Centre for Aerospace & Defence Laws (CADL)
Directorate of Distance Education
NALSAR University of Law, Hyderabad

Course Material

P.G. Diploma in GIS and Remote Sensing Laws

1.2.5. Satellite Technology and Telecommunication Laws

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First Edition: 2021

(For private circulation only)

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MODULE - I

INTRODUCTION TO SATELLITE TECHNOLOGY, SATELLITE COMMUNICATIONS AND TELECOMMUNICATIONS

Introduction:

In general terms, a satellite is a smaller object that revolves around a larger object in space. For example, moon is a natural satellite of earth.

We know that Communication refers to the exchange (sharing) of information between two or more entities, through any medium or channel. In other words, it is nothing but sending, receiving and processing of information.

If the communication takes place between any two earth stations through a satellite, then it is called as satellite communication. In this communication, electromagnetic waves are used as carrier signals. These signals carry the information such as voice, audio, video or any other data between ground and space and vice-versa.

Soviet Union had launched the world's first artificial satellite named, Sputnik 1 in 1957. Nearly after 18 years, India also launched the artificial satellite named, Aryabhata in 1975.

Need of Satellite Communication

The following two kinds of propagation are used earlier for communication up to some distance.

Ground wave propagation − Ground wave propagation is suitable for frequencies up to 30MHz. This method of communication makes use of the troposphere conditions of the earth.

Sky wave propagation − The suitable bandwidth for this type of communication is broadly between 30–40 MHz and it makes use of the ionosphere properties of the earth.

The maximum hop or the station distance is limited to 1500KM only in both ground wave propagation and sky wave propagation. Satellite communication overcomes this limitation. In this method, satellites provide communication for long distances, which is well beyond the line of sight.

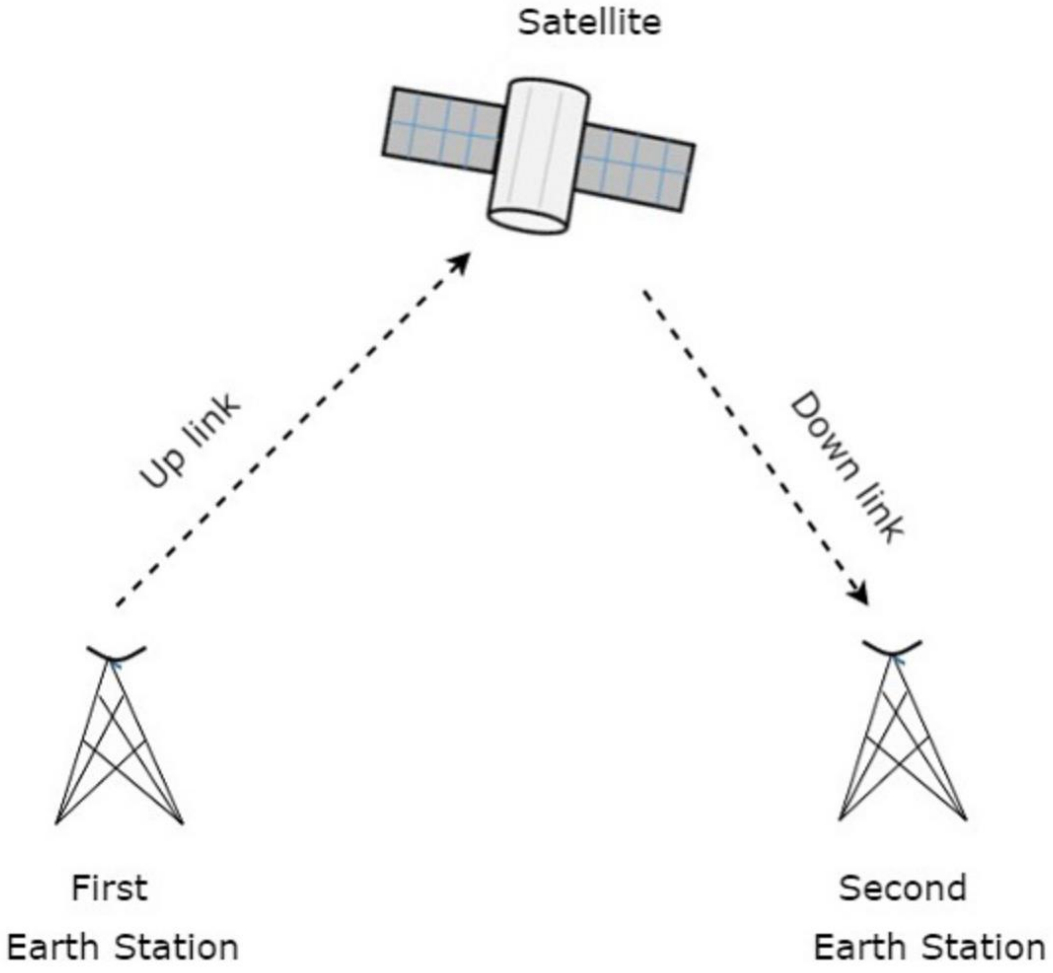
Since the satellites locate at certain height above earth, the communication takes place between any two earth stations easily via satellite. So, it overcomes the limitation of communication between two earth stations due to earth’s curvature.

How a Satellite Works

A satellite is a body that moves around another body in a particular path. A communication satellite is nothing but a microwave repeater station in space. It is helpful in telecommunications, radio and television along with internet applications.

A repeater is a circuit, which increases the strength of the received signal and then transmits it. But, this repeater works as a transponder. That means, it changes the frequency band of the transmitted signal from the received one.

The frequency with which, the signal is sent into the space is called as Uplink frequency. Similarly, the frequency with which, the signal is sent by the transponder is called as Downlink frequency. The following figure illustrates this concept clearly.



The transmission of signal from first earth station to satellite through a channel is called as uplink. Similarly, the transmission of signal from satellite to second earth station through a channel is called as downlink.

Uplink frequency is the frequency at which, the first earth station is communicating with satellite. The satellite transponder converts this signal into another frequency and sends it down to the second earth station. This frequency is called as Downlink frequency. In similar way, second earth station can also communicate with the first one.

The process of satellite communication begins at an earth station. Here, an installation is designed to transmit and receive signals from a satellite in an orbit around the earth. Earth stations send the information to satellites in the form of high powered, high frequency (GHz range) signals.

The satellites receive and retransmit the signals back to earth where they are received by other earth stations in the coverage area of the satellite. Satellite's footprint is the area which receives a signal of useful strength from the satellite.

Pros and Cons of Satellite Communication

In this section, let us have a look at the advantages and disadvantages of satellite communication.

Following are the advantages of using satellite communication:

- Area of coverage is more than that of terrestrial systems
- Each and every corner of the earth can be covered
- Transmission cost is independent of coverage area
- More bandwidth and broadcasting possibilites

Following are the disadvantages of using satellite communication −

- Launching of satellites into orbits is a costly process.
- Propagation delay of satellite systems is more than that of conventional terrestrial systems.
- Difficult to provide repairing activities if any problem occurs in a satellite system.
- Free space loss is more
- There can be congestion of frequencies.

Applications of Satellite Communication

Satellite communication plays a vital role in our daily life. Following are the applications of satellite communication −

- Radio broadcasting and voice communications
- TV broadcasting such as Direct To Home (DTH)
- Internet applications such as providing Internet connection for data transfer, GPS applications, Internet surfing, etc.
- Military applications and navigations
- Remote sensing applications
- Weather condition monitoring & Forecasting

We know that the path of satellite revolving around the earth is known as orbit. This path can be represented with mathematical notations. Orbital mechanics is the study of the motion of

the satellites that are present in orbits. So, we can easily understand the space operations with the knowledge of orbital motion.

Orbital Elements

Orbital elements are the parameters, which are helpful for describing the orbital motion of satellites. Following are the orbital elements.

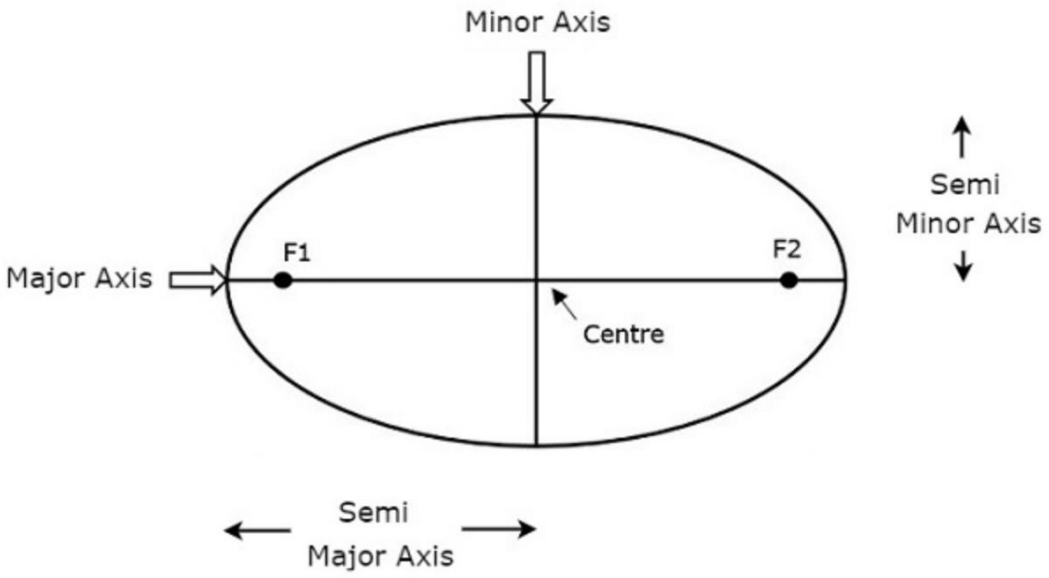
- Semi major axis
- Eccentricity
- Mean anomaly
- Argument of perigee
- Inclination
- Right ascension of ascending node

The above six orbital elements define the orbit of earth satellites. Therefore, it is easy to discriminate one satellite from other satellites based on the values of orbital elements.

Semi major axis

The length of Semi-major axis (a) defines the size of satellite's orbit. It is half of the major axis. This runs from the center through a focus to the edge of the ellipse. So, it is the radius of an orbit at the orbit's two most distant points.

Both semi major axis and semi minor axis are represented in above figure. Length of semi major axis (a) not only determines the size of satellite's orbit, but also the time period of



revolution.

If circular orbit is considered as a special case, then the length of semi-major axis will be equal to radius of that circular orbit.

Eccentricity

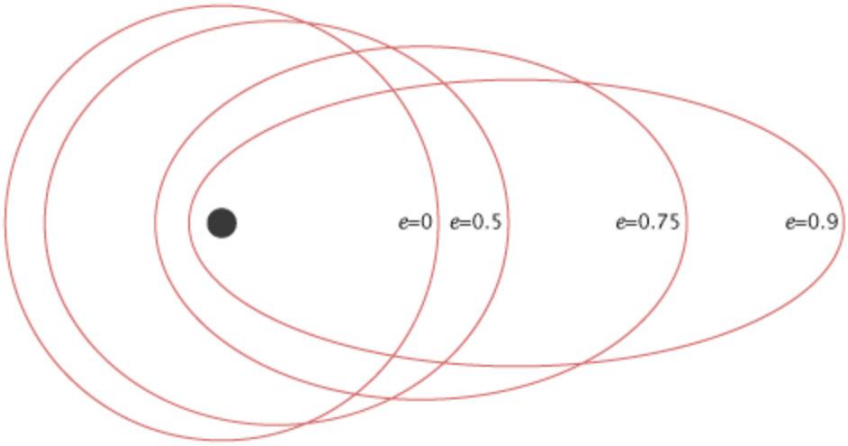
The value of Eccentricity (e) fixes the shape of satellite's orbit. This parameter indicates the deviation of the orbit's shape from a perfect circle.

If the lengths of semi major axis and semi minor axis of an elliptical orbit are a & b, then the mathematical expression for eccentricity (e) will be

$$e = \frac{\sqrt{a^2 - b^2}}{a}$$

The value of eccentricity of a circular orbit is zero, since both a & b are equal. Whereas, the value of eccentricity of an elliptical orbit lies between zero and one.

The following figure shows the various satellite orbits for different eccentricity (e) values



In above figure, the satellite orbit corresponding to eccentricity (e) value of zero is a circular orbit. And, the remaining three satellite orbits are of elliptical corresponding to the eccentricity (e) values 0.5, 0.75 and 0.9.

Mean Anomaly

For a satellite, the point which is closest from the Earth is known as Perigee. Mean anomaly (M) gives the average value of the angular position of the satellite with reference to perigee.

If the orbit is circular, then Mean anomaly gives the angular position of the satellite in the orbit. But, if the orbit is elliptical, then calculation of exact position is very difficult. At that time, Mean anomaly is used as an intermediate step.

Argument of Perigee

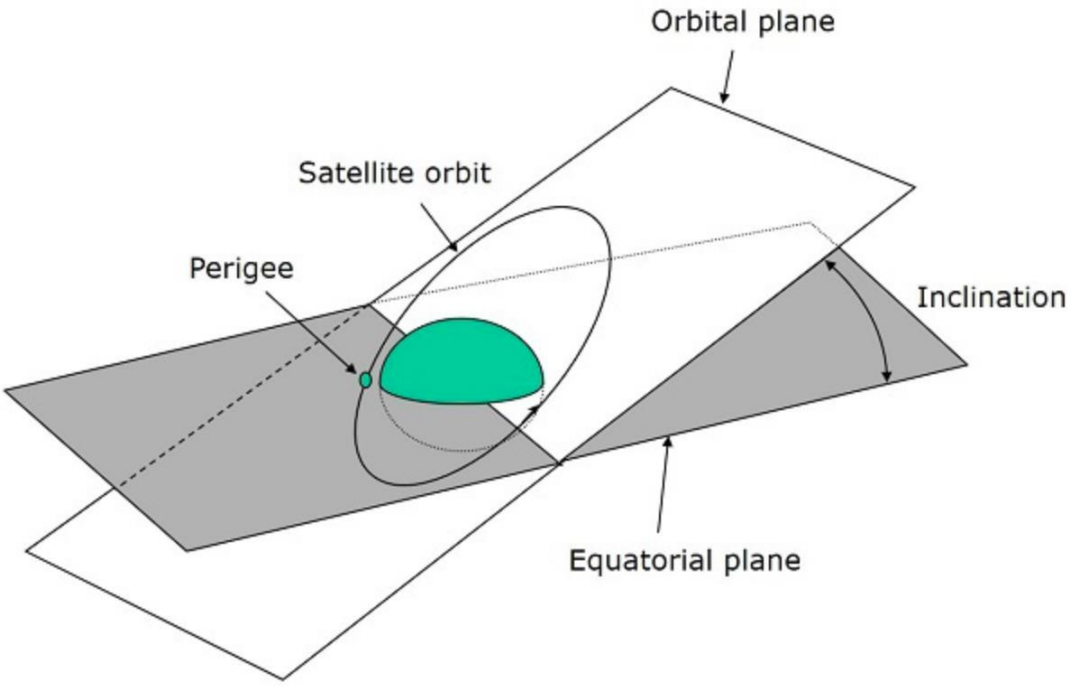
Satellite orbit cuts the equatorial plane at two points. First point is called as descending node, where the satellite passes from the northern hemisphere to the southern hemisphere. Second point is called as ascending node, where the satellite passes from the southern hemisphere to the northern hemisphere.

Argument of perigee (ω) is the angle between ascending node and perigee. If both perigee and ascending node are existing at same point, then the argument of perigee will be zero degrees

Argument of perigee is measured in the orbital plane at earth's center in the direction of satellite motion.

Inclination

The angle between orbital plane and earth's equatorial plane is known as inclination (i). It is measured at the ascending node with direction being east to north. So, inclination defines the orientation of the orbit by considering the equator of earth as reference.



There are four types of orbits based on the angle of inclination.

- Equatorial orbit − Angle of inclination is either zero degrees or 180 degrees.
- Polar orbit − Angle of inclination is 90 degrees.
- Prograde orbit − Angle of inclination lies between zero and 90 degrees.
- Retrograde orbit − Angle of inclination lies between 90 and 180 degrees.

Right Ascension of Ascending node

We know that ascending node is the point, where the satellite crosses the equatorial plane while going from the southern hemisphere to the northern hemisphere.

Right Ascension of ascending node (Ω) is the angle between line of Aries and ascending node towards east direction in equatorial plane. Aries is also called as vernal and equinox.

Satellite's ground track is the path on the surface of the Earth, which lies exactly below its orbit. The ground track of a satellite can take a number of different forms depending on the values of the orbital elements.

Orbital Equations

In this section, let us discuss about the equations which are related to orbital motion.

Forces acting on Satellite

A satellite, when it revolves around the earth, it undergoes a pulling force from the earth due to earth's gravitational force. This force is known as Centripetal force (F1) because this force tends the satellite towards it.

Mathematically, the Centripetal force (F1) acting on satellite due to earth can be written as

$$F_1 = \frac{GMm}{R^2}$$

Where,

- G is universal gravitational constant and it is equal to 6.673 x 10-11 N·m2/kg2.
- M is mass of the earth and it is equal to 5.98 x 1024 Kg.
- m is mass of the satellite.
- R is the distance from satellite to center of the Earth.

A satellite, when it revolves around the earth, it undergoes a pulling force from the sun and the moon due to their gravitational forces. This force is known as Centrifugal force (F2) because this force tends the satellite away from earth.

Mathematically, the Centrifugal force (F2) acting on satellite can be written as

$$F_2 = \frac{mv^2}{R}$$

Where, v is the orbital velocity of satellite.

Orbital Velocity

Orbital velocity of satellite is the velocity at which, the satellite revolves around earth. Satellite doesn't deviate from its orbit and moves with certain velocity in that orbit, when both Centripetal and Centrifugal forces are balance each other.

So, equate Centripetal force (F1) and Centrifugal force (F2).

$$\frac{GMm}{R^2} = \frac{mv^2}{R}$$

$$=> \frac{GM}{R} = v^2$$

$$=> v = \sqrt{\frac{GM}{R}}$$

Therefore, the **orbital velocity** of satellite is

$$v = \sqrt{\frac{GM}{R}}$$

Where,

- G is gravitational constant and it is equal to 6.673 x 10-11 N·m2/kg2.
- M is mass of the earth and it is equal to 5.98 x 1024 Kg.
- R is the distance from satellite to center of the Earth.

So, the orbital velocity mainly depends on the distance from satellite to center of the Earth (R), since G & M are constants.

CONCEPTUAL FRAMEWORK FOR INTERNATIONAL TELECOMMUNICATION LAWS

MEANING AND CONCEPT

The meaning of communication is ***the imparting or exchanging of information by speaking, writing, or using some other medium.***

Modern means of communications connect all corners of the earth. Internationally the International Telecommunication Union (ITU) is in place to regulate Telecommunications. ITU is the leading United Nations agency for information and communication technology issues, and the global focal point for governments and the private sector in developing networks and services.

Until the mid-19th century, single inter-governmental agreements were used to regulate various aspects in conjunction with telegraphy, the foundation stone of modern telecommunication. Out of the necessity to find and develop international S3 1 4 standard and to provide necessary technical assistance the International Telegraphic Union - the predecessor of today's International Telecommunication Union (ITU) -was founded as a specialized body in 1865. In 1932 it changed its name to the current one and was later made an agency under the UN umbrella in 1947, retaining its specialized character until today.

The International Telecommunication Union (together with the Universal Postal Union- UPU) belongs to the lesser known UN agencies and seems to be the Sleeping Beauty among international organizations.

Following the 1992 Additional Plenipotentiary Conference, which took place in Geneva, the ITU was dramatically remodeled in order to provide it with greater flexibility to adapt to today & increasingly complex, Telecommunications and related industries are undergoing continuous technological and legal change, particularly as businesses move to the cloud. It is crucial to have an attorney who understands the law, the technology, and the evolving business models.

As the worldwide explosion of information technology, including computing, telecommunications, and networks, is changing the way we conduct business, government, and education, it promises to change the way we fight. Information technology is diffusing into virtually all military weapons, communications, and command and control systems, as well as the civilian systems that support modern industrial (or post-industrial) economies and their military efforts. Some of the new ways of fighting have been labeled "information warfare," which has been broadly defined as "any action to deny, exploit, corrupt, or destroy the enemy's information and its functions; protecting ourselves against those actions; and exploiting our own military information functions. As such, information warfare includes both new techniques, such as computer intrusion and disruption and telecommunications spoofing, and old ones, such as ruses, camouflage, and physical attacks on observation posts and lines of communication. Some have suggested that information warfare could usher in an era of largely bloodless conflict; battle would occur in "cyberspace," as U.S. "information warriors" would be able to disable important enemy command and control or civilian infrastructure systems with little, if any, loss of life. Others have projected futures of conflict in which the bloodletting is only enhanced by improved and broadened communications. Still

others have suggested that information technology may contribute to the development of new forms of social organization, along with new forms of conflict.

Whatever the development and diffusion of information technology mean for the future of warfare, it is apparent that some of the new forms of attack that information technology enables may be qualitatively different from prior forms of attack. The use of such tools as computer intrusion and computer viruses, for example, may take war out of the physical, kinetic world and bring it into an intangible, electronic one. These newer forms of attacks, some of which may seem to be the products of science fiction, range along continuums extending from those with no physical impact on the enemy to some that would cause grave destruction or loss of life, from those with no physical intrusion beyond national borders to those requiring traditional, military invasions, and from those affecting purely civilian targets to those hitting purely military ones. Attacks could be conducted from a distance, through radio waves or international communications networks, with no physical intrusion beyond enemy borders. Damage could range from military or civilian deaths from system malfunctions, to the denial of service of important military or governmental systems in time of crisis, to widespread fear, economic hardship, or merely inconvenience for civilian populations who depend upon information systems in their daily lives.

The following are examples-some likely, some perhaps farfetched-of attacks that countries or nongovernmental entities might pursue, or suffer, as they wage warfare in the Information Age.

• A "trap door" might be hidden in the code controlling switching centers of the Public Switched Network, causing portions of it to fail on command.

• A mass dialing attack by personal computers might overwhelm a local phone system.

• A "logic bomb" or other intrusion into rail computer systems might cause trains to be misrouted and, perhaps, crash.

• An enemy's radio and television network might be taken over electronically, and then used to broadcast propaganda or other information.

Advanced techniques such as "video morphing" could make the new broadcasts indistinguishable from the enemy's own usual broadcasts.

• A computer intruder might remotely alter the formulas of medication at pharmaceutical manufacturers, or personal medical information, such as blood type, in medical databases.

• A concerted e-mail attack might overwhelm or paralyze a significant network..

• Computer intruders might divert funds from bank computers, or corrupt data in bank databases, causing disruption or panic as banks need to shut down to address their problems.

• Computer intruders might steal and disclose confidential personal, medical, or financial information, as a tool of blackmail, extortion, or to cause widespread social disruption or embarrassment.

• A "computer worm" or "virus" could travel from computer to computer across a network, damaging data and disrupting systems.

• An "info blockade" could permit little or no electronic information to enter or leave a nation's borders.

• A nation's command and control infrastructure could be disrupted, with individual military units unable to communicate with each other, or with a central command.

• Stock or commodity exchanges, electric power grids and municipal traffic control systems, and, as is frequently suggested, air traffic control or navigation systems could be manipulated or disrupted, with accompanying economic or societal disruption, physical destruction, or loss of life.

Even when legal norms seem well-established in theory, patterns of contrary state practice may contribute to the decline or alteration of the principles. Just as popular disregard for a trademark, such as cellophane, aspirin, or thermos, can result in that trademark losing its legal force and becoming a generic term, violation of an ostensible customary legal principle can cause its demise. Law based upon actors' recognition that it is indeed law loses force when those actors no longer recognize it. In considering international law, particularly in the context of national security, it is important to stress some distinctions between international and domestic law. Unlike most nations' domestic law, international law is not a body of law created by legislatures and courts and enforced by police through a court system. Rather, international law is generally established by agreement, either explicit or tacit, among the parties who will be bound by it, much as private parties enter into contracts with each other. Although international legal forums, such as the International Court of Justice, do exist, their enforcement mechanisms are limited at best; no international police force walks the world beat. Consequently, a country that is willing to accept the political and diplomatic consequences that may ensue when it defies international law may do so. As a crude example, the Revolutionary Islamic government of Iran blatantly disregarded the traditional sovereignty and sanctuary of the U.S. Embassy in Tehran in the late 1970s and early 1980s, but if it had any concerns about external reactions, those concerns seemed more directed at the threat of economic sanctions or U.S. military action, not at some global police force. It seems likely that nations will be least likely to follow the dictates of international law where those dictates endanger or conflict with the pursuit of their fundamental interests, including national security.

