

1.1 Background

With the progress and the great development in Mobile internet services, as well as the need to increase the use of data services, have emerged the need to adopt a new pricing mechanisms for data services, because the traditional methods are not valid (the flat rate pricing model), which often cause problems paid for both the service provider and the customer. As a result of the high costs in addition to the limited spectrum resources, neither the service provider has the ability to pay for network expansion nor the customer beneficiary of the service provided as a result of bad quality. [1]

The quality of service (QoS) based pricing is one of the new pricing mechanisms developed to avoid different problems like congestion in the network , high cost of network expansion and bad level of QoS , where this mechanism represents best solution to provide different quality levels depending on the price paid. The provisioning and monitoring of pricing scheme based on QoS will reduce the conflict of interest between the service provider and the customer. Furthermore, it will encourage the service provider to deal with investment, continuous upgrading, expansion of the network and join fair competitions with other operators. Also from an economical point of view, a pricing mechanism based on the quality of service provided, will optimize the use of service provider resources and the customer will choose the level of quality he or she wants depending on the nature used to serve data in accordance with the amount to be paid. [2]

1.2 Importance of the research (motivations)

Although currently, in the market place, pricing mechanism for Mobile Internet Service based on quality is applied and announced to customers. However, most of the existing pricing mechanism for Mobile Services is used without the

presence of regulation and monitoring frameworks that confirm the prescribed QoS.

1.3 Problem Definition:

The close relation between competition and pricing, where the pricing is one of the main elements for controlling the level of competition, dictates that it is impossible to leave any mechanism for pricing without regulation, management and control. This issue becomes serious especially when the price is linked with the QoS

The absences of regulation framework and monitoring mechanisms generate serious problems and conflicts. Thus, there is an urgent need for developing a regulation to ensure that all parties have received their rights and are committed to their obligations and on the other hand to guarantee upgrading and maintaining high levels of QoS provided.

However, recently, service providers have applied pricing mechanism for Mobile Internet in Sudan based on Quality level without a regulatory framework or guidelines that ensure the customer level of quality matches the money paid. Therefore, it became clear that the establishment and formulation of a regulatory framework to monitor and control the pricing mechanism based on the level of quality provided to the Mobile internet service is urgently needed.

1.4 Research Hypothesis

The first hypothesis: The existence of a regulatory framework to monitor the QoS based pricing for mobile internet service, leads to the grantee of the level of service quality as stated in the Service Level Agreement (SLA).

The second hypothesis: The adoption of the pricing mechanism on the basis of the level of quality brings financial, numerous technological and competitive gains to the service provider.

The third hypothesis: The increase in user's awareness and knowledge about QoS based pricing enables users to balance between the budget and the QoS requirements for their mission critical applications.

1.5 Research question

1.5.1 Main Research question

How to formulate a regulatory framework for monitoring QoS based pricing of mobile internet service?

1.5.2 Supporting Research questions

How to encourage service provider to adopt QoS based pricing mechanisms?

How to do awareness to customers regarding QoS based pricing mechanisms?

How to ensure that the customers have received the QoS as stated in the Service Level Agreement (SLA)?

1.6 Research objectives

The objectives of this research are represented in the following points:

To develop a regulatory framework to monitor the QoS based pricing for Mobile Internet.

To encourage service providers to adopt a pricing mechanism depending on the QoS.

To increase the customer awareness about the link between the levels of QoS and the tariff imposed.

1.7 Scope

The scope of this research can be summaries as follows

This research is dealing with the QoS pricing mechanism for mobile internet in Sudan telecom market.

The data collection is taken based on a questionnaire filled by stakeholders through consulting them and taking their opinions, The research focused on the analysis the results of the questionnaire and is used to assist in the formulation of the regulatory framework to control the pricing of Mobile Internet service depending on the QoS level.

It only deals with the formulation of a regulation framework by providing a set of recommendations and it does not cover all aspects or technical systems to measure and control the pricing mechanism dependent on quality.

1.8 Methodology

This research focuses on setting the regulation framework of QoS based pricing for mobile internet service. The regulation framework will depend on recommendations of the International Telecommunication Union (ITU), international experience and the field questionnaire. The international experience was examined through selection of five countries that have special regulation for QoS and telecom sector in those countries was compared with Sudan telecom sector and then these experiences were used as guide in designing the questionnaire. The questionnaire asked for the stakeholders opinion to help in formulation the general QoS based pricing monitoring framework regulation in Sudan.

1.9 Thesis layout

This research is split into five chapters:

Chapter One provides an overview about the problem definition, objective of the research, its scope and the methodology that is used.

Chapter Two give a basic understanding of the definition of QoS and parameters, the importance of QoS, the QoS based pricing challenges, the common pricing methods used in internet service, the benefits from using QoS based pricing, the shortcomings of QoS based pricing, and the related regulations of QoS around world.

Chapter Three assesses Sudan regulations in QoS area, provide definition of factors used in the selection of similar countries, and defines the QoS recommendations of the ITU, an over view of values of those factors in selection countries, and methodology used.

Chapter Four presents data collected based on the questionnaire in addition to data analysis and then present the results.

Chapter Five is about Conclusions, Shortcomings of the research and recommendations.

Appendix (A) Contains summaries of the ITU recommendations in addition to the questionnaire in Arabic language that had been distributed to the three different categories of participants (Regulator, operators and customers) and Chi Square table.

2.1. Introduction

This chapter presents general theoretical background in term of definition of QoS based pricing for mobile internet and provides the reader with overview of the importance, challenges, and characteristics of QoS and common method of internet pricing. It also presents the benefits, shortcomings of used QoS based pricing and finally, in addition to that it explores the experience of certain countries that have special regulation for QoS for mobile internet service.

2.2 Definition of the QoS based pricing of Mobile internet service

Mobile Internet refers to the access of the [Internet](#) via a cellular telephone service provider. It is wireless access that can handoff a user from one radio tower to another while it is moving across the service area[3] and as usual this service require level of QoS which is defined in cellular networks as the capability of the cellular service providers to provide a satisfactory service, totality of characteristics of a telecommunication service that bear on its ability to satisfy stated and implied needs of the user of the service or the collective effect of service performances, which determine the degree of satisfaction of a user of the service[4], and any level of quality provided to end user is linked with amount of money paid and this concept is called QoS based pricing. [5]

2.3 Importance of QoS

Internet has been providing a Best Effort service (BE), giving the same treatment to all data services. This approach has not been an issue during the past years, and BE networks are already able to support services like streaming or Internet Protocol (IP) voice [6]. But still not being able to control the network congestion, this approach can easily degrade the quality and even avoid the access to these services [6]. Emerging services with more demanding QoS requirements, and the need to have control over the performance of these services, are nowadays creating the need for a better QoS management in the

network [6]. From the fixed network point of view, increasing the backbone capacity and user access bandwidth is a necessary first step for accommodating these real-time applications, but it is not the final solution since lower-priority traffic may still flood the network, utilizing all the available resources[6]. The real challenge is to manage the existing network bandwidth, so that a QoS can be delivered to all users. In wireless networks, radio resources are usually more scarce and expensive than in fixed networks, thus an appropriate resource management is essential. While the circuit-switched approach is based on a permanent and exclusive use of the radio channel as long as the connection is active, packet-switched networks allow several data flows to be multiplexed, sharing the same resources along the time .[6]

2.4 Quality of Service Challenges

Wireless mobile networks QoS refers to the measurement of a system with good transmission quality, service availability and minimum delay. The major challenges when considering QoS in cellular networks are varying rate channel characteristics, bandwidth allocation, fault tolerance levels and handoff support among heterogeneous wireless networks. Some of the other challenges are efficient usage of the spectrum as its availability is limited. Bandwidth allocation plays a major role with respect to this aspect. It must be made sure that bandwidth is allocated in an efficient manner and also the remaining bandwidth should not be wasted. Some schemes takes care of this issue by allocating the remaining bandwidth to lower priority classes. Things get even more complicated when data and voice service has to be supported. Voice services are very delay sensitive and require real-time service. On the other hand data services are less delay sensitive but are very sensitive to loss of data and also they expect error free packets. So both these factors have to be considered for providing QoS for voice and data services. [7]

2.5 Service quality characteristics

Service quality characteristics are those features and characteristics of a service that bears its ability to satisfy stated or implied needs, Below is list of these characteristics:

2.5.1 Speed

Performance criterion that describes the time interval that is used to perform the function or the rate at which the function is performed. (The function may or may not be performed with the desired accuracy).[8]

2.5.2 Accuracy

Performance criterion that describes the degree of correctness with which the function is performed. (The function may or may not be performed with the desired speed.) [8]

2.5.3 Dependability

Performance criterion that describes the degree of certainty (or surety) with which the function is performed regardless of speed or accuracy, but within a given observation interval.[8]

2.5.4 Availability

Availability of an item to be in a state to perform a required function at a given instant of time or at any instant of time within a given time interval, assuming that the external resources, if required, are provided.[8]

2.5.5 Reliability

The probability that an item can perform a required function under stated conditions for a given time interval.[8]

2.5.6 Simplicity

Ease and lack of complexity in the benefit to the user of a function of the service.[8]

2.5.7 Charging

Is determine the price of service utilization according to set of functions needed.
[8]

2.5.8 Billing

Administrative function to prepare bills to service customers, to prompt payments, to obtain revenues and to take care of customer reclaims.[8]

2.5.9 Billing Error Probability

The probability of an error when billing a user for a service.[8]

2.6 Pricing methods:

Pricing is the process of determining what a company will receive in exchange for its products. Pricing factors are [manufacturing cost](#), market place, competition, market condition, and quality of product. Pricing is also a key variable in [microeconomic](#) price allocation theory. Pricing is a fundamental aspect of [financial modeling](#) and is one of the [four Ps](#) (price, product, promotion, and [place](#)) of the [marketing mix](#). Price is the only revenue generating element amongst the four Ps, the rest being [cost centers](#) [9].

All pricing methods for [products](#) or [services](#) encompass three main ways to improve profits. The business owner can cut costs or sell more, or find more profit with a better pricing strategy. When costs are already at their lowest and sales are hard to find, adopting a better pricing strategy is a key option to stay viable [10].

With increased consumer demand for streaming content such as video on demand and peer-to-peer file sharing, demand for bandwidth has increased rapidly and for some internet service provider ISPs the flat rate pricing model may become unsustainable. From this view generally we need to adapt pricing strategy to be valid with any situation [11]. The most important Internet pricing models are listed below:

2.6.1 Auction Mechanisms

To encourage network growth and guide resources to most valuable use we need to adopt special pricing schema.

2.6.1.1 Centralized packet-oriented

As most of the costs for the internet are fixed costs, the marginal cost for transporting packets over the network is essentially zero as long as the network is not congested. Therefore, usage-sensitive pricing schemes appear to be a good candidate for congestion control mechanisms, as they approach the allocation of scarce internet resources in an economic context. It should be noted that the objective is not to raise profits, but to find a pricing mechanism yielding most efficient usage of existing resources. Congestion pricing allows the user to decide about the value of his/her packets instead of leaving it basically to chance.[12]

2.6.1.2 Decentralized flow-oriented

The model considered here allows guaranteeing multiple QoS (especially for inelastic traffic) by scheduling resources in advance (where in fact shrinking the advance notice period as well as the length of the reservation interval allows to approach arbitrarily close to continuous real-time pricing). Decentralization requires that the users truthfully reveal their preferences so that Pareto efficient allocation can be calculated (Pareto efficient is a method of allocation of

resources in which it is impossible to make any one individual better off without making at least one individual worse off).[12]

2.6.1.3 Reservation-based

This approach requires the possibility of per-flow resource reservations. The resulting two-dimensional bids (price and quantity) allow determining the clearing price directly from the bids only without including the explicit preferences of the users. The calculation of your price per unit is based on the bids of your opponents. Your price is a weighted average where each of their bids is weighted by the quantity this opponent does not receive because of your presence. Hence, for each small share of the resource, you pay the price that the player who is denied it would have been willing to pay for it.[12]

2.6.2 Profiles and Classes

2.6.2.1 User Profiles

How to increase predictability of the QoS to be expected while still running the usual BE strategy in the Internet. Instead of allocating capacity to users by explicit reservations, the “Expected Capacity” framework handles periods of congestion by a much simpler mechanism: using service profiles, demands are separated into those within the profiles and those outside. Treating these two types of packets differently allows the network to offer different levels of service with high predictability (even during congestion periods), according to the individual expectations of the users. The general approach of the mechanism is to define a service profile for each user and to somehow favor offered traffic that obeys the profile. [12]

2.6.2.2 Service Classes

Here, it is not the users but the services that are classified. Inside each service class every customer receives equal service, but higher service classes offer

significantly better service than any lower service classes and are therefore charged higher prices. the nominal bit rate(NBR), provides the underlying parameter for a monthly fee. Congestion is recognized by monitoring the load level of output buffers in the nodes; the system reacts by discarding some packets, preferably from flows with actual bit rate to NBR ratio being high. Each packet carries drop preference (DP) and delay indication (DI) bits, based upon which the system decides about the discarding of packets. [12]

The above mechanisms represent the beginning of the application of the concept of pricing based on the level of quality, where the first mechanism adopted for to find solutions to the problem of network congestion book sources in advance and the user will be accountable for a number of bids that have been booked. The second mechanism is held accountable for user depending on the level of quality required by or classification level of quality depending on the type of service required, either mechanism currently used and that we are going to put a proposed regulatory framework for monitoring take into account the management of network resources optimally in addition to provide various levels of quality based on the user's choice.

