Q.1 a. What are the security issues in telecom areas?

Answer:

Security in telecommunications and information technologies, describes practical issues, and indicates how different aspects of security in today's applications are addressed by ITU-T. It collects security related material from ITU-T Recommendations into one place and explains respective Srelationships. In this first edition, the manual does not cover all aspects of security, in particular not those that relate to availability – for which ITU-T has a great deal to offer – and to environmental damage in which area ITU-T is also active. Further, aspects covered are based on existing work, not on work in progress, which will be addressed in future editions of this manual.

b. Discuss the growth pattern of telecom industry in India & other countries.

Answer:

Governments and public agencies in most countries, both developed and less developed, spend large sums of money on infrastructure. The purpose of infrastructure investment is to positively influence economic activity in terms of employment, value added, productivity, capital formation and income. The idea that infrastructure investment is correlated with economic development is appealing and intuitive. Telephone service is a category of infrastructure investment.

The previous discussion of the relationship between infrastructure investment and economic development generally applies to telephone service as a category of infrastructure investment. Some developing countries investas much as 0.61 percent of their gross domestic product (GDP) in telecommunications. In the 1970s the average was 0.25 percent (developed countries average 0.8 percent of GDP during the same period). At least one group studying the issue suggested that developing countries invest not less than 0.5 percent of GDP in telecommunications infrastructure.

A telecommunication investment affects economic development in the same general way as other infrastructure investment. It can reduce the cost of production. It can increase revenues. Finally, it can increase employment through both direct and indirect effects. Telecommunications, however, will affect revenues and costs in more indirect ways than many other types of infrastructure investment. The reason is that much of the benefits of increased telephone service are derived from increases in information and knowledge.

c. Discuss Six Sigma concepts for total quality management.

Answer:

Total quality management (**TQM**) consists of organization-wide efforts to install and make permanent a climate in which an organizationcontinuously improves its ability to deliver high-quality products and services to customers. While there is no widely agreed-upon approach, TQM efforts typically draw heavily on the previously developed tools and techniques of quality control. TQM enjoyed widespread attention during the late 1980s and early 1990s before being overshadowed by ISO 9000, Lean manufacturing, and Six Sigma.

Six Sigma is a set of techniques and tools for process improvement.**Six Sigma** seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors) and minimizing variability in manufacturing and business processes. It uses a set of quality management methods, including statistical methods, and creates a special infrastructure of people within the organization who are experts in these methods. Each Six Sigma project carried out within an organization follows a defined sequence of steps and has quantified value targets, for example: reduce process cycle time, reduce pollution, reduce costs, increase customer satisfaction, and increase profits.

The term Six Sigma originated from terminology associated with manufacturing, specifically terms associated with statistical modelling of manufacturing processes. The maturity of a manufacturing process can be described by a sigma rating indicating its yield or the percentage of defect-free products it creates. A six sigma process is one in which 99.99966% of the products manufactured are statistically expected to be free of defects (3.4 defective parts/million), although, as discussed below, this defect level corresponds to only a 4.5 sigma level. Motorola set a goal of "six sigma" for all of its manufacturing operations, and this goal became a by-word for the management and engineering practices used to achieve it.

d. What are the risks associated with FDI? Also, discuss global competition issues.

Answer:

Foreign direct investment (FDI) is a direct investment into production or business in a country by an individual or company of another country, either by buying a company in the target country or by expanding operations of an existing business in that country. Foreign direct investment is in contrast to portfolio investment which is a passive investment in the securities of another country such as stocks and bonds.

Broadly, foreign direct investment includes "mergers and acquisitions, building new facilities, reinvesting profits earned from overseas operations and intra company loans".In a narrow sense, foreign direct investment refers just to

building new facilities. The numerical FDI figures based on varied definitions are not easily comparable.

As a part of the national accounts of a country, and in regard to the GDP equation Y=C+I+G+(X-M)[Consumption + gross Investment + Government spending +(eXports - iMports], where I is domestic investment plus foreign investment, FDI is defined as the net inflows of investment (inflow minus outflow) to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. FDI is the sum of equity capital, other long-term capital, and short-term capital as shown the balance of payments. FDI usually involves participation in management, joint-venture, transfer of technology and expertise. *Stock* of FDI is the *net* (i.e. Inward FDI minus Outward FDI) cumulative FDI for any given period. Direct investment excludes investment through purchase of shares. FDI is one example of international factor movements.

Types of FDI:

1. **Horizontal FDI** arises when a firm duplicates its home country-based activities at the same value chain stage in a host country through FDI.
2. **Platform FDI** Foreign directs investment from a source country into a destination country for the purpose of exporting to a third country.
3. **Vertical FDI** takes place when a firm through FDI moves upstream or downstream in different value chains i.e., when firms perform value-adding activities stage by stage in a vertical fashion in a host country.

e. 11.6 of Syllabus

f. 13.2 of Syllabus

g. 4.5.2 of Syllabus

Q.2 a. What do you understand by Telecommunication Economics? Discuss different elements of market structure.

Answer:

Extensive studies from the 1960s to the present have documented a strong correlation between GDP per capita and telephone density indicators. The data for all countries generally fall within a small band along a straight line on a logarithmic chart. Recent statistical tests for the direction of causality by Hardy (1980), DRI/McGraw-Hill (1991) and Norton (1992) show that the growth of telecommunications investment or penetration is a statistically significant predictor of economic growth, and vice-versa: indicators of economic growth are significant predictors of telecommunications investment. Telecommunications is thus considered to be both a cause and a consequence of economic growth. According to Norton (1992), "The

data in this study...are consistent with the proposition that telephones provide substantial growth- and investment enhancing activity and thus facilitate economic growth." Input-output studies of the economic impact of telecommunications also show that it makes substantial contributions to the efficiency of the economy.Economic analysis is used to help a country, firm or individual allocate scarceresources in order to optimize efficiency.