HISTORY AND DEVELOPMENT OF INTERNATIONAL TELECOMMUNICATIONS:-

The Legal Challenges of Information Warfare:-

From a legal perspective, the older forms of information warfare pose few unanswered questions under customary or treaty law. For example, the use of camouflage to elude enemy observers was old even when Mac duff and his men brought Burnham Wood to Duns inane; Ancient Greek soldiers blinded their foes by reflecting the sun off their shields; and both sides attempted to cut each others' telegraph lines during the U.S. Civil War, and there is little doubt of these actions' propriety. Similarly, wartime physical attacks against military observation systems, from lookout posts to radar stations, are unquestionably acceptable under international law. But the development of information technology, specifically computers, telecommunications, and networks, makes it possible for adversaries to attack each other in new ways and with new forms of damage, and may create new targets for attack. Attackers may use international networks to damage or disrupt enemy systems, without ever physically entering the enemy's country, and countries' dependence upon electronic or other information-based systems may make those systems particularly attractive targets. Furthermore, the dual-use nature of many information systems and infrastructures may blur the distinction between military and civilian targets.

Such new attacks may pose problems for international law because law is inherently conservative; technological change may enable new activities that do not fit within existing legal categories, or may reveal contradictions among existing legal principles. Information warfare challenges existing international law in three primary ways.

First, the sort of intangible damage that such attacks may cause may be analytically different from the physical damage caused by traditional warfare. The kind of destruction that bombs and bullets cause is easy to see and understand, and fits well within longstanding views of what war means. In contrast, the disruption of information systems, including the corruption or manipulation of stored or transmitted data, may cause intangible damage, such as disruption of civil society or government services that may be more closely equivalent to activities such as economic sanctions that may be undertaken in times of peace.

Second, the ability of signals to travel across international networks or through the atmosphere as radio waves challenges the concept of national, territorial sovereignty. Sovereignty, which has been a fundamental principle of international law since the Treaty of Westphalia of 1648, holds that each nation has exclusive authority over events within its borders.24 Sovereignty may not be suited to an increasingly networked, or "wired" world, as signals traveling across networks or as electromagnetic waves may cross international borders quickly and with impunity, allowing individuals or groups to affect systems across the globe, while national legal authority generally stops at those same borders. Furthermore, the intangible violation of borders that signals may cause may not be the sort of violation traditionally understood to be part of a military attack. Third, just as information warfare attacks may be difficult to define as "peace" or "war," it may be hard to define their targets as military (and thus generally legitimate targets) or civilian (generally forbidden). Furthermore, the intangible damage the attacks cause may not be the sort of injuries against which the humanitarian law of war is designed to protect noncombatants. Graphic representations may be helpful in understanding the analytical continuums along which information attacks may occur.

The history of telecommunication began with the use of smoke signals and drums in Africa, the Americas and parts of Asia. In the 1790s, the first fixed semaphore systems emerged in Europe; however it was not until the 1830s that electrical telecommunication systems started to appear. This article details the history of telecommunication and the individuals who helped make telecommunication systems what they are today. The history of telecommunication is an important part of the larger history of communication.

Early telecommunications included smoke signals and drums. Talking drums were used by natives in Africa, New Guinea and South America, and smoke signals in North America and China. Contrary to what one might think, these systems were often used to do more than merely announce the presence of a military camp.

In 1792, a French engineer, Claude Chappe built the first visual telegraphy (or semaphore) system between Lille and Paris. This was followed by a line from Strasbourg to Paris. In 1794, a Swedish engineer, Abraham Edelcrantz built a quite different system from Stockholm to Drottningholm. As opposed to Chappe's system which involved pulleys rotating beams of wood, Edelcrantz's system relied only upon shutters and was therefore faster.[3] However semaphore as a communication system suffered from the need for skilled operators and expensive towers often at intervals of only ten to thirty kilometres (six to nineteen miles). As a result, the last commercial line was abandoned in 1880.

A very early experiment in electrical telegraphy was an 'electrochemical' telegraph created by the German physician, anatomist and inventor Samuel Thomas von Sömmerring in 1809, based on an earlier, less robust design of 1804 by Spanish polymath and scientist Francisco Salva Campillo. Both their designs employed multiple wires (up to 35) in order to visually represent almost all Latin letters and numerals. Thus, messages could be conveyed electrically up to a few kilometers (in von Somme ring's design), with each of the telegraph receiver's wires immersed in a separate glass tube of acid. An electrical current was sequentially applied by the sender through the various wires representing each digit of a message; at the recipient's end the currents electrolyzed the acid in the tubes in sequence, releasing streams of hydrogen bubbles next to each associated letter or numeral. The telegraph receiver's operator would visually observe the bubbles and could then record the transmitted message, albeit at a very low baud rate.[5] The principal disadvantage to the system was its prohibitive cost, due to having to manufacture and string-up the multiple wire circuits it employed, as opposed to the single wire (with ground return) used by later telegraphs.

The first commercial electrical telegraph was constructed in England by Sir Charles Wheatstone and Sir William Fothergill Cooke. It used the deflection of needles to represent messages and started operating over twenty-one kilometers (thirteen miles) of the Great Western Railway on 9 April 1839. Both Wheatstone and Cooke viewed their device as "an improvement to the [existing] electromagnetic telegraph" not as a new device.

On the other side of the Atlantic Ocean, Samuel Morse independently developed a version of the electrical telegraph that he unsuccessfully demonstrated on 2 September 1837.

Soon after he was joined by Alfred Vail who developed the register — a telegraph terminal that integrated a logging device for recording messages to paper tape. This was demonstrated successfully over three miles (five kilometers) on 6 January 1838 and eventually over forty miles (sixty-four kilometers) between Washington, D.C. and Baltimore on 24 May 1844. The patented invention proved lucrative and by 1851 telegraph lines in the United States spanned over 20,000 miles (32,000 kilometers).

The first successful transatlantic telegraph cable was completed on 27 July 1866, allowing transatlantic telecommunication for the first time. Earlier transatlantic cables installed in 1857 and 1858 only operated for a few days or weeks before they failed. The international use of the telegraph has sometimes been dubbed the "Victorian Internet".

The electric telephone was invented in the 1870s, based on earlier work with harmonic (multi-signal) telegraphs. The first commercial telephone services were set up in 1878 and 1879 on both sides of the Atlantic in the cities of New Haven and London. Alexander Graham Bell held the master patent for the telephone that was needed for such services in both countries. The technology grew quickly from this point, with inter-city lines being built and telephone exchanges in every major city of the United States by the mid-1880s.[9][10][11] Despite this, transatlantic voice communication remained impossible for customers until January 7, 1927 when a connection was established using radio. However no cable connection existed until TAT-1 was inaugurated on September 25, 1956 providing 36 telephone circuits.

In 1880, Bell and co-inventor Charles Sumner Tainter conducted the world's first wireless telephone call via modulated lightbeams projected by photophones. The scientific principles of their invention would not be utilized for several decades, when they were first deployed in military and fiber-optic communications. Over several years starting in 1894 the Italian inventor Guglielmo Marconi built the first complete, commercially successful wireless telegraphy system based on airborne electromagnetic waves (radio transmission). In December 1901, he would go on to established wireless communication between Britain and Newfoundland, earning him the Nobel Prize in physics in 1909 (which he shared with Karl Braun). In 1900 Reginald Fessenden was able to wirelessly transmit a human voice. On March 25, 1925, Scottish inventor John Logie Baird publicly demonstrated the transmission of moving silhouette pictures at the London department store Selfridges. In October 1925, Baird was successful in obtaining moving pictures with halftone shades, which were by most accounts the first true television pictures.[15] This led to a public demonstration of the improved device on 26 January 1926 again at Selfridges. Baird's first devices relied upon the Nipkow disk and thus became known as the mechanical television. It formed the basis of semi-experimental broadcasts done by the British Broadcasting Corporation beginning September 30, 1929.

For most of the twentieth century televisions depended upon the cathode ray tube invented by Karl Braun. The first version of such a television to show promise was produced by Philo Farnsworthand crude silhouette images were demonstrated to his family on September 7, 1927. Farnsworth's device would compete with the concurrent work of Kalman Tihanyi and Vladimir Zworykin. Zworykin's camera, based on Tihanyi's Radioskop, which

later would be known as the Iconoscope, had the backing of the influential Radio Corporation of America (RCA). In the United States, court action between Farnsworth and RCA would resolve in Farnsworth's favor. John Logie Baird switched from mechanical television and became a pioneer of color television using cathode-ray tubes.

After mid-century the spread of coaxial cable and microwave radio relay allowed television networks to spread across even large countries. The development of video telephony involved the historical development of several technologies which enabled the use of live video in addition to voice telecommunications. The concept of video telephony was first popularized in the late 1870s in both the United States and Europe, although the basic sciences to permit its very earliest trials would take nearly a half century to be discovered. This was first embodied in the device which came to be known as the video telephone, or videophone, and it evolved from intensive research and experimentation in several telecommunication fields, notably electrical telegraphy, telephony, radio, and television. The development of the crucial video technology first started in the latter half of the 1920s in the United Kingdom and the United States, spurred notably by John Logie Baird and AT&T's Bell Labs. This occurred in part, at least by AT&T, to serve as an adjunct supplementing the use of the telephone. A number of organizations believed that video telephony would be superior to plain voice communications. However video technology was to be deployed in analog television broadcasting long before it could become practical—or popular—for videophones.

Video telephony developed in parallel with conventional voice telephone systems from the mid-to-late 20th century. Only in the late 20th century with the advent of powerful video codecs and high-speed broadband did it become a practical technology for regular use. With the rapid improvements and popularity of the Internet, it became widespread thru the use of videoconferencing and webcams, which frequently utilize Internet telephony, and in business, where telepresence technology has helped reduce the need to travel.

The first U.S. satellite to relay communications was Project SCORE in 1958, which used a tape recorder to store and forward voice messages. It was used to send a Christmas greeting to the world from U.S. President Dwight D. Eisenhower. In 1960 NASA launched an Echo satellite; the 100-foot (30 m) aluminized PET film balloon served as a passive reflector for radio communications. Courier 1B, built by Phil co, also launched in 1960, was the world's first active repeater satellite. Satellites these days are used for many applications such as uses in GPS, television, internet and telephone uses.

Telstar was the first active, direct relay commercial communications satellite. Belonging to AT&T as part of a multi-national agreement between AT&T, Bell Telephone Laboratories, NASA, the British General Post Office, and the French National PTT (Post Office) to develop satellite communications, it was launched by NASA from Cape Canaveral on July 10, 1962, the first privately sponsored space launch. Relay 1 was launched on December 13, 1962, and became the first satellite to broadcast across the Pacific on November 22, 1963.

The first and historically most important application for communication satellites was in intercontinental long distance telephony. The fixed Public Switched Telephone Network relays telephone calls from land line telephones to an earth station, where they are then transmitted a receiving satellite dish via a geostationary satellite in Earth orbit. Improvements in submarine communications cables, through the use of fiber-optics, caused some decline in the use of satellites for fixed telephony in the late 20th century, but they still exclusively service remote islands such as Island, Saint, Diego Garcia, and Easter Island, where no submarine cables are in service. There are also some continents and some regions of countries where landline telecommunications are rare to nonexistent, for example Antarctica, plus large regions of Australia, South America, Africa, Northern, China, Russia and Greenland.

After commercial long distance telephone service was established via communication satellites, a host of other commercial telecommunications were also adapted to similar satellites starting in 1979, including mobile satellite phones, satellite radio, satellite television and satellite Internet access. The earliest adaption for most such services occurred in the 1990s as the pricing for commercial satellite transponder channels continued to drop significantly.

On September 11, 1940, George Stibitz was able to transmit problems using teletype to his Complex Number Calculator in New York and receive the computed results back at College in New Hampshire. This configuration of a centralized computer or mainframe with remote dumb terminals remained popular throughout the 1950s. However it was not until the 1960s that researchers started to investigate packet switching — a technology that would allow chunks of data to be sent to different computers without first passing through a centralized mainframe. A four-node network emerged on December 5, 1969 between the University of California, Los Angeles, the Stanford Research Institute, the University of Utah and the University of California, Santa Barbara. This network would become ARPANET, which by 1981 would consist of 213 nodes.[19] In June 1973, the first non-US node was added to the network belonging to Norway's NORSAR project. This was shortly followed by a node in London.

ARPANET's development centered on the Request for Comment process and on April 7, 1969, RFC 1 was published. This process is important because ARPANET would eventually merge with other networks to form the Internet and many of the protocols the Internet relies upon today were specified through this process. In September 1981, RFC 791 introduced the Internet Protocol v4 (IPv4) and RFC 793 introduced the Transmission Control Protocol (TCP) — thus creating the TCP/IP protocol that much of the Internet relies upon today. A more relaxed transport protocol that, unlike TCP, did not guarantee the orderly delivery of packets called the User Datagram Protocol (UDP) was submitted on 28 August 1980 as RFC 768. An e-mail protocol, SMTP, was introduced in August 1982 by RFC 821 and http://1.0 a protocol that would make the hyperlinked Internet possible was introduced on May 1996 by RFC 1945.

However not all important developments were made through the Request for Comment process. Two popular link protocols for local area networks (LANs) also appeared

in the 1970s. A patent for the Token Ring protocol was filed by Olaf on October 29, 1974.[21] And a paper on the Ethernet protocol was published by Robert Metcalfe and David Boggs in the July 1976 issue of Communications of the ACM.

Internet access became widespread late in the century, using the old telephone and television networks.

DISTANCE TELECOMMUNICATIONS

Visual, auditory and ancillary methods (non-electrical):

- Prehistoric: Fires, Beacons, Smoke signals, Communication drums, Horns
- 6th century BCE: Mail
- 5th century BCE: Pigeon post
- 4th century BCE: Hydraulic semaphores
- ca. 490 BCE: Heliographs (shield signals)
- 15th century CE: Maritime flag semaphores
- 1672: First experimental acoustic (mechanical) telephone
- 1790: Semaphore lines (optical telegraphs)
- 1867: Signal lamps
- 1877: Acoustic phonograph

1.2.3. Basic electrical signals:

- 1838: Electrical telegraph. See: Telegraph history
- 1858: First trans-Atlantic telegraph cable
- 1876: Telephone. See: Invention of the telephone, History of the telephone, Timeline of the telephone
- 1880: Telephony via light beam photo phones

1.2.4. Advanced electrical and electronic signals:

- 1893: Wireless telegraphy
- 1896: Radio. See: History of radio.
- 1914: First North American transcontinental telephone calling
- 1927: Television. See: History of television
- 1927: First commercial radio-telephone service, U.K.–U.S.
- 1930: First experimental videophones
- 1934: First commercial radio-telephone service, U.S.–Japan
- 1936: World's first public videophone network
- 1946: Limited capacity Mobile Telephone Service for automobiles
- 1956: Transatlantic telephone cable

- 1962: Commercial telecommunications satellite
- 1964: Fiber optical telecommunications
- 1965: First North American public videophone network
- 1969: Computer networking
- 1973: First modern-era mobile (cellular) phone
- 1979: INMARSAT ship-to-shore satellite communications
- 1981: First mobile (cellular) phone network
- 1982: SMTP email
- 1983: Internet. See: History of Internet
- 1998: Mobile satellite hand-held phones
- 2003: VoIP Internet Telephony
- 2007: iPhone (1st generation)

Telecommunication – the transmission of signals over a distance for the purpose of communication. In modern times, this process almost always involves the use of electromagnetic waves by transmitters and receivers, but in earlier years it also involved the use of drums and visual signals such as smoke, fire, beacons, semaphore and other optical communications.

IMPACT OF GLOBALIZATION ON THE INTERNATIONAL TELECOM INDUSTRY

A CHANGE IN THE PARADIGM

The increasing globalization of corporate activities (in both the manufacturing and service sectors)in OECD Member countries has spilled over into the telecommunication sector since the end of the 1980s, thereby creating fundamental changes in the paradigm of international telecommunication service provision. A number of public telecommunication operators (PTOs) are extending their business activities, either explicitly or implicitly, to countries outside their home territory. Although these activities are a relatively new phenomenon, the speed of this expansion has been dramatic. In monetary terms, investment in global activities may be relatively small when compared to total PTO investment covering installation and improvement of network facilities. Its strategic importance should, however, not be overlooked.

PTOs traditionally restricted their activities to domestic markets. International telecommunication services did exist in the past, but the role played by the PTOs was different. International telephony services were operated as an extension of domestic services under bilateral agreements between PTOs. The PTOs' role in international services was to interconnect domestic networks in different countries. The International Telecommunication

Union (ITU) has been serving as a forum for PTOs to formulate commonly-needed technological standards and other operational rules (such as principles of international tariffs). Under this system, each PTO was considered to represent each country's interest, and did not share its customers with other PTOs. There was very limited competition between PTOs in international telecommunications, although a certain level of competition exists in some cases, such as for transit traffic.

PTO globalization in its current forms is different in nature from the traditional international telecommunication services described above. Many PTOs in OECD Member countries are extending their geographic coverage of service provision beyond their national boundaries. New services are increasingly available to customers outside the home country. Such services go beyond the simple interconnection of domestic networks between two different countries. Many PTOs are developing distinctive features as global, rather than as local, enterprises. As a result, they increasingly compete with each other on international markets.

PTO globalization includes activities separate from trade and foreign investment. Most globalization in fact occurs between those two, as the example described below indicates: 2 "One of the largest French insurance companies (A) has a corporate network system over14 location in seven countries in Europe and North America to transmit and process various data, such as insurance, accounting and financial reports. This system was operated on number ofX.25 public networks based on agreements with PTOs in seven countries. Company A, when it upgraded the network, awarded a contract to British Telecom (BT, the United Kingdom) to use its Global Network Services (GNS). GNS is an international value-added network that consists of communications processors connected by a network of leased circuits, microwave links and satellite channels. British Telecom has installed communications nodes in major cities in Europe, North America and Asia. Company A is now freed from the complicated task of negotiating with PTOs in seven countries and handling many different standards. British Telecom's contract includes a further update of the corporate network system that includes voice and image transmissions. "There are a increasing number of similar examples with other combinations of nationalities of PTOs and their users. The example above illustrates the following changes in international telecommunications which have significant policy implications: -- the nationality of the PTO does not matter to the customer; -- the nationality of the customer does not matter to the PTO;-- PTO are both customers of, and competitors with, each other. What matters to customers is the quality of services and costs. If a service-provider satisfies customer requirements, its nationality will not matter to the customer. This is economic logic. On the other hand, national telecommunication policies are concerned with the nationalities of users since they are originally formulated for the welfare of the national public. This is political logic. A possible contradiction between the two systems of logic is emerging from the sphere of global telecommunications. PTOs are increasingly adopting contradictory roles in relation to each other. In service provision to customers in foreign countries, a PTO is both a customer and a competitor of the PTO in the host country. In the example of British Telecom's GNS, British Telecom is a customer of the French PTO France Telecom since the former leases circuits from the latter in order to provide GNS in France. British Telecom is, at

the same time, competing with France Telecom in pursuing customers located in France, such as company A.

There is a growing discrepancy between recipients of national telecommunication policy and recipients of telecommunication services. In the past, both telecommunication policy and services were addressed to national users. This still holds true for policy, but services are being extended to include both national and foreign users in national and foreign markets. A number of policy issues arise from this discrepancy. Asymmetry in the level of liberalization between OECD countries adds to the economic impacts of PTO globalization, giving birth to a set of policy issues relevant to all countries.

Thus, national telecommunication policy has broader cross-border implications than was the case in the past. This report is intended to provide empirical data regarding PTO globalization and users' interests, and to formulate policy questions regarding the implications for current national telecommunication policy in Member countries.

The report focuses on PTOs because they are traditionally highly domestic institutions and play a significant role in the shaping of national telecommunication policy. International telecommunication consortia that provide international transmission routes to PTOs and large users, such as INTELSAT and IMMARSAT, are excluded from this analysis. While these institutions are instrumental in shaping competition in international telecommunication markets, their impact on national telecommunication policy is relatively indirect when compared with those of national PTOs. A major message of this report is that even national policies for the domestic sector of national telecommunication services which were until now considered to be more or less removed from international dynamics are feeling the direct impacts of economic globalization. The focus of the analysis is on telecommunication services, not equipment. This is because most Member country governments traditionally considered telecommunications to be an important public service. Its provision (tariff, options, etc.) and regulation have been of major importance in telecommunication policy in all Member countries. The impacts of globalization on the telecommunication equipment sector will, however, are discussed in connection with the international implications of market liberalization. It should be noted that this report is a preliminary assessment of a rapidly-evolving area.

Although this area is important to all Member countries, there is not yet a consensus on the direction or meaning of key trends and developments regarding PTO globalization. The OECD is contemplating further survey and analysis of various subjects related to the globalization issue. Following the introductory discussion in this section, Section II examines new PTO globalizing activities, including: i) new service options in the provision of existing international telecommunication services; ii) foreign direct investment (FDI); and iii) off-shore services provided by alliances between PTOs (e.g.so-called "one-stop-shopping" and "outsourcing"). National and international policy implications are identified. The interests of users of global telecommunication systems are also examined in order to clarify the policy implications of PTO globalization as viewed from the point of view of the receiver of

services. However, the distinction between user and supplier appears to be evaporating in global corporate network markets.

Section III analyses the main factors that have motivated major PTOs to extend their business sphere on a global scale in the economic, technological and political contexts. These factors include: the ever-growing dependence of nations on the economy beyond their national boundaries; the decreasing profit margin of PTOs in their domestic market due to competition in telecommunication services; and the increasingly diverse nature of PTO competitors due to the convergence of information and telecommunication technologies.

The implications of PTO globalization for national telecommunication policies will be assessed in Section IV; the focus is on policy instruments for the control of foreign ownership of PTOs. Market liberalization in an increasing number of countries has opened investment opportunities abroad; explicit, as well as implicit; policy instruments for control are analyzed. Views of countries who's PTOs are investing in foreign countries, as well as those of countries receiving investment from foreign PTOs, are included in the analysis.

In Section V, conceptual analysis of interrelationships between telecommunicating and two originally different, but closely related, policies, i.e. trade and competition policies, is undertaken in search of a possible framework for telecommunications policy that can adjust to a globalizing economy. A possible framework for the analysis of these policies will be proposed. New movements in the formulation of rules for the integration of telecommunication services in a regional trade agreement are discussed, drawing upon trends observed in two recent experiences in North America, specifically the Free Trade Agreement between Canada and the United States in 1988, and the North American Free Trade Agreement (NAFTA) between Canada, the United States and Mexico in which took effect on 1 January 1994.

Section VI summarizes national and international policy issues arising from international telecommunication markets. Increasing globalization Rapid growth in the level of international investment by PTOs in telecommunications and in the number of options in international services has occurred only in the past few years, but has been dramatic.