2.7 Benefits from using QoS based pricing:

Policy management is the process of applying operator-defined rules for resource allocation and network use, hereunder are three closely-related areas support the use QoS control :

2.7.1 Limit Congestion and Enhance Service Quality

Additional transmission lines, fatter pipes, and improved efficiency are common responses to network congestion. However, this strategy works better for wired networks than for wireless networks. Increasing capacity with additional spectrum and improving spectrum efficiency are important steps in handling the

substantial growth of mobile data. However, capacity improvements alone will not solve this complex challenge. Mobile operators do not have unlimited resources and capital and the radio spectrum is finite. Even if operators significantly increase capacity, bandwidth-hungry applications such as peer-to-peer (P2P) services and video will eventually consume any excess capacity. Providing high service quality by over-provisioning network capacity will eventually leave an operator at a competitive disadvantage to providers that offer the same or better QoS, at a lower cost. A solid policy strategy maintains network performance during peak traffic times and spikes in user demand, saving the operator from having to carry excess capacity. With proactive management policies, combined with other strategies such as network offloading and demand calibration, mobile broadband networks with finite resources can better satisfy consumers' demand for multiply services. Policy management differentiates services (applications) and subscriber types, and then controls the Quality of Experience QoE of each type. Policy management allows operators to granularly control the availability and QoE of different services. First, policies are used to dynamically allocate network resources – for example, a particular bandwidth can be reserved in the radio base station and core network to support a live video conversation. Next, policy rules control the priority, packet delay, and the acceptable loss of video packets in order for the network to treat the video call in a particular manner. In other cases, policy rules might be used to limit traffic rates on the network in order to curb network abusers and provide fair use – preventing one user from negatively impacting the quality of another service. P2P file sharing is one example of a very bandwidth-intensive, non-real-time service. P2P services, if left unmanaged, can consume a disproportional amount of network resources and negatively impact the network's ability to establish and maintain real-time service quality.[13]

2.7.2 New Business Models for Service Monetization:

The market landscape is rapidly changing for wireless operators. With voice-only services, operators captured the majority of the customers' mindshare and service revenue. To the consumer, the voice-only wireless operator was viewed as an end-to-end service provider. With the emergence of smart devices (such as smart phones and tablets), the line between who provides value to the subscriber and whom they pay has blurred. Operators are at greater risk of becoming bit transporters, while content/application providers and device manufacturers capture more of the revenue from mobile subscribers. Policy management is one method operators can implement to form new business models and maximize the service monetization. Policy management helps to retain subscriber mindshare and dollars by allowing granular control of service quality. Policy control enables operators to meet service expectations through network performance modulation, guaranteeing customer QoE and limiting subscriber churn (the subscribers who discontinue their use of a service for period of time). Policy management can also be taken a step further towards the creation of new business models by offering tiered service levels. Tiered service levels can guarantee superior performance and quality to higher paying subscribers (such as corporate accounts). Tiered performance levels can be based on subscription or instant demand. Dynamic policy management allows providers to "put a coin slot in front of the customer." By improving the content delivery quality for fixed periods, policy control supports subscribers' impulse buying of premium services. As an example, a subscriber can upgrade their service for a fixed period of time to watch a video in high definition. This type of end-to-end network flexibility and service quality control can potentially lead to revenue-sharing agreements with third-party content providers and application content vendors. Operators can form strong relationships with content providers based on excellent service delivery.[13]

2.7.3 Phasing-In Policy Management

Operators will likely take a phased approach in adding policy management to their networks, starting with congestion reduction for applications such as P2P services. Aggregate-level policy will probably also be introduced in the first phases. It is unlikely that per-subscriber policy management will be implemented early, due to its high complexity. However, as the technology matures, traffic congestion increases, and competitive pressures mount, QoS and policy management will become more and more important. In preparation, operators must make sure they are working with vendors that have a strong framework to supply end-to-end QoS and are capable of supporting evolving needs [13].

2.7.4 General benefit from using QoS pricing

- Achieve the financial goals of the company (e.g., profitability)
- Fit the realities of the marketplace (Will customers buy at that price?)
- Support a product's [positioning](#) and be consistent with the other variables in the [marketing mix](#) [1].
- Guarantees bandwidth for key applications and users.
- Can put off the need for faster network infrastructure.
- Can help in network planning by measuring and managing traffic flow [14].

2.8 Shortcoming of QoS based pricing

- There is a lack of accounting information systems able to provide the necessary measurement and billing between networks.

- The superior QoS or the offer of several service categories with different qualities, cannot be retained between ISP networks due to technical reasons, such as software and even hardware incompatibility (an ISP's software/hardware may not support the QoS features provided by another ISP).
- There is no interface with end-users that enables different Class of Service (CoSes) to be chosen in a way that provides value to users.
- The quality of access networks is presently insufficient for QoS problems between backbones to be noticed by end-users under most circumstances.
- Congestion management on IP networks is not yet especially well developed, and often results in inadequate quality of service for some types of service, e.g. voice over internet protocol (VoIP).

These issues remain largely unresolved, although considerable effort is being undertaken to overcome them. [15]

2.9 Exploring the experiments of certain countries have special regulation for QoS

When reviewing the regulations that are made by the regulators of telecommunications in a number of countries with regard to the QoS we found that those publications have addressed the issue of QoS by emphasizing the need to provide a certain level of quality through defining a minimum set of quality parameters and setting benchmark for these parameters, without linked the quality level require with the tariff, but it approved the principle of the existence of different levels of quality vary according to tariff. Here we presented general overview of regulation for certain countries which recognized special regulation for level of quality offered:

2.9.1 Lebanon

In 2009 the Commission issued a special bylaw of quality control services under name Technical QoS and Key Performance Indicators(KPI) Regulation and this regulation is designed to define a minimum set of standards that service providers shall meet when the service provider not meet those standards the regulator impose penalties on service provider ,the Authority will ensure that these KPIs are regularly published to assist users to make informed decisions as to their service provider, The main purpose of those regulations are service availability, QoS and network performance.[16]

2.9.2 Bahrain

The Telecommunications Regulatory Authority of Bahrain in 2008 issued a regulation to follow up the QoS called QoS Regulation which aims to create a competitive environment among providers of telecommunications services, and then comes the role of Authority to ensure that the services provided offer quality compatible with international standards (recommendations of the ITU), while regulation goals included a comprehensive upgrade and development of telecommunications services in the State of Bahrain and associated upgrading the telecommunications sector with the QoS provided. [17]

2.9.3 Jordon

Telecommunications Regulatory Commission issued the regulatory framework named instructions for implementing the quality of service framework in jordan in the year 2010 in order to monitor the QoS, where the frame mechanism relies on reports from telecommunications companies licensed and operating in Jordan where they are to submit reports containing information about the quality of telecommunications services provided in Jordan to the TRC; with the aim of monitoring the QoS offered by these companies to consumers; where comes the role of the Commission in the research and analysis of those reports and

determine the reality of the quality of telecom services for each licensed separately, and the availability of quality information for users of telecommunications services to introduce them by the level of quality they receive . [18]

2.9.4 India

In 2012 the Telecommunications Regulatory Authority issued the Indian bylaw of quality of Internet calling the standards of quality of service for mobile data services regulations. the regulation define the QoS as main indicator of the performance of a telecommunication network and of the degree to which such network conforms to the standards of such QoS as specified in these regulations for specified parameters . [19]

2.9.5 Nigeria

The Nigerian Communications Commission issued in 2012 bylaw of regulates and quality control under the name of QoS regulations, The main objectives of these Regulations are ensure the protection and promotion of the interests of consumers against unfair practices including matters relating to the availability and quality of communications services, equipment and facilities and make available information that will help customers make an informed choice of services and service provider. to achieved those objective the regulator define in this regulation the Measurement methods, Data Services KPIs and Penalties. [20]

3.1 Introduction:

This chapter shows the general phases of the research, addresses the assessment of the current situation with respect to the quality of control through general revision of laws and bylaws and regulations. And then defines the main factors with essential effect in the formation of telecommunications market for certain countries that have separate regulations to regulate the level of QoS provided. The recommendations of the ITU regarding the QoS are then reviewed, and methods of data collection, processing are provided .

3.2 Research roadmap

Figure (3.1) shows the general phases of the research:

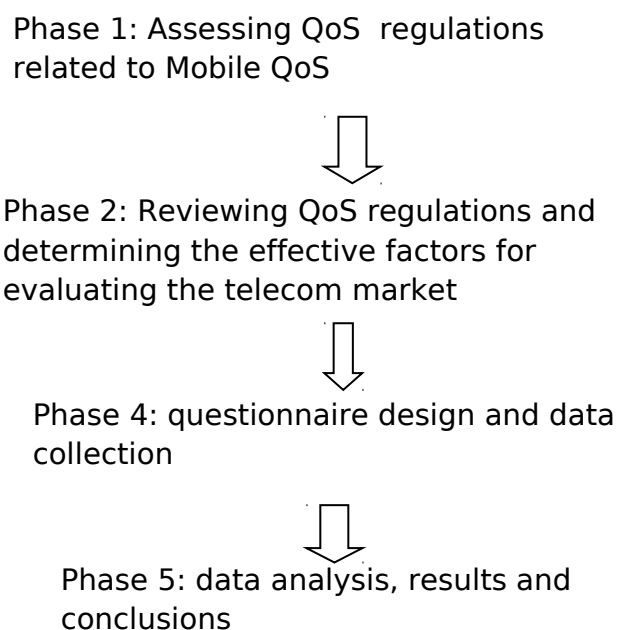


Figure (3.1): General roadmap of research

3.3 Assess the current situation in Sudan with regard to the QoS

The National Telecommunication Corporation (NTC) as a regulator of the telecommunications sector in Sudan reviews the laws that govern and regulate the field of telecommunication in collaboration with the Ministry of Justice and enact legislation. As the NTC raise its amendments for telecommunications regulations according to current situation requirement. The supervision of the performance of telecom sector and application of the laws and regulations approved is a key role for the NTC.

3.3.1 Telecommunication Act of year 2001:

The telecommunications act issued in 2001 and was valid since the date of signature (19 June 2001) through review the law, we found that chapter VII (inspection and monitoring) of article thirty-fifth paragraph (c) (as one of the control procedures are reviewed, the level of service provided and their effectiveness), while paragraph (b) of the same article (is checked technical records and systems used for billing) and the forty-second article (you must adhere to international laws in the field of telecom and including the quality and levels of service and standards of international tariff). [21]

3.3.2 General Telecommunications bylaw of 2012:

Was mentioned quality of services in the general bylaw in article IX of the obligations of the licensee paragraph (g) (provide high efficiency and quality at all times) and also in the sanction's chapter where in case of violation of technical quality and standard measurements for the quality of performance of the various telecommunications services licensed is a fine of not less than ten thousand Sudanese pounds and not more than fifty thousand Sudanese pound.

Figure (3.2) illustrates the form of dealing with the concept of quality with shortage in each of the bylaw and the law.[22]

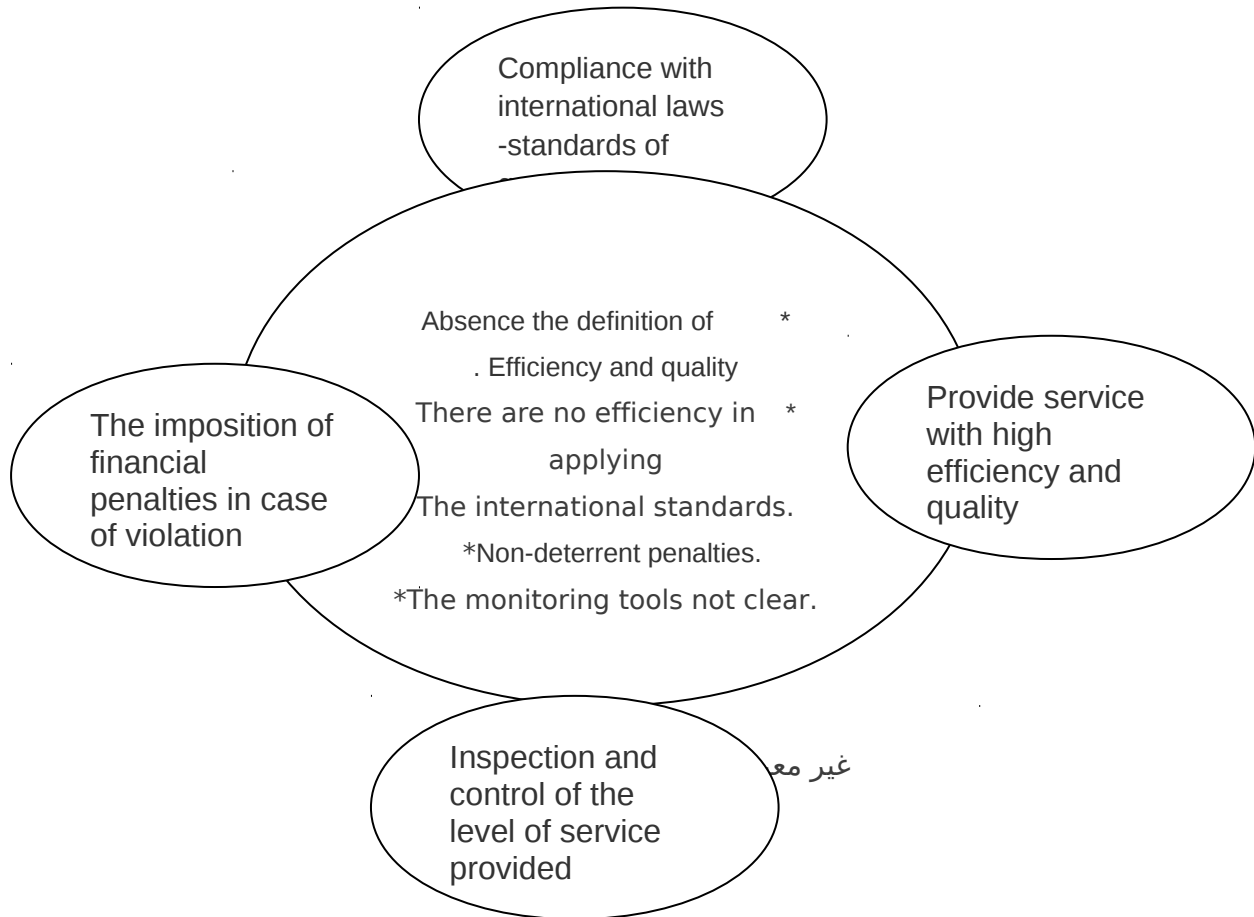


Figure (3.2):Analysis Model of the shortcomings of bylaw and law

3.3.3 Reports and publications

The department of specifications and standards in NTC manages the formulation and measurement of QoS indicators. In the year 2011, the NTC issued a paper that contains indicators to measure the level of QoS. These indicators have been discussed and circulated to the operators. Based on that the specifications and standards team in NTC regularly carried out field surveys to measure the QoS levels, compared and analyzed the survey's results with quarterly performance reports submitted by operators and then published these

reports on the website of the NTC. Figure (3.3) illustrates the sequence of QoS measurement process.

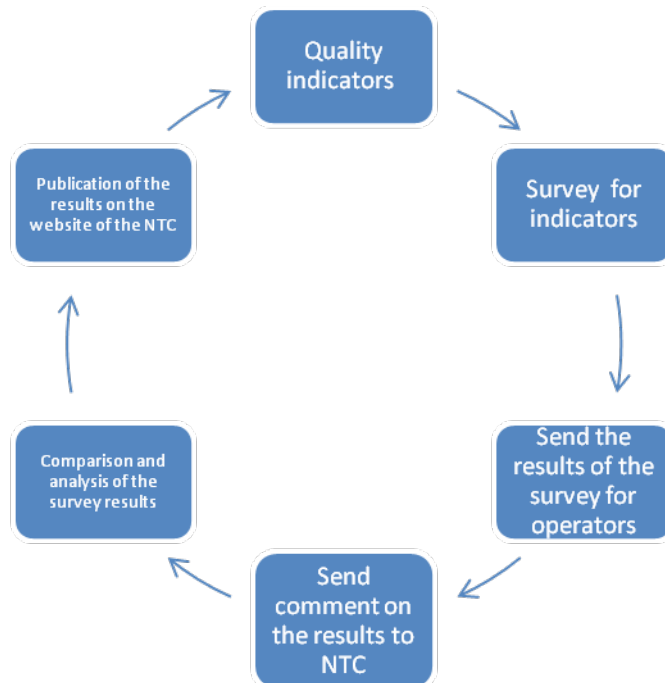


Figure (3.3) the sequence of service measurement process

3.4 Comparing the Telecommunications market in Sudan, with some countries

To take the experiences of countries that have extensive experience in the field of control and regulation of the QoS it was necessary to review the status of the telecommunications market in those countries through examining the factors that affect on shaping the market like the level of competition, a number of telecommunications services provider , The gross domestic product (GDP) per capita income, Skills indicators/ tertiary, Market need/Percentage of Individuals using the internet and penetration of telecommunications services in those countries . Here we try to present the definition of these factors and then present the values of those factors in table (3.1):

3.4.1 Mobile phone penetration rate

Mobile phone penetration rate is a term generally used to describe the number of active mobile phone numbers (usually as a percentage) within a specific population. [23]

3.4.2 Competition

We use the term competition in reference to markets in which firms must compete strongly for sales. Below are types of Competition:

- **Pure Competition:** the market situation in which there are many buyers and sellers of a product where no single buyer or seller is powerful enough to affect the price of that product.
- **Monopolistic Competition:** a market situation in which there are many buyers along with a relatively large number of sellers who differentiate their products from the products of competitors. The various products available in a monopolistically competitive market are very similar in nature and are intended to satisfy the same need. However each seller attempts to make its products somewhat different from the others by providing unique product features; an “attention – getting” brand name, unique packaging or services such as free delivery or a "lifetime" warranty. Product differentiation is a fact of life, in our case, for providers of Telecommunication and Internet services.
- **Oligopoly:** a market situation (or industry) in which there are few sellers. Generally these sellers are quite large and sizeable investments are required to enter into their market.
- **Monopoly:** a market with only one seller. Because only one firm is the supplier of a product, it would seem that it has complete control over

price. However, no firm can set its price at some astronomical figure just because there is no competition. The firm would soon find that it has no customers or sales revenue. Instead, the firm in a monopoly position must consider the demand for its product and set the price at the most profitable level.[24]

3.4.3 Per Capita gross domestic product (GDP): measure of the total output of a country that takes the gross GDP and divides it by the number of people in the country. The per capita GDP is especially useful when comparing one country to another because it shows the relative performance of the countries. A rise in per capita GDP signals growth in the economy and tends to translate as an increase in productivity.[25]

3.4.4 Skills indicators/ tertiary education

Proportion of people who enter tertiary education during the year (Tertiary enrollment rate in the year).

