driven improvement. This requires a comprehensive database and not just records of sales. This process helps to identify opportunities for improvement (quality costing).
- To measure competitive strengths and weaknesses - determine customer perceptions of competitive choices and companies.
- To link customer satisfaction measurement data to internal system.

Many companies identify the level of customer satisfaction through;

- Number of product or service support problems
- Number of direct complaints by phone, email, etc
- Number of returned products or services and the reason for their return, etc

The criteria for measurement should be customer defined so as to collect, analyze the appropriate data and provide relevant information. Thus, to obtain the right information, efforts should be made to filter out the irrelevant information and concentrate on the valuable dimensions. A convenient tool to achieve this aim is to first conduct a simple pre-study and from this a more effective study can be created. Therefore, for any company to achieve true customer satisfaction there should be:

- Customer-oriented culture
- Customer-centered company
- Employee empowerment
- Process ownership
- Team building, and
- Partnering with customers and suppliers

He further expressed that the measurement research technique include:

- Survey methodologies
- Focus groups
- Standardized packages
- Various computer soft wares

However, these typical measurement techniques have some problems which include;

- Analytical – this involves techniques, formal procedures, systems, etc
- Behavioral – involves the attitudes, beliefs, perceptions, motivation, commitment and resulting behaviors of the people involved in the process.
- Organizational – involves the organizational structure, information flows, management style and corporate culture.

Hill et al. (2003) [148] expressed that one of the methods to measure customer satisfaction is through the simple frequency statistics of the Microsoft office Excel or that of the Statistical Package for Social Science (SPSS). Fečiková (2004) [149] reported that there are other methods for customer satisfaction measurement and these include;

1. The indicator of customer satisfaction level

Hazes (1998) proposed that customer satisfaction could be measured as:

$$I_{CS} = \frac{I_{RCS}}{I_{OCS}} \times 100\ [\%]$$

I_{CS} = increasing customer satisfaction

I_{RCS} = the real value of the customer satisfaction index which is used routinely as a tool of customer satisfaction measurement.

I_{OCS} = the optimum value of such an index.

2. The index of satisfaction

Bhave (2002) [150] proposed that to obtain the index of satisfaction, the satisfaction score is multiplied by the corresponding weighting factor to produce weighting score. The index of satisfaction is the sum of the weighting score. The overall satisfaction index of any company is the average of every respondent's individual satisfaction index.

3. ACSM method of customer satisfaction measurement

The American Customer Satisfaction Model (ACSM) method is a set of causal equations that link:

- customer expectations
- perceived quality,
- And perceived value to customer satisfaction (ACSI).

Several empirical studies done on the assessment of customer satisfaction levels include: Gerpott et al. (2001) [151] investigated the customer satisfaction level of 684 residential customers of mobile operators in Germany using the frequency distribution, the results showed that 28% of the respondents were completely satisfied and 6.3% were slightly satisfied or not satisfied. Turel and Serenko, 2006, assessed customer satisfaction level of 210 young adult mobile subscribers in Canada by adapting the American Customer Satisfaction Model, the result obtained was 54.67%. This score was relatively low compared to the 65% obtained by ACSI organization for the USA in 2004.

Fornell (1992) [152] investigated customer satisfaction with 100 corporations in over 30 industries in Sweden and expressed that the benefits of customer satisfaction include the following; highly satisfied customers -

- Stay longer (i.e. prevent customer churn)
- Purchase more as the company introduces new products and upgrades existing products
- Talk favorably about the company and its products or services (helps to improve advertisement)
- Pay less attention to competing brands
- Less sensitive to price
- Offer product or service ideas to the company
- Cost less to serve than new customers because transactions are routine
- Enhances business reputation

These benefits make customer satisfaction and its measurement an important marketing construct, which is especially essential to the mobile telecoms industry in which the long-term links between operators and customers are of greater importance to business performance.

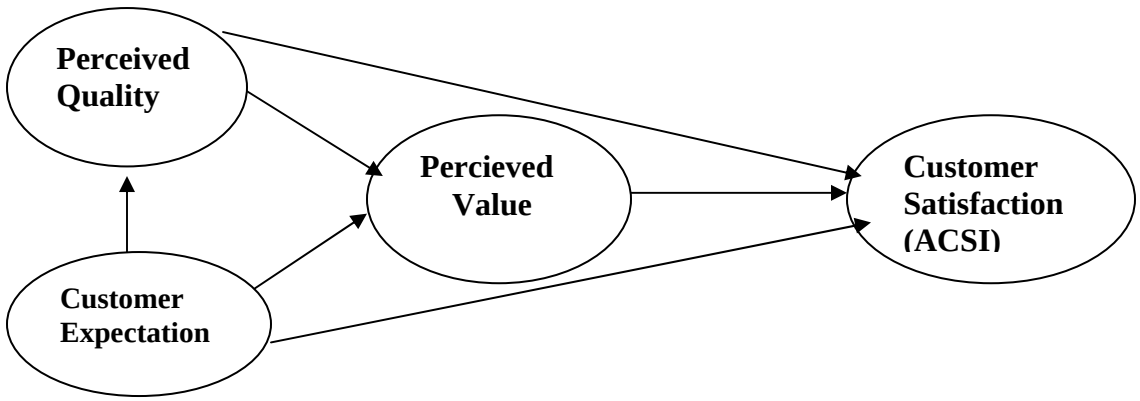

Figure 5.1 The ACSM model of customer satisfaction measurement by Fornell et al.19
Source: Customer Satisfaction by Fornell et al.1996.

5.7 Consequences

Several research works have shown that customer satisfaction is positively associated with desirable business outcomes namely; Customer Loyalty, Customer Retention, and Customer Profitability. Gerpott et al. (2001) reported that these consequences are important goals for telecommunications operators to have superior economic success.

5.8 Customer Loyalty

Coyne (1989) [153] stated that customer satisfaction has measurable impact on customer loyalty in that when satisfaction reaches a certain level; on the high side, loyalty increases dramatically; at the same time, when satisfaction falls to a certain point, loyalty reduces equally dramatically. Yi (1990) [154] expressed that the impact of customer satisfaction on customer loyalty by stating that "customer satisfaction influences purchase intentions as well as post-purchase attitude". In other word, satisfaction is related to behavioral loyalty, which includes continuing purchases from the same company, word of mouth recommendation, and increased scope of relationship.

Fornell (1992) [155] found out that there is a positive relationship between customer satisfaction and customer loyalty but this connection is not always a linear relation. This relationship depends on factors such as market regulation, switching costs, brand equity, existence of loyalty programs, proprietary technology, and product differentiation at the industry level. Jones and Sasser (1995) [156] proposed that link between satisfaction and loyalty can be classified into four different groups: loyalist& apostle (high satisfaction, high loyalty), defector terrorist (low satisfaction, low loyalty), mercenary (high satisfaction, low loyalty), and hostage (low satisfaction, high loyalty).

Roger Hallowell (1996) [157] confirmed the link between customer loyalty (in the context of behavioral loyalty) and customer satisfaction. Oliver (1999) stated that the relationship between satisfaction and loyalty is that satisfaction is transformed into loyalty with the assistance of a myriad of other factors. However, this relationship is complex and asymmetric.

High levels of satisfaction lead to high levels of attitudinal loyalty. Attitudinal loyalty involves different feelings, which create a customer's overall attachment to a product, service, or company (Lovelock et al., 2001). Gerpott et al. (2001) in their study of the German mobile telecommunication found that customer satisfaction is positively related to customer loyalty, and both factors are important parameters in the mobile telecommunications industry. Turel and Serenko, 2006, in their study of Canadian mobile telecommunications also confirmed this finding.

5.9 Customer Retention

Several research works have shown that there is positive relationship between customer satisfaction and customer retention; customer satisfaction has a direct effect on customer retention (Rust and Subramaman, 1992); [158] customer satisfaction is positively related to customer retention (Anderson and Sullivan, 1993); [159] to retain a customer, it is necessary to satisfy him. Satisfied customer is more likely to return and stay with a company than a dissatisfied customer who can decide to go elsewhere (Ovenden, 1995); [160]satisfaction leads to retention and the retention is not simply because of habit, in difference or inertia (Desai and Mahajan, 1998)[161]; customer retention is central to the development of business relationships, and these relationships depend on satisfaction (Eriksson and Vaghult, 2000)[162];customer satisfaction is an antecedent of customer retention (Athanassopoulos, 2000) [163]; customer satisfaction is a central determinant of customer retention (Gerpott et al., 2001); customer satisfaction is positively related to customer retention and the effect varies by customer size and the customer's current level of satisfaction (Niraj et al., 2003) [164].

5.10 Customer Profitability

Research studies conducted by Gale (1992) and Fornell (1992) showed that higher customer satisfaction translates into higher than normal market share growth, the ability to charge a higher price, lower transaction costs, and a strong link to improved profitability. Nelson et al., (1992) [165] also demonstrated that customer satisfaction is related to higher profitability and proved his findings statistically. Andersson et al., (1994) [166] found a significant association between customer satisfaction and

accounting return on assets. Ittner and Larckner (1996) found that shareholder value is highly elastic with respect to customer satisfaction. Fornell et al., 1996, found out that customer satisfaction is significantly related to firms' financial performance. The volume of business conducted with a firm is directly related to customer satisfaction, which in turns affect profitability [167].