The major PTOs in Member countries are becoming increasingly dynamic and outward looking, regardless of their status (i.e. government, private, or owned by both). FDI by PTOs is not necessarily a new phenomenon. There are many earlier examples of investment by European PTOs in the telecommunication sector of countries in the Asia-Pacific, Caribbean and African regions. Recent FDI, however, is different; PTOs accord it strategic importance as an extra source of revenue and/or a foothold for further development in service provision in the host countries. For example, the data in Figures 2-1 and 2-23 below indicate a rapid increase of FDI by PTOs since the end of the 1980s. According to estimates made by a consulting firm, there were 25 cross-border acquisitions by PTOs and other telecommunication firms from 1988 to 1989, while there were six in the previous year. The total value of the same acquisitions was over US$2.1 billion in 1988-89, from US$120 million in the previous year. The value per investment has rapidly increased since the end of

the 1980s. In 1989 and 1990, PTOs invested more than half of the total investment that occurred between 1986 and 1990. This was true for both the number of investments and their value. It may be reasonably estimated that the acquisition of shares of New Zealand's PTO (Telecom Corporation of New Zealand Limited, TCNZ)4 in 1990 and of Mexico's PTO (Telmex) in 1991 were larger than the value of all acquisitions made in the five-year period indicated in the figures. International expansion is thought by major PTOs to be a prerequisite for long-term success. For example, AT&T, in its annual report for 1991, announced that it intended to enhance its international activities.5 While 15 per cent of AT&T's revenue was generated from those activities, the goal was to obtain 25 per cent of sales performance from international markets by 1995, and 50 per cent by the year 2000. Although the source of this increase was not specified (e.g. existing international telecommunication services, newly-developed services, the sale of equipment or other businesses), then company's intention to further pursue international market opportunities well represents general intentions in globalization commonly observed among major PTOs. The 1991 purchase of NCR, one of the major computer manufacturers based in the United States, accords with the promotion of globalization of AT&T corporate activities, allowing the company to provide a high level of system integration services with a wide geographical coverage.6 similar example are found in a number of PTOs in Member countries. AOTC (Australia -- now known as TELSTRA), in its annual report for 1991, stated that the company should increase its revenue from its global business from around A$ 70 million in 1989-90 to A$ 800 million by 1994-957. It is an ambitious requirement; it is stated, but necessary if the company "were to have serious aspirations to be a more significant global carrier by the mid-1990s". The same applies to PTT Telecom Netherlands. The necessity of its development in both national and international markets was repeatedly emphasized with equal importance in the statement of the Chairman of the Board of Management of its shareholding company, the Royal PTT Nederland.

Foreign direct investment (FDI) by PTOs is increasing in terms of both the number and the level of investment. FDI takes various forms: purchase of shares of TOs (both PTOs and other service-providers), establishment of joint ventures (JVs), obtention of franchise for the operation of telecommunication services, and mergers and acquisitions (M&A) of providers of enhanced communication services other than TOs. Tables 2-1 and 2-2 below list major FDI recently undertaken by PTOs in Member countries.

Direct investment has an advantage for PTOs in that it becomes globally known (i.e. global presence) in a relatively short time and is a means of rapidly entering the telecommunication market. Examples of large-scale direct investment include the purchase of shares of the PTO in New Zealand (Telecom New Zealand) in 1990 by a consortium of Ameritech and Bell Atlantic (both from the United States, and the purchase of 49 per cent of the shares (with voting rights) of Mexican PTO, Telefonos de Mexico (Telmex) by a consortium including South Western Bell (a Regional Holding Company in the United States) and France Telecom (FT, France) in 1991.

Observation of the cross-border movements of investments in terms of geographical origin and destination reveals several distinctive features (Tables 2-1 and 2-2). For example, foreign

PTOs invest more in countries where the level of liberalisation is high, such as the United Kingdom and the United States. Many of the investments by European PTOs in Asian, Pacific and African countries are derived from traditional ties between Europe and these countries (Table 2-2) Investments such as those by Cable & Wireless (C&W, the United Kingdom) in PTOs in the People's Republic of China, Hong Kong and Macau, and those by France Telecom (FT, France) in the Central African Empire and Chad reflect historically close relationships between these countries and the home countries of the PTOs.

Foreign direct investment gave rise to several policy issues in an interface between existing rules for trade and international capital movements (an external factor) and telecommunications regulation that controls the level of openness of domestic markets (an internal factor). One issue is the foreign ownership policy of PTOs. For those countries that receive investments (host countries), the level of foreign ownership of PTOs and entry of foreign-owned service-providers in various services [e.g. Public Switched Telephone Network (PSTN), cellular, value added services, etc.] have to be considered in relation to the purpose of market liberalization and national interests in telecommunications. This issue will be further elaborated in Section IV. Foreign direct investment is, in the light of trade policy, a market access issue. The question arises as to whether or not or to what extent telecommunication policy should draw upon free trade rules. Many issues arise from the existence of asymmetry in national telecommunication policy. This point will be further elaborated in Section V. Alliances and outsourcing Co-operation between PTOs can greatly enhance service to customers via geographical coverage.

Co-operation began in the form of joint account management (JAM) agreements in the late 1980s between major PTOs in Member countries, and evolved into more extensive forms.

Under JAM, two PTOs in different countries take care of each other's corporate customers, i.e. those having branches in the other country. Under this system customers may construct and maintain international corporate network systems only with the support of their home country's PTO. Concentration of billing of all worldwide telecommunication expenses to the customer's headquarters (i.e. so-called "one-stop billing") is also made possible. The home PTO co-ordinates in satisfying the requirements (technical, legal, etc.) of the other PTO, an otherwise complicated task for the customer.

Outsourcing services in which a PTO owns facilities, as described above, may have implications for telecommunication infrastructure policy. PTOs providing outsourcing services have their own switches and/or nodes in countries, even those that are not members of the alliance. MDN is a penetration of foreign PTO infrastructure in the host country. Users, however, do not care about the details of infrastructure ownership. It is a well-recognised fact that users' priority for the selection of a service-provider is best quality at a low price, not the nationality of the provider.15 Thus the reasoning that "the government should own telecommunication infrastructure in order to guarantee the quality of service" -- may need to be reconsidered. An additional observation arises from the analysis above: the representation system for user interests in international telecommunications for technology standards and rule-setting of services, such as the International Telecommunication Union (ITU), will have

to be reconsidered. In monitoring user interests within global corporate networks, it has become apparent that the perception supporting the ITU system that one country's PTO represents the interests of that country's users is no longer commonly held.

These issues are not a question of good or bad, but represent the facts. It should be recognized that the ITU is becoming obsolete. Changes in market structure in international telecommunication services are increasing their economic impacts on all players in the international economy. Adjustment of existing policies to the new market environment is urgently needed. Regionalization in this international development is, however, a natural result. Telecommunication services are highly dependent on physical infrastructure. Telecommunications was originally a regional business and is likely to remain so, at least until some point in the future when technology innovations will have made personal and mobile communication systems available at affordable prices. Further development of satellite communications, for example, may enable PTOs to be "location-free". There are some indications of a potential development in this direction, such as the "Iridium" project launched by Motorola in 1993.

Globalization is an umbrella term that describes an ongoing process of establishing various personal, cultural, and business relationships with other countries. This process embodies an increasing view of the world as a community. People and companies are interacting with others in different countries more than ever before. This includes personal communication between people that live on the other side of the world from each other. Companies are now striving to open markets in developing countries, instead of only delivering products and services domestically. Technology is beginning to expand across nations. Information is being shared with a multitude of people throughout the world in a fraction of the time that it would take to contact someone down the hall from your office. There is a growing interdependence of one country on another.

The process of globalization appears to be accelerating and growing rapidly. As time continues to pass, it appears that we are moving to a world where the lines that divide one country from another will begin to blur and eventually fade away entirely. Globalization – the growing integration of economies and societies around the world – has been one of the most hotly-debated topics in international economics over the past few years. Rapid growth and poverty reduction in China, India, and other countries that were poor 20 years ago, has been a positive aspect of globalization. But globalization has also generated significant international opposition over concerns that it has increased inequality and environmental degradation. This site provides access to some of the most recent presentations on globalization and some of the leading research on the subject. Globalization is a term that is used to describe the changing world order in which various aspects of a nation that include the economic, social, political, cultural and environmental factors are viewed as being part of a global community and not restricted in their scope.

In the area of employment creation, extrapolation from various sources suggests a possible direct employment effect of Globalization in developing countries of around 26 million jobs in 1997. Estimates of the indirect employment effect of FDI vary widely around a multiplier

of 1.6 (i.e. 1.6 indirect jobs for every one direct job). Also, foreign-invested enterprises (FIEs) do generally pay higher wages than domestic companies, and even in low-wage, labor-intensive industries, FIE jobs are often considered better than the alternatives of unemployment or underemployment. However, investments in different industries clearly have different job-creation propensities which policymakers need to take into consideration. There is also an increasing recognition that ways of harnessing FDI to support small and medium enterprise (SME) sectors in developing countries, and associated employment creation, remain under-exploited. (Heien. D, and Wessells, C.R. et al. 1990) regarding employment practices, a key issue is the effect of FDI on female participation in the labor force.

The observed effects of the Asian crisis have heightened concerns of this kind. So many millions who had been raised out of poverty during years of rapid economic growth have been thrown back into poverty. As a result, developing countries, and their bilateral and multilateral donors, are now focused on such core imperatives as sustainable human development (SHD) and equitable poverty reduction. So, in place of a blind faith that economic growth, and FDI within that context, leads to poverty reduction, it has become more important to understand how the various contributors to growth, including FDI, deliver their benefits, and how policy measures can reinforce that delivery process. Conversely, some FDI may have had negative impacts, especially in the context of sustainable development and equitable poverty reduction, and it is important to understand how policy can help reduce such detrimental impacts (Carl Aoran et al 2000).

COMPUTABLE GENERAL EQUILIBRIUM MODEL (CGE)

To compare the impact of Globalization on rural and urban population we started with the simple model, which however integers all the standard characteristics of the CGE model of small under developed country. The demand system is derived from the Cobb Douglas utility function with two factors of Globalization and poverty relationship.

Regarding the household model we have an income function consisting of rural projects of FDI and their general impact on the rural households on consumption. The rural household model is used to calculate the impact of Globalization on the employment and consumption pattern of rural household. Based on the behavioral equation based on the CGE Model. The household model operates as follows the income equations are specified in the CGE model but at disaggregate level and we introduced the demand system which specified the marginal consumption system.

The domestic telecommunications markets in the United States, the states of the European Union, and Japan differ in their structures and their rates of growth. Between 1985 and 1995 telecommunications revenues for the surveyed countries have generally grown at rates faster than new line activation or increasing call volume. Tariffs have been restructured, the mix of calls—local, long distance (trunk), and international—has changed, and leased-line and mobile services have grown relative to traditional switched, wire line telephony. The revenues for telecommunications carriers have increased dramatically with the liberalization

of domestic markets. Yet, there is no obvious correlation between a relatively "early" or "late" opening of domestic markets and overall rates of revenue growth.

Countries differ in the amount of domestic foreign investment allowed and carriers differ in the nature of their foreign direct investment (FDI) in telecommunications markets abroad. The United States, for example, currently allows 25 per cent foreign ownership of its domestic telecommunications carriers, while Japan is only just beginning to open its market to foreign investment and partnering. While carriers in the EU and the United States invest heavily in liberalized cellular markets, EU-based carriers tend to invest in markets to which they have a "natural" cultural or historical affinity. U.S.-based carriers are more motivated by market opportunities and expectations of growth in their choice of FDI.

Two major trends characterize the international telecommunications industry:

- rapid technological advances, and
- the growing realization that liberalizing telecommunications industries is key to overall industry growth.

These two trends hasten the liberalization of telecommunications markets around the world. The role of national governments is changing from that of a direct player to that of policy maker and regulator. The nature of international telecommunications trade is evolving from a bilateral, nation-to-nation framework to a multinational, multilateral company-to-company paradigm. Major international telecommunications alliances have taken many forms with the potential to dominate segments of international. Nevertheless, demand will increase for smaller firms able to provide local presence and technological expertise.

There are various strategic options available to smaller countries and carriers. These strategies range from domestic to regional to international:

- lead the domestic market in phased liberalization
- seek opportunities to integrate vertically
- promote regional opportunities
- capture a major share of a regional market
- Expand enhanced services internationally.

Difference in Environment:-

The domestic telecommunications markets in the United States, the states of the European Union and Japan differ in their structures, rates of growth, and reliance on inflows associated with terminating international calls. They also differ in their openness to foreign investment and in the nature of the relationships between equipment manufacturers and carriers.

TRANSITION TO COMPETITIVE NATIONAL MARKETS

United States:-

The domestic telecommunications market in the United States was dominated by AT&T for most of the twentieth century. GTE, a much smaller local carrier, offered service in isolated parts of the country, and there were approximately one thousand very small local operating companies. In 1982, Judge Harold Green approved the Modified Final Judgment (MFJ),

settling an antitrust case first brought in 1974. The MFJ broke up the Bell system into seven large regional holding companies and their operating company subsidiaries (the RHC's and RBOC's or "Baby Bells"). A new AT&T was created with long distance (including international) and manufacturing divisions and two smaller companies formed out of the non-wholly-owned Bell subsidiaries of Cincinnati Bell and Southern New England Telephone. The divestiture of AT&T into the smaller units formally took place in 1984.

As dramatic as the break-up of AT&T was, it is useful to remember that entry into long-distance (trunk) carriage, by MCI and Sprint, and entry into equipment manufacturing, by Nortel, Ericsson, etc., had been allowed prior to the divestiture. The "new" AT&T had both carrier and manufacturing arms and kept the strong international presence of the pre-breakup company. (The manufacturing functions have recently been spun off into Lucent Technologies Corporation.) From the start, the Baby Bells have sought to expand beyond their local-service orientation by entering the long-distance business and, in several cases, cable television or video delivery. Many have invested in operating companies abroad, and all have sought international roles. As the result of recent mergers, at the time this is being written there are now five remaining Baby Bells, each with a number of international holdings but no significant long-distance or international traffic.

Japan:-

In Japan, the reform of the telecommunications industry began in 1985. In April of that year, competition was introduced by privatizing NTT and allowing new common carriers (NCC's) to operate for domestic long-distance and international telephony. New carriers were also allowed to operate regionally with mobile telephones and satellites.

During the period from 1985 to 1991, NTT reduced the price of long distance calls. The NCC's started to compete with NTT in the long-distance market in 1986. It was clear that the introduction of competition reduced prices. As the NCC's tried to gain market share and NTT, in trying to keep market share, lowered its prices, a cycle of price wars took place.

Japan's Ministry of Post and Telecommunications (MPT) believed that the monopoly power of NTT, particularly the bottleneck in access services, was slowing down the development of the Japanese telecommunications industry. A division of NTT would introduce more competition and the speed of growth of the industry would be greater. In December 1996, MPT and NTT agreed upon a plan for restructuring NTT. NTT will be divided into NTT Long-Distance, NTT East-Japan, and NTT West-Japan. NTT East-Japan and NTT West-Japan will be heavily regulated by the MPT, while NTT Long-Distance would be allowed to enter into the international telecommunications market and KDD, the major supplier of international services in Japan, will be allowed to supply domestic telecommunications services. Divestiture of NTT should be completed by the end of the 1999 fiscal year, and KDD started to supply domestic telecommunications services in July 1997.

European Union

One can view the European Union (EU) as a single entity that is only now opening up its telecommunications markets to competition. An alternative view is that the EU is in the process of moving disparate countries toward common policies, or at least common policy

objectives in telecommunications. EU telecommunications policy has been driven by two major themes:

- First, that telecommunication networks and services are seen as drivers of organizational and national competitiveness. An efficient, competitive, and innovative telecommunications industry is fundamental to future economic prosperity.
- Second, liberalized and efficient markets are crucial to better resource allocation, lower costs, and better service.

The Telecommunications Review of 1992 concluded that monopolies would no longer be sustainable. The European Commission adopted a Council resolution in 1993 that agreed to the liberalization of the telecommunications infrastructure with a deadline of accomplishing this by January 1, 1998.

Individual countries have different policies in completing the transition to a competitive home market. Countries such as the United Kingdom, Sweden, and Finland have already liberalized their markets to a considerable extent and are characterized by a competitive environment in many portions of the market place. By engaging in market liberalization for a number of years, these three countries have gained expertise in creating and fostering a competitive telecommunications industry.

The United Kingdom has long had competition in several sectors of the market. Policies concerning terminal equipment and VANs were liberalized in 1981 and competition in analogue mobile services was introduced in 1985. Since 1991, over 150 new companies have entered the fixed-link market. Since 1987, there has been steady deregulation of all market segments in Sweden. Competition was introduced into the mobile cellular market in 1981, and in the fixed-link segment in 1991. There has been competition in virtually all market segments since 1993. Finland has allowed competition in data networks and services since 1988, competition in cellular services since 1992 and in 1994 began to introduce competition at the local and international levels.

Denmark, Germany, France, and the Netherlands are on schedule to open up their markets to competition in 1998. These countries are developing regulations for ending their fixed-link telephony monopolies and each allows competition in the cellular market. Although de jure monopolies are officially ended, de facto monopolies often remain. France and the Netherlands have been slow to liberalize their markets so that they could protect the incumbent from competitive pressures.

Denmark opened up the supply and service of telecommunications equipment in 1990 and the mobile telecommunications market in 1992. Competition was opened for using leased lines for data communications in 1993, and for using leased lines for voice services in 1994. As of late 1995, Tele Denmark no longer has exclusive rights to install local area broadband networks, and direct interconnect traffic between national and mobile operators were permitted. Full liberalization of the telecommunications industry in Denmark was achieved on July 1, 1996.

Germany separated the regulatory and operating functions of the telecommunications sector in 1989 with the principle that competition is the rule and monopoly the exception. In the early 1990's, terminal equipment, value added networks services, satellite and data and mobile communications services have been liberalized. As competition is being introduced, the key issues of interconnection and pricing of network components have been raised.

France introduced competition into its analogue cellular mobile communications in 1989. Since 1992, there has been competition in the digital cellular services as well. Full scale competition in network infrastructure and telecommunication services is scheduled for 1998 in line with the EU deadlines.

In the Netherlands, competition for VANs, terminal equipment and satellite services has been introduced. Data communication policies were liberalized in 1993, and competition in mobile services was introduced in 1995. The telecommunications sector was fully opened to competition on July 1, 1997.

Progress towards liberalization has been slow in Italy, Spain, and Portugal, where it has been necessary to overcome internal vested interests. Competition in digital mobile services began in 1995 in Italy. Opening up other sectors of the telecommunications industry to competition is behind the EU guidelines. In Italy, telephony services and infrastructure will open to competition in 1998. Spain and Portugal have asked for and received extensions to meeting the January 1, 1998 deadline, and will open their markets on December 1, 1998 and January 1, 2000 respectively.

RATE OF GROWTH OF DOMESTIC MARKETS

There have been different rates of growth in the domestic markets of the United States, Japan, and the countries that comprise the European Union. As one can see in Table 1, telecommunications revenues for the ten-year period from 1986 to 1995 have generally grown at rates faster than those of activating new lines or of increasing call volume, though the rate of increase has differed among countries. It is useful to look at the possible determinants of the different rates of growth across the twelve countries that are studied in the papers in this volume. Two possible hypotheses are that the differences in the rates of growth are determined either by the extent and timing of the opening of domestic telecommunications service markets or by relative level of economic development and rates of average economic growth.

Before examining the two hypotheses we look more closely at the telecommunications growth data. While one might expect the growth in revenues to be easily decomposed into the growth in main lines and the growth in call minutes—where such data are available, this is not the case. First, the rates—and more importantly, the structures of rates—have been changing in many countries. Second the mix of local and long distance (trunk) calls also continues to change. Third, there are many other sources of revenue, such as leased lines that, while generally small, are growing rapidly in many of these countries. And finally, mobile telephony accounts for an increasing share of traffic and has a differential share of the market across these countries. As we have complete data on main (fixed) lines in operation and total telecommunications service revenues from the ITU, we focus on these measures.

First we look at whether early or late opening of domestic markets appears to affect growth in telecommunications services. It does not appear that there is a correlation of when domestic markets were opened and the rate of revenue increases nor is there a correlation between the amount of increase of revenues over new lines or call rates. (Although it is difficult to fix a single date, this discussion focuses on Europe and uses the dates presented in the papers by Elixmann and by Scanlan, Williams, and Whalley. See Table 2 for a complete listing of these dates.) For example, Sweden opened its cellular market to competition in 1981 and its fixed-link segment in 1991, and Sweden's rate of telecommunications services revenue increased 7% per year, substantially more than the increase in new lines (1.3%) or the increase in minutes (2.8%). Yet Finland, which opened its markets in 1992 and 1994 respectively, had revenues increase at a rate of 8.2% per year with new lines (2.4%) and minutes (3.8%) increasing only marginally over the rates of increase experienced in Sweden.

France opened its cellular markets in 1992, and just opened its fixed-link segment as of January 1, 1998. Revenues for telecommunications services increased at a rate (4.7%), close to the increase in minutes of telephone service (4.5%) and slightly better than the rate of increase for new lines (3.4%). Yet Italy, which only liberalized its cellular market in 1995 and its fixed-link segment 1998, had increases in revenues (10.3%) that were far higher than the increase in new lines (3.5%) and almost 50% higher than the increase in domestic calls (7.4%). Clearly there are factors which influence telecommunication revenue increases other than when domestic markets were liberalized or the percentage of new lines installed in the domestic market.

We tested the hypothesis that growth in telecommunications services was related to the level of development and the rate of overall economic growth using more formal methods. Given the nature of the data, we chose to employ both non-parametric tests that compare rankings and linear regression methods. The results from the two approaches gave similar results, and we found that growth in telecommunications was inversely related to the initial level of economic development and positively related to the level of growth in the aggregate economy, although with varying levels of statistical significance. In other words we found that, in general, the countries that started with the lowest levels of per-capita gross domestic product (GDP) in 1985 had the highest rates in telecommunications growth over the next nine years. Additionally, the rate of telecommunications growth was positively correlated with the rate of overall economic growth. In these analyses we used per-capita GDP, converted to U.S. dollars at market exchange rates, as the measure of economic development.

The correlations for the rankings of the twelve countries by telecommunications lines and revenues, on one hand, and economic level and growth, on the other, are shown in Table 3. The telecommunications data used are shown in Table 1 and the values of 1986 GDP per capita and growth in GDP per capita (both in U.S. dollars) are shown in Table 2. Both sets of data were taken originally from tables provided by the ITU.

We also used linear regression methods to investigate the relationships between the telecommunications growth variables and the variables based on aggregate economic data. The same data set was used. Although one should worry that the small sample size and limited range of the growth rate variables may lead to violations of the assumptions of the

linear regression model, one can draw modest conclusions from the results. (See Table 4.) We ran two sets of regressions, one with growth in telecommunications lines as the dependent variable, the other with growth in telecommunications revenues. Each set consisted of three equations—one with the level of 1986 GDP per capita as the independent variable, one with the rate of growth of GDP per capita, and one with both independent variables. As shown in Table 4, three of the four single-variable regressions were statistically significant and all the coefficients in these equations had the expected signs. Only two of the four coefficients from the multiple regression equations had significant coefficients, and one of the coefficients that was not statistically different from zero had the wrong sign. Overall, we found that the regression results confirm the results of the non-parametric tests in that overall growth in telecommunications services in the twelve countries, by either measure, was inversely related to the initial level of GDP and in most cases—positively related to the growth of the overall economy. Again, to restate these findings in less technical terms: in general we found that the lower the initial level of economic development, the faster the growth in telecommunications. Furthermore, growth in telecommunications was usually correlated with overall economic growth. In fact, we see from the R^2values that the variation in overall aggregate growth (on a per-capita basis) accounted for approximately 20% - 40% of the growth in telecommunications.

"NATURAL" MARKETS FOR INTERNATIONAL COMMUNICATIONS:-

Countries often have "natural" foreign markets for their goods and services. The criteria for these "natural" markets include geographic proximity, common language, and former colonies. There are also high telecommunications traffic destinations that may be influenced by the presence of multi-national corporation traffic as well as the presence of immigrants within a country. For investment in international telecommunications, some countries may try to enter their "natural" markets or markets of high traffic destination. Others may pursue a different course of action based on other factors, such as experience in a certain technology. The "natural" and high traffic destination markets for the countries that are being discussed.

US have invested in telecommunications carriers in other countries:-

During the years 1986-1995, main lines that became operational in the US increased an average of 3.4% per year, while at the same time minutes of telephone service increased 5.6%. Revenues from telecommunications services increased to 6.3% each year. Canada ranks highest as a "natural" market, a major trading partner, and in international telecommunications traffic. Mexico also appears on all three lists, but there is not perfect commonality across these categories. In the case of the United States, it appears as though telecommunications traffic is more correlated with the volume of trade than with any notion of "natural' markets, but this conclusion is weak at best.

Japan:-

Japan passed the 1985 Reform legislation liberalizing telecommunications, and domestic long-distance competition has emerged. Further competition in its domestic markets will be seen in 1999 when NTT will be divested. In the period from 1987-1995, a period which saw

several price wars among NTT and the new common carriers, Japan's telecommunications sector experienced an annual increase of 3.0% in new phone lines, a 3.4% increase in telephone minutes, and a 5.8% increase in revenues.

In the case of Japan, it appears as though international telecommunications traffic is related to both the volume of international trade (United States being the largest trading partner) and "natural" markets (with China, with its similar ideographic language and cultural ties, accounting for the second highest level of traffic).