Telecommunications have beenconsidered an essential factor of production for the output of a country, and botha catalyst and product of economic growth. There are two distinct analyticalapproaches for reviewing the impact of telecommunications on economicdevelopment. One is macro-economics in orientation and the other is microeconomicsin orientation. Both approaches have distinct advantages anddisadvantages and can be used in complementary ways. Macro-economicstudies are designed to present an overview of the economy based on nationalstatistical data. Micro-economics studies are designed to evaluate the economicimpact of telecommunications applications on a detailed sector or unit ofproduction within the economy based on a specific sample.

Elements of Market Structure are:

1. Seller concentration
2. Product Differentiation
3. Barriers to Entry
4. Buyer Concentration
5. Demand Growth
6. Principles of Supply & pricing

Economic development policies in the industrial countries increasinglyinclude telecommunications as an essential component of the economicinfrastructure.The primary benefits include reduced transportcosts, reduced transaction costs, improved marketing information andincreased efficiency of industrial production. In all economic sectors--agriculture, manufacturing and services--advanced telecommunicationssystems are becoming an integral part of business operations. The lesserdeveloped countries must accelerate their application oftelecommunications technology or fall further behind in economiccompetitiveness.

b. What is role of telecom in Rural Development in India?

Answer:

Mobile telecommunication is creating a great transformation in rural India and resulting in all round economic as well as social development. Information received through mobile like weather reports and market prices, has begun to have an impact on productivity for the agricultural sector. Recent studies have identified seven areas where mobiles can affect rural communities- micro commerce, education, information, healthcare,

governance, finance and transport. After the GOI (Government of India) opened up the sector, many domestic as well as foreign players entered this sector, especially in mobile service. With increasing tele-density, competition and urge to boost subscriber base, mobile operators are exploring the rural India markets with greater interest. The rural population is also accepting modernization and change. According to Telecom Regulatory Authority of India (TRAI), number of mobile users has increased from 109.7 million in 2009 to an astonishing 652 million by Sept 2010. New and existing mobile hands set manufacturers have also taken note of these recent market changes and are coming out with sets specifically for the rural population. Understanding the rural consumers can help in formulating more targeted marketing plan and also ensure greater level of satisfaction for the rural consumers. Specific segments have different requirements regarding tariff plans based on usage pattern and preferences.

THE INDIAN TELECOM SECTOR

The history of the Indian telecom industry goes back to 1839, with the setting up of the first telegraph line between Kolkata and Diamond Harbour. Formally the industry started in 1881 after the first telephone exchanges were established connecting Kolkata, Ahmedabad, Mumbai and Chennai. In the year 1948 tele-density was about 0.02 with a total of 0.1 million telephone connections. By 31 March 2010, the total telecom subscriber base including fixed line and mobile stood at a mind boggling 621.28 million with a tele- density of 52.74. Presently the Indian telecom sector is only second only to China in terms of number of subscribers. Several factors can be said to be responsible for such tremendous growth- a large population, low telecom penetration, an increase in the disposable income owing to strong economic growth and favourable government policies. According to researchers by 2012 telecom industry will create direct job opportunity to approximately 2.5 million people and for 7 million indirectly. Telecom tariffs in India are one of the lowest in the world (2-3 US cents).

For a long time the telecom service industry was monopolized by the government owned BSNL which focused mainly into providing fixed line telephony across India. After the national telecom policy 1994 (NTP-94) was enacted, it was acknowledged that private investment in the telecom sector, especially in infrastructure development is required to meet the growing demand for telecom services for bring fast growth in the . The Telecom Regulatory Authority of India (TRAI) was established in the following year to reduce the governments control regarding fixing of tariff rates and intruding in telecom policy matters. During the period 2000-2002 some important changes were observed in the sector. The license fee for

mobile service providers (MSP) were reduced and foreign equity investments reduced from 49% to 74%.

In rural telephony BSNL/MTNL are the market leaders in the fixed line segment (TRAI). Private players have very marginal share in the rural market segment, mostly in the mobile telephony segment in which Airtel is the market leader.

Conclusion: Telecommunication has become a vital part of our life; maintain social contact, emergency relief, health and education. There are many noteworthy challenges to rural telecommunication. Rural network infrastructure is difficult to maintain as access to power, transport and road communication is poor. Most of the big telecom operators are taking a wait and watch policy regarding making considerable investments in rural telecommunication. In spite of the creation of the universal services obligation fund (USOF) which is a pool created for financing of rural network by mandatory contribution from telecom service providers, big players are going slow. Small local operators are more flexible in creating a profitable rural business model but they require expensive state wide licenses. According to TRAI, Rs. 8000 crore is remaining unused with USOF. Rural telecom will not happen on its own but great deal of attention is to be given by the GOI to ensure that all obstacles are removed in licensing, spectrum allocation, technology acquisition, so that small 'niche' operators who are unable to make a mark in the highly competitive urban market

Q.3 a. What is innovation and explain its association with technology management?

Answer:

Innovations have acquired a key-role in the growth and competition strategies of firms today. They are regarded as an essential tool to stimulate growth and enable firms to master the competition brought about by the forces of globalization. In developed countries they are thought to provide a vital buffer against challenges from low-cost producers from emerging countries.