Other empirical findings further demonstrated that; customer satisfaction has greater influence on repurchase intentions and profits for service companies (Edvardsson et al., 2000b) [168]; customer satisfaction affects share-of-wallet (SOW) positively (Braun and Scope, 2003; Keiningham et al., 2003); customer satisfaction leads to increased profits (Fečiková, 2004); and customer satisfaction is strongly associated with improved share-of –spending (Keiningham 2005)[169]. The significance of this sub-section to this study is that it helps to provide better understanding that customer satisfaction to some extent affects loyalty which in turn may affect retention and profitability.

5.11 Demographics and Customer Satisfaction

The social identity theory proposed that attitudes are moderated by demographic, situational, environmental, and psychosocial factors (Haslam et al., 1993; Jackson et al., 1996; Platow et al., 1997) [170]. According to the social psychological theories, consumers' evaluations are moderated, or in some cases mediated, by personal feelings of equity in the exchange, disconfirmation between desires and outcomes, individual preferences, social comparisons, and other complex phenomena. These theories strongly suggest that differences in these phenomena among consumers influence their attitudes (Williams et al., 1998) [171].

Several empirical findings that have shown the relationship between demographic variables and satisfaction include:

Bryant et al. (1996) [172] conducted a study on 400 companies using the American Customer Satisfaction Index (ACSI) and demonstrated that there is significant relationship and consistent differences in the levels of satisfaction among demographic

groups: Sex – positively related to satisfaction and female customers are more satisfied than the male customers. Female of all ages are more satisfied than the male. Women are more involved with the process of purchase and possibly use the mobile phone more for relational purposes (social network device) while men use it for functional purposes (businesses, sales, etc). Age – positively related to satisfaction but the relationship is not a straight line. Satisfaction increases with age. The major increase in satisfaction is seen within the age 55 and over. Income – the higher the income, the lower the satisfaction level. Location (type of area) – positively related to satisfaction. Customers living within metropolitan areas (central city and suburban areas) are less satisfied than those customers in non-metropolitan areas.

Palvia and Palvia (1999) [173] found out that age is a significant determinant of satisfaction with information technology industry. Oyewole (2001) [174] in his research on customer satisfaction with airline services reported also that gender, occupation, education, and marital status have significant influence on customer satisfaction, while age and household income had no significant influence. Homburg and Giering (2001) [175] conducted a study on German car manufacturers using LISREL notation and demonstrated that it is important to study demographic variables as determinants of customer behaviors. The results of their study showed that gender has significant moderating effect on satisfaction- loyalty relationship. Women are satisfied with sales process while men are satisfied with the impact of the product. Age showed a positive moderating effect and income had moderating influence with high income showing weaker effect and low income, high effect. Jessie and Sheila (2001) in their empirical work on patients' assessment of satisfaction and quality using factor analysis and regression, reported that age, beneficiary group, location, rank, service affiliation, education, marital status, race, gender, health status and number of visits (socio-demographic variables) have minimal influence on satisfaction.

Ahmad and Kamal (2002) [176] conducted a study on a commercial bank using a stepwise regression and demonstrated that there is negative significance between age and satisfaction. When age goes up, satisfaction levels are likely to go down. However,

occupation and income levels are positively related to satisfaction. Lightner (2003) [177] in his study on online experience using regression expressed that age is an important factor in determining satisfaction levels and technology perceptions. VanAmburg (2004) [178] conducted a study on 200 companies using the American Customer Satisfaction Index (ACSI) and demonstrated that age has a significant effect on satisfaction. Younger age groups are less satisfied than older age groups across all products and services industries.

Venn and Fone (2005) [179] conducted a study on patient satisfaction with general practitioner services in Wales using logistic regression and reported that satisfaction varied with age, gender, employment status, and marital status. The results obtained indicated that higher satisfaction is significantly related with increasing age, female gender, unemployed (those at home, disabled and retired), and married patients. However, unemployed - students and those seeking work, reported lower satisfaction.

Turel and Serenko (2006) [180] in their study on customer satisfaction with mobile services in Canada using ACSI reported that age has a significant influence on customer satisfaction and lower satisfaction level is found among young adults.

From this literature review, it is suggested that consumers differ in behaviors and attitudes and one of the factors responsible for this difference is demographics. It is therefore necessary to investigate the impact of demographic factors (age, gender, type of employment and location) on customer satisfaction of Pakistani mobile telephone industry. This investigation is necessary basically for three reasons:

- It is the first academic study on Pakistani customers
- Demographic factors are important factors in the society and greatly affect attitudes, lifestyle, standard of living, etc. This study intends to investigate the impact of these factors on customer satisfaction with mobile services in Pakistan.
- It helps to investigate the different market segments so as to better understand the needs of different customers.

The contribution of the aforementioned literature to this study is:

- Better understanding that consumer attitudes are influenced by several factors. In accordance with this review, the following relationships were tested by analyzing the results obtained from survey. `
  - There is a strong relationship between age and customer satisfaction.
  - There is a strong relationship between gender and customer satisfaction.
  - There is a strong relationship between location and customer satisfaction.
  - There is a strong relationship between employment and customer satisfaction.
  - There is a strong relationship between age, gender and customer satisfaction.
  - There is a strong relationship between age, location and customer satisfaction.
  - There is a strong relationship between age, employment and customer satisfaction.
  - There is a strong relationship between gender, location and customer satisfaction.
  - There is a strong relationship between gender, employment and customer satisfaction.
  - There is a strong relationship between location, employment and customer satisfaction.
  - There is a strong relationship between age, gender, location, employment and customer satisfaction.

CHAPTER 6

DATA ANALYSIS, RESULTS &DISCUSSION

6.1 Frequency Statistics

A total of 400 questionnaires were administered and collected in four different cities of Pakistan. The data collected was analyzed with the Statistical Package for Social Science (SPSS). Table 6.1 presents the descriptive statistics (frequency statistics) of the independent variables (demographics).

Variables		Frequency	Percent	Cumulative Percent
Age				
	16-25	81	20.3%	20.3%
	26-40	222	55.5%	75.8%
	41-55	56	14.0%	89.8%
	56-65	34	8.5%	98.3%
	66-75	7	1.8%	100.0%
	16-25	81	20.3%	20.3%
Gender				
	Male	186	46.5%	46.5%
	Female	214	53.5%	100.0%
Employment				
	Public	72	18.0%	18.0%
	Private	142	35.5%	53.5%
	Self	119	29.8%	83.3%
	Student	49	12.3%	95.5%
	Unemployed	18	4.5%	100.0%
Location				
	Islamabad	100	25.0%	25.0%
	Lahore	100	25.0%	50.0%
	Karachi	100	25.0%	75.0%
	Rawalpindi	100	25.0%	100.0%

Table 6.1 Data Analysis for measuring the age, location, Gender and Employment frequency

6.2 Analysis of Customer Satisfaction

The dependent variable (customer satisfaction) was analyzed with the descriptive statistics (frequency distribution). Table 6.2 presents the result of the analyzed overall customer satisfaction.

Satisfaction	Level	Frequency	Percent	Cumulative Percent
1	**Very satisfied**	8	2%	2%
2	**Satisfied**	137	34.3%	96.3%
3	**Dissatisfied**	228	57%	62%
4	**Very dissatisfied**	20	5%	5%
5	**No opinion**	7	1.5%	100%

Table 6.2 Overall Customer Satisfactions

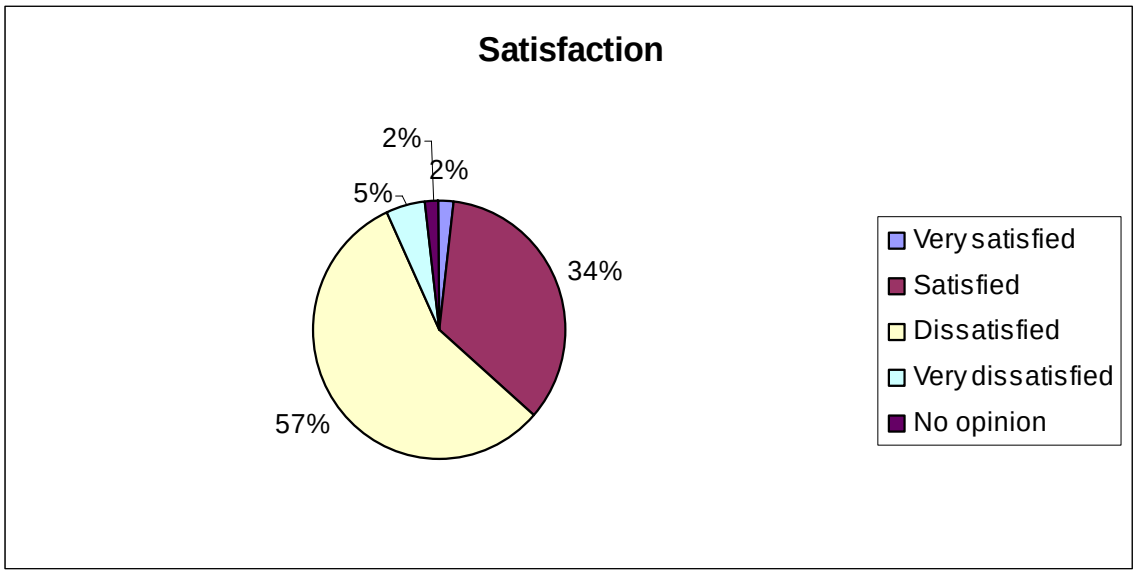

Figure 6.1 Representation of Customer Satisfaction

The graph represents the outcome of the analysis of the Pakistan's customer satisfaction with the mobile telecoms services (frequency distribution in percentage).