European Union:-

The carriers based in the countries that make up the European Union are discussed on a country-by-country basis. These sections draw heavily on Elixmann.

United Kingdom:-

In the UK, both BT and Cable & Wireless (C&W) have a large number of investments around the world that cover both cellular and fixed-link ventures. "Comparing the target countries of BT and C&W's FDI with the main destinations of outgoing traffic from the UK…BT is active in four out of five of the most important traffic destinations either by itself or by the alliance with MCI. In the case of C&W there is, however, only one correspondence, namely in the U.S, (which is the most important outgoing traffic route from the U.K.)." The U.K. has experienced a growth rate of new main lines of only 3.4% in the past ten years and yet has seen upwards of 150 new entrants into the telecommunications market. Minutes are more than double the rate of new lines (7.8%) and revenues have almost kept pace with an increase of 7.3% annually.

Sweden:-

The Swedish carrier Telia has invested in Eastern and Western Europe and—to a lesser extent—in other parts of the world. There is a high correlation between FDI investment and the main destinations of outgoing traffic, with Telia investing in fixed-link ventures in four of the top five countries (Finland, Norway, Denmark, UK). For Germany, the Unisource alliance links the two markets. Telia experienced "competition in its home market relatively early (and) has since then developed a…international strategy consisting of FDI and Unisource." Results of this strategy may be seen in that Sweden experienced only a 1.3% increase in lines between 1986 and 1995, 2.8% annual increase in minutes of telephone service, yet saw revenues climb 7.0% each year.

Finland:-

Telecom Finland has focused on cellular ventures abroad, in keeping with its own experience at home. Telecom Finland has invested in Sweden, Estonia, and the UK, all high traffic destinations, as well as in Latvia where it has close ties. Telecom Finland is not a shareholder in any strategic alliance nor is it formally allied with any other carrier. Even though growth of new main lines going into operation in Finland averaged only 2.4% each year from 1986-1995 and calls increased slightly more at 3.8%, revenues jumped on average 8.2% each year.

Denmark:-

Tele Denmark's focus of FDI has been on cellular ventures in foreign countries, possibly due to experience in cellular technologies. Investments by Tele Denmark in other countries seem to correspond with Denmark's opening up of the home cellular market in 1992. The high traffic destination countries of the UK, Norway, and US have not seen any direct investment, but are covered by the Concert alliance. (See Table 10.) Ameritech, the Chicago-based Baby Bell, has recently acquired 42% of Tele Denmark and now has operating control. Although Denmark has experienced the lowest rate of annual percentage revenue growth of any of the countries studied (4.2%) with a miniscule .4% annual increase in the number of calls, the 4.2% is almost twice the rate of the number of new lines activated (2.2%).

Netherlands:-

KPN of the Netherlands has made few investments, and none in the high traffic destination markets. Those markets are served by the Unisource alliance and the alliance with AT&T in North America.

The Netherlands has seen an increase in lines of 3.4% each year, the number of calls increasing 5.5%/year, and revenues up 7.9% a year (1986-1995).

Germany;-

Foreign direct investments by Deutsche Telecom have concentrated mainly on cellular ventures in Eastern Europe and Asia, but none are in its five top outgoing traffic destination markets. (See Table 12.) Those destination markets are served by DT's Global One partners. Germany has seen an increase in active lines grow at the rate of 5% a year from 1986-1995. At the same time, the number of calls increased 7.1% annually, and revenues kept pace with the increase in calls to grow at the rate of 7.8% annually.

France:-

France Telecom aligned much of its FDI with its strategic Global One partners and has recently broadened investments outside that partnership. FT is a major cellular player, distributes global mobile satellite services, and is setting up its own international data ventures. (See Table 13.) Activity in high traffic destination markets is covered by Global One in Germany and the UK, and recent FDI in Italy and Spain. Telecommunication services revenues, increasing an average of 4.7% for the years 1986 through 1995, have only kept pace with new lines (3.4%) and increased minutes of telephone service (4.5%).

Italy:-

Telecom Italia has made a number of foreign direct investments in both fixed-link and cellular markets. An investment has been made in the high traffic destination of France, but in no other outgoing high traffic destination country. (See Table 14.) Telecom Italia is "based on a more or less closed home market, has gained substantial international position as an investor in markets abroad (but is) still lacking presence in important markets in Western Europe, Asia, and North America….It is a latecomer with respect to global strategic alliances."

Revenue increases (10.3% annually) have far surpassed the number of new main operating lines which increased 3.5% a year. Revenues also were higher than the annual increase in domestic calls (7.4%).

Spain:-

Spain's Telefonica has not invested in its major trading partners nor in countries of high traffic destinations. Rather, Telefonica has invested in some of its natural markets—Spanish-speaking countries in Latin America. (See Table 15.) The communications needs of Telefonica's international business customers are taken care of by its participation in the Concert alliance, which is active in all five of Telefonica's top outgoing traffic destinations.

Spain in 1995 opened its cellular market to competition, and is scheduled to open to competition its fixed-link markets in 1999. Yet, despite the lateness of opening its home market to competition, Spain has seen an increase of 4.9% a year of new lines activated (1986-1995). The number of calls increased slightly more than the number of lines installed, reaching a 5.2% increase per year. During this same period, telecommunication services revenues jumped 12.8% per year, more than 2 ½ times the number of new lines or calls.

Portugal:-

Portugal Telecom has invested little outside of Portugal and what little it has invested has remained mostly in the Portuguese-speaking world. (See Table 16.) The high traffic destinations from Portugal will be served by the Concert alliance, which Portugal Telecom recently joined. Portugal Telecom has also forged closer ties with Spain's Telefonica.

Portugal has seen a huge increase in the number of new lines activated from 1986-1995, roughly 10.1% each year. Telecommunications services revenue likewise have climbed an average of 17.7% each year.

OVERVIEW OF THE GLOBAL STATE OF TELECOMMUNICATIONS

There is sustained growth in the telecommunications sector, as well as rapid progress in policy and technology development. Three factors contributing to this growth are privatization, opening of markets to competition and the establishment of telecommunication regulatory authorities at both regional and national levels.

MOBILE AND FIXED TELEPHONY

Globally, mobile telephony has continued to grow, surpassing fixed telephony. Between 2000 and 2001, mobile telephony growth rates rose rapidly to catch up with fixed-line growth rates. Since 2002, there are more mobile subscribers than fixed line subscribers around the world, with mobile teledensity rates outstripping fixed teledensity in every region of the world. ITU statistics show that from just 740,035 million subscribers in 2000, the number of mobile cellular subscribers exceeded 1.8 billion subscribers, or 28 per cent of the world's population, by the end of 2004. This is an annual average growth rate of 45 per cent, compared to a global average of just 5.1 per cent for fixed telephone line subscribers. In terms of users, one in three people around the world today have a mobile phone. In contrast,

there were 1.2 billion fixed telephone lines, i.e., a penetration rate of 19 per cent1. Fixed line growth has been slow, and in several countries the number of fixed lines is actually falling. Typically, the countries with an already high fixed line penetration are the ones showing low growth rates, whilst low penetration regions like Asia and Africa show above average growth rates.

Regionally, Asia has overtaken Europe as the region with the largest share of mobile subscribers in the world. Interestingly, more than 70 per cent of mobile subscribers are found in Asia and Europe combined. By the end of 2004, the majority of countries in the world (166) had more mobile than fixed line users2. The main reasons for the strong mobile growth have been rapid network deployment, prepaid services and a highly competitive environment. The mobile sector is marked by more competition than any other sector. The rapid rise of mobile phones as the premier choice for voice communications is also attributed to the drop in prices for mobile services, subsidized handsets in some countries and the popularity of short message services (SMS).

THIRD GENERATION (3G) DEPLOYMENT

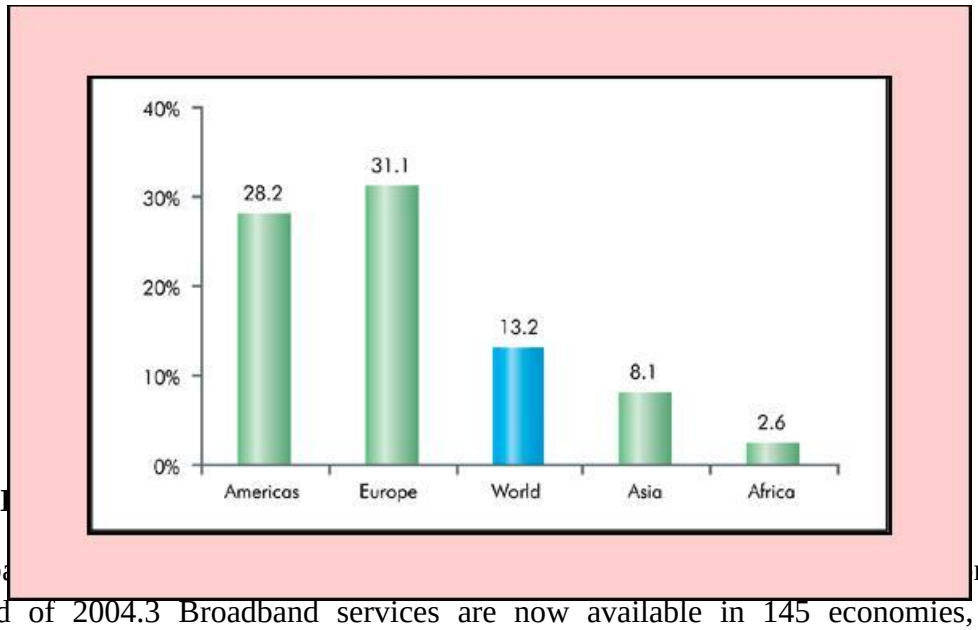
The phenomenal growth rates in mobile telephony in least developed countries is being used as evidence that the gap that separates developed and developing countries is being reduced, since 58 per cent of mobile subscribers are based in the developing world. As developing nations catch up in the area of mobile telephony, developed nations are charging ahead into other areas, such as broadband. This, in a way, is creating a new form of a divide, as most developing countries, especially LDCs, continue to compete in the "catch-up" race. Third Generation (3G) mobile technology, with its wide range of innovative applications for users and new revenue sources for operators, has not made the massive uptake strides that were expected of it. Ninety-three per cent of 3G subscribers are in Asia-Pacific and the Americas regions, with only a small fraction being in Oceania and Africa.

The majority of least developed countries have not yet deployed 3G services, as most of them are still in the process of rolling out second-generation networks. Even Europe, which took a leading position with second-generation mobile network availability and subscriptions, has not as yet taken to 3G in the same way. Operators in the developing world are exercising caution in their investment into 3G networks. By the end of 2004, the 3G rankings were as follows: United States (49.5 million), Korea (27.5 million) and Japan (24.7 million). These three countries alone represent 75 per cent of the world's 3G rollout.

INTERNET

Internet has continued to make major inroads into general usage, both as a communications platform and a knowledge infrastructure. By the end of 2004, there were an estimated 840 million internet users in the world, which is a penetration rate of 13.2 per cent of the total world population. The highest penetration rates are in Europe and the Americas, where almost one third of the population is online. The lowest penetration rates are in Africa where, on average, only 2.6 per cent of an estimated 850 million population is online, as shown in Figure 1.1.

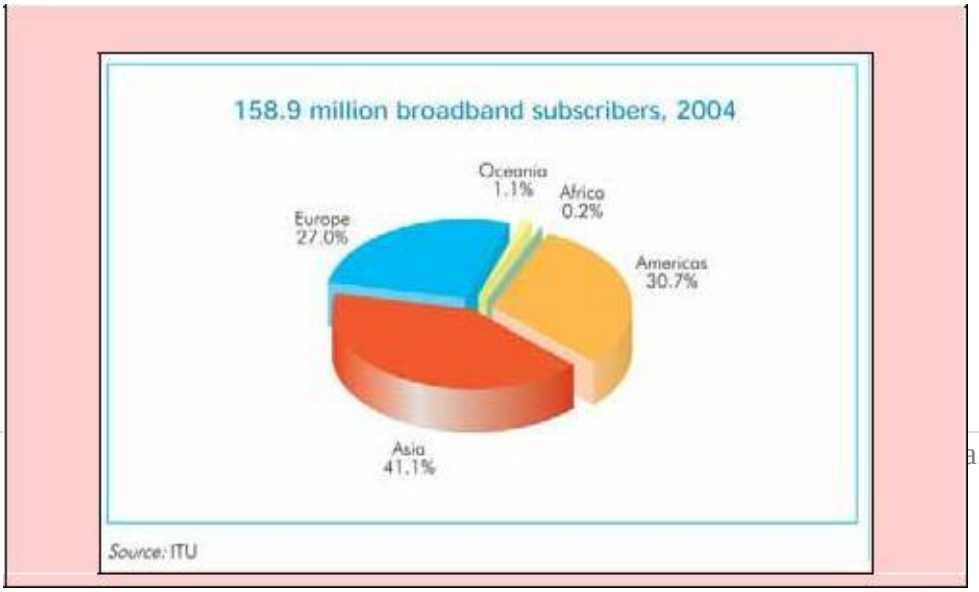
Figure 1.1: Internet penetration by region in 2004



BROAD

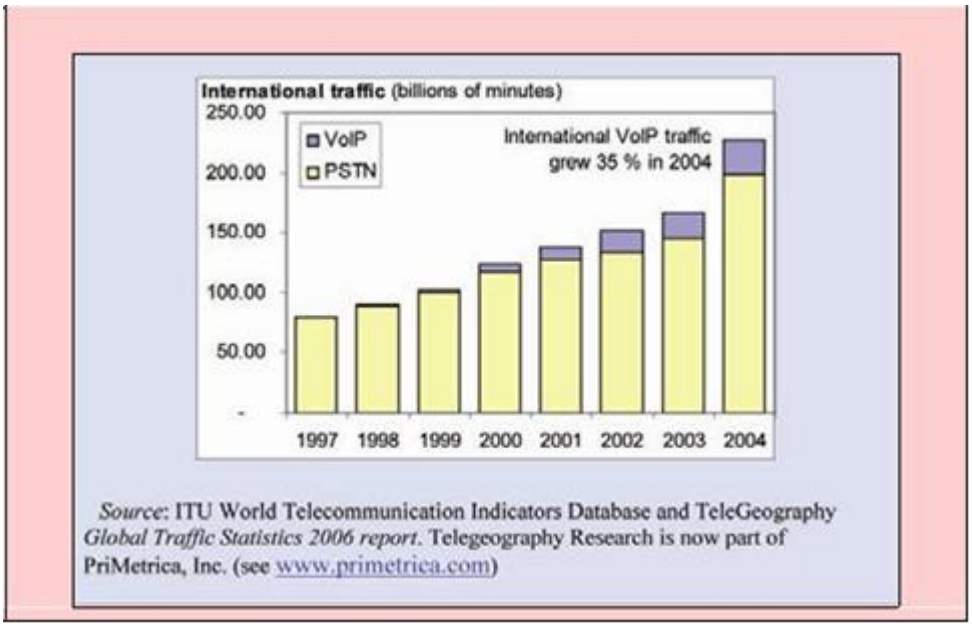
Broadba rldwide by the end of 2004.3 Broadband services are now available in 145 economies, including developing countries in central Asia and Latin America. In terms of subscribers, Asia is still leading in the world, with 41.1 per cent of the worldwide total, followed by the Americas with 30.7 per cent and Europe with 27 per cent. Oceania and Africa account for only 1.1 and 0.2 per cent, respectively, as shown in Figure 1.2 below.

Although broadband is spreading in many developing countries, it must be noted that broadband access in these markets is often priced way in excess of the world average, worsened by extremely expensive access through leased lines. Some providers in these countries engage in premium pricing of sought-after advanced services or passing off Integrated Services Digital Network (ISDN) as broadband. The most expensive pricing packages found in this analysis are in the LDCs where, for instance, Myanmar charges USD 1247 per 100 kbits/s and Uganda charges USD 1125. In mid-2005, six out of the top ten most expensive countries for broadband access worldwide were in Africa. This is an important issue, since the cost of access to ICTs in LDCs is a critical factor in determining access and usage. Highly priced ICT tend to weaken these countries' potential to spur economic growth.



VOICE OVER INTERNET PROTOCOL (VOIP)

International VoIP increased by 35 per cent from 2003 to 2004, as shown in Figure 1.3.



Many operators around the globe are using VoIP to carry part of their international traffic. Regulators' reactions to VoIP have been varied. Some have tried to ban it; some have ignored it by leaving it unlicensed, while others have licensed it. In several countries, users are allowed to make IP calls while, at the same time, no operator is allowed to provide the service. There are also some countries where providers in the markets are allowed to provide VoIP, but nobody is allowed to use it. The good news is "there is a movement towards a new stance that recognizes that IP-based networks will soon become the main bearers of voice traffic".4

SPAM

The world continues to be hampered by the spectre of spam. According to some analysts, spam accounted for around 70 per cent of all e-mail traffic by mid-2005. Apart from the sheer volume of spam traffic, it often carries viruses and worms, and threatens the stability and security of networks.

TRENDS IN TELECOMMUNICATIONS IN THE LEAST DEVELOPED COUNTRIES

Introduction

The current state of telecommunications in the least developed countries shows that progress is being made towards bridging the digital divide. Since 2001, the number of people using information and communication technologies has tended to rise exponentially. A number of reasons accounted for this positive development, as shall be discussed in later pages. By the end of 2001, out of 495 LDCs, 36 had teledensities6 above one (1). In terms of main lines, four countries had more than five (5) lines per 100 inhabitants. By 2002, 12 countries had teledensities above five (5). At the end of 2003, 15 LDCs had teledensities above five (5), while 31 countries had above two (2) telephone lines per 100 inhabitants and seven remained with teledensities below one (1). In 2004, 21 LDCs achieved the targets for telecommunications set by the Brussels Programme of Action to achieve an average teledensity of five (5) main lines (ML) per 100 inhabitants.

Teledensity has almost doubled in the majority of the least developed countries since 2000. It is clear that some countries, although they had a low teledensity of less than four telephone lines per 100 inhabitants in 2004, have not only doubled their teledensities but that these have boosted their telephone lines by as much as 15 times since 2000.

Countries like Afghanistan, with a teledensity of 0.13 in 2000, experienced a 20 per cent growth by end of 2004, which translates to a 20-fold growth. The same levels of growth were experienced in Dem. Rep. of the Congo (which recorded a 22-fold increase), in Eritrea (16-fold) and Mauritania (14-fold) increase.

Maldives, Cape Verde and Samoa, which are both SIDS and LDCs, have shown a remarkable positive development in telecommunications. This can be attributed to the liberalization of their telecommunication sector, which has attracted foreign investment that led to the upgrading of facilities and the expansion of the network. All three islands depend heavily on tourism, which accounts for a significantly increased demand for telecommunication services. In 2004, Maldives and Cape Verde led all the other LDCs, with teledensities of 44 and 29, respectively

These countries took advantage of the dramatic technological breakthroughs over the last decade, such as the development of the internet and satellite communications.

Steady fixed-line networks

Even though some LDCs have made remarkable progress in increasing their teledensities, the overall average growth of fixed lines in the LDCs over the period 2000-2004 is quite steady: almost two lines per 100 inhabitants per year. This trend is in line with the overall growth of fixed lines worldwide, as noted in the 2006 World Telecommunication Development Report. One of the reasons for this sluggish growth of fixed lines is the growth of the mobile market, especially in rural areas, where people go straight to mobile phones, rather than wait for a fixed line connection that may take years to be established.

The boom of mobile phones

Between 2000 and 2003, the average growth rate of the mobile sector in LDCs was 72 per cent, accounting for the highest and fastest growth of all sectors, as shown in Figure 2.4.

People who were first telephone owners in LDCs simply subscribed straight to cellular phones for the following reasons:

■Availability: Easy connectivity and deployment of infrastructure, even in rural communities.

■Frustration at the long wait for a fixed-line connection which, in some countries, took up to two years to be established.

■Introduction of prepaid cards, which allowed users that might not have qualified for a monthly subscription to control their own call spending. For operators, this helped reduce the risk of late or non-payments.

■ Gradual reduction of mobile phone call charges, due to increased competition.

Internet, fixed, mobile, computers, television: Together for better access

The mobile sector has shown a significant growth of 72 per cent from 2000 to 2003, compared to internet users (16%) and fixed lines (9%). The internet, a communication platform riding on network access technologies such as fixed lines and mobile cellular, has gained widespread recognition as a driving force in the social and economic development of countries. In 2004, internet penetration caught up with fixed line penetration in LDCs, which shows the gradual importance that internet access and its applications, such as e-education, e-health, e-business, e-agriculture, e-government, etc., have gained for people living in both urban and rural areas. Nevertheless, internet users in LDCs are still very few: only an estimated 5.5 million of the LDC population are online, representing 0.75 per cent of the LDC population (720 million) in 2004, against 840 million world internet users, constituting 13.2 per cent of the total population.

Generally, there is increased access to computers. This increased growth of personal computers is influenced by the popularity of internet usage. In 2004, almost five million people out of a population of 720 million were using computers in the LDCs, accounting for a penetration rate of 0.7 per cent. Looking back over the previous three years: in 2003, when LDCs had a population of 700 million, there were 3.5 million computer users accounting for a penetration rate of 0.5 per cent.

In 2002, when the total LDC population was 685 million, 2.4 million people were using computers, accounting for a penetration rate of 0.3 per cent; and finally, in 2001, when LDCs had a population of 670 million, 168 million people used computers, accounting for a penetration rate of 0.2 per cent.

The growth in internet penetration is due to the expansion of broadband. Broadband technologies, which bring high-speed access and increased capacity to a number of applications, such as music, images and video files, are in great demand in LDCs. Although the majority of LDCs have not yet launched high-speed internet services, the demand for access to internet at higher speeds is making more and more countries upgrade from dial-up internet connection to broadband. For instance, in 2004, Maldives had 57 per cent DSL

subscribers as a percentage of total internet subscribers, Senegal had 40 per cent, Myanmar had 22 per cent, Lao P.D.R. had 11 per cent and Cape Verde had 5 per cent.

Broadband might be the gateway to universal access for rural areas and to narrowing the gap between urban and rural areas. The challenge is to attract investment, especially in rural areas, with low return on investment. Fixed wireless access, which provides high-speed internet access to users in a fixed location, is also a cost-effective, but limited, solution because such networks are too expensive or simply not available in LDCs. A shortage of fixed lines in LDCs would suggest that mobile phones are extensively used to access the internet, but 3G networks are not yet widely developed in LDCs. It follows, therefore, that other affordable technologies will be needed to provide high speeds.

Digital subscriber lines (DSL), cable modems, and Wireless Local Area Network (LAN) are other broadband platforms which again have little coverage in the LDCs. Wireless fidelity (Wi-Fi), which has been used to offer public broadband access in so called "hotspots", remains a challenge in LDCs. WiMAX, which offers high-speed connectivity over a range of up to 50 km, could be an efficient solution to fill infrastructure gaps in rural and underserved areas.

Television

The sustained increase of TV receivers in LDCs shows the willingness of people to gain access to information and communication technologies. In 2000, the LDCs accounted for about 26 million sets, almost doubling the number in 2004 to 42 million, as shown in Figure 2.7. The penetration rate in 2004 was 5.72 per cent. This growth shows that there is a general tendency in poor countries to own TV sets, as ownership is linked to social status. Technological convergence is expected to effectively contribute to universal access, as the same medium, such as TV broadcasting, could be used for interactive communications and mobile phones for entertainment.

MODULE-II

INTERNATIONAL TELECOMMUNICATIONS LAW

INTRODUCTION TO TELECOM REGULATIONS

The long term evolution of new technologies and services has continued, focusing attention on the growing importance of telecommunications for national economies and the growth of international trade in telecommunications services. In turn this has fuelled the transition in recent decades from monopoly structures to competitive ones.

Apart from these general trends, the global telecommunications landscape in 2010 has been particularly shaped by the rapid take-up of the Internet and mobile wireless communications across the world. At the turn of the millennium, these technologies predominantly served the wealthy elite. Now mobile phones are in the hands of the majority of people on the planet. And the Internet has truly become mainstream with Web 2.0 applications such as Facebook making it relevant for so many people in their daily lives.