At the same time, innovations in today's "globalized" world are hardly feasible in isolation. World-wide economic reforms and far-reaching technological advancements have brought to fore new economic powerhouses, such as China and India, which possess strong scientific capabilities. Products are marketed internationally which often necessitates adaptation to specific needs of targeted markets. All these developments are leading to the "globalization of innovation".

Innovation activities too generate costs which need to be minimized in order to compete with other "innovators", especially so since the outcome and the ensuing commercial success of innovation efforts remain to a large extent

uncertain. A logical extension of the BPO trend has therefore resulted in Knowledge Process Outsourcing (KPO), whereby knowledge-intensive research & development work (R&D) is outsourced either to an external entity (e.g. contract R&D by a domestic or foreign-based firm) or to an off shore subsidiary ("captive offshoring"). Primary motives of "offshore KPO" are thought to be, for instance, the availability of highly-skilled labor force, cost benefits, location of industry specific clusters and/or the incentive to develop products designed to suit the specific needs of a target market physically and culturally distant from the home market of a firm.

The innovation process encompasses systematic steps, beginning from the problem/requirement analysis to idea generation, evaluation and selection, project planning, product development and testing to finally product marketing. The individual steps may overlap each other and may be categorized into 3 broad phases, which represent a simplified innovation process.

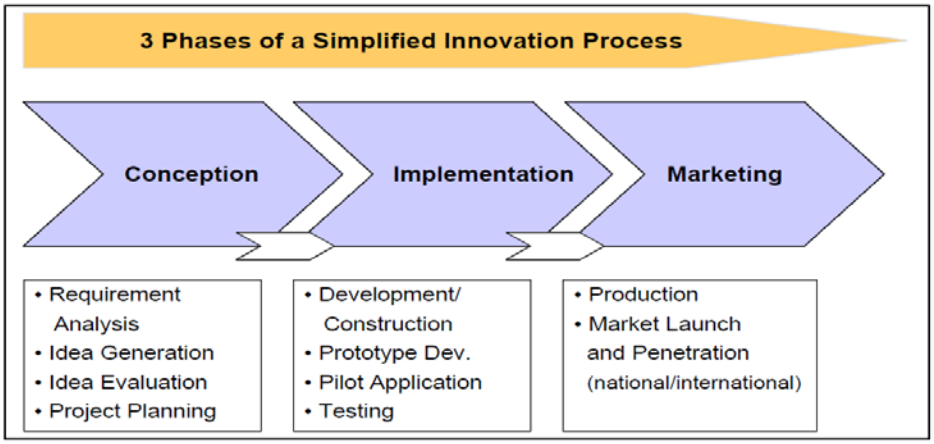


Fig. Three phases of a simplified Innovation Process

This model retains its validity even today and may be applied not only for GPN but also for "global innovation networks", which have been gaining ground in recent past. The economic reforms and the technological progress, especially in ICT, have made it easier to break the innovation process into several individual steps and to conduct innovation activities at various locations, even simultaneously if so required.

b. Explain SWOT model in detail.

Answer:

In the 1960's and 70's, Albert Humphrey is said to have developed this strategic planning tool using data from the top companies in America at the time. *SWOT* stands for Strengths, Weaknesses, Opportunities and Threats. It is a way of summarizing the current state of a company and helping to devise a plan for the future, one that employs the existing strengths, redresses existing weaknesses, exploits opportunities and defends against threats.

A SWOT Analysis is a tool which allows users to look at the direction a company or organization may wish to move towards in the future.By specifying clear objectives and identifying internal and external factors that are either helpful or not, a short and simple SWOT analysis is a useful resource which may be incorporated into an organizations strategic planning model.

Strengths- Internal attributes those are helpful to the organization to achieving its objective
Weaknesses – Internal attributes that are harmful to the organization to achieving its objective
Opportunities – External factors that help the organization achieve its objective
Threats - External factors that are harmful to the organization to achieving its objective

After identifying the SWOT's, identification of the factors and their interdependence helps clarify the steps needed to achieve the ending objectives.
The aim of any SWOT analysis is to identify the key internal and external factors that are important to achieving the objective. SWOT analysis groups key pieces of information into two main categories:

- **Internal factors –** The strengths and weaknesses internal to the organization.
- **External factors –** The opportunities and threats presented by the external environment.

  The internal factors may be viewed as strengths or weaknesses depending upon their impact on the organization's objectives. What may represent strengths with respect to one objective may be weaknesses for another objective. The factors may include all of the 4P's; as well as personnel, finance, manufacturing capabilities, and so on.

  The external factors may include macroeconomic matters, technological change, legislation, and socio-cultural changes, as well as changes in the marketplace or competitive position. The results are often presented in the form of a matrix.

Q.4 a. Suggest ideas to formulate the effective strategy planning for telecom business upliftment and elaborate your answer

Answer:

The Telecommunications Strategic planning provides reliable, modern, and integrated communications services to enable teaching, learning, research, and outreach. This can be achieved via setting **GOALS, CRITICAL SUCCESS FACTORS, andOBJECTIVES** which includes differentstrategy formulation&their assessment approaches. The three broad areas for strategy formulation in telecom business are:

1. Corporate Growth Strategy
2. Competitive Business Strategy
3. Mergers & acquisitions Strategy

Explain these terms in detail as per reference book Richard A Gershon, Telecommunication & Business Strategy (Taylor & Francis) chapter no 3 (3.1.1; 3.1.2; 3.1.3).

b. Explain the concept of public broadcasting. Why? How?