This result demonstrates that 34.3% of the respondents are satisfied, and 2% very satisfied with the mobile telecoms services in Pakistan. Although this score is slightly

above average, it is an over all customer satisfaction that majority of people in the survey are not happy with Customer satisfaction and quality provide by mobile companies. There is a need to bring improvement and competitiveness in mobile cellular industry which is more than 10 years old.

The interpretation of this result could be that Pakistan's customers are not very satisfied with the mobile service performance and its impact. In line with the adopted definition, this result showed that customers are not satisfied with their experiences of use of the mobile services (services meet expectation). This satisfaction measure could also result from lack of quality and high call rates and also viable competitor that the customers can compare services with and/or could be due to the fact that customers are kind of new to satisfaction measurement and may not be able to express their perceptions well. Thus, there is need for routine customer satisfaction measurement to better capture customer's perceptions.

Almost every user has rated and strongly agreed upon the thing that these billing details should be provided to them. For billing accuracy the details should be provided by operators. For Telecommunication users right protection, there was a question asked during survey and every user has replied in assertive, it means that they agree upon the foundation of such organization which can take care of telecommunication consumer rights.

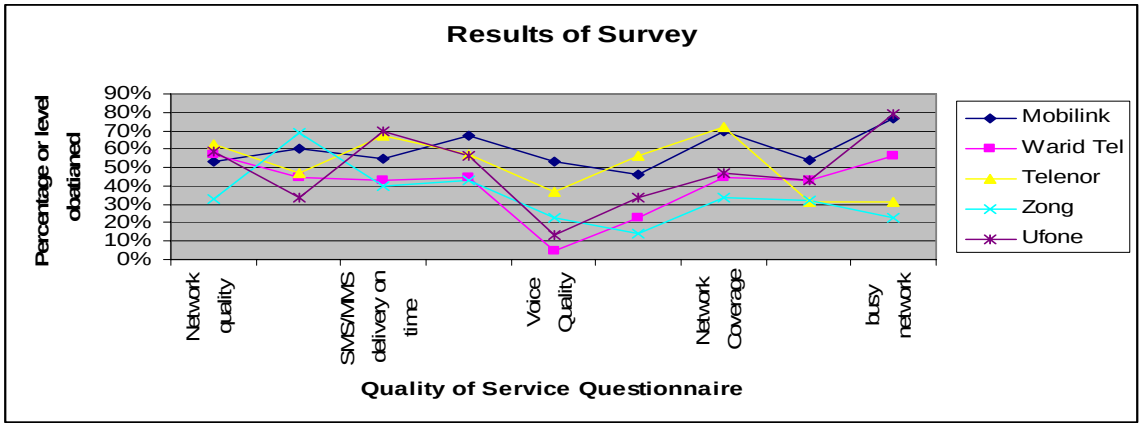

Figure 6.2 Results of Survey (Percentage of Mobile Users from five different Operators companies participated in Survey)

6.3 Results

The following table shows the Quality parameters and questionnaires asked during survey. There are total eighteen questions asked regarding Quality of Service and the results of this survey is documented in the below mentioned table.

S. NO	Quality Parameters	Strongly Agree	Agree	Disagree	No answer
1	Call disconnects in middle of conversation	120	130	100	50
2	Level of disturbance in Call is High	180	134	80	6
3	SMS receive on time	200	100	97	3
4	MMS receive on time	197	103	99	1
5	Call rates gone down	201	34	100	65
6	Still expensive to use cell phone over the landline	207	100	80	13
7	Should Call rates further go down at the cost of quality	180	130	90	0
8	Satisfied with Voice Quality	103	60	200	37
9	Satisfied with QoS of my cellular connection	122	23	255	0
10	Call dropping issue faced very frequently	178	132	90	0
11	Signal dropping problem	310	70	20	5
12	Busy network issue	209	120	70	1
13	Network coverage is important factor that my cellular service provides.	310	23	66	1
14	Network coverage is an important factor for me while selecting mobile service.	310	23	66	1
15	GPRS service is good	32	79	280	9
16	Internet service on mobile is satisfactory	37	63	290	10
17	Value added services are up to mark	340	2	50	8
18	Call drop while travel from one area to other	321	29	50	0

Table 6.3. Analysis of Questionnaire Quality of Service Survey.

The results in the above mentioned table shows that most of the customers are not satisfied from the quality of service and they are facing problems which are highlighted in this technical survey. Some questions are also asked from corporate sector regarding QoS. Results shows that customers are not satisfied with the quality of service i.e. call connection, interruption in conversation is often observed. The level of disturbance in call is high. In some cases SMS and MMS are not received on time. There is a call dropping

issue and signal dropping issue faced by customer. There is a need to provide complete network coverage at remote area. Remote area users are facing the network coverage issue. The value added services are not up to the mark. Hence customers are not very much satisfied with the available service.

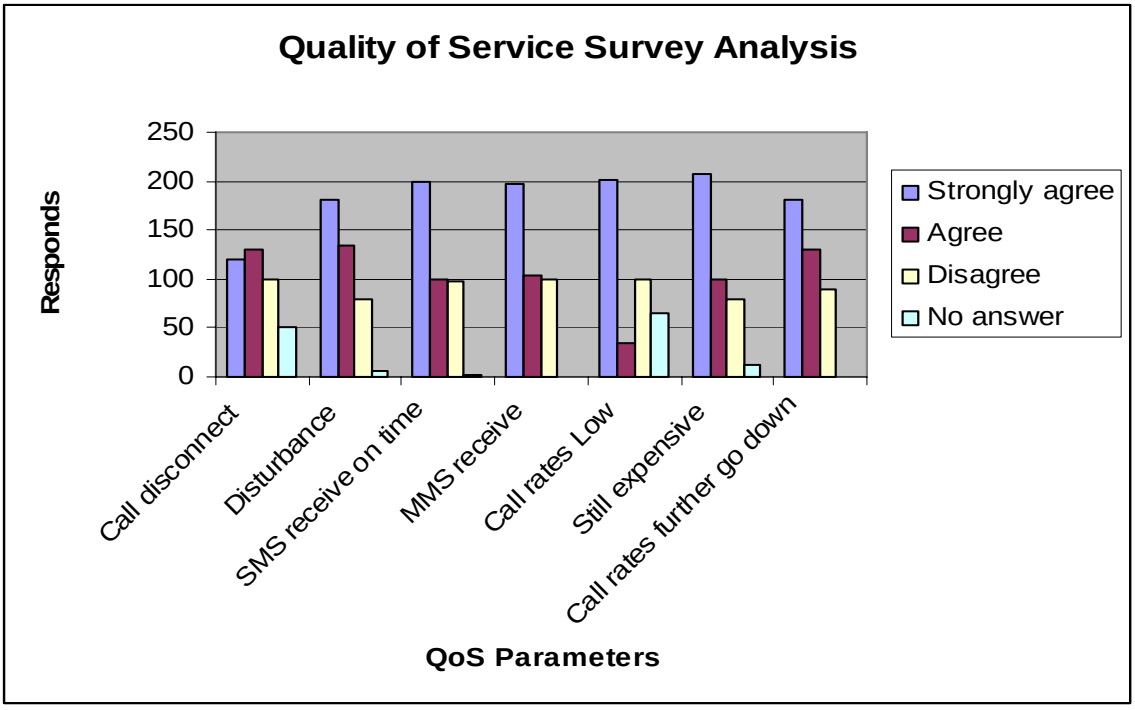

Figure 6.3. Analysis of Questionnaire Quality of Service Survey.

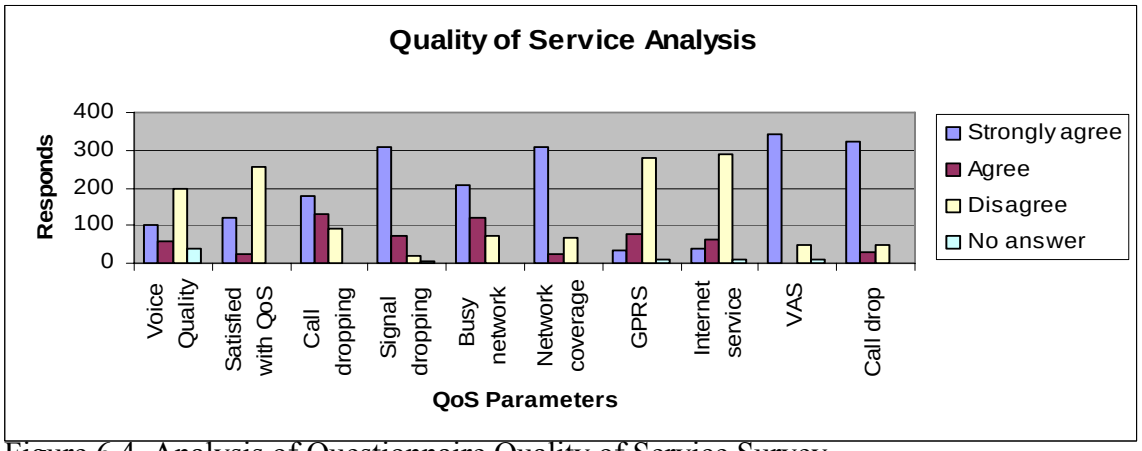

Figure 6.4. Analysis of Questionnaire Quality of Service Survey

The graph shows the detail of Quality of Service survey regarding the quality parameters. All the parameters show that customers are not happy

with the mobile networks quality and they are facing some issues regarding the quality and there is a need to improve network quality.

Customer survey shows that customers are not satisfied with tariff rates. They will switch to other networks if they offer lower charges. Hidden charges should be advertised on TV/Media. The billing details should be transparent. Telecom users are agreed to unite and establish an Association TCPA (Telecom Consumer Association, Pakistan). This association will protect the rights of consumer.