3.4.5 Market need/ Percentage of Individuals using the Internet

The percentage of individuals who use the Internet service from the total of population in the State.

3.4.6 Number of operators

Number of licensed mobile service providers.

3.5 The recommendations of the International Telecommunication Union (ITU)

The recommendations of the ITU (E802 and E803) used as a guideline in formulation of the questionnaire. for more details about ITU recommendations can be referred to in appendix 1.

Table (3.1) the values of factors that affect on shaping the telecom market in certain countries[27][28][29][30]:

Country name	GDP per capita in USD	Percentage rate %	Number of operators	Competition level	Skills indicators%	Individual using the internet%
Lebanon	9,165	81	3	Full competition	54	61
Bahrain	19,512	133	3	Full competition	51.2	88
Jordon	4,556	101	4	Full competition	16.2	41
India	1,528	76	13	Full competition	41.8	12.6
Nigeria	1,509	70	8	Full competition	10.3	32.9
Sudan	1,583	78	3	Full competition	4.1	21

3.6 Procedures of the research

The research here deals with a description of the method and procedures that have been followed in implementing this research. First of all, the research adopted the recommendations of the ITU for the quality of Mobile Services and the experiences of some countries (selected at random) which have special regulations for regulate the quality of Mobile Services. Secondly, we opted for using such recommendations and countries experience for designing a questionnaire to formulation the proposed general framework for monitoring QoS based pricing of mobile internet service in Sudan and keeping pace with what is currently applied in the field of regulation quality of mobile Services.

At this point, the research tried to establish similarities between the telecommunications market in those countries and that of Sudan across a number of influential factors shaping the communications markets. The reason for taking such a step was our honest search to be guided by the experience of markets of countries comparable to our own, so that we can arrange the components of the proposed regulatory framework and adopt as a reference for future studies dealing with developing regulations on the quality of the field of Mobile services in Sudan.

3.6.1 Procedures of field research

In the following chapter, we provide a description of the community of the research, its sample, the way in which its performance was approached, the actions taken to ensure its sincerity and persistence, the way it was applied, the statistical treatment under which the analysis of the data was conducted and the way in which results were obtained as defined in the description of the research's methodology.

3.6.1.1 The population of the research and the research sample

The intended meaning of the term “the population of the research” is the total collection of elements on which the research seeks to base results related to the problem under scrutiny. The original research population consists of all telecommunications companies, NTC and users of Mobile Services in Sudan.

The “research sample”, was selected at random from the population of the research, where it was the work of two questionnaires:

The first of which was designed for employees in the telecommunications sector and the second was specially designed for the users of mobile services. Questionnaire was distributed among fifty (50) individuals from the first group whereby employees of the telecom companies and the NTC and all of them

responded and answered questionnaire with all the required information producing a result which accounted for almost 100% of the target. The other group (users of mobile services), was allocated a hundred (100) questionnaires which were distributed among the targeted population whereby the response matched that of the first group with 100% questionnaires filled out with all of the targeted information too.

3.6..1.2 Research tools

There are many tools used in the field of scientific research to get the information and data necessary for all types of studies, however, the search tool is the means by which the researcher has collected the necessary information about the phenomenon under study. This research has adopted the questionnaire as the main tool to collect information from the research sample. Questionnaire advantages include:

- Can be applied to obtain information about a number of individuals.
- Low cost and ease of application.
- Its words are easy to devise and ascertain.
- It provides time for the respondent and gives him a chance to think.
- Respondents express opinions freely without fear of disapproval by others.

3.6..1.3 Description of the questionnaire

The targeted groups were enlightened about the subject of the research by means of an attached letter to the questionnaire. The letter clarified the broad goal of the questionnaire and its purpose. The questionnaire contained two main sections:

3.6.1.3.1 The first section

This section included statements about the personal data of the research sample of workers in the telecommunications sector and it contained statements about gender, age, academic qualification, field of academic specialization and number of years working in the telecommunications sector.

As for the members of the research sample of users, this section contains statements about gender, age, academic qualification and length of time using mobile Internet service.

3.6.1.3.2 The second section

This section contains (41) expressions whereby the research sample were requested to determine their response for each statement on the gradient scale of Likert, which consists of five levels (strongly agree, agree, neutral, disagree and strongly disagree). The expressions were distributed on the hypotheses of the third research as follows:

The first hypothesis which was aimed at workers in the telecommunications sector: includes (21) expressions.

The second hypothesis which was aimed at workers in the telecommunications sector: include (7) expressions.

The third assumption which was aimed at Mobile Services users: include (13) the expressions.

3.6..1.4 Statistical methods used

To achieve the objectives of the research and to verify the hypotheses, the statistical methods used were the following:

- Graphic formats.

- Frequency distribution of the answers.
- Percentages.
- Median.
- Weighted average.
- Chi-square test for the significance of differences between the answers.

3.6..2 Treatment of the values of influential factors in the formation of the telecommunications market

First, due to the different in the forms of the values handled in the research (percentages, whole-sums figures, characters and currency), all these values have been converted to whole-sums figures so it can be dealt with. The table (3.2) below shows the referential values that have been given to the transactions and table (3.3) shows assigning referential values of transactions in accordance with the actual values shown in the table (3.1) above. This action was carried out in order to calculate the value of these factors, and then identify the country bearing the most similarity to Sudan, which will be described in chapter IV entitled “results and discussion”.

Table (3.2) Reference values for Factors

GDP per capita in USD	Reference
1,000 - 5,000	1
5,000 – 10,000	2
10,000 – 15,000	3
15,000 – 20,000	4
Penetration rate%	Reference
0 – 50	1
50 -75	2
75 – 100	3
>100	4
Number of operator	Reference
1	1

2	2
3	3
>4	4
Competition level	Reference
Monopoly	1
Oligopoly	2
Fully Competition	3
Skills indicators/ tertiary %	Reference
0-20	1
20- 40	2
40 -60	3
>60	4
Individuals using the Internet %	Reference
0-20	1
20- 40	2
40 -60	3
>60	4

Table (3.3) Assigning the referential values of the factors according to the actual values of the states

Country name	Individuals using the Internet	Skills indicators/ tertiary	Competition level	Number of operators	Mobile Penetration rate	GDP per capita
Lebanon	4	3	3	3	3	2
Bahrain	4	3	3	3	4	4
Jordan	3	1	3	3	4	1
India	1	3	3	4	3	1
Nigeria	2	1	3	4	2	1
Sudan	2	1	3	3	3	1

Finally, to obtain the results as accurate as possible, the SPSS statistical software has been used, which indicates a shortcut to the Statistical Package for the Social Sciences. The application Excel has also been used for the implementation of the required graphics in the research.

4.1 Introduction

Two models of questionnaires were circulated. One consisted of fifty copies aimed at individuals working in the telecommunication sector while the other, which consisted of one hundred copies, was responded to by users of mobile services.

In this chapter, we present the analysis of results obtained from the questionnaire for those working in the telecommunication sector (operators and the National Telecommunications), sort out the factors influencing the formation of telecommunications' market, present the analysis of results obtained from the questionnaire for the users of mobile services and finally, present the summary results of the two questionnaires.

4.2 Results of the first questionnaire for individuals working in the telecommunication sector.

(Details of questionnaire distributed can be referred to in appendix 2)

4.2.1 Demographic information

Table (4.1)
Frequency distribution of the research sample of employees according to demographic information.

Type	Number	Percentage
Male	31	62.00%
Female	19	38.00%
Age	Number	Percentage
below 30 years	13	26.00%
from 30—40 years	29	58.00%
from 41—50 years	6	12.00%
over 50 years	2	4.00%
Qualification	Number	Percentage
bachelor degree	27	54.00%
higher diploma	3	6.00%
Master degree	20	40.00%
Phd	0	0
field of academic specialization	Number	Percentage

Economics	6	12.00%
Technical/ engineering	43	86.00%
Other	1	2.00%
years of service at telecommunication sector	Number	Percentage
Below 5 years	16	32.00%
from 5—10 years	24	48.00%
more than 10 years	10	20.00%

4.2.2 The application of the research tool on the first questionnaire

4.2.2.1 The result of ranking the factors influencing the formulation of the telecommunications market:

According to the opinion of those specializing in the telecommunications sector in Sudan, Table (4.2) below, illustrates the importance of the test results and the order of the factors that influence the formulation of the telecommunications market. This was achieved through uploading the results of responses concerning the factors which influence the formulation of the telecommunications market and ranking them (from 1— 6, whereby 1 is most important and 6 is the least important factor). In the table below, the factors are represented by the number of responses and a weight of ranking achieved through multiplying the number of responses by the value of ranking as follows: **(1:100, 2:80, 3:60, 4:40, 5:20, 6:0)**. In order to get the weight of the answer, the weights of responses' factors ranking were then added up to determine the first to the sixth ranking. For the sake of easy reading of the data and minimizing the value however, the values were divided by a 1000.

According to the table (4.2) below, it's clear that the level of competition takes the first ranking as the most influential in the formulation of the Sudanese telecommunications' market. The second place in the ranking is taken by the level of income per capita followed by the mobile penetration rate in third place, the number of operators in the market in fourth, the number individuals using

the Internet in fifth and the proportion of the individuals with university education in the sixth and final place.

Table (4.2) Frequency distribution of the number of responses representing the research sample of employees on the ranking of factors influencing the formulation of the telecommunications' market.

Table (4.3) the weight of factors multiplied by the actual values shown in the third chapter Table (3.3).

Country	Individuals using the Internet	Skills indicators/ tertiary	Competition level	Number of operator	Penetration rate	GDP per capita in USD	Total
Lebanon	6.96	2.94	10.8	7.62	8.76	6.12	43.2
Bahrain	6.96	2.94	10.8	7.62	11.68	12.24	52.24
Jordon	5.22	0.98	10.8	7.62	11.68	3.06	39.36
India	1.74	2.94	10.8	10.16	8.76	3.06	37.46
Nigeria	3.48	0.98	10.8	10.16	5.84	3.06	34.32
Sudan	3.48	0.98	10.8	7.62	8.76	3.06	34.7

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The weight of ranking shown in Table (4.2) were multiplied by the actual values of factors of each country and then they were added up to ascertain the value of each country.

Table (4.4) difference between the Sudan and countries which have special regulations for regulating the quality of mobile services in place.

Country	Value of country	Degree of Difference
Lebanon	43.2	8.5
Bahrain	52.24	17.54
Jordon	39.36	4.66
India	37.46	2.76
Nigeria	34.32	-0.38
Sudan	34.7	0

The above table illustrates that the market that bears the most similarity to or the least different one from the Sudanese market is the Nigerian telecommunication market with a degree of difference barely totaling -0.38

4.2.2.2 The application of the tool research for the first and the second hypothesis (Regulatory Framework Articles, encourage operators):

The first assumption comprise 21 expressions designed to form the suggested Regulatory Framework whereas the second hypothesis consists of 7 expressions designed to encourage operators to adopt a pricing mechanism on the basis of the level of quality of service provided for Mobile Internet service.

Table (4.5) Frequency distribution of the research sample of individuals on the first hypothesis (Regulatory Framework Articles)

No.	Expressions	Strongly agree	agree	neutral	Disagree	Strongly disagree
	The existence of a regulation ensures					

1	raising the level of quality of service provided	33	16	0	0	1
2	The existence of a regulation ensures the clarity of rights and obligation of all parties	24	25	1	0	0
3	The existence of a regulation ensures reduces the likelihood of the emergence of disputes between the parties	22	25	3	0	0
4	The existence of a regulation helps settle disputes between the parties	27	21	2	0	0
5	The existence of a regulation encourages the service provider to continue developing his network	15	23	9	3	0
6	The quality of mobile internet can be measured by means of throughput	19	23	6	2	0
7	The quality of mobile internet can be measured by means of service availability	22	23	4	1	0
8	The quality of mobile internet can be measured by means of the Ratio of packet loss	14	24	6	6	0
9	The quality of mobile internet can be measured by means of the change in the time of the delayed packages(Jitter)	13	20	12	5	0
10	The quality of mobile internet can be measured by means of the proportion of users who have failed to connect to the network(Mobility Management)	17	16	12	5	0
11	The quality of mobile internet can be measured by means of the number of users connected to the network simultaneously	25	19	4	1	0
12	“Drive Test” can be used as a principal tool to measure the quality of mobile internet	20	18	11	1	0
13	Statistics Systems can be used as a principal tool to measure the quality of mobile internet	14	28	7	1	0
14	customer’s opinions based on survey can be used as a helping tool to measure the quality of mobile internet	19	23	7	1	0
	expert’s opinions based on survey can be used as a helping tool to measure the	24	23	1	2	0

15	quality of mobile internet					
16	In the case of breach of the standard of quality declared punishment is determined according to the discretion of the authorities of the National Telecommunications	22	14	9	4	1
17	Regulations contain a special item to determine the kind of sanctions in case of failure to provide the level of quality as advertised	24	16	7	3	0
18	In the case of failure to provide the level of quality advertised penalties are in the form of issuing orders to correct the situation and compensate the aggrieved	17	24	5	4	0
19	In the case of failure to provide the level of quality advertised penalties are in the form of issuing orders to suspend the service	3	11	13	20	3
20	In the case of failure to provide the level of quality advertised penalties are in the form of fines	9	17	17	6	1
21	In the case of failure to provide the level of quality advertised penalties are in the form withdrawal of licence	3	5	13	16	13

Table (4.6)
Frequency distribution of the research sample of individuals on the second hypothesis (encourage operators)

No.	Expressions	Strongly agree	agree	neutral	Disagree	Strongly disagree
1	Adoption of pricing mechanism based on quality achieves increase in profits	14	20	14	2	0
2	Adoption of pricing mechanism based on quality achieves optimum	9	30	9	2	0

	utilization of network resources					
3	Adoption of pricing mechanism based on quality encourages the operator to invest in the expansion of the network	16	25	9	0	0
4	Adoption of pricing mechanism based on quality reduces customers complaints	14	23	9	0	0
5	Adoption of pricing mechanism based on quality helps create new samples of business and diversifying the advanced services	13	27	9	4	0
6	Adoption of pricing mechanism based on quality helps in expanding and the widespread use of the service	13	24	10	1	0
7	Adoption of pricing mechanism based on quality ensures high levels of competition	23	22	5	0	0

4.2.3: Testing the validity of the hypotheses of the first questionnaire of the employees in the telecommunications sector

To answer the questions of the research and verify its hypotheses, a calculation of the median for each of the expressions in the questionnaire which illustrate opinions of the research sample regarding a regulatory framework to monitor the pricing of Mobile Internet service on the basis of the level of quality was conducted. In doing so, weight allocation for responses was distributed as follows: While the number (5) was given as weight for “strongly agree”, (4) was given as weight for “agree”, (3) was given as weight for “neutral”, (2) was given as weight for “disagree” and (1) was given as weight for “strongly disagree”. However, according to the requirements of statistical analysis, all of the above-mentioned analysis was in fact a conversion of nominal variables to quantitative variables. After such a step, the Chi-square test will be used to determine the

significance of the differences in the responses of the research sample on the expressions of each hypothesis.