Answer:

Organizations and persons devoted to the promotion of public service broadcasting throughout the world, especially in developing countries, often ask the World Radio and Television Council for an explanatory document. Much has been written about public service broadcasting – books, essays, conference reports, and legislation – but a clear, practical definition of this type of institution seems tobe hard to come by, although models have existed in many countries of the world for the past seventy years.

Public broadcasting is defined as a meeting place where all citizens are welcome and considered equals. It is an information and education tool, accessible to all and meant for all, whatever their social or economic status. Its mandate is not restricted to information and cultural development—public broadcasting must also appeal to the imagination, and entertain. But it does so with a concern for quality that distinguishes it from commercial broadcasting.

Because it is not subject to the dictates of profitability, public broadcasting must be daring and innovative, and take risks. And when it succeeds in developing outstanding genres or ideas, it can impose its high standards and set the tone for other broadcasters. It describes it by defining its underlying principles & from these principles flow specific missions, a

particular mode of financing, distinct programming, and a specific relation with the "public."

Programming for public broadcasting:

A. Unbiased, enlightening information
B. General interest and service programming
C. Programs that leave their mark
D. In-house production
E. National content

Most public broadcasting services have a threefold mandate to inform, educate, and entertain. Many private broadcasting stations have also been offering information and entertainment programs for a long time. Should we conclude, then, like those who would restrict the public broadcaster to complementing the commercial sector, that the public broadcaster's sole responsibility today is to educate? Obviously, not. This threefold mandate or these missions, for their true worth to be appreciated, must be understood within the general framework of the role and principles underlying public broadcasting. Public broadcasting, as mentioned earlier, must do things differently. We should also see related goals in these missions: Enabling citizens to be informed on a variety of subjects and to acquire new knowledge, always within the scope of interesting and attractive programming.Depending on the country, particular missions may be entrusted to public broadcasting.

One such mission, fairly frequent, is to strengthen national identity. This must be done cautiously. The public broadcasting model has survived these past few years in an audio-visual universe otherwise dominated by commercial broadcasting. But the broadcasting world is changing quickly, very quickly.

Q.5 a. Explain the cable television industry structure. Also, describe different type of distribution network deployed in cable television.

Answer:

After collecting and combining the complete forward services lineup, the cable operator places it onto a system of cables, active devices, passive devices and power supplies for transport to the subscriber's premises. This system can be broadly referred to as the cable plant. In a two-way capable cable plant, the equipment at the customer's premises put return signals onto the same cable plant for transport to the cable operator. The configuration of the cable plant can vary widely from Cable Company to cable company and may vary within the same company based on several factors. These factors could be the services being offered, the brand, model and age of the plant equipment, the geography of the serviced area, the population density of the serviced area and the climate of the area.

Tree and Branch Topology

This is the traditional cable system topology that dates back to some of cable's earliest designs. It is so named because like a tree trunk, the cable plant's main lines stretch from the origination point out towards the end or top of the tree and smaller branches reach out from the trunk to feed the signal to the customers. The plant cables are in three categories known as *trunk, feeder* and *drop.*

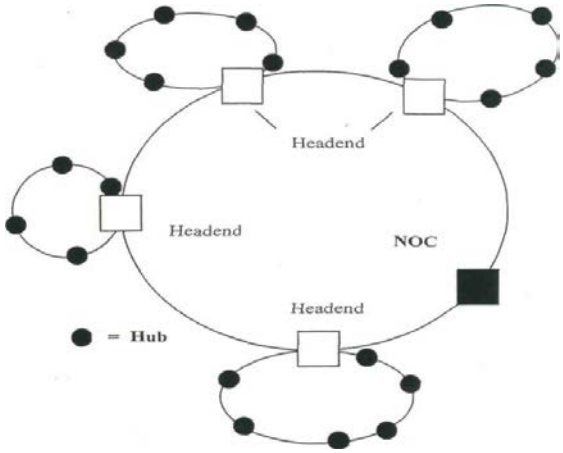
The forward signals originate at the head end and are transmitted toward the subscribers (downstream) on trunk cables and are amplified as needed. A string of amplifiers connected to one another is known as a cascade. In the tree and branch topologies, amplifier cascades of over 32 are not uncommon. Customers are not directly connected to trunk cables in order to receive the downstream services.

The trunk cables are connected to the branch or feeder cables through special bridger amplifiers. Once going through the bridger, the signals are passed on through the streets and neighbour hoods on feeder cables. Small amplifiers maintain the strength of the downstream signals on the feeder cables. These feeder amplifiers are called line extenders. It is the feeder cables that provide a place for the wires going into each subscriber's home to hook up. These home connection points are called taps. The tap is the transition point between the feeder system and the house wiring or drop system.

The return signals originate at the subscriber's premises and are transmitted toward the head end (upstream) on the drop cables. The upstream signals are then passed from the drop to the feeder system at the tap, then into the trunk system, and finally to the head end for processing.

HFC Topology The use of fiber optic technology has resulted in improvements to the tree and branch topologies of the past. Fiber optic cables now replace and/or compliment the traditional coaxial cables. The use of fiber optics in conjunction with coax in cable topologies creates what is known as a **Hybrid Fiber Coax network (HFC).** There are many variations of HFC network combinations that are in use today.

The most reliable HFC networks employ ring topologies that provide an alternate route for signals in the event of cable damage. Fiber optic rings make the dependable interconnection of several regional Head Ends possible. This type of interconnectivity creates a situation where Head Ends can share enormous amounts of data very quickly. One Head End can be made a Network Operations center (NOC) that receives and processes channels then sends them to the other Head Ends thus eliminating costly duplicate receiving and processing equipment.