There is a need to keep check and balance of call rates, SMS and MMS along with GPRS and Internet services. There is a need to check the validity period of mobile network. The customers are not satisfied by overall customer care services like the ability to attend call and provide a solution. Customers are also not very much satisfied and contend with the reliability of network. Hence a mark improvement is required to improve customer satisfaction and quality of service of mobile network.

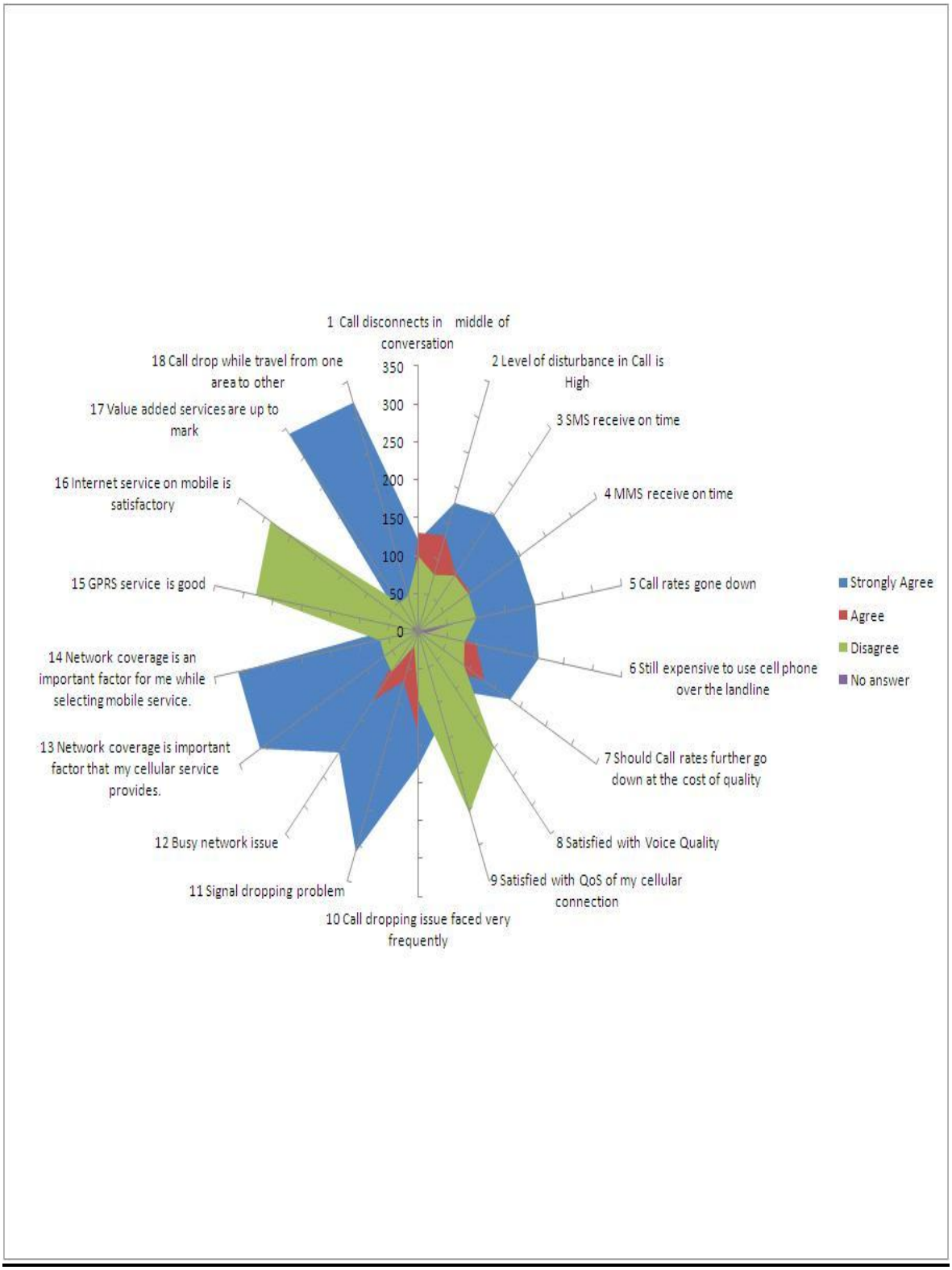

Figure 6.5. Results of Quality of Service Survey.

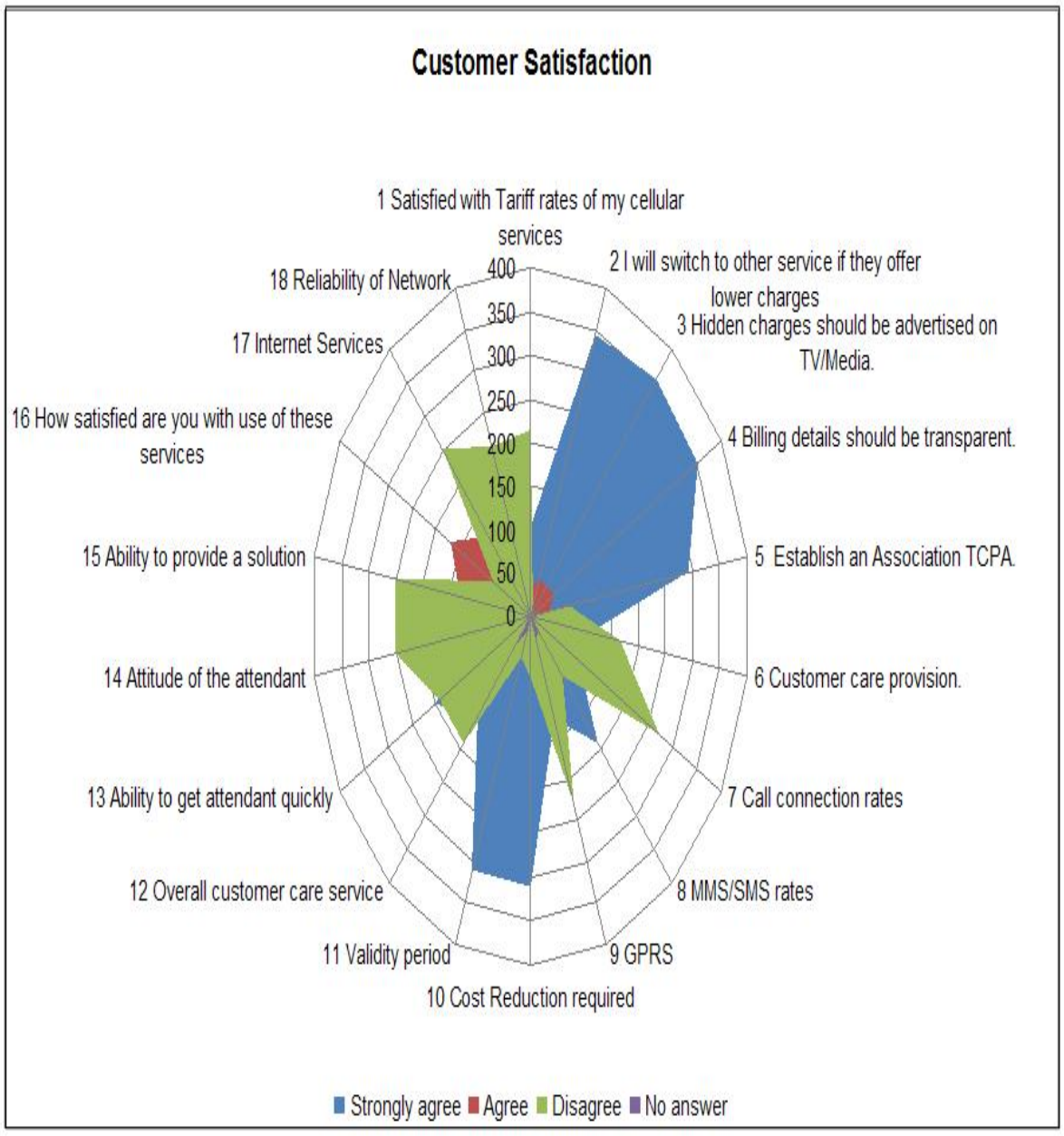

Figure 6.6. Analysis of Questionnaire Customer Satisfaction Survey.

The above mentioned table shows the questionnaire and their results regarding customer satisfaction regarding mobile services. The parameters like network validity, tariff rates, billing rates, call connection, hidden charges and customer care services are reviewed through this survey. Customers are not much satisfied and there is lot of improvement required to upgrade the services and to maintain services to adequate level. The reliability of network parameter is also enquired from customers. Hidden charges should be disclosed and there should be proper check and balance. There is a need to create a

Telecom Consumer Association, a question regarding the formation of some union or platform is asked and a positive response is obtained in favors of such association.

6.4 Customer Satisfaction among the demographic groups

The demographic variables were analyzed against customer satisfaction using the cross tab of the descriptive analysis to show assessments of customer satisfaction among various categories of the demographic variables. Table 6.5 presents the outcome of the analysis.

Variables		**Satisfaction (Mean) (%)**
Age	**Young**	61.8%
	Old	68.6%
Gender	**Male**	68.3%
	Female	56.5%
Employment	**Employed**	72%
	Unemployed	91.9%
Location	**High income**	58.5%
	Low income	65.5%

Table 6.5. Presents the result of the assessment of customer satisfaction in two categories of Demographic variables.