4.2.3.1 Presentation and discussion of the results of the first hypothesis “the Regulatory Framework articles”

To test this hypothesis, firstly, we need to know the direction of the views of the research sample for each of the expressions relating to the first hypothesis. Secondly, the median for the research sample responses to each of the expressions is calculated. However, the median is a measure of central tendency, which is used to describe the phenomenon. The median represents the answer that mediates all responses after they are arranged in ascending or descending order. This could be illustrated in the following table:

Table (4.7) The median of the responses of the individuals’ research sample on the expressions of the first hypothesis (Regulatory Framework articles)

No	EXPRESSIONS	MEDIAN	INTERPRETATION
1	The existence of a regulation ensures raising the level of quality of service provided	5	Strongly agree
2	The existence of a regulation ensures the clarity of rights and obligation of all parties	4	Agree
3	The existence of a regulation ensures reduces the likelihood of the emergence of disputes between the parties	4	Agree
4	The existence of a regulation helps settle disputes between the parties	5	Strongly agree
5	The existence of a regulation encourages the service provider to continue developing his network	4	Agree
6	The quality of mobile internet can be measured by means of throughput	4	Agree

7	The quality of mobile internet can be measured by means of service availability	4	Agree
8	The quality of mobile internet can be measured by means of the Ratio of packet loss	4	Agree
9	The quality of mobile internet can be measured by means of the change in the time of the delayed packages(Jitter)	4	Agree
10	The quality of mobile internet can be measured by means of the proportion of users who have failed to connect to the network(Mobility Management)	4	Agree
11	The quality of mobile internet can be measured by means of the number of users connected to the network simultaneously	4	Agree
12	“Drive Test” can be used as a principal tool to measure the quality of mobile internet	4	Agree
13	Statistics Systems can be used as a principal tool to measure the quality of mobile internet	4	Agree
14	customer’s opinions based on survey can be used as a helping tool to measure the quality of mobile internet	4	Agree
15	expert’s opinions based on survey can be used as a helping tool to measure the quality of mobile internet	3	Neutral
16	In the case of breach of the standard of quality declared punishment is determined according to the discretion of the authorities of the National Telecommunications	4	Agree
17	Regulations contain a special item to determine the kind of sanctions in case of failure to provide the level of quality as advertised	2	Disagree
18	In the case of failure to provide the level of quality advertised penalties are in the form of issuing orders to correct the situation and compensate the aggrieved	5	Strongly agree
19	In the case of failure to provide the level of quality advertised penalties are in the form of	4	Agree

	issuing orders to suspend the service		
20	In the case of failure to provide the level of quality advertised penalties are in the form of fines	4	Agree
21	In the case of failure to provide the level of quality advertised penalties are in the form withdrawal of licence	1	Strongly disagree
	All expressions	4	Agree

Table (4.7) illustrates the value of the median of the research sample responses to all expressions of the first hypothesis amounted to (4). This value means that the majority of the research sample individuals agree on about the expressions of the first hypothesis.

However, the results above do not mean that all of the research sample individuals agree unanimously on that. For example, in Table (4.5) there are neutral individuals or do not agree on that. In order to test for the presence of statistically significant differences between the number of approvers and neutrals and those non-consenting to the results of table (4.5) above, Chi-square test was used for the significance of differences between the responses to all of the expressions in the first hypothesis. Chi-square test is a statistical analysis designed to find out whether the difference between the expected results and the seen results is a moral difference which needs to be taken into account or just a coincidental non-moral difference which needs to be disregarded. This is done by means of the following mathematical formula [31]:

$$\chi^2 = \sum \frac{(\text{Observed frequency} - \text{Expected frequency})^2}{\text{Expected frequency}}$$

Where χ^2 is the value for chi square .

Afterwards, at table (4.8) we compare the calculated value with the tabular value of chi-square and at the point of the specified degree of freedom, and then verified to have statistically significant differences if the calculated value of Chi-square is higher than the tabular value for Chi-square.

Table (4.8)
Chi-square test results for the significance of differences of the responses to the first hypothesis phrases (Regulatory Framework articles)

No.	Expressions	The degree of freedom	The value of chi-square	Tabular value of chi-square
1	The existence of a regulation ensures raising the level of quality of service provided	2	30.76	9.21
2	The existence of a regulation ensures the clarity of rights and obligation of all parties	2	22.12	9.21
3	The existence of a regulation ensures reduces the likelihood of the emergence of disputes between the parties	2	17.08	9.21
4	The existence of a regulation helps settle disputes between the parties	2	20.44	9.21
5	The existence of a regulation encourages the service provider to continue developing his network	3	17.52	11.35
6	The quality of mobile internet can be measured by means of throughput	3	24.40	11.35
7	The quality of mobile internet can be measured by means of service availability	3	32.40	11.35
8	The quality of mobile internet can be measured by means of the Ratio of packet loss	3	17.52	11.35

9	The quality of mobile internet can be measured by means of the change in the time of the delayed packages(Jitter)	3	9.04	7.82
10	The quality of mobile internet can be measured by means of the proportion of users who have failed to connect to the network(Mobility Management)	3	7.12	7.82
11	The quality of mobile internet can be measured by means of the number of users connected to the network simultaneously	4	50.40	13.28
12	“Drive Test” can be used as a principal tool to measure the quality of mobile internet	3	17.68	11.35
13	Statistics Systems can be used as a principal tool to measure the quality of mobile internet	3	32.40	11.35
14	customer’s opinions based on survey can be used as a helping tool to measure the quality of mobile internet	3	25.20	11.35
15	expert’s opinions based on survey can be used as a helping tool to measure the quality of mobile internet	3	38.80	11.35
16	In the case of breach of the standard of quality declared punishment is determined according to the discretion of the authorities of the National Telecommunications	4	27.80	13.28
17	Regulations contain a special item to determine the kind of sanctions in case of failure to provide the level of quality as advertised	3	21.20	11.35
18	In the case of failure to provide the level of quality advertised penalties are in the form of issuing orders to correct the situation and compensate	3	22.48	11.35

	the aggrieved			
19	In the case of failure to provide the level of quality advertised penalties are in the form of issuing orders to suspend the service	4	20.80	13.28
20	In the case of failure to provide the level of quality advertised penalties are in the form of fines	4	19.60	13.28
21	In the case of failure to provide the level of quality advertised penalties are in the form withdrawal of license	4	12.80	9.49

In validating the hypothesis in total for all expressions we notice that the number of the expressions of the first hypothesis is (21) which have (50) responses. This means that the number of total responses to the research sample of the first hypothesis of all the expressions will be (1050) response. Responses of the subjects of the research sample on the expressions of the first hypothesis can be summarized as in table (4.9) and Figure (4.1) below:

Table (4.9)
Frequency distribution of individuals' responses to all the expressions of the first hypothesis (Articles of Regulatory Framework)

RESPONSE	NUMBER	PERCENTAGE
Strongly agree	386	36.8%
Agree	414	39.4%
Neutral	149	14.2%
Disagree	81	7.7%
Strongly disagree	20	1.9%
Total	1050	100.0%

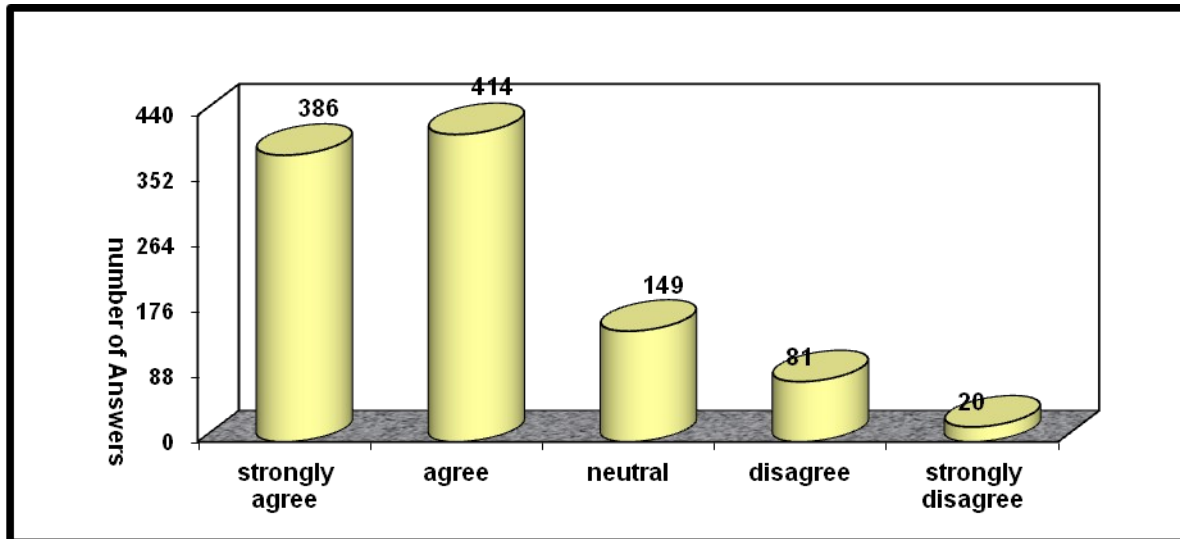


Figure (4.1)

Frequency distribution of responses of the individuals' research sample on the entire expressions of the first hypothesis

It can be seen from Table (4.9) and Figure (4.1) that the research sample included 414 responses with the rate of 39.4 % (agree) on what was contained in all of the phrases of the first hypothesis , 386 responses with the rate of 36.8% (strongly agree) , 149 response rate of 14.2% (neutral) , 81 responses with the rate of 7.7% (disagree) and 20 responses with the rate of 1.9% (strongly disagree) . However, the value of chi-square calculated for the significance of differences between the number of approval, neutral, and disapproval responses of what was included in all the phrases of the first hypothesis has reached (614.54). This value is, nevertheless, greater than the value of chi-square spreadsheet at the degree of freedom (4) and the level of significance (1%) which amounts to (13.28). Depending on what was stated in table no (4.12), this indicates a statistically significant difference at a 1 % level of significance between the responses and in favor of the approval responses included in all of the expressions of the first hypothesis.

From the above, we conclude that the hypothesis of the first research, which stipulates: " The existence of a regulatory framework to monitor the QoS based

pricing for mobile internet service, leads to the grantee of the level of service quality as stated in the Service Level Agreement (SLA)" is achieved.

4.2.3.2 Presentation and discussion of the results of the second hypothesis

The second hypothesis of the research's hypotheses states the "**Encouraging operators** "

To test this hypothesis, firstly, we need to know the direction of the views of the research sample for each of the expressions relating to the second hypothesis. Secondly, the median for the research sample responses to each of the words is calculated and then for the expressions combined. However, the median is a measure of central tendency, which is used to describe the phenomenon. The median represents the answer that mediates all responses after they are arranged in ascending or descending order. This could be illustrated in the following table:

Table (4.10)
The median of the responses of the individuals' research sample on the expressions of the second hypothesis (encouraging operators)

No	Expressions	MEDIAN	INTERPRETATION
1	Adoption of pricing mechanism based on quality achieves increase in profits	4	Agree
2	Adoption of pricing mechanism based on quality achieves optimum utilization of network resources	4	Agree
3	Adoption of pricing mechanism based on quality encourages the operator to invest in the expansion of the network	4	Agree
4	Adoption of pricing mechanism based on quality reduces customers complaints	4	Agree
5	Adoption of pricing mechanism based on quality helps create new samples of Business	4	Agree

	and diversifying the advanced services		
6	Adoption of pricing mechanism based on quality helps in expanding and the widespread use of the service	4	Agree
7	Adoption of pricing mechanism based on quality ensures high levels of competition	4	Agree
	Total expression	4	Agree

Table (4.10) illustrates the value of the median of the research sample responses to all expressions of the second hypothesis amounted to (4). This value means that the majority of the research sample individuals agree on about the expressions of the first hypothesis.