A ring connected to a ring describes the HFC Head End-to-Hub Topology. In this configuration the ringed Head Ends supply signals through another secondary fiber rings to several hub sites a piece. A hub site may actually be located inside the same building as the Head End equipment that it is connected to.

From the hub sites more fiber optic cables reach out even closer to the subscribers. These are known as distribution fibers. However these fibers are not ringed like the others. They have no redundancy built in to them. If an active distribution fiber is damaged there is no alternate path for forward and return signals to take and a service outage results. Distribution fibers connect to fiber optic nodes where light signals are converted into RF signals for distribution to subscribers on coaxial cables.

b. Discuss on Telephone Communication and competition.

Answer:

The telecommunications industry is in a state of transformation and becoming ever more complex. Fast changes in the communication landscape, resulting from technological change and the development of new services, are affecting the core business of telecommunication operators. The industry is to refocus on emerging higher value-added services, which often require significant investment in new network technologies, and balancing this against shareholders' focus on short term performance.

The following main trends are evident in the telecommunications sector:

1. **Convergence of traditionally different technologies and industries resulting in the blurring of market definitions:**

Primarily, the word "convergence" was used to describe a wide range of phenomena from the increased interaction of complementary technologies (e.g. fixed and mobile) to the use of a single network to carry a range of media such as communications and entertainment. In 2006, one

distinguishes not only technological convergence but also Industrial convergence when industries with different backgrounds are competing in new markets as a result of common platforms, networks and services with similar functionalities. This happens both at the horizontal level, where traditionally separated industries compete with each other, e.g. cable and telecommunications operators offering VoIP, and at the vertical level, where new partnerships emerge, bringing about the need for new business models and sometimes trends towards vertical integration e.g. application providers' or end-user device producers' move to adjacent areas. As a result, it is obvious that bundling offers should be provided by a telecommunications operator to sustain in the current competitive environment. Furthermore, for a successful telecommunications operator it is not enough to offer only bundling offers. Business expansion through M&A domestically and internationally as well as gaining entry into adjacent areas, e.g. into mobile advertising, are required to ensure competitiveness.

2. Increasingly global nature of some types of technology services:
Increased penetration of broadband provides a platform for services to be soldon aglobal basis. This phenomenon challenges the regulatory framework, especiallythe need to regulate at a retail level. In Europe, industry globalization stimulatesthe discussion about the necessity of a single European telecommunicationsregulator.

3. Movement towards using Internet Protocol (IP) in the transmission of allservices, together with all the benefits (and problems) that it provides: Telecommunicationsoperators around the world are replacing the multiple networks and based on legacy technologies with a single network based on an IP core. Marketdemand on converged products is accelerating this trend.

4. Strong growth in bandwidth demand and challenge of serving that demandwith aged infrastructure:
The utility of the Internet is currently limited by accessbandwidth. The limits of the existing copper access infrastructure have alreadybeen reached at some points. Operators around the world are moving to increasethe bandwidth through deployment of fiber to the customer premises.These projects are usually very expensive and require a reasonable degree ofconfidence that the investment will be recovered.

5. Changing structure of the industry, consolidation in some areas and fragmentationin others:

Consolidation is often seen as a major force in the industry.In comparison to the US, the European operators are significantly weakerbased on subscribers' numbers and revenues. The continuation of the consolidationtrends are to be expected in Europe. Regarding the fragmentation,market liberalization and in particular local loop unbundling

obligations area driving force in Europe to increase fragmentation of the telecoms market,which is a potential threat to investment.All of these trends have an enormous impact on the regulatory implications inthe telecommunications industry. In this chapter, the general structure and technologicaldevelopments in the telecommunications industry worldwide is presented.Then attention is directed to the current state of telecommunications around theworld. The reforming processes and their reasons are presented. Furthermore, theWTO agreements on telecommunications, as the main international regulatoryframework in this sector, are described. The most interesting examples of sectorreforming around the world are explained. The historical developmentof telecommunications regulation in the centrally planned system is presented,giving an idea, where the liberalization processes in the transition countries werestarted. Then the focus is shifted to the Russian telecommunications sector, whichis of special interest in this research, and an in depth analysis of the current statetakes place.

Q.6 a. Discuss on Telephone Communication and competition.

Answer:

Since the 1920s, traditional wireline transmission technology has meant the twisted pair of copper wires, which still connect the customer premises to a remote terminal or a central office (first switch). Copper wire pairs are well suited to carry voice, but they have rather limited capacity. However, due to high teledensity in developed countries, PSTN has long served as a primary access network to the Internet, through dialup modems or leased telephone lines. Data rates vary between 2.4 and 56 Kbps per connection depending on the quality of the analogue copper telephone line, whether or not the network operator’s central office switch is digital, whether the switches are clock synchronized, and whether the switches are connected via modern media like fiber or microwave.

Another possibility to increase capacity of PSTN network was upgrade to ISDN. This requires a digital network to the user premises, and thus investment in equipment both at the central office and at the user end. According to the costassessment, if already installed, ISDN is still an alternative for Internet access inareas where more advanced services such as DSL, cable networks or fiber networkscannot be used. However, if ISDN is not already installed, DSL appearsto be a better investment since it facilitates cheaper and higher quality broadbandservice. ISDN and some DSL systems are not designed to be used over thesame infrastructure.