The past decade has also witnessed two major setbacks. Following a period of growth in the telecommunications industry in the late 1990s, the

―dot com bubble‖ burst at the beginning of the 21st century, resulting in a steep drop in stock market value for major operators. The crash in the telecommunications market affected numerous companies, but did not appear to deter the development of new technologies and the continuing evolution of the information and communications technology (ICT) sector. The end of the decade has been overshadowed by the global economic crisis. It remains to be seen how the sector will withstand the latest economic shock, particularly as the mobile wireless market nears saturation in most industrialized countries. Wireless is, of course, a continuing success story in the developing world and there remains potential for growth, particularly in those countries that have yet to fully embrace competitive markets.

In such a rapidly evolving field, it is necessary to ensure that regulation adapts to new developments. Countries around the world have been reviewing their existing frameworks, enacting legislation and creating new regulatory authorities to implement their legal and regulatory framework.

Nevertheless, there are also emerging issues arising from particular new technologies that raise new regulatory issues, e.g., Voice over Internet Protocol (VoIP), Internet Protocol Television (IPTV), social networking, etc. This new edition brings the Handbook up to date with regard to such matters. In addition, the wider take up and convergence of ICTs also raises new regulatory issues that traditionally would be seen as separate from telecommunications regulation. However, in the digital age, questions such as protection of minors, privacy and intellectual property are increasingly becoming part of the agenda for policy makers and regulators too. Reflecting these changes this edition of the Handbook goes beyond the usual definition of telecommunications regulation to address those issues arising from the transition to a more ubiquitous and participatory digital age.

This introductory chapter provides an overview of the main communications regulation issues – the big picture. It begins by highlighting the important role of information and communications technology as both social and economic enabler and the rapidly evolving

and converging nature of communications technologies. A key question – why regulate? – is then explored and the principles of regulation expounded. Regulatory organizations and elements for an effective regulator are described as well as international regulatory frameworks. Finally, the chapter looks ahead to the issues that are likely to be of increasing importance over the next decade.

TECHNOLOGY IN CONTEXT

Brave New Words, Brave New Economy

Digital technologies are changing the ways in which the majority of people live, work, play and interact with each other. We can see this reflected in the language we use. Our vocabulary is evolving as existing words assume new meanings – app, burn, text – or appear in new combinations, such as smart phone, cyber crime, file sharing. Some vocabulary is entirely new: the words blog, podcast and googling have become commonplace. The range of technology acronyms in everyday use continues to expand – P2P, SMS, MP3 – and adds to the sense that what we are witnessing is the dawn of a new information age, in which ICTs become part and parcel of daily life. As a result, we now live in what has been termed the ―information society‖. The ongoing World Summit on the Information Society (WSIS) process is global recognition of the impact of ICTs on society, and the need to ensure that a global digital divide does not persist.

ICTs, such as the Internet and the mobile phone, have become vital for almost all economic and social activity. The new digital economy runs on the fuel of ICTs, from e-commerce to professional networking.

A key characteristic of ICTs is that they are regulated by national administrative agencies that are keen on ensuring that principles such as fair competition and universal access are upheld in the public interest. Government regulation of ICTs extends into many disparate areas, ranging from pricing regulation, mergers and market entry to content, copyright, and privacy.

Given the speed of technological innovation, it is not surprising that the substance of ICT regulation has had to evolve rapidly. The liberalization of ICT markets has stimulated cumulative interacting innovations in products, services and technologies with a general convergence or blurring of distinctions between platforms, products and services. These developments necessitate some form of regulatory response to keep them in check.

The evolutionary nature of regulation is evident, for instance, in the moving target of European Union (EU) regulation. There have been successive ―packages‖ updating the regulatory framework, most recently in 2009. A growing number of countries have adopted this framework as member of the European Union. The EU regulatory approach is also reaching outside of Europe and influencing the frameworks that other countries are adopting. The 2009 reform followed several years of consultation and the new framework continues the shift to less sector-specific and more ex post regulation in the European Union. Significantly, the EU regulatory package has been forcefully linked to broader policy objectives concerning inclusiveness, innovation, job creation, growth, energy and environmental issues in

information society. The EU is not alone in this. Countries around the world and at all stages of economic development are implementing similar ICT strategies. ICTs also enable the participation of individuals, governments and organizations in the global economy.

ICT as Social and Economic Enabler

These initiatives reflect the growing acceptance that ICTs offer major transformational opportunities. They can contribute to enhanced productivity, competitiveness, growth, wealth creation, and poverty reduction. They have the potential to catapult us from an information society to the next level – that of a knowledge-based society and economy. ICTs provide the means by which knowledge is developed, stored, aggregated, manipulated and diffused.

These opportunities are well known and are not just a developed country phenomenon. ICTs, particularly access to broadband internet, are vital for developing nations as well. The ITU‘s Build on

Broadband project is dedicated to promoting equitable, affordable broadband access to the Internet for all people, regardless of where they live or their financial circumstances. In a speech in 2009, ITU Secretary-General Dr Hamadoun I. Touré stated:

> *“In the 21st century, affordable broadband access to the Internet is becoming as vital to social and economic development as networks like transport, water and power. Broadband access – and the next generation broadband network infrastructure which underpins it – is a key enabler for economic and social growth… Broadband changes everything. It enables not just great new enabling applications, such as VoIP and IPTV, but also the delivery of essential services – from e-health to e-education to e-commerce to e-government. And broadband is helping us make great progress towards meeting the Millennium Development Goals – and improving the quality of life for countless people around the world.”*

The importance of ICT was also recognized by World Bank President Robert B. Zoellick in a speech to the African Union Summit in 2010:

> *“ICT is a key enabler of productivity and creator of jobs. It can help farmers, small businesses, and those excluded from traditional banking services. It can extend and speed up government services. In Ghana, the introduction of IT systems and Business Re-engineering resulted in a drop in average customs clearance time from 2-3 weeks to 1-2 days and a 50% increase in revenue. In Kenya, ICT slashed the number of days it took to register a vehicle from 30 to 1.”*

A new program focused on bringing ICTs to the developing world was introduced by the World Bank in 2008. This program, called New Economy Skills for Africa Program-Information and Communication Technologies (NESAP-ICT), supports the growth of Information Technology (IT) and IT-Enabled Services (ITES) industry in Sub-Sahara African countries. The NESAP-ICT program noted that ICTs transform the economy and people’s lives and provided various examples, including:

- New jobs: In India, the expansion of the IT-ITES industry over the last 15 years has added more than 10 million direct and indirect jobs. In South Africa, the industry has employed 100,000 workers directly and indirectly by 2009. In the Philippines, a projected 900,000 people will be employed directly or indirectly by IT-ITES by 2010.

- Economic growth: In 2009, the Indian IT-ITES industry contributed an estimated US$70 billion to the GDP or six percent share of total GDP. In the Philippines, the industry‘s contribution in 2010 is expected to reach US$13 billion, or about eight percent of GDP.

- Increased productivity: The rapid spread of e-applications and digital tools to such diverse areas as manufacturing, transportation, logistics, finance, banking, governance, health, education and even in traditional sectors like agriculture is transforming the economies of developing countries. IT investments raise worker productivity three to five times that of non-IT capital. U.S. studies have shown that the IT-ITES industry was responsible for two-thirds of total factor productivity growth between 1995 and 2002 and for nearly all of the growth in labor productivity in that period.

Clearly, ICTs can have an important impact on everyday lives and on general economic activity, but the opportunities only materialize fully to the extent that the regulatory framework, as implemented, supports and fosters both investment in and widespread diffusion of ICTs. Absent these conditions, the full promise of ICTs is unrealized. ICTs offer the prospects of rapid advancements, but if appropriate conditions are not in place, the outcome can be a rapid slide down the digital divide. And although the digital divide is narrowing, particularly due to the rise of Internet-enabled mobile phones and applications, a new broadband divide is growing that governments need to address.

Mobile cellular has been the most rapidly adopted technology in history. In 2002, the total number of mobile subscribers in the world surpassed that of fixed customers. Mobile phone subscriptions worldwide grew from nearly 500 million in 1999 to an estimated 4.6 billon at the end of 2009, translating into a growth in mobile penetration from 8 percent to 68 percent. Today it is the most popular and widespread personal technology on the planet.

The growth in internet users has also been remarkable, with more than a quarter of the world‘s population now using the internet. But mobile broadband subscriptions overtook fixed broadband subscribers in 2008, highlighting the huge potential for the mobile internet.

The Asia-Pacific region is the largest mobile market in the world, and by 2013, Asia is expected to have almost three billion mobile subscribers. In 2009, China alone had 747 million mobile subscribers, which far exceeded the combined number of mobile subscribers in Japan and the United States at 115 million and 298 million subscribers, respectively. Sub-Saharan Africa had a mobile penetration rate of 42 subscribers per 100 people in 2009, translating into over 295 million mobile customers.

Mobile phone handsets are now turning into smart-phones equipped with digital cameras, Internet-enabled video, pre-installed social networking applications such as Facebook and music juke box payment terminals. Billboard magazine publishes a list of top 20 ring tones, a market that generates billions of dollars in revenue. These new functionalities are transformational. For example, as digital cameras, mobile devices provide benefits such as instant news gathering or create harmful effects like facilitating industrial espionage. Their internet-enabled video, access to social networks and music capability brings them into the realm of media, copyright and internet governance. As a component of the banking system, the mobile network can provide services where the financial network is weak, but there is also the risk of banking fraud and identity theft. These widely used electronic consumer devices now straddle several regulatory jurisdictions, raise new legal issues, and present new challenges to existing regulatory frameworks. From a government standpoint, the challenge becomes how to sustain investment and promote widespread diffusion of technologies, while protecting the legitimate interests of all players, particularly consumers.

ICTs have significantly affected business operations where a large number of new, non-OECD countries have successfully entered the market. This is particularly the case for software and IT- enabled services. Market entry is partly explained by the―death of distance‖ or the dramatic fall in the costs of international connectivity. The latest manifestation is the proliferation of broadband access networks. Broadband can carry huge quantities of data, at very high speeds. Although postal and courier services can deliver large quantities of data (e.g., a truckload of CDs), they fail the speed test. To transfer the digital information contained in an average two-hour movie downloaded from Apple‘s iTunes takes about three days using a 56Kbps dial-up modem; two hours using a 1.5 Mbps connection; two minutes using a 100 Mbps connection; and 15 seconds using a 1000 Mbps (1 Gbps).

In the broadband world, large volumes of data can be moved almost instantaneously to widely dispersed locations at low cost. Through the application of ICTs, many services once considered non-tradable are now tradable, such as back-office functions including the management of employee benefits or dental records. ―Out-sourcing‖ and/or ―business process off-shoring‖ (BPO) have seen massive increases, amounting to a total addressable market estimated at US$ 300 billion, of which about US$ 100 billion was off-shored in 2010. In the BPO market, India is a tremendous success story. It has become the dominant player in the BPO market. India‘s BPO exports grew by 35 percent a year between 2005 and 2008, and employment in the sector increased from 42,000 jobs in 2002 to an estimated 700,000 people in 2008.3 The global economic downturn of 2009 saw a slowdown in the market but prospects for future growth remain. Other countries like the Philippines, Brazil, Romania and Ireland have also been particularly successful in attracting investment and creating employment from BPO- related activities. These successes have come about due to a commitment from the government to foster and support these activities by implementing necessary policies and developing the supporting regulatory framework. In the case of India, government policies and reforms, including telecommunications reforms implemented in 1999, established the foundations for these new activities.

The use of ICTs in e-government services is also transforming citizen's interactions with the public sector by improving efficiency, effectiveness and accountability of governments. In India, for example, a comparison of manual and e-government services found that computerized services substantially increased cost-savings and access to services. The survey showed that e-services lowered travel costs, made delivery of services more predictable, decreased waiting times, reduced corruption and generally improved overall quality of service.

Although ubiquitous and open networks produce great gains for society as a whole, they also increase our vulnerability. Maximizing the connectivity and openness of networks requires regulators to create new laws in several areas, including privacy and data protection; protection of children online; and prevention of cyber crimes such as identity theft. Regulators must also ensure that law enforcement techniques evolve with technology in order to continue protecting society against those who would take advantage of these vulnerabilities. This requires adequate provisions for emergency services and lawful interception (i.e. ―wiretapping‖).

Innovative Technologies and Services

All ICT organizations have legacy assets, some more than others. The evolving regulatory frameworks have facilitated or even encouraged the introduction of new technologies and services. Ideally, ICT organizations would like to manage the transition to new technologies in a way that allows them to optimize their returns on legacy assets. The reason is that new technologies disrupt (or make obsolete) pre-existing business plans and thereby the value of legacy assets. In economic terms, this is an example of a ―Wave of Creative Destruction‖ in which disruptive technologies can bring wider choices and lower prices for the consumer.

Innovative technologies and NGNs may offer substantial opportunities for incumbents with limited legacy assets, as is the case in many developing economies. But for those with significant legacy assets, innovative technologies and services may be very disruptive if incumbents do not remain competitive and continue to innovate. Chief executive officers in many developed economies may be forced to choose between competing with their own businesses and having another company doing it. The threat of innovation may also cause some strong incumbents to adopt delaying tactics. The extent to which they can adopt such tactics depends largely on the effectiveness of implementing pro-competitive regulatory frameworks. However, innovative technologies and NGNs can benefit incumbent service providers through the lower cost of using more efficient technology. They also allow providers to compete in new service areas in order to offset declines in tradition lines of business.

Incumbents are also facing disruptive elements in cases where, frustrated by existing suppliers, local governments and municipalities are constructing their own networks, sometimes using the ―open access‖ model and the ―bottom up‖ development of applications. For example in Ottawa, Canada, local residents are able to purchase their fiber connections directly from the municipal government, which has built and continues to

subsidize fiber network. Such―open access‖ models are also gaining currency in international networks.

The process of managed transition is becoming more difficult in the current ICT environment for at least two reasons. First, the rate of change in technology is increasing. Second, the organizations introducing the new technologies are not necessarily members of the traditional telecommunications community, but innovators that may not play by the same rules. Established organizations as well as new entrants are arming themselves with different business models like ―triple or quad play,‖ ―always on,‖ ―flat charges,‖ ―all you can eat,‖ or even ―free.‖

These business models differ from the more traditional models where a limited range of services or a single service are offered at prices based on distance and time. In some instances, the provision of voice services is ancillary to the main line of business of the new entrant. For example, the voice version of Yahoo! Instant Message service is not the core business of the company.

Voice over Internet Protocol (VoIP) is an example of an innovative and disruptive technology VoIP demonstrates that the basic premise of traditional voice telephony – the network and voice services must be owned and operated by the same firm – is no longer relevant. VoIP is disrupting the pre-existing business plans of traditional telephone service providers and is being introduced by firms outside the traditional community. For instance, Google launched its Google Voice service in March 2009. Rather than own or operate any part of the underlying network, Google simply offers an application that gives users one phone number for all of their phones, provides free long distance within the United States and has low international calling rates. As a result of this and other examples, traditional operators are responding.

Another innovative and disrupting technology is Internet Protocol television (IPTV). By providing video services, such as live television channels and video-on-demand, as well as interactive services, over an IP platform, IPTV allows traditional telephone service providers to compete with terrestrial over-the-air broadcasters, cable television operators and satellite television providers.

ICTs have transformed many other activities, notably the media and the creative industries. Traditional broadcast media offer limited ―mass fare‖ to mass audiences, due to the economics of the sector and radio spectrum restrictions. Cable and satellite platforms have expanded choice for television and radio by offering services such as video-on-demand. However, new technologies expand choice even further and are able to cater to targeted audiences. The combination of broadband (wired or wireless), the digitalization of media content, and the falling costs of producing digital content herald an age of abundance. The falling costs of producing media has placed digital content production, including documentaries, entertainment, news, music, blogs, in the hands of many and has created a bottom-up trend.

The introduction of broadband and the switch to digital from analogue broadcasting will increase delivery capacity enormously in comparison to traditional broadcasting. New content producers have a means of distributing their creations instantly and globally. Content can be customized to the personal tastes of an individual rather than be defined for a mass audience. Many observers are focusing on the ―long tail‖ of digital content in which a large number of unique services, content or applications are sold in relatively small quantities. Although there are still services and items that large numbers of people will wish to purchase, many small providers and developers can become successful by selling their products to niche markets.

With broadband, this ―long tail‖ of niche media content has found a highly receptive audience, for example, through the popularity of the video-sharing site ―YouTube.‖ Apple‘s iPhone App Stor e provides another example of how small developers are finding great success by targeting the ―long tail.

After a developer completes a relatively simple process for developing and getting approval for a new application, iPhone subscribers are able to search through and download these specialized applications at fees set by the developer. By the end of 2009, there were more than 125,000 developers in

Apple‘s iPhone Developer Program and subscribers had downloaded over two billion of their applications.6 This continued abundance of choices in existing and new digital content, produced and distributed at rapidly falling costs on converged platforms, presents new disruptive challenges to both existing players or ―major (content producers and distributors) and regulators.

The rapid increase in content choices for consumers and the speed of delivery through broadband connections are also transforming social and cultural landscapes. For example, broadband helps to reduce carbon emissions through environmentally-friendly business practices such as remote management of equipment, telecommuting and live video-conferencing and can result in a reduction of carbon emissions five times greater than the emissions that the ICT industry produces. The growth of innovative technologies, NGNs and convergence promises to become a disruptive force for the way individuals interact with one another in society.

WHY REGULATE?

Evolution of Regulatory Reforms

The need for regulation varies depending on the conditions of the marketplace. While the design of the regulatory framework may differ, certain critical elements should be included in an effective regulatory framework, such as the functional aspects of the regulatory authority; decision -making processes; accountability; consumer protection, dispute resolution and enforcement powers. Consideration and proper implementation of these features are key elements for creating an enabling environment for development of the sector and for increased consumer welfare.

In the 1990s, many countries introduced the first wave of reform by privatizing their national operators. Until that time, telecommunications services were largely provided under monopoly conditions and thus limited regulation existed because the government was acting as both operator and regulator. In the very initial stages of liberalization, some countries have created a regulator when introducing a private monopoly. These regulators oversee the sector and ensure that the private operator knows and can comply with the―rules of the game.‖ In the second wave of liberalization, which sometimes occurs simultaneously with privatization, governments typically authorize the entry of new service providers and new services (e.g., mobile services and value-added services) into the market. Generally, this involves the modification of the licensing framework in order to allow the entry of the new players, as well as the introduction of complementary rules and regulations to allow these operators to participate in the marketplace.

The third wave of liberalization occurs when the incumbent operator‘s exclusivity period ends and full competition can be introduced. With the introduction of full competition, the role of the regulator actually increases, particularly during the early stages of transition from the former monopoly to effective competition. Regulation is not an end in itself, but rather a vehicle to attain, and subsequently sustain, widespread access, effective competition and consumer protection.

To transition to an effective, competitive environment, regulatory reform must include measures aimed at:

(i) creating functional regulators to oversee the introduction of competition;

(ii) preparing the incumbent operator to face competition (e.g., deadlines for market exclusivities)

(iii) allocating and managing scarce resources in a non-discriminatory way;

(iv) expanding and enhancing access to telecommunications and ICT networks and services; and

(v) promoting and protecting consumer interests, including universal access and privacy.

Once a fully competitive environment is attained, it is generally agreed that a more limited need for regulation exists. In certain areas such as universal access and service, however, market forces often fall short of creating the conditions necessary to satisfy public interest objectives and thus regulatory intervention is required. Similarly, regulatory agencies must ensure that spectrum is properly managed and allocated.

Moreover, despite the benefits of new technologies, regulators also must be attentive and responsive to the regulatory issues that arise from the implementation of these new technologies and their related services. For example, regulators are currently grappling with issues such as spam and consumer concerns regarding privacy, which were not issues of concern to regulators 10 years ago. In addition, governments are reviewing their regulatory

structures to determine whether their current organizational structures are best suited for regulating a converged marketplace with multiple services offered by the same platform.

Likewise, regulators are realizing that their existing regulatory frameworks may impede the ability of operators to make triple or quadruple play offerings to consumers or use low-cost Voice over Internet Protocol (VoIP). Similarly, numerous governments are currently holding consultations regarding digital television in order to assess what standard should be used for such services. In addition, regulators should ensure that consumers are made aware of potential limitations associated with new technologies (e.g., emergency services may not be available through such services, and services offered may be of lower quality).

The implementation of an effective regulatory framework has resulted in greater economic growth, increased investment, lower prices, better quality of service, higher penetration, and more rapid technological innovation in the sector. In fact, investors consider the regulatory environment to be a critical factor in their analysis of whether or not to invest in a country.

Telecom Regulatory Authority of India (TRAI) has made a comprehensive reform of the regulatory framework to promote technological neutrality and take advantage of inter-modal competition. These regulatory efforts have brought economic growth to the sector and produced a marked increase in mobile subscribers and a fall in mobile tariffs. In 1999, when its New Telecommunications Policy was adopted, India had about 1.2 million mobile subscribers, and effective charges were 14.51 Rs./minute. Pro- competitive and liberalization-oriented policies, such as issuing additional mobile licenses in 2001 and 2002, and awarding Wireless Local Loop (WLL) licenses in 2002, had a positive effect both on penetration and prices. As of December 2009, mobile subscribers had increased to 525 million and prices had dropped to 0.64 Rs./minute.7

Similarly, lower prices for international telephone calls, for example, are also highly correlated with the level of competition. Regulators must often intervene to remedy shortcomings in competition and ensure that competition is working effectively. In certain cases, this includes imposing some form of regulation, such as rules related to: interconnection charges requiring incumbent operators to charge competitive operators wholesale cost-oriented rates; liberalizing the international gateway; and eliminating restrictions on resale to allow entry of multiple operators and greater competition.

Benchmarking Competition

As discussed above, liberalization and fostering competition are the best means to ensure efficient and high quality services at low costs, and thus, are key regulatory objectives. This once radical message has become mainstream around the world. This section benchmarks the level of competition in key sectors, worldwide and by region. The analysis compares the level of competition in:

- Local service
- Domestic long distance

- International long distance
- Mobile
- Internet services
- Leased lines

Worldwide Comparison by Sector

The trend towards liberalization is evident in the data (see Figure 1.6). According to ITU data, as at the end of 2009, over 65 percent of countries worldwide have either full or partial competition in basic services (local, long distance and international services). Competition in mobile and internet services is extremely common – 90 percent of countries have either partial or full competition in the mobile sector and 93 percent in the internet services sector. Leased lines show a similar pattern to the local, domestic long distance and international sectors discussed below. In most regions, the majority of countries have introduced some degree of competition.

Local Service:

Monopoly provision of local service is still prevalent, particularly in Africa and the Arab States, where 44 and 57 percent of countries respectively have a monopoly local service provider. The data show significant competition in Europe and the Commonwealth of Independent States (CIS), where 82 percent of countries report full or partial competition in local service. This reflects the significant impact of the European Union‘s competition policy and telecommunications requirements.

Domestic Long Distance: The picture for domestic long distance is very similar to the local service sector. Approximately 40 percent of African countries and 52 percent of Arab States have a monopoly in the provision of domestic long distance services. Approximately 60 per cent of countries in Asia-Pacific, 83 percent of countries in Europe, 55 per cent in the CIS and 66 per cent of countries in the Americas, report full or partial competition in this sector.

International Long Distance: Competition is more widespread in most regions in the international long distance sector than in local and domestic long distance. In Africa and the Asia Pacific region respectively, 55 and 58 percent of countries have introduced full or partial competition for international calls. In the Americas, 71 percent of countries, in Europe 88 per cent and in the CIS 64 per cent, have full or partial competition in this sector. The Arab States show a higher level of monopoly in this sector compared to other regions (57 percent of Arab States report a monopoly).

Mobile: All regions show a high degree of liberalization in the mobile sector. 93 per cent of countries worldwide have introduced full or partial competition, with Europe, CIS and Africa leading the way. Competition is accompanied by sector growth, as illustrated by the case of Jamaica.

Internet Services: Unsurprisingly, the Internet services sector is by far the most competitive of the sectors surveyed. Over 90 percent of countries in Africa, the Americas and the Asia Pacific region, and all of Europe and the CIS have either full or partial competition in the Internet services sector. Over 78 percent of Arab States have introduced competition.

REGULATORY ORGANIZATIONS

Elements for an Effective Regulator

The aim of a regulator is to ensure that the sector is working properly and that consumer and other stakeholder interests are protected in a fair and balanced manner. An effective regulator is the vehicle to ensure credible market entry, as well as compliance with and enforcement of existing regulations. To achieve this, governments must create and maintain an environment conducive to good governance and regulatory success.