However, the results above do not mean that all of the research sample individuals agree unanimously on that. For example, in Table (4.6) there are neutral individuals or do not agree on that. In order to test for the presence of statistically significant differences between the number of approvers and neutrals and those non-consenting to the results of table (4.6) above, Chi-square test results shown that significant differences for expressions answer at below table(4.11)

Table (4.11) Chi-square test results for the significance of differences of the responses to the second hypothesis phrases (encouraging operators)

No.	Expressions	The degree of freedom	The value of chi-square	Tabular value of chi-square
1	Adoption of pricing mechanism based on quality achieves increase in profits	3	13.68	11.35
2	Adoption of pricing mechanism based on quality achieves optimum utilization of network resources	3	35.28	11.35
3	Adoption of pricing mechanism based on quality encourages the operator to invest in the expansion of the network	2	7.72	5.99

4	Adoption of pricing mechanism based on quality reduces customers complaints	3	15.76	11.35
5	Adoption of pricing mechanism based on quality helps create new samples of business and diversifying the advanced services	3	28.40	11.35
6	Adoption of pricing mechanism based on quality helps in expanding and the widespread use of the service	3	18.32	11.35
7	Adoption of pricing mechanism based on quality ensures high levels of competition	2	12.28	9.21

In validating the hypothesis in total for all expressions we notice that the number of the expressions of the second hypothesis is (7) which have (50) responses. This means that the number of total responses to the research sample of the first hypothesis of all the expressions will be (350) response. Responses of the subjects of the research sample on the expressions of the first hypothesis can be summarized as in table (4.12) and Figure (4.2) below:

Table (4.12)
Frequency distribution of individuals' responses to all the expressions of the second hypothesis (Encouraging operators)

RESPONSE	NUMBER	PERCENTAGE
Strongly agree	102	29.1%
Agree	171	48.9%
Neutral	65	18.6%
Disagree	12	3.4%
Total	350	100.0%

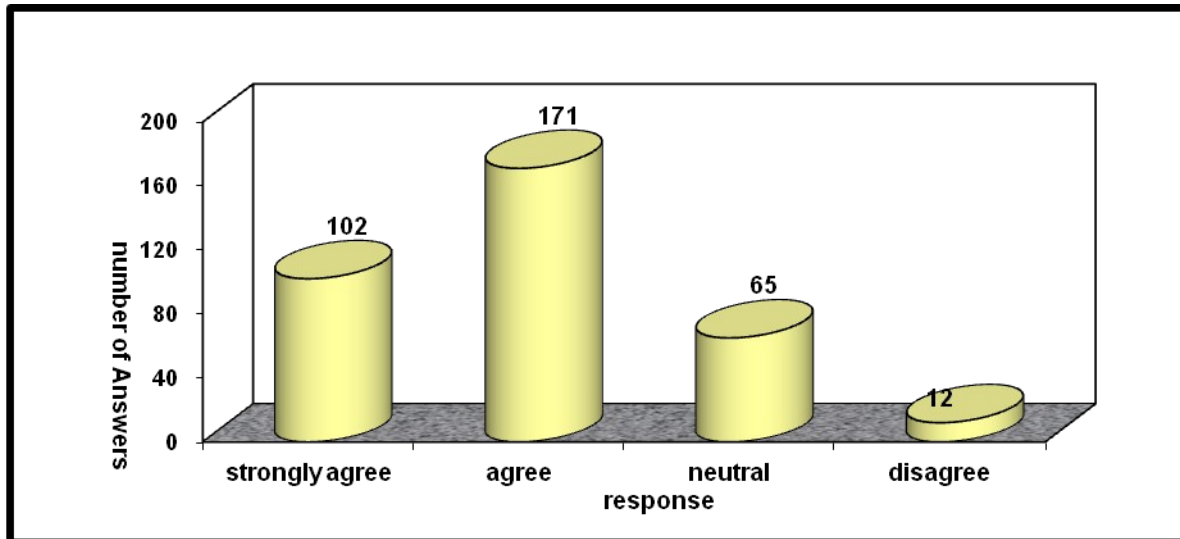


Figure (4.2)

Frequency distribution of responses of the individuals' research sample on the entire expressions of the second hypothesis

It can also be seen from Table (4.12) and Figure (4.2) that the research sample included 171 responses with the rate of 48.9% (agree) on what was contained in all of the phrases of the second hypothesis, 102 responses with the rate of 29.1 % (strongly agree) , 65 responses with the rate of 18.6 % (neutral), and 12 answer with the rate of 3.4% (disagree). However, the value of chi-square calculated for the significance of differences between the number of approval, neutral, and non- approval responses of what was included in all the phrases of the second hypothesis has reached (153.01). This value is, nevertheless, greater than the value of chi-square spreadsheet at the degree of freedom (4) and the level of significance (1%) which amounts to (11.35). Depending on what was stated in table no: (4.17), this indicates a statistically significant difference at a 1 % level of significance between the responses and in favor of the approval responses included in all of the expressions of the second hypothesis

From the above, we conclude that the hypothesis of the second research, which stipulates: “The adoption of the pricing mechanism on the basis of the level of

quality brings financial. Numerous technological and competitive gains to the service provider “ was achieved .

4.3 The results of the second questionnaire for users of Mobile Services:

Details of the distributed questionnaire can be referred to in appendix2.

4.3.1 Demographic information

Table (4.13)

Frequency distribution of the research sample of users of mobile services according to demographic information

Type	Number	Percentage
Male	41	41%
Female	59	59%
Age	Number	Percentage
below 30 years	60	60%
from 30—40 years	39	39%
from 41—50 years	1	1%
Qualification	Number	Percentage
secondary school	4	4%
Diploma	7	7%
Bachelor	68	68%

higher education	21	21%
Length of use mobile internet service	Number	Percentage
less than six months	5	5%
from 6 months—one year	8	8%
more than a year	87	87%

4.3.2 The application of research tool for the third hypothesis (increasing user awareness)

The third hypothesis includes 13 expressions designed so that there are mechanisms for increasing user awareness to link the level of quality provided with the advertised tariff.

Data and information has been uploaded into the tables prepared by the researcher for this purpose whereby nominal variables (strongly agree, agree, neutral, disagree and strongly disagree) were converted to quantitative ones (1, 2, 3, 4 and 5) respectively. The data was uploaded into the following tables:

Table (4.14)
Frequency distribution of responses to the expressions of the research sample of the third hypothesis (increasing user awareness)

No	EXPRESSIONS	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
1	The announcement of the tariff provided on the basis of the level of quality helps the user to choose what fits their needs	48	45	4	2	1
2	Disseminating information on the levels of quality provided helps fair comparison between the performances	46	44	7	2	1
3	Publishing periodic performance	42	34	17	4	3

	reports helps operators to identify the shortcomings and excellence for every service provider					
4	Conducting periodic surveys for customers' feedback about the quality of service helps to assess the level of awareness of the customer about the concept of quality	66	29	4	0	1
5	endow the customer with information on the level of quality and imposed tariff increases elements of transparency and credibility of the service provider	65	24	5	6	0
6	Using printed press to disseminate information about services suits every customer	14	36	21	26	3
7	Using visual advertising channels to disseminate information about services suits every customer	18	33	26	22	1
8	Using short messages through mobile phones helps to communicate information about services	34	40	18	6	2
9	There is a need for adopting new mechanisms and channels to communicate information about services	33	41	21	5	0
10	Customer satisfaction with the quality of service provided is an essential requirement for the Service Provider	71	20	9	0	0
11	Your opinions and suggestions will be referred to in the case of initiating an issuance of a new service	22	27	26	13	12
12	The service provider considers you as one of his most important priorities	37	28	22	11	2
13	Quality based Pricing is considered a fair mechanism which is compatible with the principle of equivalence (what is being presented is worth what must be paid)	42	31	18	6	3

4.3.3 Testing the validity of the hypotheses of the second questionnaire regarding users of mobile services

To answer the questions of the study and verify its hypotheses, a calculation of the median for each of the expressions in the questionnaire which illustrate opinions of the research sample, about a regulatory framework to monitor the pricing of Mobile Internet service on the basis of the level of quality, was conducted. In doing so, weight allocation for responses were distributed as follows: While the number (5) was given as weight for “strongly agree”, (4) was given as weight for “agree”, (3) was given as weight for “neutral”, (2) was given as weight for “disagree” and (1) was given as weight for “strongly agree”. However, according to the requirements of statistical analysis, all of the above-mentioned analysis was in fact a conversion of nominal variables to quantitative variables. After such a step, the Chi-square test will be used to determine the significance of the differences in the responses of the research sample on the expressions of each assumption.

4.3.3.1 Presentation and discussion of the third hypothesis:

The third hypothesis of the research’s hypotheses states the "Increasing user awareness to link the level of quality with the announced tariff”

To test this hypothesis, firstly, we need to know the direction of the views of the research sample for each of the expressions relating to the third hypothesis. Secondly, the median for the research sample responses to each of the words is calculated and then for the expressions combined. However, the median is a measure of central tendency, which is used to describe the phenomenon. The median represents the answer that mediates all responses after they are arranged in ascending or descending order. This could be illustrated in the following table:

Table (4.15)
The median of the responses of the individuals' research sample on the expressions of the third hypothesis for users of mobile services (increasing user's awareness)

No.	EXPRESSIONS	MEDIAN	INTERPRETATION
1	The announcement of the tariff provided on the basis of the level of quality helps the user to choose what fits their needs	4	Agree
2	Disseminating information on the levels of quality provided helps fair comparison between the performances	4	Agree
3	Publishing periodic performance reports helps operators to identify the shortcomings and excellence for every service provider	4	Agree
4	Conducting periodic surveys for customers' feedback about the quality of service helps to assess the level of awareness of the customer about the concept of quality	5	Strongly agree
5	endowing the customer with information on the level of quality and imposed tariff increases elements of transparency and credibility of the service provider	5	Strongly agree
6	Using printed press to disseminate information about services suits every customer	3	Neutral
7	Using visual advertising channels to disseminate information about services suits every customer	4	Agree
8	Using short messages through mobile phones helps to communicate information about services	4	Agree
9	There is a need for adopting new mechanisms and channels to communicate information about services	4	Agree
10	Customer satisfaction with the quality of service provided is an essential requirement for the Service Provider	4	Agree
11	Your opinions and suggestions will be referred to in the case of initiating an issuance of a new service	3	Neutral
12	The service provider considers you as one of his most important priorities	4	Agree

13	Quality based Pricing is considered a fair mechanism which is compatible with the principle of equivalence (what is being presented is worth what must be paid)	4	Agree
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Table (4.15) illustrates the value of the median of the research sample responses to all expressions of the third hypothesis amounted to (4). This value means that the majority of the research sample individuals agree on about the expressions of the third hypothesis.

However, the results above do not mean that all of the research sample individuals agree unanimously on that. For example, in Table (4.14) there are neutral individuals or do not agree on that. In order to test for the presence of statistically significant differences between the number of approvers and neutrals and those non-consenting to the results of table (4.14) above. Chi-square test results shown that significant differences for expressions answer at below table(4.16)

Table (4.16) Chi-square test results for the significance of differences of the responses to the third hypothesis phrases (increasing service user's awareness)

No.	Expressions	The degree of freedom	The value of chi-square	Tabular value of chi-square
1	The announcement of the tariff provided on the basis of the level of quality helps the user to choose what fits their needs	4	117.50	13.28
2	Disseminating information on the levels of quality provided helps fair comparison between the performances	4	105.30	13.28
3	Publishing periodic performance reports helps operators to identify the shortcomings and excellence for every service provider	4	61.70	13.28
4	Conducting periodic surveys for customers' feedback about the	3	108.56	11.35

	quality of service helps to assess the level of awareness of the customer about the concept of quality			
5	endowing the customer with information on the level of quality and imposed tariff increases elements of transparency and credibility of the service provider	3	94.48	11.35
6	Using printed press to disseminate information about services suits every customer	4	30.90	13.28
7	Using visual advertising channels to disseminate information about services suits every customer	4	28.70	13.28
8	Using short messages through mobile phones helps to communicate information about services	4	56.00	13.28
9	There is a need for adopting new mechanisms and channels to communicate information about services	3	29.44	11.35
10	Customer satisfaction with the quality of service provided is an essential requirement for the Service Provider	2	65.66	9.21
11	Your opinions and suggestions will be referred to in the case of initiating an issuance of a new service	4	10.10	9.49
12	The service provider considers you as one of his most important priorities	4	38.10	13.10
13	Quality based Pricing is considered a fair mechanism which is compatible with the principle of equivalence (what is being presented is worth what must be paid)	4	54.70	13.28

In validating the hypothesis in total for all expressions we notice that the number of the expressions of the second research is (13) which have (100) responses. This means that the number of total responses to the research sample of the first hypothesis of all the expressions will be (1300) response. Responses

of the subjects of the research sample on the expressions of the first hypothesis can be summarized as in table (4.17) and Figure (4.3) below:

Table (4.17)
Frequency distribution of individuals' responses to all the expressions of the third hypothesis (Increasing user's awareness)

Response	Number	Percentage
Strongly agree	538	41.4%
Agree	432	33.2%
Neutral	198	15.2%
Disagree	103	7.9%
Strongly disagree	29	2.2%
Total	1300	100.0%

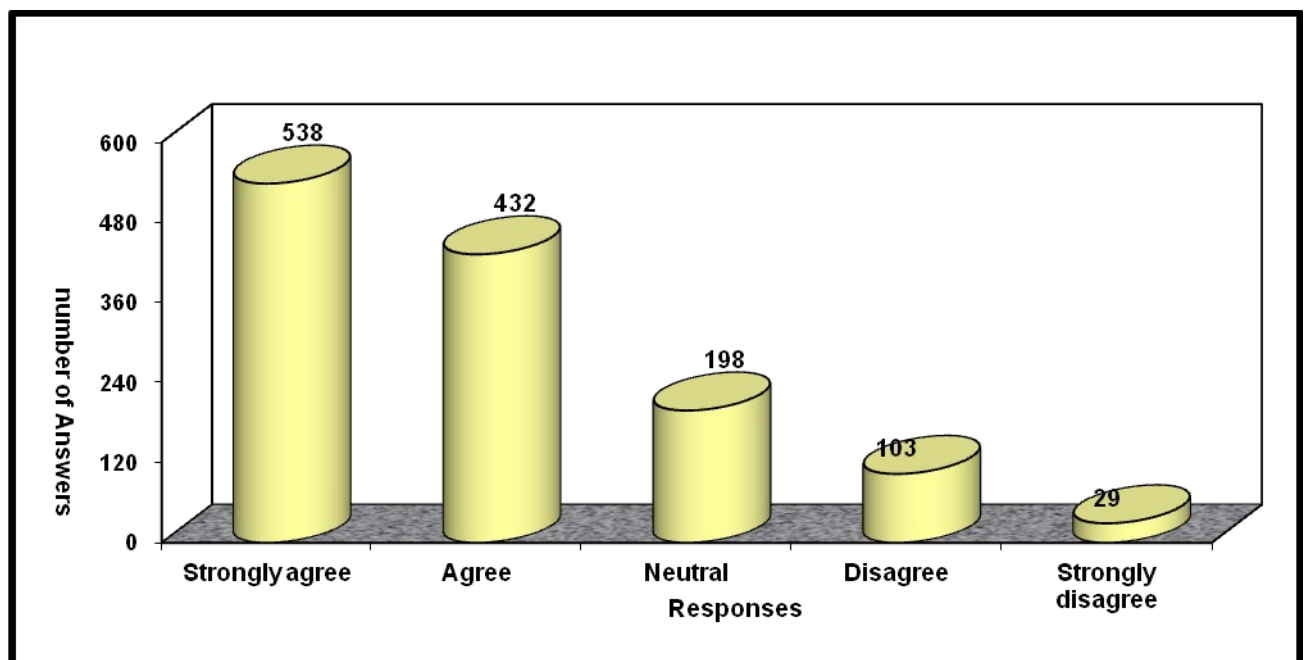


Figure (4.3)
Frequency distribution of the individuals' answers to all expressions of the third hypothesis of the research sample

It can be seen from Table (4.17) and Figure (4.3) that the research sample included 538 responses with the rate of 41.4 % (strongly agree) on what was contained in all of the phrases of the third hypothesis, 432 responses with the

rate of 33.2 % (agree), 198 responses with the rate of 15.2%, (neutral) 103 responses with the rate of 7.9% (disagree) , and 29 with the rate of 2.2% (strongly disagree). This value is, nevertheless, greater than the value of chi-square spreadsheet at the degree of freedom (4) and the level of significance (1%) which amounts to (13.28). Depending on what was stated in table no: (4.17), this also indicates a statistically significant difference at a 1 % level of significance between the responses and in favor of the approval strongly responses included in all of the expressions of the third hypothesis.

From the above, we conclude that the hypothesis of the study, which stipulates: " The increase in user's awareness and knowledge about QoS based pricing enables users to balance between the budget and the QoS requirements for their mission critical applications " was achieved.