This result demonstrates that customer satisfaction level differs among the various demographic variables. Within the age groups, the old people are more satisfied than the young people. The low satisfaction of the young people could result from the fact that they are more demanding as a result of their greater familiarity with mobile technologies and higher tendency to complain than the old people. Within the gender groups, this result revealed that male customers are more satisfied than the female. The higher satisfaction reported by the male customers may imply that they are well satisfied with the impact of the service and the mobile telecoms boost their functional activities

(businesses, sales, etc), while for the female customers, their low satisfaction could be due to less or no personal interaction with sales process (mobile subscription is through vendors and not directly from the operators, unlike the fixed telecoms) or less influence of mobile telecoms on their relational activities. This result is in contrast with the findings of Bryant et al. (1996), who revealed that the female customers are more satisfied than the male customers across all industries; Venn and Fone (2005) revealed that higher satisfaction is positively related to female gender.

The result also indicates that the unemployed customers are more satisfied that the employed ones. Employment relates to education. Unemployment results from both lack of jobs for qualified people and lack of education. The higher satisfaction of the unemployed customers could be that they are truly satisfied with the services irrespective of their status or their perception is a result of their level of education. This study did not examine the influence of education on satisfaction and future studies could investigate this. Additionally, this result confirms the findings of Venn and Fone (2005), which reported higher satisfaction level among unemployed customers.

Accordingly, customers living within the low-income areas are more satisfied than those in the high-income areas. High-income areas dwellers have greater tendency to be more familiar with information technologies and be more demanding and these factors could be responsible for the low satisfaction obtained in the high-income areas. This result confirms the findings of Bryant et al. (1996) which reported that the higher the income, the lower the satisfaction.

6.5 Quality of Service

H0: The cellular companies are providing adequate level of service.

H1: The cellular companies are not providing adequate level of service.

Consumer perception of Quality is a function of a lot of variables. This research work has been done to check few of these variables to check the level of satisfaction.

The coverage of the mobile companies has increased tremendously in the past few years. Currently the number of Land line users in Pakistan is 5.5 million and the mobile users are around 93 million. It has already exceeded the Land line connections due to its availability in rural areas. It is a misconception with the people that mobile companies are not operating in the villages but the fact is that the mobile service providers are not only operating in many villages but also getting the major source of revenue from them.

It is in the contract that government signs with every service provider that it will expand it base in the villages where the fixed PTCL lines are not present. Mobile service providers also benefits from the village services: this is because:

- These people are fair in their dealings and they don't cheat.
- Secondly they pay all the bills on time, as they are simple people.
- Thirdly they use mobile very frequently than the city people because no alternate is available so they have to stick with option. They keep mobile to be used for even small tasks and as they don't have other expenses they have a lot of money to spend on these calls.

The results obtained from questionnaire were analyzed graphically and they are showing that in general consumer or customer is not very satisfied in Pakistan with QoS and Customer satisfaction. There are some technical issues and problem regarding quality which is highlighted in the research and there is a great need for mobile companies to address them seriously. Hence the results show there service companies are not providing adequate level of service and there are quality issues which are highlighted during analysis.

Though these questionnaire and conversation with the Marketing team in the 5 major mobile phone companies, it has been identified that business in the mobile communications industry is growing and consumers are more powerful than ever before. They are better informed, more demanding, have individual needs and now that they have a variety to choose from they wont settle for less. Therefore to satisfy and retain consumer is a challenge faced by these companies and they do it by regular updates in their quality of service.

Also, since the industry is highly dynamic, technological advancements have to be made and kept up to date with global standards. These standards have to meet with the competition as well. Among the information found was that Mobilink has extended its network with the increase in consumers.0300, 0301, 0302 are three networks currently in service. Similarly, companies like Warid and Telenor have had to reconcile their differences with PTCL as it is the monopoly in the land-line. If customers don't get connected from PTCL lines in one go, they get agitated and consider with a mobile company problem.

It has been concluded from the data collected is that a number of mobile communication companies with the increase in competition have brought about changes in their cellular networks. The reason for these changes has been mostly customer complaints due to lack of good service and also disloyalty of customers that exists in this industry. The results shows that there is a need to improve quality and Customer Satisfaction, both parameters are not up to mark and survey shows there is mark improvement required in technical and administrative issue while planning the network.

The changes have been in the network lines and services being offered. These changes have instilled a sense of confidence in the consumers that their complaints are being heard. Therefore, a certain amount of loyalty is now seen. Quality complaints however have not been completely eradicated. This is because of umpteenth factors like lack of coordination between technical team and marketing teams.

The future looks bright as a sense of stability will soon be achieved. No more licenses will be awarded to any new company and so consumers will soon settle for one company of their choice.

CHAPTER 7

RECOMMENDATIONS AND CONCLUSIONS

7.1 Recommendations

There are some recommendations which have been concluded from this research are as follows.

7.1.1 Recommendations Related to Companies and PTA

Companies spend a lot of money on advertisement of their product just to catch more and more customers. Similarly mobile phone companies are giving their advertisements on televisions and different media channels. But for catching more customers, they should provide the adequate level of service and they should study the culture of the country and also give awareness of all those hidden charges. Because a customer should be aware of all the charges and cost of calls and PTA should keep an eye over all advertisements and call rates.

Mobile companies should provide a better voice, signal quality. The roll-out for network expansion should be properly planned and each technical detailing should be observed closely. Surveys should be conduced properly.

Call drop issue is very common, Mobile operators should increase the bandwidth for frequency re-use. As the car moves from one area or cell to another area, often voice quality de-grade, it is due to call hand over process from one cell site to other. So Operators should keep a check on frequency re-use and user density in the same area where this problem occurs.

There should be no hidden charges and PTA should fine and create check and balance.
The billing accuracy or wrong billing is a very common problem. A common user should be informed about all billing details including GST and government taxes. The level of

disturbance should be controlled and monitor regularly by Operators. Roll-out should be planned accordingly in order to provide or expand the network coverage.

With the arrival of MNP (Mobile Number Portability) technology, this suggestion is of more value for companies to give heir customers some packages comprising of mobile connection along with hand set so that the customers would have to stick with the company for the whole period according to the package. It has been observed through this survey that people still prefer the internet facility on their computers rather than on mobile phones. Companies should look into this matter as proportion of people using internet is also very high. So companies should lower their rates of GPRS and should advertise this technology so that people can use more and more internet on their mobile phones.

Network congestion is a very common problem, often we call to other network and we get a message network is busy. Mobile operators should create a check and balance on other networks where the customer makes a call. It is the duty of mobile operator to create a check and balance whether its customer can easily make calls on other network. PTA should also observe regularly and make huge fines to such Operators. Often it happens; that a user only dials a number and his/her balance gets reduced. PTA and mobile operators should regularly check these issues. PTA should fine such operators.

According to some analyst Pakistan is likely join the small group of countries with over 100 million mobile subscriber during the second half of 2008, and that by the end of 2010, there could be over 120 million cellular customers in Pakistan. Let's hope that this growth does not come at the cost of quality or service.

As Pakistan has nominal consumer protection laws, the consumer are being fleeced by every kind manufacturer/business including telecom operators. Wrong billing, deceptive price formulas, connectivity, clarity of voice, sale of used prepaid cards, deceptive advertisements, and lack of any compensation for damages incurred due to bad service of telecom operator are only a few.

Pakistan Telecommunication Authority established a complaint cell in 2002 to "facilitate and resolve the complaints made by a individual or a group against Telecommunication services". Complaints can be reported by a toll free number (0800-55055) or using an online form. However there is no public information about the volume of complaints or its rate of successful resolution of these complaints. Judging from situation, PTA complaints cell performance has not been satisfactory.

PTA should give response to consumer complaints and take action immediately. Consumers, lack of awareness about their rights compounds the problem. Most of the people do not know that they can sue a company for bad service. Their complaints are not resolved. PTA should maintain the record of QoS of internet, GPRS and MMS/SMS services including all VAS services.

Mobile companies while planning their roll-out or future expansion should go each and every minute technical detailing. Because these surveys, plans and expansion affect the end-users. Operators along with regulator have to keep an eye on their internal decisions. Authorities need to check if the roll-out or expansion is done in proper manner. There should be draft for every new cell –site or transmission site which should be included in Annual reports.

PTA should make huge fine to operators for mismanagement and should give importance to each complain of user in order to bring improvement in QoS.

7.1.2 Recommendations Related to Consumer

It has been observed that these network quality of service issues and billing accuracy problems are happening because telecom users are not organized and do not have any say in these affairs. Telecom users need to get organized and establish an Association: Telecom consumers Association, Pakistan (TCPA) that represents them and guides them in telecom related issues. The Association would make demands on these

companies on behalf of telecom consumers. If a company does not behave, it can ask its members to boycott such company.

The Association can take up following functions:

1. It can create awareness among consumers about their rights with special focus on telecom consumers.
2. It can conduct quality and popularity surveys independently and let the consumers know which company offers best service.
3. It can keep an eye on the advertisements being aired by telecom operators and warn (or even sue) companies about unethical or deceptive advertisements.
4. It can inform its members and public about misleading advertisements of telecom operators.
5. It can have a good liaison with telecom operators to inform them about consumer issues and concerns.
6. It can mobilize telecom consumers to arrange peaceful protest rallies against companies that indulge in anti-consumer activities.
7. It can support and encourage Pakistan Telecom Authority to be tough on companies to protect consumers.
8. It can take up issues like reduction of broadband price and Mobile Number Portability and pressurize large companies to become consumer friendly.
9. It can mobilize policy makers/law makers to enact and implement consumer protection laws especially with provisions for compensation.