Users that have upgraded from PSTN to ISDN may have todowngrade again, before upgrading to DSL. The ISDN equipment supports automaticopening of new channels as needed when the traffic increases, thereby providingfrom 64 to 1.5/2 Mbps connections.

Even in the best of circumstances with 56/64 Kbps maximum bandwidth perconnection at voice tariffs, dialup systems or ISDN systems are not able to offercompetitive broadband services.

Digital Subscriber Line (DSL)

DSL includes a family of technologies which provide a digital connection in anunused part of the frequency spectrum of the copper wire subscriber line in thetelephone network. This technology provides a significant enhancement of theinstalled PSTN base and protects the value of the copper network. Usually, thisis accomplished by installing a simple remote DSL unit at the subscriber's siteand a DSL rack at the central office building. In this basic configuration, the systemis rather simple and economical, as it is not necessary to deploy new access lines.

The bandwidth that DSL systems can provide has been increasing and there arenow systems installed that can provide 256 Kbps–1.2 Mbps upstream and 512 Kbps–28 Mbps downstream. The limits are set by the attenuation of signals at higherfrequencies, which depends on the quality of the copper lines and their installation.The distance between the subscriber and the exchange usually has to be inrange 0.3–5 km, depending on data rates.

ADSL (Asymmetric Digital Subscriber Line) is the most widely deployedDSL technology, where the data channels use one frequency band for a low speedupstream channel (25–138 KHz) and another for a high-speed downstream channel(139 KHz–1.1 MHz). Data transmission speeds vary mainly based on the distancebetween the subscriber and the central office. Some users cannot be reached byADSL due to their distance from the central office. In Denmark in 2004, forexample, about 5% of households could not be reached by any ADSL servicesand only 70% of the population could access a 2 Mbps connection. More recentADSL standards, such as ADSL2 and ADSL2+ promise improved capacity andcoverage.

VDSL (Very high-rate Digital Subscriber Line) is similar to ADSL but optimizedfor shorter distances, 300–1,500 m. Existing systems offer capacities up to52 Mbps by including more high frequency bandwidth in the copper cables andby deploying more efficient modulation. To extend the range, VDSL requiresdeployment of a fiber optical backbone network to the curb, block or neighbourhood (street cabinet), and a power supply for the street cabinet, which is notrequired by PSTN. This increases

deployment costs significantly. It has also otherlimitations, including interference from ADSL and AM radio services. VDSL2, astandard under development, promises to achieve bit rates of up to 100 Mbps.

b. Discuss on the various architectural challenges of 3G & 4G networks.

Answer:

3G technology which is founded on the ITU or International Telecommunication Union group of a standard which belongs to the IMT-2000 use W-CDMA technology. It allows operators to provide users a bigger range of the latest services, as it gets bigger network capacity via heightened spectral efficiency. The included services are video calls, wide-area wireless voice telephone and broadband wireless information all included within the mobile environment. Whereas 4G technology which was started within cable television industry in 2009 which make users to explore new downloading speeds and capabilities. The utilization of LTE mobile broadband technology is an opportunity for the corporation to expand itshorizons into 4G territory, upstaging current 3G capabilities.The necessity for 4G networks is associated with the increased utilization of data websites, which require tremendous bandwidth in order to be used successfully.

3G stands for 3rd Generation while 4G stands for 4th Generation:3G is currently the world's best connection method when it comes to mobile phones,and especially mobile Internet. 3G stands for 3rd generation as it is just that in termsof the evolutionary path of the mobile phone industry. 4G means 4th generation. Thisis a set of standard that is being developed as a future successor of 3G in the very nearfuture.

Architectural difference: both the Figures below provide the key components ofthese two architectures.

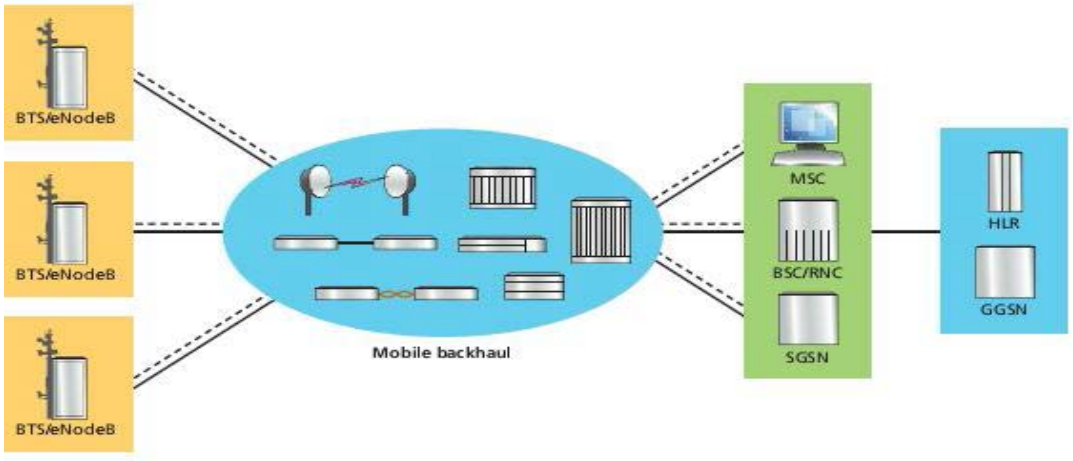


Fig: 3G Architecture

Several key differences in a LTE network enable more flexibility in itsarchitecture than in a 3G. A functional representation of 3G network architecture isshown in above figure. In this network, the Base Terminal Station (BTS)/NodeBsaggregate the radio access network (RAN) traffic and transport it over a mobilebackhaul network to the Radio Network Controllers (RNCs)/Base Station Controller(BSCs). Typically this transport is over T1/E1 copper facilities. The bearer traffic from a number of RNCs/BSCs ismultiplexed at the Mobile Telephone Switching Office (MTSO) and then transportedvia direct tunneling to the Gateway GPRS Serving Nodes (GGSNs) in the hub datacenter. This transport is normally over a SDH/SONET ring or a carrier Ethernetnetwork. This tiered aggregation and transport structure lends itself to a point-to-pointnetwork topology to minimize both the amount of aggregation equipment requiredand the transport backhaul expense.