4.4 Final results yielded from discussing the results of the questionnaires:

4.4.1 The final outline of the recommended Regulatory Framework in relation to the results of the questionnaires:

4.4.1.1 Goals of the Regulatory Framework:

- Raising the level of quality of the service provided.
- Determining the obligations and rights of all parties.
- Reducing the manifestation of conflicts between the parties
- facilitating the resolution of disputes between the parties
- Encouraging the Service Provider to invest in the upgrade of its network

4.4.1.2 Indicators for measuring the quality of mobile internet

- throughput
- Service availability

- Ratio of packet loss
- Jitter(change in the time delay of the packages)
- percentage of users who have failed to connect to the network

4.4.1.3 Tools for measuring the quality of the Mobile Internet

- Drive test
- Systems' statistics
- customer's opinions based on survey 9

4.4.1.4 Sanctions in case of violation of standards of quality as advertised

Punishment is determined according to the discretion of the authorities of the NTC and will be in the form of:

- Issuing orders to correct the situation and compensate the aggrieved
- Issuing orders to stop service
- Fines

4.4.2 Incentives for Mobile service providers for adopting pricing on the basis of quality of service of mobile internet, according to survey's the results are as follows

When pricing is based on the level of quality of service provided by mobile internet, the service provider will achieve a large number of benefits , not to mention gaining competitive advantages, namely:

- Achieving an increase in profits
- utilization of network resources

- Investment in network expansion
- Diminishing of complaints from users of the service
- Creation of new models of business (diversification of services provided) to keep pace with the competition
- expansion and widespread use of the service

4.4.3 Mechanisms for increasing the awareness of users of mobile services to link the level of quality of service provided or paid with the value of the tariff imposed according to the results of the questionnaire

4.4.3.1 In order to help the service user to choose what fits their needs, the following actions should be taken:

- Disseminating information about the levels of quality provided
- Publishing periodic performance reports for operators
- Conducting polls periodically to examine customer feedback about the quality of service
- Endowing the customer with information on the level of quality and tariff restrictions and thus the service user may make sure that the service provided is worth what he paid for.

4.4.3.2 Using appropriate advertising channels such as:

- Visual advertising channels
- Short messages through mobile phones.

For the sake of delivering adequate information on the service provided, the Service Provider must opt for adopting new mechanisms, from time to time, to keep pace with rapid and steady developments until the service User is sure that

his satisfaction with the service provided is a key demand for the service provider.

5.1 Introduction

The common sense at the market of telecommunications in general and mobile internet service in particular shows that it is clear that there is a considerable need to urgently introduce a regulatory framework to monitor pricing mechanism for mobile internet service on the basis of the level of quality offered and advertised. That's to say, the service provider needs guidelines and criteria for launching mobile internet service at a certain level of quality and at the same time, the service user needs to be familiar with this level of that quality and its worth of the imposed tariff.

This chapter, presents the conclusion of the study along with the corresponding limitations, and it finally, provides set of recommendations for the future researchers.

5.2 Conclusion

Firstly, this research aimed at developing a regulatory framework to monitor pricing mobile internet service on the basis of the level of quality offered, through the use of the recommendations of the ITU for the quality of services as well as through taking into account the experiences of the most comparable countries with Sudan, in the terms of the telecommunications market. Secondly, we planned to link those recommendations and experiences of what is found in the Sudanese telecommunications sector by means of a field survey investigating the views of stakeholders, service providers and mobile users as well as the views of the regulatory body for the telecommunications sector in Sudan.

All these procedures will, hopefully, bring about a general formulation of a framework to monitor pricing mechanism based on the quality of mobile internet service and confirm the benefit to be harvest by service providers of

that service based on quality and also raise the levels of awareness of service users and improve their knowledge regarding the details and tariffs of the service.

The features of proposed regulatory framework for monitoring the pricing mechanism on the basis of the level of quality provided to serve mobile internet service. This proposal is composed of four key provisions. They are the objectives of the regulatory framework, indicators to measure the quality of the mobile Internet, tools to measure the quality of the mobile internet and sanctions in case of violation of standards of quality as advertised. The provisions themselves have been adopted by The Nigerian Communications Commission in 2012 under the name of “regulation of the quality of services”. However, the reason behind our decision to adopt these provisions is that the telecommunications market in Nigeria bear great resemblance to that of Sudan as confirmed by the research.

Moreover, the research found that service providers of mobile internet are prepared to adopt the pricing mechanism on the basis of quality of mobile internet service because of a range of prospective benefits which they will accrue. These benefits include increase of profits, the best use of network resources, reduction in the number of complaints from users of the service and help in diversification and expansion of services. In the end, the research showed that the most effective mechanisms for increasing the awareness of users of the service is to publish reports of the performance of the service providers, periodic information about services, quality levels and the tariff imposed. These mechanisms can be disseminated through advertising channels, sending short messages through mobile phones and continuing to devise mechanisms to keep pace with the steady development in the field for communicating information to users of the services.

In short, the core conclusion of this research, is a proposal of regulatory framework for monitoring the pricing mechanism based on the level of QoS provided by mobile internet with an emphasis on the need for the implementation of the proposed framework rigorously for the interests of all parties in the telecommunications sector in Sudan. Furthermore, the implementation of the framework is expected to satisfy all the involved parties (users, service providers as well as regulators)

5.3 Shortcomings of the research

The questionnaire aimed at on workers in the telecommunications sector does not contain to a question which illustrates the type of worker in the sector (operator, regulator).

Factors influencing the formation of the telecommunications market generally impacts on the level of quality of service provided and are linked indirectly to it.

The questionnaire aimed at users of the service was not exclusively distributed among users of mobile internet service.

5.4 The recommendation of the research

- To identify the factors most influential in shaping the telecommunications sector, the recommendations of the International Telecommunication Union for the identification of the information community has been adopted but there was no directly linked factors to determine the extent of development and progress in the levels of service quality. Therefore, we recommend that interviews should be held with specialists in the field of communications to identify the factors most influential and directly linked to levels of quality of services available.

- Indicators which measure the quality were taken from the recommendations of the International Telecommunication Union. In addition, experiences of countries which have special regulations organizing the quality of services where there are no fixed values for those indicators have also been adopted. Therefore, we recommend that a study be carried out to determine the values of standardized criteria to measure the quality of mobile internet service according to the current infrastructure in Sudan.
- The research has produced the general regulatory framework to monitoring the pricing of Mobile Internet service on the basis of the level of quality but without addressing the mechanisms for calculating tariffs of mobile internet service or determining the technical aspects of the quality of mobile Internet. We, therefore recommend that a research dealing with the technical aspects of the pricing of mobile internet service be carried out.

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Apendix1

ITU-T Recommendation E.802

Framework and methodologies for the determination and application of QoS parameters

This Recommendation provides a framework and methodologies for the identification of QoS criteria relevant to users and guidelines for conversion of these criteria into QoS parameters that can be used to evaluate the QoS of telecommunication services.

Guidelines are also given to obtain user's QoS requirements and to prioritize the criteria or parameters. All these may be applied to services supported by the terrestrial and wireless legacy networks as well as services supported by the emerging IP network.

These QoS criteria are primarily of interest to users and service providers. Those criteria which are of primary concern to the service/network providers (e.g., network performance parameters that contribute to QoS and other performance criteria) to ensure the delivery of the required level of QoS to the user are not covered in this Recommendation.

This Recommendation introduces three models for the identification of QoS criteria of any telecommunication service. All models or a combination of these models may be used for a particular service to enable most, if not all, QoS criteria to be identified. For a particular purpose, a selection of QoS criteria may be chosen from the list of criteria identified. Guidelines are given on how to convert the identified criteria into measurable QoS parameters and on the adoption and measurement of the parameters.

The QoS parameters may be used for various purposes including:

- Specifying the level of quality of service in customer telecommunication service contracts or in the description of terms and conditions of the service.

- Comparing the level of quality and quality commitments of services of different service providers.
- Preparing long-term studies on the level of quality attributes of a specific service.
- Preparing statistics, reports and publications of the quality of a service.
- Regulatory purposes including specification of the minimum level of quality (e.g., for universal service, interconnection regulations) and monitoring of services by, for example, reports on a regular basis and statistics for specific situations.

Choice of QoS parameters

Sets of QoS parameters are designed to be understood by the users of various telecommunications services. However, subsets of these parameters can be selected for use in different circumstances.

For example, a specific parameter might be relevant for many users in some countries or markets but the same parameter might not be of relevance in others, e.g., call set-up time could be pertinent in an all-analogue network but not on an all-digital network.

Therefore, users, customers, regulators, service providers, network operators and other parties interested in the use of QoS parameters may decide which parameters should be used in their particular situation with the cooperation of the relevant parties.

This decision should take account of:

- The precise purpose for which the parameters will be used.
- The quality and performance as expected by the users of state-of-the-art technology.
- The usefulness and relevance of the parameters from the users' perspective.
- The degree to which the parameters will provide a reliable comparison of performance.
- The cost and resources needed in order to measure and report each parameter.

All these aspects will influence the decision on the kind of parameters (quality criteria to be examined) and the number of parameters (granularity of quality analysis) to be chosen for a specific purpose.

Recommendation ITU-T E.803

Quality of Service Parameters supporting for service aspects

This Recommendation deals with the quality of service (QoS) parameters that could be of primary interest and concern to the customers and users of ICT services who wish to compare performances of service providers (SPs) of ICT services during the non-utilization stages of such services and secondarily to regulators and service providers.

Recommendations that cover service-specific performances usually apply to services when they are in actual use. However the services surrounding ICT services offered by service providers that are outside the actual usage of services would be of interest and concern to the users. Quality and content of information on a service and its features, the contractual conditions offered by the service provider, provisioning facilities, documentation, and service support after contract with customers are examples of non-utilization stages of ICT services that could be of concern to the users. This

Recommendation identifies non-utilization stages and lists a number of QoS parameters from which a selection may be made for the customer to assess the performance of the provider.

The following QoS parameters have been identified as being potentially useful for comparison of SPs' performance levels.

Preliminary information on ICT services

Parameter 1: Integrity of preliminary information

Integrity of preliminary information (PI) is characterized by a true and fair view of the main points of an ICT service provided to the potential customers by the SP.

Measured of opinionating:

Parameter Pricing transparency

Pricing transparency of an ICT service is characterized by clarity, conciseness and unambiguity in every tariff structure for all usage conditions for every service provided by the SP.

Measured as: Opinion rating

Parameter 3 : availability of PI

Ratio of the number of requests for PI from potential users and customers which have been delivered to the total number of requests within a pre-defined time interval.

Measured as: Fraction or percentage.

Parameter 4: Response time for the provision of PI

Time taken from the instant a request for PI was sent to the SP to the instant all requested information was delivered to the customer requesting the information.

Measured as: Time.

Contractual matters between ICT service providers and customers

Parameter 5: Integrity of contract information

True and fair view of pertinent information on supply, maintenance and cessation for a telecommunications service provided by a SP.

Measured as: Opinion rating.

Parameters 6: Compliance of contractual terms with preliminary information

Degree of concurrence of the contents of the contractual document to the PI. This comparison between contractual terms and PI should be based on the PI in force during the period of the contract. Contractual document could have detailed terms which were implicit in the PI. Where differences exist these are not to be considered as errors as long as additional and non-contradictory information is provide

Measured as: Ratio or percentage.

Parameter 7: Flexibility for customization

before contract

The scope and boundary to meet individual customer's specific requirements of service feature(s), service performance(s) and terms and conditions before formal signature on the contract.

NOTE – These specific requirements would be departures from the standard service features, performance and terms and conditions normally offered by the SP.

Measured as: Opinion rating.

Parameter 8: Ease and flexibility to amend terms after formal contract

The scope and boundary of the amendments that could be accommodated to contractual terms to satisfy the post contractual amendments sought by a customer.

This excludes contracts which the provider has specifically stated as not considered for amendments.

Measured as: Opinion rating.

Provision of services

Parameter 9: Meeting promised provisioning date

Successful completion of provisioning of service on the date promised in the contract in relation to the total number of signed contracts with promised service provisioning dates.

Measured as: Ratio or percentage.

Parameter 10: Time for provisioning

Period of time between the scheduled provisioning time and the actual provisioning time

Measured as: Time.

Parameter 11: Successful provisioning within specified period

Number of successful service provisioning events in relation to all expected provision events within a pre-defined period of time.

Measured as: Ratio or percentage.

Parameter 12: Contract cancelled due to non-fulfillment

Contracts cancelled due to the ongoing non-fulfilment and considered unreasonable to wait any longer to the total number of signed contracts within a given assessment period.

Measured as: Ratio or percentage.

Parameter 13: Completeness of fulfilment of contractual specification in the provision of a service

Contracts with all network and/or service features specified in the contract fulfilled (after its provisioning) in relation to the number of contracts that have been considered fulfilled for provisioning .

Measured as: Ratio or percentage.

Parameter 14: Punctuality of service provisioning

Time difference between the actual service provisioning and that contractually specified. Measured as: Time.

Parameter 15: Punctuality of equipment delivery of service provisioning

Time difference between the actual equipment delivery and the scheduled delivery announced by the service provider for the service provisioning.

Measured as: Time.

Parameter 16: Provisioning not complete and correct first time

Ratio of service provisioning that is either not completely carried out or not correctly carried out in the first attempt, to the total number of contracts where the provisioning is deemed completed.

NOTE – The indicator for this parameter provides how well the SP has performed in complete and correct provisioning at the first attempt.

Measured as: Ratio or percentage.

Service alteration

Parameter 17: Time for alteration of service

Time elapsed from the instant alteration notification is received by the user to the instant the alteration is completed

Measured as: Time.

Parameter 18: Successful service alteration within specified period

Ratio (percentage) of the number of contracts (or services) with successful service alteration to the total number of contracts (or services) with announced service alteration within the contractual specified period of time .

Measured as: Ratio or percentage.

Parameter 19: Completeness of fulfilment of contractual specification in the alteration of a service

The ratio of all contracts where all specifications related to the service alteration contractually agreed are met or completed to the total number of contracts where alteration has been requested.

Measured as: Ratio or percentage.

Parameter 20: Punctuality of appointments for service alteration

Time difference between the actual service alteration and the scheduled alteration time announced by the SP.

Measured as: Time.

Parameter 21: Punctuality of equipment delivery for service alteration

Time difference between the actual equipment delivery and the scheduled

delivery announced by the SP.

Measured as: Time.

Parameter 22: Service alteration not complete and correct first time

Ratio (percentage) of service alterations that were either not completely or not correctly carried out in the first attempt, to the total number of contracts where alterations have been requested.

Measured as: Ratio or percentage.

Parameter 23: Conformity and success of service alteration

Ratio of the number of contracts where service alterations were not according to specification and therefore requiring reworking or further service alteration, to the total number of contracts where alteration was requested.

Measured as: Ratio or percentage.

Parameter 24: Technical reliability of service within an agreed period after alteration

Number of observation phases after service alteration without any limitation to the total number of service alterations carried out.

Measured as: Ratio or percentage.

Parameter 25: Organizational efficiency of service provider to carry out service alteration

Organizational and hardware resource availability to carry out service alterations to meet the needs of the customer and/or to meet contractual promises.

Measured as: Opinion rating.

Technical upgrade of ICT services

Parameter 26: Time for technical upgrade of a service

Time elapsed from the instant the technical upgrade period was announced to the user to the instant the technical upgrade was carried out.

Measured as: Time.

Parameter 27: Successful technical upgrade within a specified period of time

Ratio of successful service technical upgrades carried out in a specified time-out interval to the total number of technical upgrades carried out within the same period.

Measured as: Ratio or percentage.

Parameter 28: Completeness of fulfilment of specification in the technical upgrade of a service

Ratio of the number of successful upgrades where all specification requirements were met to the total number of contracts with such upgrades scheduled in a specified period.

Measured as: Ratio or percentage.