It can work as a prototype for a big consumer protection association. This will set a trend, and consumers, in other sectors, would replicate it to protect their interest. It can become pioneer consumer protection association of Pakistan. Though it is merely a dream today, but it is becoming a reality eventually.

7.1.3 Recommendations Related to Future Research

This research can be further used and there can be many other topics which can be extracted from this research for further studies. This research can be used to study the Service Quality of one single company in detail. This study can be used for the research of Quality of Service for Hardcore technology and regional perspective. This study can also help to study the group categorization like education, Salary brackets etc. This segregation can be done keeping in mind the userbase of /mobile industry. The study of hardcore technologies used in telecom sector and their comparison can be further categorized and studied.

The results of this study and demographic relationship can be further used for comparing the consumer behavior of each mobile company. This study can also applied on other ISP and data-centers of Pakistan.

7.2 Conclusion

The research identified service quality, service support, service personnel, information services, network quality, performance, signal, voice and data as integral factor influencing customer satisfaction of mobile operator's end-users. Customer satisfaction is a growing concern among businesses throughout the world. Today, manufacturing and service companies, large and small, use 'satisfaction research' and 'quality of service' to determine the critical service attributes that provide customer satisfaction.

An empirical study on the measurement of quality of service and customer satisfaction was therefore taken for all five mobile operators: Telenor, Mobilink, Ufone, CM Pak, Warid Tel etc.

Pakistan telecom sector remained stagnant for many years and no major progress was seen in this segment due to the monopoly of PTCL (larger power distance factor). But time changed and with the deregulation of telecom sector, investors found a friendly atmosphere and rushed towards Pakistan to take an advantage of these policies. The telecommunication sector around the world went through a process of radical change from monolith state controlled culture to an open market competitive environment. Same

thing happened in Pakistan and there occurred a boom in the telecom sector in the area. But the real action happened in cellular segment and the number of mobile users has outstripped fixed-line subscriber and Pakistan telecom sector became the fastest growing sector as compared to other countries of that area. The users of these services became more and more conscious of the value of telecom services in changing business environment. The research includes the comprehensive study of network quality parameters and customer's survey. Different questions are being asked and on the basis of the answers, different results were concluded.

It can be said for sure that the future prospects of the growth in the mobile service providers are very bright and the current scenario is very welcoming for new advances. The Government's deregulation policy has ended the monopoly of old cellular companies who were charging exorbitant rates and not providing adequate level of service. However, with the advent of the new cellular companies the quality of service has improved and the customer face fewer problems of signal dropping and disturbance in calls. The intense competition has brought much needed improvements in this sector with network coverage of most companies increasing day by day. Most of the telecom companies have increased their network coverage to more than 200 cities and towns in Pakistan. The price of the service has gone down significantly due to the competition. However, the government's role in this cannot be ignored as the government has reduced the duties on the connections and has reduced other duties that have helped the cellular companies to lower the tariff.

The introduction of value added services such as GPRS, MMS, Balance transfer etc have been introduced to attract consumers and there are many more to introduced in future. The need for mobile phones is increasing and market is expanding day by day. The number of customers has increased from 22 million 2006 to 90 million Dec-2008. This shows the exponential increase in the number of consumers over the past few years.

An important aspect of the research was to determine the quality parameters and factors along with their measurement. It has been observed that the daily stats of all five mobile companies and interviewed different types of customers and consumers. Consumers are

extremely sensitive to price changes and are willing to switch connections if the other company reduces the tariff. Consumers also give importance to quality of service. Since, most of urban reside in urban areas or in larger towns, network coverage is important for companies who have workers working in far-off areas at their manufacturing sites. Hence, price is the most significant factor in deciding which network to choose along with QoS.

But Operators companies should keep the technical detailing of Voice, Signal, and data while planning their roll-out. Often due to management issues or technical detailing issues can create a loss for Operator Company. Often surveys are not conducted properly by mobile operators. In the end consumer has to suffer a lot by minor mistakes. Billing accuracy and customer satisfaction has got a significant impact on the future growth of Operator Company.

This study aims to investigate the QoS customer satisfaction of the mobile telecoms industry, factors influencing satisfaction and the relationship between demographic variables and customer satisfaction in Islamabad, Lahore, Rawalpindi and Karachi, in Pakistan. Customer satisfaction is an experience-based assessment made by customers how far their expectations about the overall functionality of the services obtained from the mobile operators have been fulfilled. With regards to customer satisfaction measurement, the results demonstrated that customers are satisfied with the performance of the Pakistan mobile telecoms industry. The interpretation of this result could be that Pakistan customers are truly satisfied with the service performance (satisfied with experience of the mobile services use) or their satisfaction results from lack of competing services or it could be that the customers are new to satisfaction measurement and may not be able to express their perceptions well. The result also demonstrated that customer satisfaction level differs among the specific demographic groups. Within the age groups, the older customers were more satisfied than younger ones. The low satisfaction of the young customers could be due to greater familiarity with mobile technologies and are more demanding. The male customers showed more satisfaction than the female counterpart. The high satisfaction of the male customers could be due to the impact of the

services on their functional activities. The unemployed customers demonstrated more satisfaction than the employed ones and the higher satisfaction of the unemployed group could be due to true satisfaction or low knowledge of mobile technologies. Lastly, the low-income areas showed more satisfaction than the high-income areas. The low satisfaction of high-income areas customers could probably be due to greater familiarity with information technologies and are more demanding. However, mobile operators need to strive to maximize customer satisfaction which in turn can influence the extent of loyalty and retention.

With regards to factors that influence satisfaction, network quality demonstrated a strong influence on customer satisfaction. The implication of this finding is that network quality is the most significant of all the mobile services attributes and its quality strongly affect satisfaction. Billing, validity period and customer support showed weak influence on satisfaction. These results indicate that the evaluation of these factors without alignment is meaningless and have weak impact on satisfaction. The result also demonstrated that the combination of the mobile services attributes has strong influence on satisfaction. Thus, to increase customer satisfaction, mobile operators should focus on improving mobile services attributes by investing in equipment to enhance call quality and coverage, offer reasonable pricing and price discounts, offer reasonable validity period and enhance customer care through routine personnel training and provision of better customer-friendly equipment.

With regards to influence of demographic variables on satisfaction, the result showed that the individual variables (age, gender, employment status and location) and their combination have weak influence on satisfaction. These results mean that customer's perceptions of how well the mobile services meet their needs are not affected by these specific variables. However, since the results showed different customer satisfaction levels among the various demographic groups, mobile operators can strive to better understand these market segments and adopt marketing strategies to better satisfy their different needs.

Broadly, the implication of this study for mobile operators is that operators should not just rely on profit margins as a good indicator of business performance. Rather, they should develop strategies that better capture customer's perceptions of their service offerings and these strategies can compliment the internal perceptions of service offering. Customer satisfaction strategy helps companies to compare their performance against customer standards, compare customer standards against internal process and identify opportunities for improvement.

Despite the potential contribution of this study, this study had four limitations. First, the questionnaire was self-constructed instead of adopting research standard such as SERQUAL and this made analysis difficult and affected the reliability of the result. Second, convenience data sample was used in this study and employment of random sample is necessary to judge the findings of any empirical investigation. Thirdly, the different locations of authors and interviewers made supervision impossible and this robbed this study of potential probe for any useful information. With respect to future projects, there is need for cooperation between academic bodies and mobile operators so as to achieve better customer-oriented investigations. Future studies can further investigate the factors that affect satisfaction and loyalty (such as level of education, word of mouth, life cycles and usage pattern of customers, switching barriers, etc).

ANNEXURE A, B &C

CUSTOMER SATISFACTION SURVEY

Annexure-A

QUESTIONNAIRE

This research work is a study to measure how well the Mobile Telecommunications Industry is meeting your needs and know what needs to be improved to increase your satisfaction. Your cooperation is well appreciated. Thank you.

Instruction:

Please mark your answer with an "X".

Section A

1. Which of the following age category are you?

- ☐ 16-25
- ☐ 26-40
- ☐ 41-55
- ☐ 56-65
- ☐ 66-75

2. Please indicate your gender.

- ☐ Male
- ☐ Female

3. Which of the following indicate your type of employment?

- ☐ Public employment
- ☐ Private employment
- ☐ Self-employment
- ☐ Student
- ☐ Unemployed

4. Which of the following is your area of residence?

- ☐ Rawalpindi

☐ Islamabad
☐ Lahore
☐ Other

Section B

5. Which of the mobile operators do you subscribe to?

☐ Mobilink
☐ Ufone
☐ Telenor
☐ Warid Tel
☐ China Mobile Telecom

6. Please rate your satisfaction of this service on the following:

	Very satisfied	Satisfied	Dissatisfied	Very dissatisfied	No opinion
Network availability	☐	☐	☐	☐	☐
Signal Quality	☐	☐	☐	☐	☐
Call Connection rate	☐	☐	☐	☐	☐
Voice and data quality	☐	☐	☐	☐	☐
Value Added Services	☐	☐	☐	☐	☐
Network coverage	☐	☐	☐	☐	☐
SMS & MMS	☐	☐	☐	☐	☐
Billing	☐	☐	☐	☐	☐
Validity period	☐	☐	☐	☐	☐

7. When you call to complain or query anything, how satisfied you are on the following:

	Very satisfied	Satisfied	Dissatisfied	Very dissatisfied	No opinion
Overall customer care service	☐	☐	☐	☐	☐
Ability to get attendant quickly	☐	☐	☐	☐	☐
Attitude of the attendant	☐	☐	☐	☐	☐
Ability to provide a solution	☐	☐	☐	☐	☐

8. Overall, how satisfied are you with the use of this service

☐ Very satisfied
☐ Satisfied
☐ Dissatisfied
☐ Very dissatisfied
☐ No opinion

9. Does the call ever disconnected in the middle of conversation?

☐ Never ☐ Rarely ☐ Sometimes ☐ Quiet often

☐ Most of the time ☐ Always.