In a 3G pre-Release 8 network, the RNCs and SGSNs are designed to supportboth the signalling and bearer plane processing and bandwidth requirements. Theemphasis in the design for these network elements is in providing the processingnecessary to support the high subscriber counts and Packet Data Protocol PDPcontexts as the bandwidth requirements for delivery of the initial 3G data services(text and e-mail) were not significant. Since the data services that typically ran overthese systems is not real-time neither QoS nor latency was an issue. Therefore, theplacement of these elements is usually in locations that primarilymeet the PDPcontext and network latency requirements. Thus, the current 3G packet corearchitecture is typically a centralized network design with the GGSNs deployed inmajor data enters, and all the data services are backhauled from the SGSNs whichare strategically deployed in regional serving offices. Because the aggregatebandwidth for these services did not increase significantly until the past few years, thebackhaul transport costs were manageable and could be supported with leased TDMor lower rate OC-n/STM-n interfaces.

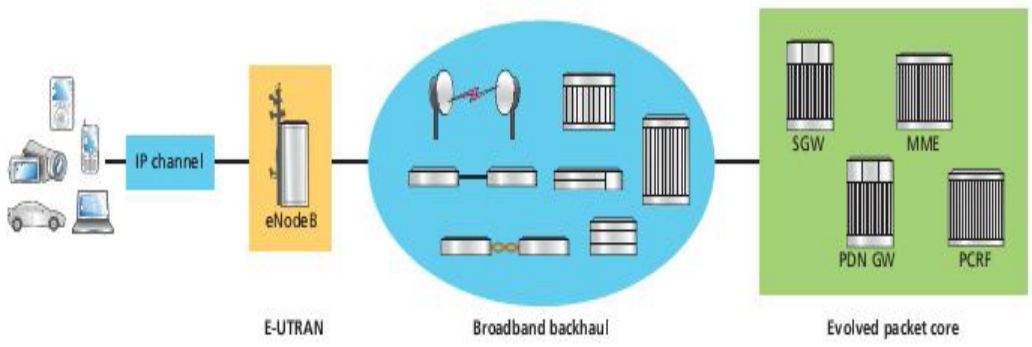


Fig. 4G Architecture

Above fig. provides a high-level functional representation of a LTE/4G network.This network is composed of three major sub-networks: the Evolved UniversalTerrestrial Radio Access Networks (eUTRAN), which provides the air interface andlocal mobility management of the user equipment (UE), the evolved

packet core(EPC), and the broadband backhaul network that provides the aggregation of celltraffic and transport back to the EPC. The 3GPP LTE standards defined the EPC as aset of logical data and control plane functions that can be implemented either asintegrated or as separate network elements. The four EPC functions are: the ServingGateway (SGW), the Packet Data Network Gateway (PGW) that supports the data orbearer traffic; and the Mobility Management Entity (MME) and the Policy Chargingand Rules Function (PCRF) which support the dynamic mobility management andpolicy control traffic. The backhaul network either is owned by the wireless operatoror is leased from a third party backhaul access provider. Any number of transporttechnologies can be used for backhaul including packet microwave, packet optical,Carrier Ethernet, IP/MPLS, GPON and xDSL.

3G technologies are in widespread use while 4G compliant technologies are still inthe horizon: The biggest difference between the two is in the existence of complianttechnologies. There are a bunch of technologies that fall under 3G, includingWCDMA, EV-DO, and HSPA among others. Although a lot of mobile phonecompanies are quick to dub their technologies as 4G, such as LTE, WiMax, andUMB, none of these are actually compliant to the specifications set forth by the 4Gstandard. These technologies are often referred to as Pre-4G or 3.9G.

Specifications	**3G**	**4G**
Frequency Band	1.8- 2.5 GHz	2-8 GHz
Bandwidth	5-20 MHz	5- 20 MHz
Data Rate	Up To 2 Mbps	Up to 20 Mbps or more
Access	Wideband CDMA	Multi-carrier-CDMA or OFDM (TDMA)
FEC	Turbo-codes	Concatenated-codes
Switching	Circuit/Packet	Packet
Data Throughput	Upto 3.1 Mbps	3to5mbps but potential estimated at a range of 10 to 300 Mbps
Peak Upload Rate	50 Mbit/s	50 Mbit/s
Peak Download Rate	100 Mbit/s	1 Gbit/s
Network Architecture	Wide Area Cell Based	Integration of wireless LAN and Wide area.
Services and Applications	CDMA 2000, UMTS, EDGE etc	Wimax2 and LTE-Advance
Forward error correction (FEC)	3G uses Turbo codes for error correction	Concatenated codes are used for error correctionsin 4G
Frequency Band	1.8 – 2.5GHz	2 – 8GHz

Q.7 a. What do you mean by Mobile commerce? Justify, how Mobile Commerce is beyond e-commerce?