Parameter 29: Punctuality of appointments for technical upgrade

Time difference between the actual technical upgrade and the scheduled upgrade time announced by the SP. Measured as: Time.

Parameter 30: Outage time due to technical upgrade

Duration when the service in part or in full is unavailable to the customer for use due to the technical upgrade process.

Measured as: Time.

Parameter 31: Technical upgrade not complete and correct first time

Ratio (percentage) of the number of contracts not completely carried out or not correctly carried out in the first attempt to the total number of contracts.

NOTE – The indicator for this parameter provides how well the SP has performed in complete and correct technical upgrade at the first attempt.

Measured as: Ratio or percentage.

Parameter 32: Conformity and success of technical upgrade

Ratio of technical upgrade not according to specification and therefore requiring reworking or further service upgrade processes and resources to get it right, to the total number of contracts upgraded.

Measured as: Ratio or percentage.

Parameter 33: Technical reliability of service within an agreed period after technical upgrade

Ratio of the upgrades that perform satisfactorily for a specified period after the upgrade to the total number of upgrades carried out.

Measured as: Ratio or percentage.

Parameter 34: Organizational efficiency of service provider to carry out technical upgrade

Organizational and hardware resource availability on the part of the SP to carry out technical upgrades to meet the needs of the customer and/or to meet contractual promises.

Measured as: Opinion rating.

Parameter 35: Competence and preparedness of service provider for technical upgrade

Degree of ability (competence) and willingness (preparedness) to incorporate technical upgrade relevant to the service for the benefit of users.

Measured as: Opinion rating.

Documentation of services (operational instructions)

Parameter 36:

Documentation of delivery time

Time taken from the instant a service is provided to the instant documentation for the commissioning and use of the service is delivered to the customer.

NOTE – Documentation not delivered before a specified timeout will be considered as not delivered in time.

Measured as: Time.

Parameter 37: Availability of documentation within specified period of time

Number of contracts where documentation was supplied within a specified period of time to the total number of contracts where documentation was expected.

Measured as: Ratio or percentage.

Parameter 38: Integrity (correctness and completeness) of documentation

Correctness, completeness and user friendliness of pertinent information associated with the use of all features of a service and its maintenance.

Measured as: Opinion rating.

Parameter 39: Modes of documentation

Number of modes in which documentation is made available to the customer or user of a service. Measured as: Number.

Parameter 40: Legibility of documentation

Visual clarity, language, understandability and layout of the information in the medium in which it is presented.

Measured as: Opinion rating.

Parameter 41: Overall reliability of documentation services

Consistent availability, integrity and speed of provisioning of the documentation and associated support activities provided by the SP for a

given service.

Measured as: Opinion rating.

Technical support provided by service provider

Parameter 42: Accessibility to technical support

Ratio of the number of successful attempts to technical support to the total number of attempts to reach this support.

Measured as: Ratio or percentage.

Parameter 43: Technical solutions achieved within a specified period

Ratio of the number of contracts with successful technical solutions applied, to the total number of contracts where solutions were sought and applied within the specified period.

Measured as: Ratio or percentage.

Parameter 44: Number of attempts before successful solutions

Number of attempts before the technical request was successfully resolved. Measured as: Number.

Parameter 45: Integrity of technical solutions

Proportion of successful solutions with respect to the total number of requests within a specified period of time.

Measured as: Opinion rating.

Parameter 46: Reliability of technical solutions achieved

Ratio of number of services that were trouble-free for a specified period of time after the technical solution was resolved, to the total number of services where the technical support was requested and implemented.

Measured as: Ratio or percentage.

Parameter 47: Modes of technical support

Number of modes in which technical support is available to the customer or user of a service. Measured as: Number.

Commercial support provided by service provider

Parameter 48: Accessibility of the commercial support

Ratio of the number of successful access attempts to the commercial support to the total number of attempts to reach this support.

Measured as: Ratio or percentage.

Parameter 49: Commercial solution delivery time

Time elapsed from the instant the customer raised a problem with commercial support to the instant a solution was achieved.

Measured as: Time.

Parameter 50: Commercial solutions achieved within a specified period of time

Ratio of the number of contracts with successful commercial solutions achieved, to the total number of contracts where solutions were sought within a specified period.

Measured as: Ratio or percentage.

Parameter 51: Integrity of commercial solutions achieved by service provider

Ratio of successful solutions achieved within the specified period of time to the total number of commercial support requests.

Measured as: Opinion rating.

Parameter 52: Modes of commercial support

Number of modes in which commercial support is available to the customer or user of a service. Measured as: Number.

Parameter 53: Organizational efficiency of commercial support

Availability of organizational resource to fulfil customer needs on commercial support. Measured as: Opinion rating.

Complaint management

Parameter 54: Accessibility of the complaint management

Ratio of the number of successful attempts to the total number of attempts to reach complaint management (CM) in a specified period.

Measured as: Ratio or percentage.

Parameter 55: Recognition of the customer complaints

Ratio of the customer claims recognized by the SP as genuine complaints to the total number of potential complaints.

Measured as: Ratio or percentage.

Parameter 56: Complaint solutions not complete and correct first time

Ratio of the number of complaints not successfully resolved at the first attempt to the total number of complaints received by the SP.

NOTE – The indicator for this parameter provides how well the SP has performed in the complete and correct handling of the customer complaint at the first attempt.

Measured as: Ratio or percentage.

Parameter 57: Integrity of complaint resolution

Ratio of the number of complete and professional resolutions of the contributory causes of a complaint, to the total number of user complaints accepted.

Measured as: Ratio or percentage.

Parameter 58: Customer perception of the complaint management

The SP's exhibition of the combination of assurance, empathy and responsiveness in dealing with complaint(s) from reporting to satisfactory resolution.

Measured as: Opinion rating.

Parameter 59: Overall quality of the complaint management process

The combined effect of accessibility of the complaint management service: correct solutions at the first attempt, speed of resolution and the organizational

capability to carry out these services.

Measured as: Opinion rating.

Parameter 60: Organizational efficiency of complaint management system

The availability and deployment of organizational and hardware resources on the part of the SP to resolve user complaints.

Measured as: Opinion rating.

Repair services

Parameter 61: Accessibility of repair services

Availability of hardware, software and staff resources necessary to restore a service (and its features) to its specified level of performance.

Measured as: Ratio or percentage.

Parameter 62: Successful repairs carried out within a specified period of time

Ratio of the number of repairs successfully carried out to the total number of repair requests accepted by the SP within a specified period.

Measured as: Ratio or percentage.

Parameter 63: Repairs not complete and correct first time

Ratio of the number of repairs which were not successfully carried out at the first (and only) attempt to the total number of repairs carried out during the specified period.

Measured as: Ratio or percentage.

Parameter 64: Punctuality of appointments for repairs

Record of attendance of a SP agent to carry out repair at the specified time (allowing, if necessary, a grace period for lateness). It may also be expressed as an opinion rating of customers.

Measured as: Opinion rating and/or time.

Parameter 65: Efficiency of the repair services

"Efficiency of the repair service" (mainly technical) of a SP is characterised by the combined performances of:

- accessibility,
- the number of repairs in a specified period of time,
- repairs carried out successfully the first time,
- punctuality.

Parameter 66: Organizational efficiency of repair services

"Organizational (or operational) efficiency of repair service" is characterized by the combined performances of:

- Punctuality,
- Time to repair,
- Provision of resources (human, hardware and software),
- The organizational logistics to provide an effective repair service. Measured as: Opinion rating. .

Parameter 67: Notification of root cause of outage

Ratio of the number of repairs, the root causes of which were shared with the customer, to the total number of repairs carried out.

Measured as: Ratio or percentage.

Charging and billing

Parameter 68: Accessibility of tariff information

Ratio of the number of successful attempts to the total number of attempts to reach this facility located as indicated in the contract or regulations (access details to this facility to be provided by the SP).

Measured as: Ratio or percentage.

Parameter 69: Successful notification of exceeding billing budget

Ratio of the number of successful notifications by the SP of exceeding the

customer's billing budget to the total number of exceeding customer's billing budget events.

Measured as: Ratio or percentage.

Parameter 70: Notification time (delay) of exceeding billing budget

Time from the instant of billing budget overrun to the instant of the reception by the customer of this notification from the SP.

Measured as: Time.

Parameter 71: Accessibility of the account management

Ratio of the number of successful attempts to the total number of attempts to reach the account management.

Measured as: Ratio or percentage.

Parameter 72: Time to update charging information

The time between the use of service and the instant the related charging information is available on the account.

Measured as: Time.

Parameter 73: Timeliness of bill delivery

The ratio of the number of bills delivered within the bill expectation period divided by the number of bills expected within the observation period.

Measured as: Ratio or percentage.

Parameter 74: Bill delivery delay

The delay between the expected time of bill and its receipt by the customer.

Measured as: Time.

Parameter 75: Late notification of amount due

The ratio of the number of bills whose "Direct Debit" amount was not advised to the customers before payment was taken from their account to the total number of "Direct Debit" payment arrangements in place.

Measured as: Ratio or percentage.

Parameter 76: Modes of billing information transfer

The number of modes offered by the SP to communicate the billing

information to the customers. Measured as: Number.

Parameter 77: Organizational efficiency of the billing service

"Organizational efficiency of the billing service" of a SP is described and measured by the organizational and hardware resource availability to carry out the billing service.

Measured as: Opinion rating.

Network/Service management by customer

Parameter 78: Outage duration

The total time a network/service management facility was not accessible to the customer during a specified reporting period.

Measured as: Time.

Parameter 79: Frequency of outages

The number of times access to the network/service management facility was not available to the customer during a specified period divided by the duration of this period.

Measured as: Number.

Parameter 80: Response time for reply to requests

The time elapsed from the instant customer requests access to the network/service management facility to the instant such a request was carried out.

Measured as: Time.

Parameter 81: Successful request response

The ratio of the number of requests made by the customer successfully handled (within a specified time-out period) to the total number of requests made over the observation period.

Measured as: Ratio or percentage.

Parameter 82: Overall reliability of network/service management service

The consistent combined performance of availability, response times,

response rates, correctness and completeness in the processing and fulfilment of customer requests for network/service management facilities.
Measured as: Opinion rating.

Parameter 83: Organizational efficiency of the network/service management service

Described and characterized by the combined effects of human, network and other pertinent resources made available by the SP to process and fulfil any volume of customer requests to the network/service management facility on a 24/7 basis.

Measured as: Opinion rating.

Parameter 84: Reliability of planned outage notification

Ratio of the number of advanced notification of planned outage to customers by a service provider to the total number of planned outage carried out.

Measured as: Ratio or percentage.

Cessation of service

Parameter 85: Cessation acknowledgement time

The time elapsed from the instant of sending the cessation request to the instant of receipt by the customer of the acknowledgment from the SP.

Measured as: Time.

Parameter 86: Cessation request acknowledgement

The ratio (percentage) of the number of cessation requests that were acknowledged to the number of such requests made in a specified period.

Measured as: Ratio or percentage.

Parameter 87: Accessibility of the cessation facility

The ratio (percentage) of the number of successful attempts to the total number of attempts to reach the cessation facility.

Measured as: Ratio or percentage.

Parameter 88: Contractual cessations achieved

The ratio (percentage) of the number of contractual cessations requested to the

total number of such requests made within a specified period.
Measured as: Ratio or percentage.

Appendix 2: A Questionnaire

IN THE NAME OF ALLAH THE MOST GRACIOUS, THE MOST
MERCIFUL

SUDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF POSTGRADUATE STUDIES

Dear Mr. _____

Peace, mercy and blessings of Allah

Subject: A Questionnaire

The researcher wishes to carry out a piece of a supplementary research entitled (**Regulatory Framework to Monitor Pricing Based on Quality of service for Mobile Internet Service**) for the purpose of completing the requirements for obtaining a master's degree in Information Communication Technology Policy and Regulations from Sudan university for Science and Technology.

You have been selected as part of the sample set for achieving the objectives of the research, therefore, your response is of paramount importance and highly appreciated as it will be a great contribution and will be an important element in achieving the objectives of the research so we hope that you will kindly cooperate with us.

Please note that all the information that will be obtained from you will be treated in full confidentiality and only for the purposes of this research research.

Thanks you in anticipation

Yours Faithfully

The researcher: _____

SECTION 1:

Please Tick (✓) the answer that suits you

1. GENDER

A. male () B. female ()

2. AGE

- A. less than 30 years () B. 30—40 years ()
 C. 41—50 years () D. Over 50 years ()

3. QUALIFICATION

- A. Secondary education () B. Postgraduate Diploma ()
 C. Bachelor degree () D. Postgraduate education ()
 E. other ()

4. LENGTH OF USE OF MOBILE INTERNET SERVICE

- A. Less than 6 months () B. 6 months—one year ()
 C. more than one year ()

SECTION 2

Please Tick (✓) the answer that suits you

Increasing user-awareness to link the level of quality with the announced tariff

Mobile Internet service pricing based on the level of quality offered is a fair pricing method which would guarantee the user a certain level of quality, depending on the financial value paid.

No	EXPRESSIONS	Strongly agree	agree	neutral	disagree	Strongly disagree
1	The announcement of the tariff provided on the basis of the level of quality helps the					

	user to choose what fits their needs					
2	Disseminating information on the levels of quality provided helps fair comparison between the performances					
3	Publishing periodic performance reports helps operators to identify the shortcomings and excellence for every service provider					
4	Conducting periodic surveys for customers' feedback about the quality of service helps to assess the level of awareness of the customer about the concept of quality					
5	endowing the customer with information on the level of quality and imposed tariff increases elements of transparency and credibility of the service provider					
6	Using printed press to disseminate information about services suits every customer					
7	Using visual advertising channels to disseminate					

	information about services suits every customer					
8	Using short messages through mobile phones helps to communicate information about services					
9	There is a need for adopting new mechanisms and channels to communicate information about services					
10	Customer satisfaction with the quality of service provided is an essential requirement for the Service Provider					
11	Your opinions and suggestions will be referred to in the case of initiating an issuance of a new service					
12	The service provider considers you as one of his most important priorities					
13	Quality based Pricing is considered a fair mechanism which is compatible with the principle of equivalence (what is being presented is worth what must be paid)					

Thank you for your cooperation and your response.