10. How many times at an average do you have to dial a number before your call connects?

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

11. Have the cell phone and Call rates gone down over the past few years?

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

12. Is it still expensive to use a cell phone over the land line?

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

13. Should the call rates further go down at the cost of quality?

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

14. What is the level of disturbance in the call?

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

15. Do the SMS and MMS you send or receive reach on time?

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

16. I am satisfied with the quality of service of my cellular service.

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

17. I am concerned with the problem of signal dropping & busy network.

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

18. VAS such as GPRS, MMS etc is very important and I am are satisfied with their service.

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

19. I am satisfied with the network coverage that my cellular service provides.

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

20. Network coverage is an important factor for me in selecting a service.

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

21. I will switch to other services if they have lower charges.

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

22. Your call drop when you are travelling from one area to other area by road?

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

23. I am satisfied with the tariff that my cellular services charges.

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

24. Hidden Charges should be advertised on Television and commercials.

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

25. Billing details and calculation should be visible to an ordinary user including GST and Govt Taxes.

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

26. Telecom users need to get organized and establish an Association TCPA (Telecom Consumers Association, Pakistan).

☐ Strongly agree ☐ agree ☐ disagree ☐ no answer

Annexure-B

ANOVA (b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	77.820	1	77.820	269.583	.000(a)
	Residual	114.890	398	.289		
	Total	192.710	399			

a. Predictors: (Constant), Network Quality, voice, data, signal
b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non-standardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.345	.069		19.557	.000
	Network	.500	.030	.635	16.419	.000

a. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	38.035	1	38.035	97.869	.000(a)
	Residual	154.675	398	.389		
	Total	192.710	399			

a. Predictors: (Constant), Billing prepaid and post paid connection
b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non-standardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.454	.099		14.660	.000
	Billing	.356	.036	.444	9.893	.000

a. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	30.966	1	30.966	76.196	.000(a)
	Residual	161.744	398	.406		
	Total	192.710	399			

a. Predictors: (Constant), Validity
b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non-standardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.691	.086		19.734	.000
	Validity	.323	.037	.401	8.729	.000

a. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	30.266	1	30.266	74.154	.000(a)
	Residual	162.444	398	.408		
	Total	192.710	399			

a. Predictors: (Constant), O.C.C.S
b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non-standardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.227	.138		8.883	.000
	O.C.C.S	.561	.065	.396	8.611	.000

a. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	88.074	4	22.019	83.120	.000(a)
	Residual	104.636	395	.265		
	Total	192.710	399			

a. Predictors: (Constant), Customer care support, Billing, Validity period, Network quality
b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non-standardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.820	.130		6.330	.000
	Network	.396	.040	.503	10.018	.000
	Billing	.200	.035	.250	5.714	.000
	Validity	-.016	.038	-.020	-.426	.670
	O.C.C.S	.122	.064	.086	1.923	.055

a. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squar	df	Mean Square	F	Sig.
1	Regression	3.073	1	3.073	6.450	.011(a)
	Residual	189.637	398	.476		
	Total	192.710	399			

a. Predictors: (Constant), Age
b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non-standardized Coefficien		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.595	.090		28.983	.000
	Age	-.097	.038	-.126	-2.540	.011

a. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squar	df	Mean Square	F	Sig.
1	Regression	.292	1	.292	.604	.438(a)
	Residual	192.418	398	.483		
	Total	192.710	399			

a. Predictors: (Constant), Gender
b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Un-standardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.360	.048		49.648	.000
	Gender	.054	.070	.039	.777	.438

a. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squar	df	Mean Square	F	Sig.
1	Regression	4.370	3	1.457	3.063	.028(a)
	Residual	188.340	396	.476		
	Total	192.710	399			

a. Predictors: (Constant), Lahore, Karachi, Gender, Rawalpindi., Islamabad

b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non-standardized Coefficien		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.260	.069		32.771	.000
	Islamabad =	.110	.098	.069	1.128	.260
	Lahore.	.100	.098	.062	1.025	.306
	Karachi.	.290	.098	.181	2.973	.003

a. Dependent Variable: Satisfaction

Excluded Variables (b)

Model		Beta In	t	Sig.	Partial Correlation	Co linearity Statistics
						Tolerance
1	karachi	.(a)	.	.	.	.000

a. Predictors in the Model: (Constant), Islamabad, Lahore, Karachi , Rawalpindi

b. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squar	df	Mean Square	F	Sig.
1	Regression	21.235	5	4.247	9.758	.000(a)
	Residual	171.475	394	.435		
	Total	192.710	399			

a. Predictors: (Constant), Unemployed, Student, Public, Self, Private

b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non-standardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.351	.469		5.013	.000
	Public	-.257	.469	-.142	-.548	.584
	Private	.257	.469	.177	.548	.584
	Self	.128	.473	.085	.272	.786
	Student	-.269	.478	-.127	-.562	.574
	Unemployed	-.351	.494	-.105	-.710	.478

a. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squar	df	Mean Square	F	Sig.
1	Regression	3.846	2	1.923	4.042	.018(a)
	Residual	188.864	397	.476		
	Total	192.710	399			

a. Predictors: (Constant), Gender, Age
b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non-standardized Coefficien		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.573	.091		28.243	.000
	Age	-.106	.039	-.138	-2.733	.007
	Gender	.090	.070	.064	1.275	.203

a. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squar	df	Mean Square	F	Sig.
1	Regression	6.933	4	1.733	3.685	.006(a)
	Residual	185.777	395	.470		
	Total	192.710	399			

a. Predictors: (Constant), Islamabad Age, Lahore, Karachi, Rawalpindi.
b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non-standardized Coefficien		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.495	.122		20.473	.000
	Age	-.093	.040	-.120	-2.335	.020
	Islamabad	.042	.101	.026	.419	.676
	Lahore	.061	.098	.038	.621	.535
	Rawalpindi	.256	.098	.160	2.607	.009

a. Dependent Variable: Satisfaction

Excluded Variables (b)

Model		Beta In	t	Sig.	Partial Correlatio	Co linearity Statis Tolerance
1	Karachi	.(a)	.	.	.	.000

a. Predictors in the Model: (Constant), Rawalpindi, Age, Lahore, Islamabad, Karachi.
b. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squar	df	Mean Square	F	Sig.
1	Regression	27.073	6	4.512	10.706	.000(a)
	Residual	165.637	393	.421		
	Total	192.710	399			

a. Predictors: (Constant), Unemployed, Student, Public, Age, Self, Private
b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non-standardized Coeffici		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.671	.469		5.691	.000
	Age	-.143	.038	-.185	-3.722	.000
	Public	-.261	.461	-.145	-.566	.572
	Private	.261	.461	.180	.566	.572
	Self	.119	.465	.078	.256	.798
	Student	-.389	.472	-.184	-.825	.410
	Unemployed	-.268	.487	-.080	-.550	.583

a. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squar	df	Mean Square	F	Sig.
1	Regression	4.739	4	1.185	2.490	.043(a)
	Residual	187.971	395	.476		
	Total	192.710	399			

a. Predictors: (Constant), Karachi, Rawalpindi, Lahore, Islamabad = 1
b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non-standardized Coefficien		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.239	.073		30.683	.000
	Gender	.063	.072	.046	.880	.379
	Islamabad =	.087	.101	.054	.863	.389
	Karachi	.090	.098	.056	.922	.357
	Lahore	.288	.098	.180	2.952	.003

a. Dependent Variable: Satisfaction

Excluded Variables (b)

Model		Beta In	t	Sig.	Partial Correlation	Co-linearity Statistics
						Tolerance
1	Lahore	.(a)	.	.	.	.000

a. Predictors in the Model: (Constant),Lahore, Karachi, Gender, Rawalpindi., Islamabad
b. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squar	df	Mean Square	F	Sig.
1	Regression	25.794	6	4.299	10.122	.000(a)
	Residual	166.916	393	.425		
	Total	192.710	399			

a. Predictors: (Constant), Unemployed, Gender, Student, Self, Public, Private
b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non- standardized Coeffic		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.326	.463		5.021	.000
	Gender	.237	.072	.170	3.276	.001
	Public	-.446	.467	-.247	-.955	.340
	Private	.209	.463	.144	.451	.652
	Self	.055	.468	.036	.118	.906
	Student	-.351	.473	-.166	-.742	.459
	Unemployed	-.418	.488	-.125	-.857	.392

a. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squar	df	Mean Square	F	Sig.
1	Regression	27.363	8	3.420	8.088	.000(a)
	Residual	165.347	391	.423		
	Total	192.710	399			

a. Predictors: (Constant), Unemployed, Student, Public, Self,, Private Lahore, Karachi, Gender, Rawalpindi., Islamabad
b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non-standardized Coeffici		Standardized Coefficients	t	Sig.
	.	B	Std. Error	Beta		
1	(Constant)	2.138	.466		4.584	.000
	Public	-.293	.463	-.162	-.634	.526
	Private	.293	.463	.202	.634	.526
	Self	.153	.466	.100	.327	.744
	Student	-.265	.472	-.125	-.562	.574
	Unemployed	-.326	.487	-.097	-.669	.504
	Islamabad	.309	.099	.192	3.114	.002
	Lahore.	.174	.094	.108	1.848	.065
	Rawalpindi.	.307	.092	.192	3.325	.001

a. Dependent Variable: Satisfaction

Excluded Variables (b)