Answer:

Throughout the 1990s the introduction of the internet and ecommerce reshaped the way that businesses do business and the way that consumers interact with businesses. Businesses took the opportunity to automate many processes that before would have been handled manually, from ordering to customer service. One clear example is the way that spending on advertising has begun to shift from traditional off-line media to online and digital media as advertisers have seen an opportunity to better connect with theirtarget audience. IBM forecasts 22% growth in mobile, digital and interactive advertising formats between 2006 and 2010 against 4% growth in traditional advertising formats.

Mobile commerce, often referred to as m-commerce, builds on the advances made by ecommerce (such as automated, electronic processes) but makes interaction available to a wider audience in a more personalised way. Like any emerging market, there are many Mobile Commerce Overviews: why mobile is changing the way business happens & how to use this technology? Some organisations adopt an aggressive policy and want to get something moving as fast as possible whilst others adopt a wait-and-see approach. As a result, proprietary solutions are developed that make integration with existing systems or by multiple partners complex and costly. At the same time, multiple solutions create a complex landscape for businesses and consumers alike - making it difficult to choose which solution to use.

The other difference between ecommerce and m-commerce is the opportunity to connect information with objects in a more direct way than has been possible until now. This is the world predicted by the *Internet of Things*, a report published by the International Telecommunications Union (ITU) in 2005, where objects have a life and history of their own that we can use to our advantage. The mobile phone can be the tool that connects the physical and virtual world. At the base of this vision is the ability to identify objects uniquely. In this context, mobile phones are enablers of an *Internet of Things*. What is special about mobile phones is the fact that they have massive adoption globally. Many more people have access to a mobile phone that to a computers and this means that m-commerce has the opportunity to connect not just big businesses but also small business and consumers on a massive scale. In this sense, mobile phones have the potential to bridge the digital divide and allow organisations and individuals to reach out to one another more easily than ever before.

We’re moving into a world where digital goods are becoming as important as physical goods. Due to the internet, value is created not just by goods

themselves but by the exchanges of those goods. Organisations that can facilitate that exchange (for example by creating communities of users with similar interests) have a significant competitive advantage in this networked world. Furthermore, these communities can be leveraged to increase sales of physical goods through more engaged users. We know we can't predict the future. This document is a way to reflect on the future together and to stimulate ideas about how to shape it.

Key actors in mobile commerce

Actor	Stakeholders	Expected roles
Consumers through mobilephones		Interact with businesses
Companies	Manufacturers Distribution / Wholesalers Logistics / Transporters (3PL) Retailers	Relevant applications, provide content and transact with consumers
Mobile Industry & Service Providers	Mobile Phone Manufacturers Mobile Network Operators/Carriers Service Providers (IT companies) Marketing Agencies	Develop technology • Device • Data Source • Network
Enablers & Regulators	Government Agencies Standards Organisations Consumer / user associations	Provide regulations, standards and guidelines

b. Discuss the role of TRAI in India.

Answer:

The role of the TRAI is to create an environment conducive to the growth of telecom sector, and safeguard a customer's interest and ensure that he gets the QoS that he has contracted for. As regards the Quality of Service, the TRAI has the substantive role in laying down standards, assessment of QoS, and action for improvements. It has, therefore, the following main functions to perform in this regard.

1. Setting Quality of Service Standards
2. Monitoring
3. Enforcement

The Telecom Regulatory Authority of India Act 1997 sets out the powers and functions of the Authority. The relevant powers and functions that directly or indirectly relate to QoS are as follows :-

• Ensure compliance of terms and conditions of licenses (including QoS standards)
• Protect the interest of the consumers of telecommunication services.
• Monitor the Quality of Service and conduct periodical survey of such provided by the service providers.
• Inspect the equipment used in the network and recommend the type of equipment to be used by service providers.
• The Authority shall have the power to issue such directions to service providers as it may consider necessary for proper functioning by service providers.
• If a dispute arises, in respect of quality of telecommunication services and interest of consumers among service providers or between service providers and a group of consumers, such disputes shall be adjudicated by a bench constituted by the Chairperson and such bench shall consist of two members.
• If any person willfully fails to comply with the orders of the Authority or any order of the High Court, as the case may be, he shall be punishable with fine which may extend to one lakh rupees and in case of a second or subsequent offence with fine which may extend to two lakh rupees and in the case of continuing contravention with additional fine which may extend to two lakh rupees for every day during which the default continues.
• If a person violates directions of the Authority, such person shall be punishable with fine which may extend to one lakh rupees and in case of second or subsequent offence with fine which may extend to two lakh rupees and in the case of continuing contravention with additional fine which may extend to two lakh rupees for every day during which the default continues.

Quality of Telecommunication Service is the end result of network designing, planning, engineering, operation and maintenance and the management of services delivered by the use of network and human resources to a customer. It depends on technical standards of various network components, trafficability, serviceability, accessibility, etc, and service management functions. The ITU-T defines the Quality of Service as: "the collective effort of service performance which determines the degree of satisfaction of user of all the services." The degree of consumer satisfaction bears a direct relation with Quality of Service where good Quality of Service gives better customer satisfaction and bad Quality of Service leads to dissatisfaction of the consumers. In a monopoly situation, a customer has no choice but to accept the quality of service of whatever level of standard that the monopoly operator provides. However, by bringing in competition and giving free choice to select an operator, the market share of an operator would largely depend on the quality of service and the price. More discerning customers might even opt to pay a higher

price for a better quality of service. Consumer complaints represent the negative perception of Quality of Service.

Reference Books

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