Independence is a critical attribute for a regulator to be effective. Effectiveness, however, has additional dimensions. In a broad sense, an effective regulator is structurally and financially independent, but the real effectiveness of the regulator will depend on how it achieves successful functionality, ideally in an independent and autonomous manner. In addition, an effective regulator should demonstrate other characteristics, including accountability, transparency and predictability.

The impact of the two new players had a tremendous impact on the sector. In particular it led to explosive growth in mobile usage with the total mobile subscriber base jumping from 144,000 in 1999 to over 1.5 million in 2005. This growth underpinned a significant increase in the Jamaica's total teledensity, which leapt from 43.53 telephones per 100 people in 2001 to 100.90 in 2004. By 2009, mobile subscribers had doubled again to nearly 3 million.

Structural Independence

The WTO Reference Paper, which requires countries to establish a regulator separate from the operator, has prompted many countries to establish a structurally independent regulator that separates the function of regulating the telecommunication market from that of supplying services. Providing a regulator with structural independence reduces the possibility of political or industry capture. When a regulatory body bows to external pressure from operators or other government entities, it often lacks independence and its decisions are neither objective nor transparent.

Financial Independence

In addition, the funding sources and budgeting processes of regulatory authorities also can have an important impact on their independence, efficiency and the cost of regulation. The source of a regulatory authority's funds and the process by which these funds become part of the authority's actual budget can directly impact the degree of a regulator's autonomy and competence when carrying out its responsibilities. While a regulator's budget may come from the government or from the telecommunications sector itself through licensing fees, fines and other administrative charges, the key element is that funding should be free from political and private interest influence.

In certain countries, the regulator‘s budget is part of the government appropriations allocated to the ministry under whose authority it resides. In these cases, the government‘s authority to determine the budget gives it a degree of direct influence and intervention, or at least the appearance of such, over the policies and regulations the agency may wish to implement. This may reduce the agency‘s effectiveness in regulating the telecommunications sector.

On the other hand, relying on multiple sources of funding rather than solely on government appropriations allows regulators to have more financial independence and can make them less subject to outside influences. Regulators, in countries such as Bahrain, Botswana, Brazil, Nigeria, Tanzania and Uganda, have been granted financial independence, coupled with the authority to manage and administer their own funds. This has been found to give regulatory agencies more regulatory certainty so that they can assert more independence in regulating the sector.

Functionality

Despite its best efforts, a government may establish a regulator that is structurally and financially separate from the other branches of government, but yet fails to function in an effective manner. In contrast, a regulator may not be legally separate from the other government agencies, but may have functional effectiveness. Unfortunately, no single feature can ensure functionality. Rather, functionality is predicated on a combination of elements such as well-defined functions and responsibilities; appropriate decision-making authority and enforcement and dispute-resolution powers; clear rules regarding the appointment, removal and mandate of the regulatory authority; incentives to promote professional expertise of the staff; and adequate provisions to address ethical and conflict-of- interest concerns. Functionality is also predicated on regulations that guarantee the consistency, timeliness and accountability of the regulator‘s decisions, as well as procedures to ensure transparency and public participation in the regulatory process. Without functional effectiveness, it is difficult, if not impossible, for a regulator to attain the necessary credibility among participants in the sector and potential investors.

Organizational and Institutional Approaches to Regulation

Separation of Powers and Relationship of Regulators with Other Entities

The mandate and competencies of the regulatory authority as well as its relationship with government and other market players depend on the delegation of powers by the state. The degree of delegation of such powers is determined by the legal tradition of the country and the political will to create an independent and effective regulatory authority. These factors influence the specific responsibilities, authority, and accountability for the performance of the regulator‘s specific activities.

Although complete ―independence is nearly impossible to attain, the regulator should have sufficient independence to implement regulations and policies without undue interference from interested parties such as politicians or other government agencies (functional independence). The institutional regulations put in place by laws and regulations as well as the administrative structure of the regulatory authority are critical to ensure such

independence, as such, the degree of independence differs considerably from country to country.

The most common institutional structure currently used is the establishment of an independent regulatory authority with responsibility for implementing and administering the regulatory framework, leaving policymaking responsibilities to a particular ministry.

However, it should be noted that independence does not mean that regulators should function in a vacuum, particularly in countries where the legal and judiciary infrastructure is weak. Independence must be balanced with clearly identified requirements for accountability. This involves establishing: (i) detailed policies and laws setting forth explicit objectives governing the regulator; (ii) specific requirements for reporting to the government or parliament; (iii) procedural requirements; and (iv) the possibility of judicial review.

At the end of 2009, 153 countries and administrative regions had created a national regulatory authority for their ICT and telecommunication sectors. Africa now has the highest percentage of countries with a separate sector regulator (91 per cent) followed by the Americas (89 per cent) and Europe (88 per cent). The Arab States and Asia-Pacific number 70 per cent and 62 per cent, respectively, and CIS countries 50 per cent.

Institutional Design Options

Once the regulator‘s mandate and competencies have been established, it is important to determine the regulator‘s institutional design, as well as its relationship with the government, industry, and the public. The institutional design of the regulator affects the structure of the regulator, including its leadership and management organization and its organizational and administrative structures.

Countries have considered four main institutional design options when faced with the task of designing and creating telecommunications regulatory entities: (i) single-sector regulator; (ii)

—converged regulator; (iii) multi-sector regulator; and (iv) no specific regulatory authority per se but rather a general competition authority with responsibility for overseeing the telecommunications sector.

No institutional design per se guarantees the successful functioning of the regulator, but when designing the institutional structure, the following important principles should be kept in mind.

- Regulators must be perceived by industry to be independent – thus the importance of transparency and accountability of the regulator.
- Regulators should have the expertise to assess and make sound judgments on both technical and industry-specific issues – thus the importance of appropriate appointment and staffing mechanisms.

- Regulators must take into account various viewpoints and interests, including economic, social, and political objectives. This balance should be reflected in the institutional structure and in the system of checks and balances.

- The institutional design, internal structure, and administration must be sufficiently flexible to allow the regulator to respond to market realities.

Single-Sector Regulator

The single-sector regulator‘s sole function is to oversee the telecommunications sector. This type of organizational structure focuses mainly on the telecommunications (and sometimes postal) sector, with other government entities responsible for broadcasting and information technology issues.

A key advantage of this option relates to staffing, since the staff is specifically dedicated to telecommunications issues. This establishes a core of specialized professionals with a strong set of legal, policy, engineering, and technical skills focused on sector issues.

Another benefit of single-sector regulators relates to the origin of their staffing. In many cases, single-sector regulators tend to initially inherit staff from the former state-owned post and telecommunications companies (PTT). They therefore have a core of specialized professionals from the start with a thorough understanding of the technical issues and strong engineering skills, which is a key advantage when dealing with complex network issues. Opponents of the single -sector regulatory structure argue that the origin of this specific skill set is, in fact, one of the key disadvantages of establishing a single-sector regulator. These critics argue that staff could be biased in favor of the incumbent operator, and thus more subject to capture by dominant forces. While this is an issue to be considered, it is not unique to the single-sector regulator as discussed below.

An additional disadvantage of having a regulator focused on the telecommunications sector alone (or for any other single sector) is that too many regulators are created for different sectors, thus leading to a higher cost of regulation. Similarly, and especially with convergence in the ICT sector blurring the boundaries between industries, overlapping responsibilities between sector regulators has also become an issue. This overlap may sometimes lead to duplication of regulations and require authorizations for what are essentially similar services being offered to the public.

The challenges of convergence have led several countries to move away from single-sector regulators and evolve towards a converged regulator, thus merging agencies in charge of the various aspects of the communications sector.

Converged Regulator

With a converged institutional design, all communications services i.e. telecommunications, including radio communications, broadcasting and media (and in some instances postal services), are under the umbrella of one agency. Several countries such as Austria, Italy, Finland, the Netherlands, Saudi Arabia, Singapore, South Africa and the United Kingdom, have followed the route of converging their institutions dealing with the ICT sector, typically

combining formerly discrete agencies responsible for telecommunications, broadcasting or information technology into one entity.

The converged regulator, like the single -sector telecommunications regulator, tends to be strong in specialized engineering skills in the communications sector, a critical skill set to deal with complex network issues. In addition, the converged communications regulator also meets the challenges posed by service convergence, overcoming one of the main disadvantages of a single-sector regulator (i.e. a regulator overly focused on the telecommunications sector).

For internal administrative purposes, this model provides greater flexibility and is administratively simpler, given that all services are within one government agency, and the staff responsible for specific services can work with other offices of the regulator that are dealing with related issues. Moreover, a more consistent approach can be taken within the regulatory authority as it adapts to changing technologies and their effect on legacy regulations. In addition, as the regulatory mandate is broadened to accommodate convergence, fewer individual regulators are deemed necessary, therefore resolving some of the overlap of regulatory functions and bringing down the cost of overall regulation.

Multi-sector Regulator

Despite a growing trend toward establishing converged regulatory agencies, the majority (56 per cent) of regulators worldwide have authority only over telecommunications. In some cases, they also have regulatory functions in traditionally adjacent markets, such as postal and information services. This is true for more than half of European countries and a third of countries in Africa and CIS.

Apart from general global trends, different regions have their own particular characteristics. Notably, no regulator in CIS and Arab States is responsible for regulating either broadcasting or utilities. In Europe, CIS and Africa, regulation of postal services has been part of the core mandate of at least a third of sector regulators. Latin America stands out with the highest concentration of multi-sector regulators

Multi-sector regulators oversee not only the telecommunications sector, but other industry sectors with common economic and legal characteristics (e.g., telecommunications, water, energy, and transportation). Costa Rica, the Gambia, Jamaica, Latvia, Luxembourg, Niger and Panama, as well as state public utility commissions in individual states in the United States, have chosen this type of organizational structure.

One of the main arguments generally raised in favor of a multi-sector regulator is based on the perceived lack of resources and the need for economies of scale to effectively regulate the different infrastructure industries and sectors. It is often argued that with this type of structural organization, one set of staff can be used to oversee a variety of industries. As the cases of Belize and Luxembourg demonstrate, however, staffs are generally recruited in terms of the sector it is regulating, and only legal and occasionally economic staff are pooled to deal with specific issues that occur across the sectors. Many issues, such as tariffing or spectrum management, are not transferable between sectors.

In addition, the suitability of a multi -sector regulator to properly address next generation communications technologies and services has been questioned. This is because a risk exists that, where economists and legal experts are shared across the utilities sector, the pool of expertise will become more diluted, thus compromising the capability and ultimately the credibility of the regulator.

Another disadvantage of this model is that often the telecommunications sector is the most liberalized under the auspices of the multi-sector regulator. It therefore can be negatively affected if it is regulated in an environment with utilities that are progressing at a different pace, where the needs and priorities are different. Moreover, by adding sectors, such as electricity and gas, that do not always produce revenues for the regulator, the telecommunications sector may bear a disproportionate share of the costs of regulation, potentially driving up regulatory costs for telecommunications providers. Supporters of this model argue that having a multi-sector regulator can reduce political and other influences regarding the decision-making process as opposed to, for example, the single-sector regulator.

Despite such claims concerning ―capture (meaning undue influence by politicians and/or dominant players), this does not necessarily seem linked to the institutional design option per se but is more a product of whether a clear set of ―checks and balances‖ is incorporated in the design of the regulator.

No Specific Telecommunications Regulatory Authority

An alternative institutional approach is to decide not to create any telecommunications-specific regulator, but instead rely on the application of competition and antitrust rules rather than on detailed sector-specific rules and institutional designs.

This model is inexpensive and simple to implement. Moreover, reliance on economy-wide rules and institutions to regulate the sector promotes a coherent treatment between telecommunications and other sectors. Another advantage is that there is less risk of political capture where the judges are ultimately in charge of enforcing economic regulation in the telecommunications sector.

Among the disadvantages of this option is that non-specialized judges are ill-equipped to deal with complex telecommunications regulatory issues. Indeed, sector-specific issues such as interconnection and number portability may be difficult to resolve in the absence of sector-specific requirements.

Today, there is no actual functioning example of this model in any country. Indeed, until the passage of the Telecommunications Act of 2001, New Zealand was the only country implementing this model, as it had chosen to entrust antitrust authorities with the task of administering all rules controlling market power in telecommunications. Instead of sector-specific regulation, the regulatory regime for telecommunications in New Zealand relied primarily upon general competition law, the Commerce Act 1986, to prevent anticompetitive behavior. The Telecommunications Act of 2001, however, established the position of a Telecommunications Commissioner, a specialist stand-alone commissioner within the

Commerce Commission, to regulate the telecommunications sector. The commissioner resolves disputes over regulated services; reports to the Minister on further designations or specifications of additional services; and monitors and enforces the Kiwi Share obligations.

Different Organizational Structures

Determining the ideal organizational structure for a regulatory authority requires an assessment of various factors, including the country‘s needs and objectives; political environment; legal requirements; and available expertise in the labor market. Essentially, there are two models of leadership organization for regulatory authorities: (i) the collegial body (a board or commission composed of multiple members); and (ii) the single regulator (often given the title of chairperson or president). Each has its advantages and disadvantages, and variations of each model are in use around the world.

The collegial body model usually involves a board or commission made up of individuals with different areas of expertise, potentially bringing those varied perspectives to bear on each regulatory issue. In addition, a collegial body could be seen as more independent, as it is less likely that all members would be influenced by the same actors, whether in the government or the private sector. As in any decision-making process involving more than one actor, however, the development of regulatory decisions can be a slower process and more subject to internal struggle.

By comparison, the single regulator model has the potential benefit of a consistent approach to regulation and decision-making, as decision-making authority is vested in a single individual who may have a unified plan for the telecommunications sector. In contrast to the collegial body model, single regulators can make decisions much more quickly, even when constrained by due process regulations. However, the single regulator is also potentially more vulnerable to undue influence exerted by external actors, whether in the government or in the private sector. In addition, a single individual may not be able to match the expertise of a collegial body made up of individuals from different backgrounds, although experienced staff can provide substantial expertise.

The number of regulators led by collegial bodies and single regulators continues to fluctuate as governments restructure their regulatory frameworks for the telecommunications sector. According to ITU data, approximately 75 percent of the regulators are collegial bodies with the remaining 25 percent constituting single regulators. Significant differences continue to exist between the balance of collegial bodies and single regulators across the various regions.

INTERNATIONAL FRAMEWORKS

Regulatory reform may accelerate in countries that make global and regional commitments to open their telecommunications markets to foreign investment and harmonize local legislation with that of other countries in similar geographic or economic situations. These commitments may also facilitate global or regional best regulatory practices, and provide telecommunications investors with a level of certainty and predictability.

Multilateral Commitments

Members of the World Trade Organization (WTO) have undertaken treaty obligations that directly affect the telecommunications sector. WTO obligations and commitments constitute legally binding obligations on members, enforceable through the WTO‘s binding dispute settlement process. As a result, the impact of WTO commitments on a country‘s regulatory framework can be seen through voluntary compliance of a member‘s commitments or as a result of enforcement through the WTO‘s dispute settlement mechanism. Periodic ―rounds‖ of negotiations are used to progressively improve and extend the obligations and commitments.

The General Agreement on Trade in Services (GATS) is foremost among the WTO instruments relevant to telecommunications. The GATS consists, in part, of a basic text and annexes (the ―framework‖), which apply to all Members. The GATS Annex on Telecommunications recognizes that access to, and use of, public telecommunications networks are essential to the effective provision of services covered under GATS.

It requires WTO members to ensure that suppliers of scheduled services may access the ―public telecommunications transport network and services‖ on reasonable and non-discriminatory terms. The 2004 panel ruling in the WTO dispute settlement case on Mexican telecom regulations confirmed the importance and legal weight of these guarantees.

In addition, GATS encompasses a set of schedules that contain market access commitments on specified services that are appended by each Member. Each Member may decide when, and to what extent, to commit on market access for telecommunications. In October 2010, a total of 108 Members had telecommunications commitments, the majority of which result from the basic telecom negotiations (1994-1997). Those negotiations established a basis for structural reform of the telecommunications sector by means of its concerted efforts at removing barriers to entry and competition. However, Members' commitments vary greatly from one schedule to the next. Which services are opened to competition and the types of restrictions maintained reflected the type of reforms in place or anticipated by each government at the time of the negotiations.

The negotiations on basic telecommunications also resulted in the Telecommunications Services: Reference Paper (see Appendix A). It was designed as template of a framework for sector regulation adapted to a competitive environment. The aim of the principles, from a trade standpoint, was to ensure the effectiveness and value of the market access commitments undertaken. Negotiated jointly by trade and telecom officials, however, it largely reflected best practice in pro-reform telecom regulation. Of the 108 WTO Members with telecommunications commitments, 82 had agreed to observe the Reference Paper principles by appending them to their schedules. The six principles of the Reference Paper have come to serve as a ―checklist of success of telecommunications reform in many countries. These principles relate to: (i) competitive safeguards; (ii) interconnection guarantees; (iii) transparent and competition-neutral universal service mechanisms; (iv) public availability of licensing criteria; (v) independence of regulators; and (vi) equitable procedures for allocation and use of scarce resources.

Further market opening is the objective in the current Doha Round of negotiations. At the time of the July 2008 Package, 39 governments had made offers to improve their existing commitments or to commit for the first time in the telecommunications sector.

Regional Initiatives and Frameworks

Regional commitments also constitute an important driver of liberalization and harmonization of the telecommunications regulatory frameworks. In various continents, regional organizations have spearheaded regulatory reform efforts, creating enabling environments for development in the sector.

Europe

In December 2009, the Council of Ministers and European Parliament adopted a new Telecoms Reform Package, to be transposed into the national laws of the 27 European Member States by May 2011. The adoption followed two years of consultation with national regulators and users and two years of negotiation between the European Commission, the Council and the European Parliament.

The EU telecoms reform package comprises the Better Regulation Directive and the Citizen's Rights Directive. The Better Regulation Directive amends the 2002 Framework Directive and four principal specific directives: (i) the Access Directive; (ii) the Authorization Directive; (iii) the Universal Service Directive; and (iv) the e-Privacy Directive. The package also includes a new Regulation establishing a European Body of Telecoms Regulators (BEREC) to replace the informal European Regulators Group.

The reform package substantially strengthens competition and consumer rights in Europe's telecoms markets, facilitates high-speed internet broadband connections to all Europeans and reaffirms the objective of completing the single market for telecoms networks and services.

Americas and the Caribbean

Mercado Común del Sur (Common Market of Southern Cone or MERCOSUR), created in 1995, is the economic block formed by Argentina, Brazil, Paraguay, Uruguay, and República Bolivariana de Venezuela, with Bolivia, Peru, and Chile as associate member states. Although MERCOSUR does not have a single body of telecommunications rules or directives, decisions issued by the Common Market Council on relevant commercial matters governed under the MERCOSUR treaty are later adopted into the national legislation of the member states. Working Subgroup 1 (SGT1), which is responsible for negotiating matters regarding communications, has issued several recommendations that have been incorporated into the national legislation of the member states in matters such as the provision of basic public telephone services in the bordering areas of MERCOSUR and the harmonization of certain spectrum bands, among others.

The Inter-American Telecommunication Commission (CITEL), an entity of the Organization of American States (OAS), focuses on promoting the development of Telecommunications and ICTs in the Americas. CITEL serves as a permanent forum that brings together government and the private sector for coordinating the Member States' diverse political, economic, social and technical perspectives required to assist in meeting their specific

infrastructure needs. CITEL's evaluations include relevant legal, regulatory and technology-related issues such as universal access to ICTs, common standards, network interoperability, and compatible use of the radio spectrum. These CITEL activities uniquely promote country and regional economic development and contribute to consolidated representation of Members' positions at regional, hemisphere and international policy meetings.

The Andean Community (CAN), formed by Bolivia, Colombia, Ecuador, and Peru, with Argentina, Brazil, Chile, Paraguay and Uruguay as associate member states, has been instrumental in promoting liberalization of telecommunications services in the region. In May 1999, it adopted a common and binding decision to remove market entry barriers in the sector (excluding broadcasting). In addition, the Andean Committee of Telecommunications Authorities (CAATEL) advises the various bodies of the Andean Integration System on telecommunications matters at the Community level.

In an effort to introduce competition in the telecommunications sector, the Eastern Caribbean Telecommunications Authority (ECTEL) was established in May 2000 by Treaty signed by the Governments of five Eastern Caribbean States – Commonwealth of Dominica, Grenada, St. Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines. ECTEL is the regulatory body for telecommunications in its Member States, made up of three components – a Council of Ministers, a regional Directorate and a National Telecommunications Regulatory Commission (NTRC) in each Member State. ECTEL aims to be a model multi-state regulatory system providing quality leadership and advice, by applying fair, transparent and independent processes to promote competition in a fully liberalized telecommunications environment for the creation of socio-economic opportunities within the Eastern Caribbean whilst ensuring global network connectivity.

Africa

The Economic Community of West African States (ECOWAS) is among the various regional economic communities in Africa actively creating initiatives to foster cooperation and integration of their telecommunications and information technology activities. The ECOWAS treaty foresees the harmonization of legislation, including in the telecommunications field, similar to the EU model. For this purpose, ECOWAS, together with The West African Economic and Monetary Union (UEMOA) undertook Telecommunications Regulation Harmonization Project aimed at designing a strategy for the harmonization of telecommunications policies in ECOWAS. ECOWAS Ministers of Telecommunications and Information Technology (ICT) adopted the guidelines in 2006.

The New Partnership for Africa‘s Development (NEPAD) is a program of the African Union (AU). The NEPAD Agency‘s work under ICTs is overseen by the NEPAD e-Africa Programme. The vision of the program is to see Africa as a globally competitive digital society. Previously known as the NEPAD e-Africa Commission, the NEPAD e-Africa Programme was endorsed in 2002 by the then Heads of State and Government Implementation Committee (HSGIC) as the NEPAD Task Team responsible for developing policies, strategies and projects at the continental level, as well as managing the structured development of the ICT sector in the context of NEPAD. The aim of the NEPAD e-Africa

Programme is to actively pursue cross-sectoral initiatives so that ICT is entrenched in the work of other sectors. The aim is to create synergy with other sectors leading to the realization of relevant e-services to further socio-economic development.

Other African regional initiatives include: the Communications Regulators Association of Southern Africa (CRASA), and the Association of Regulators of Information and Communication in Central and Eastern Africa (ARICEA).

Asia

Over the past decade, creating an effective framework to promote growth in the telecommunications industry has been a top priority for the Association of Southeast Asian Nations (ASEAN), an intergovernmental organization comprised of the Governments of Brunei Darussalam, Cambodia, Indonesia, the Lao People‘s Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. However, ASEAN regulatory reform proposals (e.g., the development of a uniform regulatory framework among ASEAN countries) have yet to yield concrete results, largely due to the lack of binding authority of ASEAN‘s decisions on its member countries.

LOOKING AHEAD

Over the past decade, new communications technologies have become cheaper, more useful and more useable and in becoming cheaper, have been embraced by the majority of people in developed countries, as well as a growing proportion of those in the developing world. This dramatic change is bringing with it a range of new challenges, related, for instance, to privacy, security and digital content regulation. These challenges, even though seemingly outside the normal bounds of telecommunications regulation, are increasingly being seen as part of the new regulatory landscape: such is the revolutionary impact of technological convergence.

REGULATORY FRAMEWORK IN DIFFERENT LEGAL SYSTEMS

The last two decades years has resulted in dramatic changes in the telecommunications regulatory frameworks of many countries as a result of market liberalization. Some degree of regulatory reform has been implemented in most countries, including the establishment of independent regulators in 131 countries by 2005. * As a result of these changes, regulatory models have been developed incorporating internationally recognized best practices, despite the countries having different legal traditions. In implementing these models, the legal tradition has influenced the procedure and approach towards the achievement of the policy and regulatory goals that support such best practices, but has not necessarily determined the content of the telecommunications regulatory framework. *

Similarly, the process of globalization and world trade has played a significant role in shaping the content of a country’s regulatory framework. As further discussed in Section 3.3, countries seeking to attract investment in their telecommunications sectors, strengthen their economies and engage in bilateral and multilateral trade integration, are often required to fulfil several regulatory preconditions aimed at the removal of market barriers. For example, the World Trade Organization (WTO) Reference Paper, which articulates the principles of a

telecommunications regulatory framework, has been adopted by close to 90 countries throughout the world. (See Table 3-1 for examples of countries with different legal traditions that have committed to the WTO Reference Paper.) This Reference Paper requires countries to establish an independent regulator, as well as incorporate fundamental tenets into their telecommunications regulatory framework regarding interconnection, universal service, competitive safeguards, licensing criteria, and allocation and use of scarce resources.