In the name of Allah the most gracious, the most merciful

SUDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF POSTGRADUATE STUDIES

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Thanks you in anticipation

Yours Faithfully

The researcher: _____

SECTION 1:

A. Please Tick (✓) the answer that suits you

1. GENDER

A. male () B. female ()

2. AGE

A. less than 30 years () B. 30—40 years ()
C. 41—50 years () D. Over 50 years ()

3. QUALIFICATION

- A. Secondary education () B. Postgraduate Diploma ()
 C. Bachelor degree () PhD ()
 E. other ()

4. FIELD OF ACADEMIC SPECIALIZATION

- A. Economic () B. Legal ()
 C. Technical / Engineering () D. Other ()

5. LENGTH OF SERVICE IN THE TELECOM SECTOR

- A. Less than 5 years () B. 5—10 years ()
 C. More than 10 years ()

B. Factors below play a key role in the growth and upgrading of the telecom market in terms of proliferation and quality of services provided as well as the pricing of those services. For this effect, numbers from 1— 6 have been used to arrange the factors below according to your assessment of the importance of its impact on the telecommunications’ market (the number “1” represent the most important factor):

- A. The level of annual income per capita ()
 B. The level of competition between service providers ()
 C. Penetration and the proliferation of mobile service ()
 D. The proportion of people who use the Internet ()
 E. The number of operators who are in the market ()
 F. Enrolment rate in tertiary education ()

SECTION 2:

Please Tick (✓) the answer that suits you

1. THE FIRST ITEM: Articles regulatory framework

1.1 The importance of having a regulation

	EXPRESSIONS	Strongly agree	Agree	neutral	disagree	Strongly disagree
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1	The existence of a regulation ensures raising the level of quality of service provided					
2	The existence of a regulation ensures the clarity of rights and duties of all parties					
3	regulation ensures reduces the likelihood of the emergence of disputes between the parties					
4	The existence of a regulation helps settle disputes between the parties					
5	The existence of a regulation encourages the service provider to continue developing his network					

1.2 Indicators to measure the quality of mobile internet

These are transactions which are linked to the values and they are used to determine the level of quality

No	EXPRESSIONS	Strongly agree	agree	neutral	disagree	Strongly disagree
6	The quality of mobile internet can be measured by means of throughput					
7	The quality of mobile internet can be measured by means of service availability					
8	The quality of mobile					

	internet can be measured by means of the Ratio of packet loss					
9	The quality of mobile internet can be measured by means of the change in the time of the delayed packages(Jitter)					
10	The quality of mobile internet can be measured by means of the proportion of users who have failed to connect to the network(Mobility Management)					
11	The quality of mobile internet can be measured by means of the number of users connected to the network simultaneously					
12	“Drive Test” can be used as a principal tool to measure the quality of mobile internet					
13	Statistics Systems can be used as a principal tool to measure the quality of mobile internet					
14	customer’s opinions based on survey can be used as a helping tool to measure the quality of mobile internet					
15	expert’s opinions based on survey can be used as a helping tool to measure the quality of mobile internet					
16	In the case of breach of the standard of quality declared punishment is determined					

	according to the discretion of the authorities of the National Telecommunications					
17	Regulations contain a special item to determine the kind of sanctions in case of failure to provide the level of quality as advertised					
18	In the case of failure to provide the level of quality advertised penalties are in the form of issuing orders to correct the situation and compensate the aggrieved					
19	In the case of failure to provide the level of quality advertised penalties are in the form of issuing orders to suspend the service					
20	In the case of failure to provide the level of quality advertised penalties are in the form of fines					
21	In the case of failure to provide the level of quality advertised penalties are in the form withdrawal of licence					

2. THE SECOND ITEM: To encourage operators to adopt a pricing mechanism based on the level of quality

No	EXPRESSIONS	Strongly agree	agree	neutral	disagree	Strongly disagree
22.	The adoption of the pricing mechanism on the basis of quality achieves an increase in profits.					
23.	Adoption of the pricing mechanism on the basis of quality achieves optimum utilization of network resources.					
24	Adoption of the pricing mechanism on the basis of quality encourages the operator to invest in network expansion.					
25	Adoption of the pricing mechanism on the basis of quality reduces complaints from service users.					
26	Adoption of pricing mechanism based on quality helps create new models of business (diversification of services provided).					
27	Adoption of the pricing mechanism on the basis of quality and help in the expansion and the proliferation of the service.					
28	The adoption of the pricing mechanism on the basis of quality to ensures high levels of competition					

Thank you for your cooperation and your response

بسم الله الرحمن الرحيم
جامعة السودان للعلوم والتكنولوجيا
كلية الدراسات العليا

السيد/.....المحترم

السلام عليكم ورحمة الله وبركاته

الموضوع: استمارة استبانة

يقوم الباحث بإجراء بحث تكميلي بعنوان (إطار تنظيمي لمرافقة تسعير خدمة الموبايل إنترنت علي أساس مستوى الجودة)، لإكمال متطلبات الحصول على درجة الماجستير في سياسات وتنظيم تكنولوجيا المعلومات والاتصالات من جامعة السودان للعلوم والتكنولوجيا، وقد تم إختياركم من ضمن العينة المحددة لتحقيق أهداف الدراسة ، لذا فإن استجابتكم للمساهمة معنا في ملء هذا الاستبانة ذات أهمية بالغة وستكون عنصرا هاما في وصول الدراسة لغاياتها ، لذا نرجو من سيادتكم كريم تفضلكم بالتعاون معنا علما بأن جميع المعلومات التي سيتم الحصول عليها منكم ستعامل بسرية كاملة ولأغراض هذه الدراسة البحثية فقط.

وتفضلوا بقبول فائق الشكر والتقدير

الباحث

ال قسم الاول:

أ/ضع علامة (√) أمام الإجابة التي تناسبك :

1- النوع

أ/ ذكر () ب/ انثي ()

2- الفئة العمرية :

أ/ أقل من 30 سنة () ب/ 30-40 سنة ()

ج/ 41-50 سنة () د/ أكثر من 50 سنة ()

3- المؤهل الاكاديمي :

أ/ بكالوريوس () ب/ دبلوم عالي ()

ج/ ماجستير () د/دكتوراه ()

4- مجال التخصص الاكاديمي :

أ/ اقتصادي () ب/ قانوني ()

ج/ تقني / هندسي () د/ أخري ()

5- عدد سنوات العمل في قطاع الإتصالات:

أ/ أقل من 5 سنوات () ب/ 5-10 سنوات ()

ج/ أكثر من 10 سنوات ()

ب/ العوامل ادناه تلعب دوراً اساسياً في النمو والارتقاء بسوق الاتصالات من ناحية الانتشار ونوعية الخدمات المقدمة وتسعير تلك الخدمات، عليه استخدم الأرقام من واحد إلي ستة لترتيب العوامل ادناه وفقاً لتقييمك لأهمية تأثيرها في سوق الإتصالات (يمثل الرقم واحد الأكثر أهمية) :

1. مستوى دخل السنوي الفرد ()

2. مستوى المنافسة بين مقدمي الخدمات ()

3. نسبة تغلغل وانتشار خدمة الموبايل ()

4. نسبة الأشخاص الذين يستخدمون الانترنت ()

5. عدد المشغلين الموجودين بالسوق ()

6. معدل الالتحاق بالتعليم الجامعي ()

القسم الثاني: بيانات الدراسة: الرجاء التكرم بوضع علامة (√) امام الاجابة المناسبة

1. البند الأول : مواد الإطار التنظيمي

1.1 أهمية وجود لائحة تنظيمية

لا أو ليقتدي

لا أو ليقتدي	لا أو ليقتدي	محايد	موافق بشدة	موافق	الذقرة
					1. وجود لائحة تنظيمية يضمن الارتقاء بمستوى جودة الخدمة المقدمة.
					2. وجود لائحة تنظيمية يضمن وضوح واجبات و حقوق كل الأطراف.
					3. وجود لائحة تنظيمية يقلل من احتمالية ظهور نزاعات بين الأطراف.
					4. وجود لائحة تنظيمية يساعد في فض النزاعات بين الأطراف .
					5. وجود لائحة تنظيمية يشجع م تقدم الخدمة على الاستثمار في تطوير شبكتة.

1.2 مؤشرات قياس مستوى جودة الموبايل انترنت

وهي عبارة عن معاملات يتم ربطها ب قيم وتستخدم لتحديد مستوى الجودة

لا أو ليقتدي

بشدة

بشدة	لا أو ليقتدي	محايد	موافق	موافق بشدة	الذقرة
					6. يمكن قياس جودة الموبايل انترنت عن طريق الاداء المنجز throughput
					7. يمكن قياس جودة الموبايل انترنت عن طريق توفر الخدمة service availability
					8. يمكن قياس جودة الموبايل انترنت عن طريق نسبة الحزم الضائعة Ratio of packet loss
					9. يمكن قياس جودة الموبايل انترنت عن طريق التغيير في زمن تأخر الحزم Jitter
					10. يمكن قياس جودة الموبايل انترنت عن طريق نسبة المستخدمين الذين فشلوا في الاتصال بالشبكة Mobility Management

بشدة	لاوافق	محايد	موافق	موافق بشدة	الفقرة
					11. يمكن قياس جودة الموبايل انترنت عن طريق عدد المستخدمين المتصلين بالشبكة في نفس اللحظة.

1.3 أدوات قياس مستوى جودة الموبايل انترنت

هي عبارة عن آليات يتم استخدامها لتحديد و قراءة قيم مؤشرات الجودة.

بشدة	لاوافق	محايد	موافق	موافق بشدة	الفقرة
					12. يمكن استخدام drive test كأداة أساسية ل قياس جودة خدمة الموبايل انترنت.
					13. يمكن استخدام احصائيات الانظمة systems statistic كأداة أساسية ل قياس جودة خدمة الموبايل انترنت.
					14. يمكن استخدام مسح اراء العملاء customer's opinions based on survey كأداة مساعدة ل قياس جودة خدمة الموبايل انترنت.
					15. يمكن إستخدام مسح اراء الخبراء expert's opinions based on survey كأداة مساعدة ل قياس جودة خدمة الموبايل انترنت.

بشدة	لاوافق	محايد	موافق	موافق بشدة	الفقرة
					16. في حالة الإخلال بمستوي الجودة المعلن عنها يتم تحديد العقوبة وفقاً للسلطات التقديرية للهيئة القومية للإتصالات.
					17. احتواء اللائحة على بند خاص بتفصيل نوع العقوبات في حالة الإخفاق في تقديم مستوى الجودة المعلن عنها.

					18. تكون العقوبات في حالة الإخفاق في تقديم مستوى الجودة المعلن عنها عبارة عن إصدار أوامر بتصحيح الوضع وتعويض المتضرر .
					19. تكون العقوبات في حالة الإخفاق في تقديم مستوى الجودة المعلن عنها عبارة عن إصدار أوامر بإيقاف الخدمة.
					20. تكون العقوبات في حالة الإخفاق في تقديم مستوى الجودة المعلن عنها عبارة عن غرامات مالية.
					21. تكون العقوبات في حالة الإخفاق في تقديم مستوى الجودة المعلن عنها عبارة عن سحب الرخصة التشغيلية لمقدم الخدمة.

البند الثاني: تشجيع المشغلين على اعتماد آلية التسعير علي أساس مستوى الجودة

لاوافق	محايد	موافق	بشدة موافق	الفقرة
				22. اعتماد آلية التسعير علي أساس الجودة تحقق زيادة في الأرباح .
				23. اعتماد آلية التسعير علي أساس الجودة تحقق الاستغلال الأمثل لموارد الشبكة.
				24. اعتماد آلية التسعير علي أساس الجودة تشجع المشغل على الاستثمار في توسعة الشبكة.
				25. اعتماد آلية التسعير علي أساس الجودة تقلل من شكاوى مستخدمي الخدمة .
				26. اعتماد آلية التسعير علي أساس الجودة تساعد في خلق نماذج جديدة من الأعمال (تنويع الخدمات المقدمة).
				27. اعتماد آلية التسعير علي أساس الجودة تساعد في توسعة وانتشار استخدام الخدمة.
				28. اعتماد آلية التسعير علي أساس الجودة تضمن مستويات عالية من المنافسة.

شكرا لتعاونكم واستجابتكم

بسم الله الرحمن الرحيم
جامعة السودان للعلوم والتكنولوجيا
كلية الدراسات العليا

السيد/.....المحترم

السلام عليكم ورحمة الله وبركاته

الموضوع: استمارة استبانة

يقوم الباحث بإجراء بحث تكميلي بعنوان (إطار تنظيمي لمرافقة تسعير خدمة الموبايل إنترنت علي أساس مستوى الجودة)، لإكمال متطلبات الحصول على درجة الماجستير في سياسات وتنظيم تكنولوجيا المعلومات والاتصالات من جامعة السودان للعلوم والتكنولوجيا، وقد تم إختياركم من ضمن العينة المحددة لتحقيق أهداف الدراسة ، لذا فإن استجابتكم للمساهمة معنا في ملء هذا الاستبانة ذات أهمية بالغة وستكون عنصرا هاما في وصول الدراسة لغاياتها ، لذا نرجو من سيادتكم كريم تفضلكم بالتعاون معنا علما بأن جميع المعلومات التي سيتم الحصول عليها منكم ستعامل بسرية كاملة ولأغراض هذه الدراسة البحثية فقط.

وتفضلوا بقبول فائق الشكر والتقدير

الباحث

القسم الاول: ضع علامة (√) أمام الإجابة التي تناسبك :

- 1- النوع
أ/ ذكر () ب/ أنثي ()
- 2- الفئة العمرية :
أ/ أقل من 30 سنة () ب/ 30-40 سنة ()
ج/ 41-50 سنة () د/ أكثر من 50 سنة ()
- 3- المؤهل الأكاديمي :
أ/ ثانوي () ب/ دبلوم وسيط ()
ج/ بكالوريوس () د/ دراسات عليا ()
هـ/ أخرى ()
- 5- عدد سنوات استخدام خدمة الموبايل انترنت:
أ/ أقل من ستة شهور () ب/ 6 شهور-سنة ()
ج/ أكثر من سنة ()

القسم الثاني: بيانات الدراسة: الرجاء التكرم بوضع علامة (√) امام الاجابة المناسبة

زيادة وعي المستخدم لربط مستوي الجودة مع التعرفة المعين عنها:
تسعيير خدمة الموبايل انترنت على اساس مستوي الجودة الم مقدمة هو أحد طرق التعبير العادلة التي تضمن للمستخدم الاستمتاع بمستوى معين من الجودة اعتماداً على القيمة المالية المدفوعة.

بشدة	لاوافق	محايد	بشدة	بشدة	الذقرة
					1.الإعلان عن التعرفة الم مقدمة على أساس مستوى الجودة يساعد المستخدم في اختيار ما يناسب احتياجاته .
					2. نشر المعلومات عن مستويات الجودة الم مقدمة يساعد على الم مقارنة العادلة بين العروض .
					3.نشر تقارير الأداء الدورية للمشغلين يساعد في التعرف على أوجه القصور والامتياز لكل م قدم للخدمة.
					4.إجراء استطلاعات دورية لآراء العملاء حول جودة الخدمة يساعد على تقييم مستوي إدراك العميل لمفهوم الجودة.
بشدة	لاوافق	محايد	موافق	بشدة	الذقرة

					5.تمليك العميل معلومات عن مستوي الجودة والتعرفة المفروضة يزيد من عناصر الشفافية والمصدقية لم قدم الخدمة.
					6. استخدام القنوات الإعلانية المروفة لتوصيل المعلومات عن الخدمات تناسب كل العملاء.
					7.استخدام القنوات الإعلانية المرئية لتوصيل المعلومات عن الخدمات تناسب كل العملاء.
					8.استخدام الرسائل القصيرة عبر الموبايل تساعد في وصول المعلومات عن الخدمات.
					9.هناك حاجة لاعتماد آليات و قنوات جديدة لتوصيل المعلومات عن الخدمات.
					10.رضاء العميل عن جودة الخدمة المقدمة مطلب أساسي لم قدم الخدمة.
					11.يتم الرجوع إلى آرائك ومقترحاتك في حالة الشروع في إصدار خدمة جديدة .
					12.يعاملك م قدم الخدمة باعتبارك أحد أهم أولوياته .
					13.التسعير على أساس الجودة يعتبر آلية عادلة وتتوافق مع مبدأ التكافؤ (مايتم تقديمه يستحق مايتوجب دفعه).

شكرا لتعاونكم واستجابتكم