Model		Beta In	t	Sig.	Partial Correlatic	Co-linearity Stati Tolerance
1	Karachi	.(a)	.	.	.	.000

a. Predictors in the Model: (Constant), Unemployed, Student, Public, Self, Private, Lahore, Karachi, Gender, Rawalpindi. Islamabad
b. Dependent Variable: Satisfaction

ANOVA (b)

Model		Sum of Squar	df	Mean Square	F	Sig.
1	Regression	37.766	10	3.777	9.481	.000(a)
	Residual	154.944	389	.398		
	Total	192.710	399			

a. Predictors: (Constant), Unemployed, Student, Gender, Self, Age, Public, Private, Lahore, Karachi, Gender, Rawalpindi. Islamabad
b. Dependent Variable: Satisfaction

Coefficients (a)

Model		Non-standardized Coeffic		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.587	.466		5.551	.000
	Age	-.168	.041	-.218	-4.071	.000
	Gender	.304	.074	.218	4.123	.000
	Islamabad = 1	.115	.104	.072	1.099	.272
	Lahore	.095	.093	.059	1.022	.308
	Rawalpindi	.250	.091	.156	2.760	.006
	Public	-.500	.452	-.277	-1.106	.270
	Private	.197	.450	.136	.438	.662
	Self	.020	.453	.013	.044	.965
	Student	-.540	.461	-.255	-1.169	.243
	Unemployed	-.337	.474	-.101	-.712	.477

a. Dependent Variable: Satisfaction

Excluded Variables (b)

Model		Beta In	t	Sig.	Partial Correlation	Co-linearity Statistics Tolerance
1	Karachi	.(a)	.	.	.	.000

a. Predictors in the Model: (Constant), Unemployed, Student, Gender, Self,., Age, Public, Private, Lahore, Karachi, Gender, Rawalpindi., Islamabad
b. Dependent Variable: Satisfaction.

Annexure-C

Random and Statistical Sampling

Random sampling of size n from a population size N. Unbiased estimate for variance of $\bar{x}$ is $Var(\bar{x}) = S^2(1-n/N)/n$, where n/N is the sampling fraction. For sampling fraction less than 10% the finite population correction factor (N-n)/(N-1) is almost 1.

The total T is estimated by N. $\bar{x}$, its variance is $N^2Var(\bar{x})$.

For 0, 1, (binary) type variables, variation in estimated proportion p is:

$S^2 = p.(1-p).(1-n/N)/(n-1)$.

For ratio $r = \Sigma x_i/\Sigma y_i = \bar{x} / \bar{y}$, the variation for r is

$[(N-n)(r^2S^2_x + S^2_y - 2 r Cov(x, y)]/[n(N-1).\bar{x}^2]$.

Stratified Sampling

Stratified sampling can be used whenever the population can be partitioned into smaller sub-populations, each of, which is homogeneous according to the particular characteristic of interest.

$\bar{x}_s = \Sigma W_t$. $Bxar_t$, over t=1, 2, ..L (strata), and $\bar{x}_t$ is $\Sigma X_{it}/n_t$.

Its variance is:

$\Sigma W^2_t /(N_t-n_t)S^2_t/[n_t(N_t-1)]$

Population total T is estimated by $N.\ \bar{x}_s$, its variance is

$$\Sigma N^2_t(N_t-n_t)S^2_t/[n_t(N_t-1)].$$

Since the survey usually measures several attributes for each population member, it is impossible to find an allocation that is simultaneously optimal for each of those variables. Therefore, in such a case we use the popular method of allocation which use the same sampling fraction in each stratum. This yield optimal allocation given the variation of the strata are all the same.

Determination of sample sizes (n) with regard to binary data: Smallest integer greater than or equal to:

$$[t^2\ N\ p(1-p)]\ /\ [t^2\ p(1-p) + \alpha^2\ (N-1)]$$

with N being the size of the total number of cases, n being the sample size, α the expected error, t being the value taken from the t distribution corresponding to a certain confidence interval, and p being the probability of an event.

What is a statistical instrument?

A statistical instrument is any process that aim at describing a phenomena by using any instrument or device, however the results may be used as a control tool. Examples of statistical instruments are questionnaire and surveys sampling.

What is grab sampling technique?

The grab sampling technique is to take a relatively small sample over a very short period of time, the result obtained are usually instantaneous. However, the **Passive Sampling** is a technique where a sampling device is used for an extended time under similar conditions. Depending on the desirable statistical investigation, the Passive Sampling may be a useful alternative or even more appropriate than grab sampling. However, a passive sampling technique needs to be developed and tested in the field.

What Is the Margin of Error

Estimation is the process by which sample data are used to indicate the value of an unknown quantity in a population.

Results of estimation can be expressed as a single value; known as a point estimate, or a range of values, referred to as a confidence interval.

Whenever we use point estimation, we calculate the margin of error associated with that point estimation. For example; for the estimation of the population proportion, by the means of sample proportion (P), the margin of errors calculated ***often*** as follows:

$$\pm 1.96\ [P(1-P)/n]^{1/2}$$

If you have a yes/no question in a survey, you probably want to calculate a proportion P of Yes's (or No's). Under simple random sampling survey, the variance of P is P(1-P)/n, ignoring the finite population correction, for large n, say over 30. Now a 95% confidence interval is

$$P - 1.96\ [P(1-P)/n]^{1/2},\ P + 1.96\ [P(1-P)/n]^{1/2}.$$

A conservative interval can be calculated, since P(1-P) takes its maximum value when P = 1/2. Replace 1.96 by 2, put P = 1/2 and you have a 95% conservative confidence interval of $1/n^{1/2}$. This approximation works well as long as P is not too close to 0 or 1. This useful approximation allows you to calculate approximate 95% confidence intervals.

Sample Size Determination

The question of how large a sample to take arises early in the planning of any survey. This is an important question that should be treated lightly. To take a large sample than is needed to achieve the desired results is wasteful of resources whereas very small samples often lead to that are no practical use of making good decision. The main objective is to obtain both a desirable accuracy and a desirable confidence level with minimum cost.

Pilot Sample

A pilot or preliminary sample must be drawn from the population and the statistics computed from this sample are used in determination of the sample size. Observations used in the pilot sample may be counted as part of the final sample, so that the computed sample size minus the pilot sample size is the number of observations needed to satisfy the total sample size requirement.

For an item scored 0/1 for no/yes, the standard deviation of the item scores is given by $SD = [p(1-p)/N]^{1/2}$ where p is the proportion obtaining a score of 1, and N is the sample size.

The standard error of estimate SE (the standard deviation of the range of possible p values based on the pilot sample estimate) is given by $SE= SD/N^{½}$. Thus, SE is at a maximum when p = 0.5. Thus the worst case scenario occurs when 50% agree, 50% disagree.

The sample size, N, can then be expressed as largest integer less than or equal to $0.25/SE^2$

Thus, for SE to be 0.01 (i.e. 1%), a sample size of 2500 would be needed; 2%, 625; 3%, 278; 4%, 156, 5%, 100.

Note, incidentally, that as long as the sample is a small fraction of the total population, the actual size of the population is entirely irrelevant for the purposes of this calculation.

Sample sizes with regard to binary data:

$$n = [t^2 N p(1-p)] / [t^2 p(1-p) + \alpha^2 (N-1)]$$

with N being the size of the total number of cases, n being the sample size, α the expected error, t being the value taken from the t distribution corresponding to a certain confidence interval, and p being the probability of an event.

For a finite population of size N, the standard error of the sample mean of size n, is:

$$\sigma[(N -n)/(nN)]^{½}$$

There are several formulas for the sample size needed for a t-test. The implest one is

$$n = 2(Z_\alpha+Z_\beta)^2\sigma^2/D^2$$

which underestimates the sample size, but is reasonable for large sample sizes. A less inaccurate formula replaces the Z values with t values, and requires iteration, since the df for the t distribution depends on the sample size. The accurate formula uses a non-central t distribution and it also requires iteration.

Percentage: Estimation and Testing

The following are two JavaScript applets that construct exact confidence intervals and test of hypothesis with respect to proportion, percentage, and binomial distribution with or without a finite population, respectively.

Enter the needed information, and then click the Calculate button.

Application to the test of hypothesis:

Notice that, one may utilize Confidence Interval (CI) for the test of hypothesis purposes. Suppose you wish to test the following general test of hypothesis:

H_0: The population parameter is almost equal to a given claimed value, against the alternative:

H_a: The population parameter is not even close to the claimed value.

The process of carrying the above test of hypothesis at α level of significance using CI is as follow:

1. Ignore the claimed value in the null hypothesis, for time being.
2. Construct a 100(1- α)% confidence interval based on the available data.

3. If the constructed CI does not contain the claimed value, then there is enough evidence to reject the null hypothesis. Otherwise, there is no reason to reject the null hypothesis.

Sample Size with Acceptable Absolute Precision: The followings present the widely used method for determining the sample size required for estimating a population mean or proportion.

Let us suppose we want an interval that extends δ unit on either side of the estimator. We can write

δ = Absolute Precision = (reliability coefficient) .(standard error) = $Z_{\alpha/2}$. $(S/n^{1/2})$

Correlation Values

For Positive Correlation it should be between o and 1. If the value of R is below 0 then it is negative correlation. If correlation is between 0 and 0.5 it is positive but weak. If the correlation is between 0.5 and 1 the value of R will be strong.

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