Implementation of Regulatory Design

The design of legal instruments used to regulate the telecommunications sector may vary depending on the legal tradition of a country. Generally, however, the legal framework follows a hierarchy beginning with primary legislation, such as laws and decrees from which secondary legislation such as regulations, resolutions and guidelines follow. This legislation, in turn, provides the legal basis for the regulator or the relevant ministry to issue authorization instruments such as licences, concessions, and permits to operators. This legal hierarchy provides certainty and predictability to consumers and other stakeholders because it specifies the rights and obligations (i.e., the rules of the game) that apply to the sector. Such hierarchy provides assurances to stakeholders that secondary legislation (e.g., rules, decrees and instructions) cannot be used by the government to nullify certain rights and obligations set forth in primary legislation. This stable environment, in turn, encourages investment and increases consumer confidence in the sector.

Primary Legislation

The primary legislation for the sector should consist of the framework that will be used to regulate the sector. To the extent possible, this should be issued through a legal instrument not susceptible to easy revocation by a government authority in order to ensure stability and predictability. It should lay out the basic elements and framework, such as the establishment of the regulator, the powers and responsibilities of the regulator, the role of the minister responsible for communications (if applicable), enforcement powers and ability to sanction. While the primary legislation should address fundamental regulatory issues such as universal service and interconnection, the details of such issues are better addressed through secondary legislation. When looking at primary legislation in both civil and common law traditions, many of the same elements are included. In countries with civil law traditions, however, subject areas covered by the principle of legal reserve (i.e., subject matters that have been constitutionally reserved to regulation by an instrument with the hierarchy of a law) also may need to be included within the text of primary legislation. Such subject areas typically encompass direct limitation of individual rights (e.g., the right to free enterprise and property, or freedom of speech) as well as the regulation of prohibited conduct and applicable sanctions. Moreover, in civil law jurisdictions it is often the case that in order to regulate certain matters through secondary legislation, they must be referred to in the primary legislation. Further, the extent of specificity contained in the primary legislation from civil law jurisdictions is mixed. In certain countries, such as Bulgaria, * the primary legislation is quite comprehensive, including extensive details regarding the licensing framework, universal service, interconnection, consumer interests, fees, and sanctions; whereas, in

countries such as Algeria, * the primary legislation address similar issues, but the provisions are much less detailed.

Secondary Legislation

The more detailed elements of regulatory issues may be addressed best in secondary legislation, which can be amended and modified more easily to complement the pace of technological development without the intervention of the legislature. Typical regulatory issues addressed through secondary legislation include interconnection, competitive safeguards, numbering, universal service, and tariffs. Secondary legislation may take different forms (e.g., regulations, instructions, decrees, guidelines) and depending on the jurisdictions there may be a hierarchy with regard to the secondary legislation. For example, in Spain, regulations may only be issued by the minister, as the regulator only has authority to issue "instructions." This challenges the independence of a regulator to establish its own policy because the ministry can always issue a regulation that modifies an "instruction" issued by the regulator.

Authorization Instruments

A variety of "authorization" instruments are used by governments to grant an entity the right to undertake certain activities in the telecommunications sector (e.g., provide telecommunications services, operate networks, and use spectrum). These instruments include concessions, franchises, delegations, licences, permits, and other forms of authorizations. * Typically, the general authorization framework is set forth in the primary legislation and further expanded upon and described in specific detail in secondary legislation.

Administrative acts and administrative contracts

In civil law jurisdictions, the "authorization" instrument often is either a unilateral administrative act or a bilateral administrative contract. A bilateral administrative contract when used as an "authorization" instrument generally is a concession, franchise, delegation or other type of agreement. However, not all contracts entered into with public entities are administrative contracts. In comparison to licences, concessions, franchises and delegations are more often in the form of an administrative contract than a unilateral administrative act. Typically, an administrative contract requires the consent of the parties to be amended. Thus, some investors find concessions (as well as franchises and delegations) to be a more attractive vehicle than a licence.

Usually, a telecommunications licence is a unilateral administrative act, rather than an administrative contract. Although different views exist as to whether an administrative act can be unilaterally amended or revoked, it is considered a more flexible instrument than an administrative contract.

In certain jurisdictions, such as Jordan, the "licensing" instrument consists of a licence and an administrative contract (i.e., licensing agreement). Jordan's Telecommunications Law provides that "the licence shall be issued by virtue of a resolution by the Board, provided that a contract of an administrative nature is drawn including the following terms and conditions

in addition to any other conditions stipulated in this law, or the regulations issued pursuant thereto, or any exceptions determined by the Board: (…).” *

Shift away from concessions

While moving towards liberalization, some countries permitted the delivery of telecommunications services through the unilateral issuance of licences or concession contracts between the relevant government authority and the private party authorized to provide a particular service. As countries implement regulatory reforms, however, they are typically shifting away from concessions and moving to licences, permits, notifications and registrations which tend to be more straightforward and uniform. Moreover, in many countries, licensing instruments are much more streamlined, with the terms and conditions associated with the licence generally addressed in secondary legislation rather than the licence. From a regulator’s standpoint, this is a less cumbersome process because changes do not have to be introduced to each licence that has been issued, rather changes can be introduced by amending, or issuing new secondary legislation.

RECENT DEVELOPMENTS IN ITU REGULATIONS

In 2012, a global treaty conference will be held under the auspices of the United Nations’ specialized agency dealing with telecommunication, the International Telecommunication Union (ITU). The treaty, called the International Telecommunication Regulations (ITRs), was developed at the 1988 World Administrative Telegraph and Telephone Conference (WATTC-88) and has not been revised in over 20 years. Its purpose is to facilitate “global interconnection and interoperability” of telecommunications traffic between borders1. The regulations, while broad and high level, are intended to impose mandatory regulation of all aspects of the international exchange of telecommunications traffic they provide a framework for international cooperation in which global interoperability is achieved. The regulations currently address high-level issues such as charging and accounting, safety of life, liability, and taxation. There is also provision made for “Special Arrangements”. That text has been important in the rapid growth in the exchange of Internet Protocol (IP) traffic, the use of virtual private networks and the provision of value added services. In essence, the ITRs of 1988 provided a high level context in which telecommunications traffic could be exchanged globally. In the pre-Internet era where many telecom enterprises were state-owned, an international treaty among governments was useful, even necessary, to ensure that telecommunications operators could interconnect around the globe. As an example of the scale involved, at the time of the treaty negotiations in 1988, American telecommunication carriers alone exchanged $12B in traffic annually over the fixed network. Having clear rules that guaranteed market access was essential to operating global telecommunications networks. The treaty gave private telecommunications carriers a baseline global framework that ensured interoperability (rather than having to obtain country-by-country agreements or licenses), and guaranteed that revenues would flow to national governments and private carriers via settlement payments.

While the ITRs were negotiated in the era of state-run telecom monopolies, there are provisions that have proven essential to the growth of the global Internet (at least from a legal

and business perspective). One of these, Article 9, Special Arrangements, allows for the exchange of certain kinds of traffic outside the provisions of the ITRs.

Originally, this accommodated virtual private networks, banking transactions, etc., but it has gradually become a legal mechanism underlying the way that Internet (IP) traffic is moved by global network operators. This notion of special arrangements is likely to be a significant part of any renegotiation of the treaty.

The amount of international (fixed-line voice) traffic that is subject to settlements has diminished significantly since 1988, putting a strain on revenue streams for telephone carriers, whether state-owned or privately owned. For many developing countries whose traditional revenue sources (i.e. the state-owned telecom companies) have been greatly reduced in the 21st century communications market, reopening the ITRs may be viewed as an opportunity to try to redress the situation bringing new technologies into the legal framework. However, in the rapidly changing, competitive and innovative IP based communications environment, the Internet Society believes it is not advisable to resolve Internet-related technical, operational or commercial issues via a static, international treaty such as the ITRs.

WORLD CONFERENCE ON INTERNATIONAL TELECOMMUNICATIONS (WCIT)

Preparations for the 2012 conference – the World Conference on International Telecommunication (WCIT) – are being overseen by an ITU Council Working Group, which is charged with holding a series of global and regional preparatory meetings starting in 2011. In addition to the global preparations, there will be regional preparatory meetings in the months leading up to the WCIT so that regions can prepare common positions and proposals.

The WCIT will take place in the context of worldwide discussions and formal conferences that are concerned with Internet governance. Internet governance issues became prominent in preparation for the 2003 World Summit on the Information Society. In discussions over the past decade, ITU Member States and Sector Members have been highly involved in trying to establish what should be the ITU role in Internet public policy. While 'saying it doesn't make it so', if Member States incorporate new conditions aimed at bringing Internet public policy under an international treaty, this could substantially change the nature of discussion on Internet matters in the ITU and throughout the Internet ecosystem.

While the existing ITRs are at a relatively high-level, viewed from today's vantage point, many proposals for revision may be more detailed, blurring the lines between traditional telecom networks and the Internet. Below is a list of issues/topics that some ITU Member States have thus far proposed to include in a revised ITR treaty.

• Mandated application of ITU-T recommendations, which could create operational issues if not compatible with Internet standards;

• Countermeasures against spam (including combating spam) and related issues such as phishing, malware, malicious code, etc;

• Dispute settlement;

• Peering arrangements and the impact on costs of international Internet traffic;

• Misuse of numbering, naming and addressing resources and subscriber identification;

• Quality of service;

• Cyber security, including security of data, of signaling and traffic information, and of billing information;

• Appropriate use of billing and payment models;

• Personal data protection;

• "New technologies" regulation;

• On-line child protection; and

• Internet addresses allocation/distribution

THE 2012 WORLD CONFERENCE ON INTERNATIONAL TELECOMMUNICATIONS:

Another Brewing Storm Over Potential UN Regulation Of The Internet:-

Once again, many companies in the telecoms and information and communications technology (ICT) sector are facing the specter of a United Nations agency (in this case the International Telecommunication Union (ITU)) regulating critically important aspects of the internet as well as substantially expanding its jurisdiction over the telecoms and ICT industries.

It is important that telecoms, technology, and ICT lawyers, consultants, and advisers – both in-house and outside – carefully monitor the domestic and international preparations by governments leading up to this major international treaty conference as it will potentially have a material impact on companies throughout the entire sector.

Specifically, in December 2012, the ITU will be holding a major treaty-writing conference in Dubai that many countries would like to use to significantly expand the jurisdiction and legal authority of the ITU, even potentially giving this United Nations agency greater influence over internet governance as well as major telecoms issues such as accounting rates and termination charges for next-generation networks, data privacy, cyber security, international mobile roaming, and equipment specifications.

For more than two decades, the story of global economic policy has been one of promoting competition and increasing liberalization across various industries, especially the telecoms and internet sectors. Today, however, significant government and civil society support is developing for a different policy outlook. Driven largely by the global financial troubles of recent years together with persistent concerns about the implications of the growth of the internet for national economies, social structures and cultures, some governments and

others are now actively reconsidering the continuing viability of liberalization and competition-based policies.

The ITU's World Conference on International Telecommunications (WCIT) could signal a shift in the regulatory paradigm on both the international and national levels. At the conference, a major 1988 treaty known as the International Telecommunication Regulations (ITRs) will be renegotiated. Some within the ITU and among its 193 member states would like to see major changes to the treaty, particularly with respect to the internet as well as wireless, IP-based, and next-generation networks, which have historically been mostly free of intrusive economic and other regulation. Stating his belief that a substantial expansion of the scope of treaty is necessary, ITU Secretary-General Hamadoun Touré recently asserted that "[w]e need updated ITRs because without them we risk the collapse of the ICT networks which underpin all communications technologies, including the internet." Other countries, however – notably, the United States – believe instead that the WCIT should adopt only minor changes to the ITRs as necessary to modernize the existing provisions of the treaty, and that new provisions and authorities are unnecessary.

Because of the ITU's international visibility, decisions made at the conference could signal to both domestic regulators and other international intergovernmental organizations that a move toward more intrusive economic and other regulation is appropriate. It seems fair to say that the decisions made by governments at WCIT will help define the international regulatory environment for the internet and telecoms in the 21st century.

The ITU, established more than 100 years ago, is a specialized agency within the United Nations that focuses on telecommunications and ICT. The ITU allocates global radio spectrum and satellite orbits, develops technical standards to promote interconnection and technical interoperability, and works to improve telecommunications access for underserved communities. The ITU has historically disclaimed any authority to regulate domestic telecommunications, clearly recognizing in the ITU Constitution the "sovereign right of each state to regulate its telecommunication."

While the ITU has a limited scope of regulatory authority over international radio-communication issues, it also adopts recommendations on a wide range of topics and facilitates the adoption of international treaties. ITU recommendations do not have the force of law, but rather set forth suggested regulations and requirements for national regulatory authorities. These recommendations address standardization, economic and technical issues. By distinction, international treaties are generally binding law for all nations that are signatories to the treaty.

The ITRs are a binding 1988 treaty that established important general principles relating to international telecommunications services and transport, interconnection and interoperability of telecommunications facilities, and accounting and settlement of international voice traffic between administrations. While the ITRs provide a general framework for mutual agreements between countries regarding the exchange of telecommunications traffic, the ITRs also allow for private agreements between non-

governmental organizations (e.g., telecommunications carriers). This is the typical method for most agreements for the exchange of international traffic today.

Since the ITRs were adopted in 1988, the international telecommunications marketplace has experienced rapid technological change, the development of competitive and liberalized markets, and the privatization of national telecommunication service providers. As a result, in December 2012, the ITU will host the World Conference on International Telecommunications in Dubai to revise and modernize the treaty for the first time since its adoption.

So far, there is no international consensus about the scope of appropriate modifications to the treaty. For some governments, the WCIT presents an opportunity to significantly expand the jurisdiction and role of the ITU into previously unregulated, lightly regulated or domestically regulated aspects of the emerging digital economy. Some of the proposed changes to the ITRs could position the ITU as a supra-national regulator and require signatory nations to enact conforming domestic laws. ITU Secretary-General Touré has asserted that the recent problems in the financial and banking sectors were caused by "inadequate regulation and regulatory supervision" and he has called for the international community to agree to "a framework that will avoid any catastrophe" in the telecoms sector.

Participation will be limited to representatives of national governments. However, private sector entities generally have opportunities to help inform the policymaking in advance of the conference, such as through meetings with individual governments, participation in working groups or preparatory meetings, and appearances before international or regional organizations. Many governments allow members of the private sector to be on their national delegations to ITU conferences.

Typically, international telecommunications issues such as international mobile roaming, internet peering, and internet governance are handled today through a combination of negotiated agreements between private parties, bilateral and multilateral trade agreements, and non-governmental technical or civil society organizations. Some countries, however – particularly within the developing world – object to the current situation on the grounds that the system does not pay sufficient regard to their economic and other needs, that it disproportionately favors major international telecom and technology companies, and that the United States government has too much direct influence in decision-making. To address these perceived inequities, several new provisions and modifications for the ITRs have been proposed:

Internet management:-

Several countries have proposed to move oversight or "control" of aspects of the internet and internet development from the non-governmental multi-stakeholder mechanisms such as ICANN and replace them with the ITU.

Internet charges:-

Some governments would also like the ITU to play a greater role in regulating peering, termination charges for data traffic, and other internet-related rate issues to, among other things, potentially lower certain internet backbone costs and to capture for domestic coffers some of the value of international VoIP services entering their countries.

MANDATED APPLICATION OF ITU RECOMMENDATIONS:-

The ITU has issued non-binding recommendations on topics ranging from accounting rates and tariff issues to the construction, installation and protection of telecommunications cables, to the power flux density of wireless transmitters. While these recommendations are only advisory at the moment, some proposals could transform some or all of these recommendations into mandatory treaty provisions with the force of law.

INTERNATIONAL REGULATION OF ROAMING:-

The ITU currently does not have legal authority to directly regulate either retail or wholesale international mobile roaming rates, but WCIT could expand the ITU's authority over international roaming, especially regarding wholesale rates.

Cyber security:-

Some countries are seeking to include cyber security and cybercrime provisions into this treaty so that the ITU can impose new regulations and establish itself as the organizational home for international cyber security policymaking. Included within this could be broad new data privacy, spam, and child protection regulations.

DEVELOPING COUNTRY ISSUES:-

Some developing world countries suggest that the ITRs be modified to allow them to charge carriers from the developed world higher rates. In addition, some countries also would like to modify the ITRs to lower the costs for developing world countries when they bargain with commercial carriers for international telecoms and internet services, as well as to ensure "transparency" for retail and wholesale prices and quality of service.

These and the other changes proposed in the WCIT preparatory process could greatly expand the scope of the ITRs and grant the ITU substantial new regulatory powers, thereby radically changing the regulatory landscape. The effects of these revisions could affect the fundamental economic structure of the entire ICT sector. For example, making the ITU Recommendations mandatory would effectively supersede established industry practice and domestic regulations with respect to core aspects of equipment design and network operations. Similarly, proposals related to how companies can collect and use customer data, cyber security, or child protection would interject an international intergovernmental organization into the relationship between service providers and their customers. Additionally, the combined effect of the proposals would be to bring under ITU authority the core functions of many established and effective international non-governmental organizations such as IEEE, ISOC, ICANN, and W3C, particularly with respect to the design

of systems and infrastructure, the development of protocols, and the management of domain and numbering resources.

OTHER PROPOSALS FOR INCREASED INTERNATIONAL REGULATION OF THE INTERNET:-

Perhaps even more significant than the specific reform proposals being considered in the run up to the WCIT is what these proposals represent in terms of the broader regulatory paradigm. The outcome of the 2012 WCIT may signal to regulators on both the international and national levels what the appropriate role of government should be in the 21st century regarding the internet and telecoms generally. Governments, particularly in the developing world, could interpret the introduction of new interventionist regulations through the ITRs as signaling that increased regulation of the ICT sectors is appropriate, which could ultimately hinder investment and competition in these markets.

Indeed, discussions regarding international internet policymaking are already gaining momentum within the UN and various other international forums. Some of these proposals are more specific than others, and they each have different likelihoods of producing real results, but taken together, they demonstrate the widespread attention these issues are receiving by governments around the world.

International Convention on Cybercrime:-

Russia has long sought UN action regarding cyber security and internet-transmitted information. In September 2011, Russia, China, Tajikistan and Uzbekistan submitted to the UN General Assembly a proposal for the adoption of an International Code of Conduct for Information Security. Among other things, this Code would commit signatories to cooperating in "curbing the dissemination of information that incites terrorism, secessionism or extremism or that undermines other countries' political, economic and social stability."

WORLD TECHNOLOGY POLICY FORUM:-

In 2013, the ITU will convene the 5th World Telecommunication/Information and Communication Technology Policy Forum to discuss internet issues related to the ITU's involvement in internet-related public policy. Unlike the WCIT, this Policy Forum will not create binding international treaty documents, and therefore it may be a more comfortable forum for some of these discussions.

London Conference:-

In early November 2011, the United Kingdom hosted an international Conference on Cyberspace in London, which emphasized the development of uniform international norms for private and governmental behavior online. This conference is expected to become an annual forum for policy discussions among high-level ministers and other governmental representatives, with meetings already being planned for the next two years.

Despite the broad and dramatic scope of various governmental proposals – which could affect core aspects of running an ICT, telecoms, or internet-based business – the WCIT preparatory process is not receiving sufficient attention from most businesses and others. The WCIT could lead to new regulations governing how these businesses are run and how such businesses may interact with their customers, partners, and vendors, as well as how they can innovate and provide new and improved services. Moreover, because of the implicit attacks on established mechanisms of internet governance, the WCIT has the potential to destabilize and politicize standardization processes and the management of the internet architecture in a way that could also hinder innovation and efficiency. Many national delegations are interested in hearing the concerns of industry and others. Interested companies and other groups should take steps to monitor the conference preparatory processes and should be on the lookout for opportunities to inform and influence the debate.

Kenya has seen great socio-economic, political, cultural and individual benefits of mobile and Internet. Recognizing these benefits, Kenya has a goal of 100% Internet penetration by 2017 and is well on its way. In 2012, Kenyan mobile phone usage jumped 19%. Moreover, the Kenya Internet Exchange Point (KIXP) currently localizes more than 1Gbit/s of peak traffic, dramatically reducing latency (from 200-600ms to 2-10ms on average), while allowing ISPs to save almost $1.5 million per year on international connectivity. The IXP also increases mobile data revenues by an estimated $6 million for operators having generated at least an additional traffic of 100Mbit/s per year; helps the localization of content in the country; is critical to raising government tax revenues, and increasingly acts as a regional hub for traffic from neighboring countries with over 50 regional networks accessible directly from KIXP.

On matters pertaining to security, the Communications Commission of Kenya has established the National Computer Security and Incident Response Team (CSIRT) that coordinates the dissemination of information from various industry-specific CSIRTs. The Internet Service providers have a functional CSIRT that provides information that is relevant to resolve potential security threats and vulnerabilities to its members.

THE INTERNATIONAL TELECOMMUNICATIONS REGULATIONS (ITRS):-

In early December 2012, a global treaty conference, the World Conference on the International Telecommunication Regulations (WCIT), was held under the auspices of the International Telecommunication Union (ITU). The treaty, called the International Telecommunication Regulations (ITRs), was developed at the 1988 World Administrative Telegraph and Telephone Conference (WATTC-88) and had not been revised since that time. The ITRs are intended to facilitate "global interconnection and interoperability" of telecommunications traffic across national borders. The regulations provide a framework for international cooperation in which global interoperability of telecommunications networks is achieved. Kenya's national consultations process leading to the WCIT12

Kenya held several multi stakeholder national consultations leading up to the WCIT meeting in Dubai:

Kenya IGF, which commenced with online discussions conducted on three local lists serves namely the Kenya ICT Action Network (KICTANet) skunkworks and ISOC Kenya and culminated in a face to face meeting that took place on July 6, 2012.

The 2012 East African Internet Governance Forum (EAIGF), which took place in July 17-18, 2012, and held in collaboration with the African Telecommunications Union (ATU) with the second day, 18th July fully dedicated to discussing the ITRs.Kenya ITRs National Consultations convened by the CCK took place on November 13, 2012. On September 24, 2012, the CCK had released the 'African Common Proposals, for public consultations.

It had been expected that after the public consultations, Kenya would develop a national position. This multi stakeholder model of policy making is enshrined in Kenya's 2010 Constitution where article 10 provides for the participation of citizens as one of the national values and principles of governance. It provides inter alia that: -

(1) the national values and principles of governance in this Article binds all State organs, State officers, public officers and all persons whenever any of them—

(a) Applies or interprets this Constitution;

(b) Enacts, applies or interprets any law; or

(c) Makes or implements public policy decisions.

(2) The national values and principles of governance include—

(a) Patriotism, national unity, sharing and devolution of power, the rule of law, democracy and participation of the people While the African block, (based on political interests and lack of foresight on the unintended consequences)-supported positions throughout the conference that may cause damage to our economy. For instance, two proposals that were in the African Common Proposal that would have had significant unintended consequences for Kenya are as follows:

1. The definition of Operating Agencies which would have potentially caused all communications providers, from mobile operators to ISPS and website providers to be subject to the provisions of the treaty. This would have caused instability in our communications market, with even the potential for MPESA (it is an international system now) coming under the provisions of ITRs.

2. The addition of article 41K, which proposed a fair compensation for, carried traffic (Sending party pays for traffic termination). This proposal was prescriptive of business models for member states to apply. This business model while beneficial in the short term for less developed countries, those that have made significant development such as Kenya and are exporting traffic, would suffer in the long term through such a provision. The unintended consequence would be a rise in the cost of services to end users attributed to the change in the business models.

Delaying the decision to sign the 2012 ITRs was the right decision both because of the unprecedented expansion of "human rights" language in the treaty that is inconsistent with international human rights standards, and the encroachment of the treaty into regulation of the Internet that could endanger Kenya's efforts to grow its Internet-based industries. Our decision to not sign at WCIT-12 is reinforced by the fact that, to the extent there are positive aspects to the treaty, Kenya and its businesses will still enjoy many of their benefits in the global international telecommunications ecosystem. We should take the decision to sign, take reservations, or not sign after further national multi stakeholder consultations and careful consideration of Kenya's national interest. Kenya is not alone in making this determination; indeed 55 countries did not sign the Final Acts of the Conference in Dubai, including both developing and developed countries, and Member States from every continent. It is normal for many countries to sign such important and binding documents like treaties after a round of consultation at the national level.

This unprecedented new human rights language is inconsistent with established principles of international law. It is a dilution of human rights as applied to the individual and a shift towards collective, state rights. This language was added to the Preamble of the treaty as a supplement to the commitment made by Member States to implement the revised Regulations "in a manner that respects and upholds their human rights obligations." The new language – (which was added on the last working day of the conference pursuant to a vote called for by Iran, and supported by various African and other nations) appears to recognize a unique international human right that is inconsistent with established human rights precedents. Regardless of whether Kenya agrees with the underlying sentiment of the provision, the ITU and telecoms sector are not appropriate venues for the creation and recognition of new human rights. Kenya, like other countries, should carefully and fully consult with all relevant legal experts and national stakeholders (especially those in other, non-telecoms parts of the government), the private sector, and civil society to determine if this radical expansion of "human rights" to include governments is appropriate and lawful.

Kenya remains committed to upholding human rights obligations and to the values of freedom of expression and the free flow of information and ideas on the Internet. Kenya will continue to work with the ITU and others to achieve universal affordable access. Recognized operating agencies versus operating agencies "authorized operating agencies," this is a category that could include a large number of new entities such as Internet access service providers (ISPs). To the extent regulatory solutions are required in these areas, they can be implemented on the national level without this revised treaty. Ultimately, Kenya – with vibrant and growing ICT and Internet content industries should see this expansion of international regulation as adverse to its national economic interests.

Article 3.7 "Implementation of regional telecommunication exchange points": This is a new introduction to the ITRs. There is no definition of "Regional telecommunication exchange points" in the telecommunications sector or ITRs. As such, this may imply "regional Internet exchange points". The growth of regional "Internet" exchange points is driven by social economic factors. Kenya has strategically managed to develop these factors in its favor hence the growth of the Kenya Internet Exchange Point (KIXP) and Mombasa

Internet Exchange Point (IXP). The unintended consequence of this article will be eliciting discussion on the location of the regional telecommunications exchange point, at regional level, since each country cannot have one. Such a process is likely to hamper national efforts, growth or emergence of a regional exchange point driven by the fundamentals.

-Article 5A "Security and robustness of networks": ITRs is not a useful venue for addressing security issues. This would have significant implications for issues of privacy and freedom of information. Kenyan stakeholders have made significant progress in addressing security concerns through collaboration and setup of industry specific CSIRTs coordinated by the CCK. We therefore encourage national, regional and international collaboration and cooperation to further enhance the effectiveness of the efforts made thus far. Kenya is an active and committed participant in such efforts, for example the multi stakeholder commonwealth Cybercrime (CCI) Initiative among others.

-Article 5B: "Unsolicited bulk electronic communications" is a new introduction to regulating spam, which is a form of content and inevitably opens the door to regulation of other forms of content, including cultural and political speech. This article introduces regulatory scope of the treaty into Internet issues and invites governments to take content-based action and moves the treaty into the realm of regulating speech on the Internet. Similar concerns are relevant to the security language adopted in Article 5A. -Resolution Plen/3 "To foster an enabling environment for the greater growth of the Internet" represents a direct extension of ITUs role and scope into the Internet despite earlier assertions from ITU that the WCIT would not address Internet issues. While the resolution is not on the body of the ITRs, and is nonbinding, it is still in the Final Acts and will therefore give the ITU the scope to assert its intergovernmental role in Internet governance processes. We also note that the highly selective references to the WSIS outcome documents do not reflect previous international agreement on Internet policy and governance This Resolution, therefore presents an unbalanced view of Internet governance that is inconsistent with the principles underlying the Internet Governance Forum (successfully hosted by Kenya in 2011) and many of the provisions agreed to at the United Nations World Summit on the Information Society (WSIS) in 2003 and 2005.

The 2012 World Conference on Information Technology (WCIT-12) in Dubai collapsed on Friday, December 14 after the United States delegation walked out and refused to sign the new International Telecommunications Union (ITU) treaty. Western allies including the UK, France, Germany, Australia and Canada joined the US.

In all, 55 countries refused to sign the agreement, while another 89 nations endorsed it. The breakdown of talks at the WCIT-12 summit signals intensified national conflicts in an increasingly interdependent world.

The Dubai conference was called by the ITU, a special agency of the United Nations for information and communications technologies (ICTs), to adopt new rules of cooperation between countries known as International Telecommunications Regulations (ITRs). The 12-day conference drew 1,950 delegates from 160 nations and was in preparation for two decades.

The last set of ITRs was adopted at a 1988 conference in Melbourne, Australia when the Internet was in its infancy, the first fiber optic cable had just been laid across the Atlantic Ocean and first generation mobile phones were used by a tiny fraction of the population in the most advanced countries.

`The ITU has a membership of 193 countries and over 700 private corporations and academic institutions. Originally founded as the International Telegraph Union in 1865, the ITU adopted its present name in 1932 and was affiliated with the United Nations in 1947, with headquarters in Geneva. Historically, the ITU has been responsible for the global distribution of the radio spectrum, cooperation in assigning satellite orbits, the improvement of telecommunication infrastructure in the developing world and establishing and maintaining worldwide technical standards.

The new treaty—scheduled to take effect January 2015—was doomed early on when intractable differences emerged over draft treaty language. Of particular interest was a clause submitted by Russia—and supported by China, Saudi Arabia, Algeria and Sudan—for equal rights among nations to coordinate the "internet numbering, naming, addressing and identification resources." A related dispute arose over a proposal for a policy on bulk email distribution.

Vowing to veto any discussion of the Internet or its content, US Ambassador and Obama administration representative Terry Kramer denounced the Russian submission: "Fundamentally, the conference—to us—should not be dealing with the Internet sector." He added, "Keeping to the pure focus of this conference, advancing broadband in a telecom arena, is the right approach."

The US delegates insisted that the scope of the treaty should be restricted to the functions of traditional telecom service providers, i.e., the companies and organizations responsible for the "pipes" of global communications. With the assistance of allies, the US blocked any discussion of the convergence of the previous generation of technology with the Internet as the new and dominant communications medium. Furthermore, US opposition was couched in hypocritical language about the need to defend a free and open flow of information. US delegates argued that any suggestion of putting the Internet's administrative functions under regulation or establishing guidelines for content distribution would be a threat to democracy and open the door to censorship. In the end, the US prevented the Internet from being included in the 10-page treaty. Under threat of failure, the Russian delegation agreed to withdraw its proposal and have it moved to a mildly worded addendum resolution. Treaty editors inserted language into the first paragraph specifically excluding "content-related aspects of telecommunications." They also inserted a reference in the preamble to the "human rights obligations" of the signatories. These changes, however, were not enough to save the treaty, as Kramer's team denounced the final text and led a US walkout of the conference anyway. An analysis of the conference published in *The Economist* science and technology blog writing approvingly of US policy provided a glimpse of the reasons for US obstruction of treaty negotiations: "[N]o other country benefits as much from the status quo in the online world. Since much of the internet's infrastructure is based in America and most of its traffic zips through it, America is in a unique position to eavesdrop,

should it be so inclined. America's internet firms also capture most of the profit pool of the online industry."

The origin of administrative control of the Internet by the US is complex but important. Academic institutions under US government commission created the original structure of the Internet in the 1960s. Throughout the 1970s and 80s, standards and protocols—such as TCP/IP—were established for research purposes, most of it funded by the US military. During this time, domain name allocation was contracted by the US Department of Defense with the Network Information Center (later known as Inter NIC) run by the Stanford Research Institute (SRI). After commercial Internet service providers went online—the first dial-up access came in 1989—the US government passed a law that allowed non-research and education use of the network.

In 1991, as the World Wide Web was being created, the Defense Information Systems Agency awarded the functions previously managed by InterNIC to a private company called Government Systems, Inc., who in turn subcontracted to Network Solutions, Inc. Since 1998, the administration of the Internet—funded by the US Department of Commerce—has been managed by the private non-profit Internet Corporation for Assigned Names and Numbers (ICANN) located in Marina del Rey, California.

Through its operation of a sub-group called the Internet Assigned Numbers Authority (IANA), ICANN manages the unique domain name and Internet Protocol (IP) addresses that are critical to the functioning of the Internet. ICANN manages the top-level domain name spaces (also known as the DNS root zone) that include the operation of root name servers. This means that a US government contracted "gatekeeper" approves every address lookup on the Internet and has the authority to render them inoperable at any moment. Through ICANN, the US wields power over the Internet and can disable or manipulate entire country's top-level domains. *The Economist* blogger's reference to "eavesdropping" is also significant. US pronouncements about democratic rights are exposed as a fraud by ongoing illegal surveillance by the Obama administration's National Security Agency. Behind the backs of the American people, the NSA is intercepting, deciphering, analyzing and storing the world's communications running over international, foreign and US networks.

According to a report in *Wired* magazine, covert NSA intelligence operations are scanning everyone's online activity and storing "all forms of communication, including the complete contents of private emails, cell phone calls, and Google searches, as well as all sorts of personal data trails parking receipts, travel itineraries, bookstore purchases, and other digital 'pocket litter.'"

There is no doubt that the Russian and Chinese governments, among others, are engaged in similar surveillance programs for international espionage and domestic spying purposes. They are also exploring methods for establishing a "shut-off switch" to terminate Internet communications in the event of social or political crisis. As long as the US maintains the upper hand in Internet naming and numbering, all other governments have a distinct disadvantage in planning and executing such programs. It is from this standpoint that US rivals are advocating a more equitable Internet administration system.

There are legitimate concerns among engineers, technology specialists, Internet pioneers and users about the future of online freedom and "neutrality." However, it is dangerously false to place confidence in the US government or any of its contracted agencies as protectors of privacy and democratic rights. Meanwhile, Internet corporations such as Google and telecom providers such as Verizon and AT&T—having generated enormous profits from the information technologies business over the past two decades—have demonstrated that they have no qualms about collaborating with illegal US government spying on foreigners and US citizens.

By any objective measure, the WCIT-12 represented a breakdown of international cooperation and a failure of global telecom integration in the age of the Internet. Far from paving the way to a more equitable distribution of technology, the collapse of the talks—in which the developed nations emerged in a standoff against developing nations—can only bring a further divergence between rich and poor countries. Understood in historical context, the collapse of the conference means the end of the post-World War II era of UN-mediated communications cooperation. Even at the height of the cold war, differences were resolved and the ITU successfully brokered multilateral telecommunications treaties.

In contrast to the role of the US in the twentieth century, there has been a rapid shift in the center of gravity in telecom development and adoption from west to east over the past 25 years. The ITU reports, for example, that China is the first country in the world to achieve 1 billion cellular subscribers, is now the world's largest smart phone market and accounts for 25 percent of the world's Internet users.

The rapid adoption of cellular and broadband devices by billions of people throughout the world demonstrates society's need for a democratic and centrally organized international authority to coordinate the communication of all with each. Meanwhile, it shows that the sharing of telecom advancements equally among every region and country as a lever against poverty, hunger, illiteracy and backwardness throughout the globe is within reach. These are problems that can only be solved by the international working class and the world socialist revolution.

MODULE-III

INTERNATIONAL RADIO COMMUNICATIONS LAW

BACKGROUND

After a hundred years of extraordinary development, radio is entering a new era. The converging computer and communications technologies add "intelligence" to old applications and generate new ones. The enormous impact of radio on the society continues to increase although we still do not fully understand all consequences of that process. There are numerous areas in which the radio frequency spectrum is vital. National defence, public safety, weather forecasts, disaster warning, air-traffic control, and air navigation are a few examples only. Radio and television broadcasting have become the main source of everyday information for most people of the world. They play a principal role in meeting information needs of illiterate people unable to read, a large part of the world's population.

The number of terrestrial and space radio stations grows without precedence and the frequency demand follows that trend. The ITU has recorded more frequency assignments in the last few years than during the whole previous history of radio. Liberalization, privatization, competition, and deregulation trends encourage the introduction of new services and new technologies. In the next few years, new High Altitude Platforms (HAP) and constellations of low-orbiting (LEO) satellites are expected to be launched to fulfil the promise of universal worldwide communication services accessible anywhere, anytime, and at an affordable cost. It is widely accepted that the uses made of the RF spectrum will be the main engine of economic growth and improvement of the living standard in the next few decades.

One of the difficulties radiocommunication confronts is the apparent spectrum congestion and scarcity of radio frequencies. Most of the suitable frequencies have already been used in many regions of the world and new demands exceed what can be accommodated. In some frequency bands and geographical regions there is no place for new radio stations and new services. The same concerns the geostationary satellite orbit. The issue is critical to all radio-dependent activities. The growing disproportion between the demand for radio frequencies and orbital positions on one hand, and what is apportioned on the other, calls for reconsideration of the existing ways these resources have been used. As radio has an immense impact on many aspects of our life, the issue deserves serious considerations by a wider community.

Table 1. Changing approach to the radio frequency spectrum.

Year	Major events	Approach
Now	Global Information Infrastructure * Information Society concept * Wireless computer LAN, WAN * Wireless Internet. * Digital high-definition television (DTV, HDTV) * Digital audio broadcasting (DAB) * Ultra-Wide Band (UWB) systems * Constellations of low-orbiting satellites (LEO) * High Altitude Platforms (HAP)	Privatization of spectrum/ orbit resources? Free Spectrum/Orbit markets?
1995	Record spectrum auctions in USA: 258M USD/MHz	
1995	Major ITU reform. The ITU membership open to non-governmental entities. The IFRB replaced by part-time Radio Regulations Board (RRB).	Direct participation of private sector in international regulation process
1989	Creation of trade-able rights in radio frequencies in New Zealand	Spectrum is a sellable commodity in some countries
1978	First wireless public phone	
1965	First commercial communication satellite	
1963	First World Space Radiocommunication Conference	The geostationary satellite orbit included into spectrum concept
1958	First data transmission via satellite	
1957	First artificial Earth satellite	
1949	First public paging system.	
1949	The ITU became the United Nations' specialized agency for telecommunications	Spectrum is a "common heritage of mankind"
1947	Creation of International Frequency Registration Board (IFRB) and International Frequency List	Spectrum use is to be coordinated and registered and controlled internationally
1939	First commercial TV	
1932	Integration of Radio, Telegraph & Telephone regulatory activities in the framework of the International Telecommunication Union (ITU)	Spectrum is regulated by an intergovernmental organization
1927	Creation of International Radio Consultative Committee (CCIR) with membership open to non-governmental entities, to study questions related to radio communications. International Frequency Allocation Table covers 10 kHz - 60 MHz	Spectrum is allocated to separate services
1925	"...no more spectrum available" declares a US Secretary of Commerce	Spectrum is a scarce resource and requires conservation
1921	First broadcasting network	
1910	First aviation radio	
1906	First Radiotelegraph Conference in Berlin (27 States)	Spectrum is a shared resource requiring coordination among all its users
1901	First transatlantic wireless transmission	Spectrum is an inexhaustible natural resource from which everybody can profit freely
1895	First experiments with wireless communications (Marconi, Popov)	Spectrum is a physical object of no value
1888	First experiments with radio waves (Hertz)	
1873	Concept of radio waves (Maxwell)	Spectrum is an abstract concept of no practical value
1822	Concept of spectrum (Fourier)	

Basic concepts

What is the RF spectrum? This simple question has more than one answer, as our approach to the spectrum changes. Originally, the spectrum was only an abstract mathematical idea introduced by Jean-Baptiste Fourier (1768-1830). At the beginning, the Fourier's spectrum concept was strongly criticized and considered as a strange curiosity of doubtful value. Only when Peter Dirichlet (1805- 1859) and Georg Riemann (1826-1866) resolved the doubts, it was generally accepted to become now a powerful tool used in many branches of theoretical sciences. In the meantime, experimental radio science and technology have been developed and the RF spectrum has become also a measurable physical object: a spectrum analyzer is now a basic instrument in any radio laboratory.

Table 2. The ITU frequency bands.

Band No.	Symbol	Frequency	Wavelength
4	VLF	Very Low Frequency 3 to 30 kHz	Myriametric waves 100 to 10 km
5	LF	Low Frequency 30 to 300 kHz	Kilometric waves 10 to 1 km
6	MF	Medium Frequency 300 to 3000 kHz	Hectometric waves 1000 to 100 m
7	HF	High Frequency 3 to 30 MHz	Decametric waves 100 to 10 m
8	VHF	Very High Frequency 30 to 300 MHz	Metric waves 10 to 1 m
9	UHF	Ultra High Frequency 300 to 3000 MHz	Decimetric waves 100 to 10 cm
10	SHF	Super High Frequency 3 to 30 GHz	Centimetric waves 10 to 1 cm
11	EHF	Extremely High Frequency 30 to 300 GHz	Millimetric waves 10 to 1 mm
12	THF	Tremendously High Frequency 300 to 3000 GHz	Decimillimetric waves 1 to 0,1 mm

The ability to carry energy and messages at a distance, with the speed of light and at no cost, made the spectrum of radio waves a valuable resource from which everybody can profit. Free access to it, from any place and at any time, added much to its attractiveness. The spectrum has become treated as a natural resource, a common heritage of humanity. Not so long ago, another abstract concept, the geostationary satellite orbit (GSO), has been integrated with the original conception of the radio spectrum. Our attitude to the radio spectrum changes, as does our understanding of its value and social role.

Since the First Radiotelegraph Conference, Berlin, 1906, all governments interested have committed themselves to develop common rules and regulations concerning the use of the radio frequency spectrum and to follow these rules in practice. The ITU Member States update periodically these rules and regulations at radiocommunication conferences, to satisfy current needs. The access to the spectrum is now strictly regulated nationally and internationally. To use a specific frequency band or orbital position, one has to pass through a process of coordination, authorization, licensing, etc., as agreed among Administrations.

Internationally, the use of spectrum resources is free, but most countries introduced a system of fees for using the spectrum. A few countries went even further, creating the RF spectrum market. The spectrum has now its price but the market approach has not been universally accepted. There is a growing debate over whether spectrum is a free common heritage of humankind, a scarce natural resource, a renewable and reusable commodity, or a saleable, auction-able, rentable piece of real estate. According to a French jurist J.D. Bedin “the frequency spectrum is technology, industry, money, culture, and power” [Dougan 1992].

Spectrum Metrics

The RF spectrum is a multi-dimensional concept. It is widely agreed in scientific community that its dimensions involve radio frequency bandwidth, time span, geometrical volume, and - for space applications - a segment of the satellite orbit. There have been suggestions that other quantities, such as polarization, are also its dimensions. The argument for including

these quantities is that two systems using orthogonal parameters do not interfere with each other. Horizontally and vertically polarized radiowaves, and spread-spectrum systems with orthogonal codes are examples. However, these suggestions have not been universally accepted. The Radio Regulations are built around the frequency allocation table that traditionally differentiates only between frequency bands and administrative regions.

Spectrum Use

"Used" means "denied to others". It is important to differentiate between the active and passive spectrum uses. The active ones involve radiation of RF energy whereas passive applications are based on the absorption of that energy. A broadcasting transmitter is an example of active usage whereas a radioastronomic observatory is an instance of passive one. The service area around a transmitter in which the usable signal can be received is usually smaller than the area in which the same transmitter can cause unacceptable interference to neighbouring systems. It is the area that is denied to other potential users that is related to spectrum congestion. The same concerns the frequency bandwidth and time denied to other users.

It is important to differentiate between the physical denial and administrative denial [Berry 1985]. The spectrum space is physically denied if it is filled with sufficient RF power to interfere with other proposed operations. The space may also be denied administratively by spectrum management rules and radio regulations. Administrative denial is applied to simplify spectrum management and often represents practical approximations to physical denial. It is a means to reserve spectrum for passive applications, that is, for receiving radio stations. In that convention the transmitters and receivers use the spectrum in a complementary way. A protected transmitter denies use of a specific amount of spectrum space to receivers wishing to receive other communications. A protected receiver denies some amount of the space to transmitters whose operation would interfere with it. The spectrum administratively denied by a specific system may differ from that denied physically.

EMC

A compatible operation of radiocommunication systems implies two conditions. First, the radio system at hand must operate correctly in its electromagnetic environment. Second, the operation of that system must not introduce intolerable disturbance to its environment. These are the conditions of electromagnetic compatibility (EMC). They assure what the language of politics qualifies as '*peaceful co-existence'*. The criteria of 'correct operation', 'intolerable disturbance' and 'electromagnetic environment' are application-dependent. Generally, the '*electromagnetic environment*' includes radio waves of any origin, natural and man made, intended and unintended.

The EMC theory says that each radio system can be associated with some specific '*sphere of influence*' in a multidimensional (multivariable) space within which no other outsider station should operate. The sphere of influence is known as the area denied to other systems. Transmitters deny space to extrinsic receivers and receivers deny it to extrinsic transmitters.

The variables involved are application dependent. They include time and the length, width, and height of three-dimensional geometrical space that we know from everyday experience. In addition, they embrace the frequency, polarization, direction and power of the electromagnetic wave used, and other parameters.

A simplified interpretation of EMC conditions is shown in Figure 1. Only three variables are shown: the frequency, the North-distance and the East-distance. For simplicity, a non-directional station is assumed. The radio station under consideration is inside the cylindrical volume shown. No extrinsic station is allowed to operate within that volume, as a collision occurs otherwise. The associated frequency band is shown on the vertical axis, and the geographic area denied to other systems is shadowed on the North-distance - East-distance plane. EMC theory involves a large variety of physical phenomena in a complex manner, but we will leave aside all these meticulous considerations and focus on basic concepts only.

The frequency band and geographic area occupied are denied to other stations because of harmful interference. For actual systems, the forbidden volume has much more complex shape, as shown in Figure 2. The figure presents computer simulations of operation of the LEOSAT-1 satellite system near Buenos Aires, where the existing terrestrial microwave stations use the same frequency (18 GHz band). The figure represents only two variables: the North-distance and the East-distance. The microwave stations can cause severe interference to the satellite user terminals, and the interference zones must be excluded from the satellite service. These exclusion zones, shadowed in the figure, occupy 37% of the reference circle of 40 km diameter.

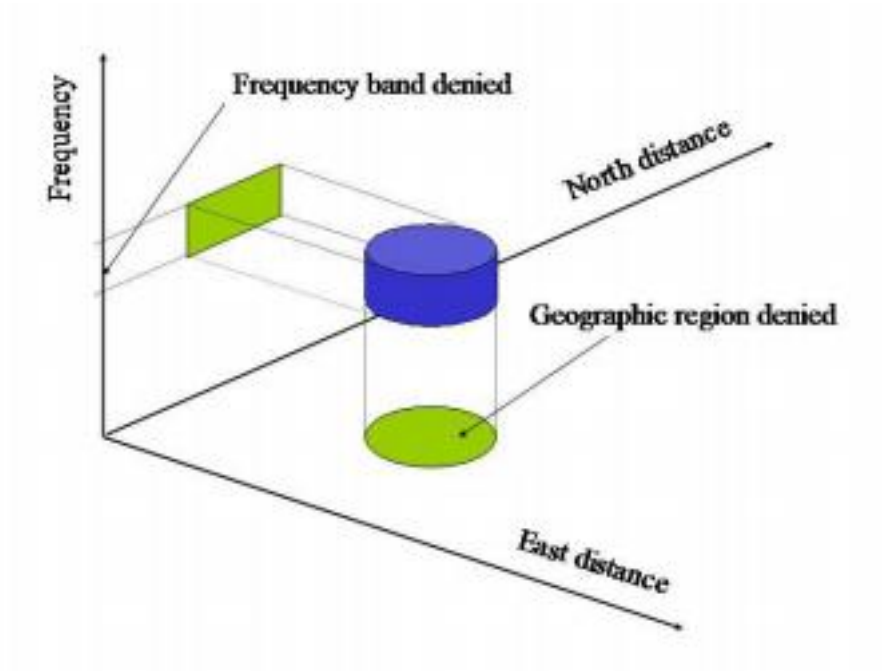


Figure 1. *A radio station can be associated with a specific volume it 'occupies' in multi-dimensional space.*

Sharing the Spectrum

Free-Pasture Model

Common resources such as the radio frequencies and geostationary-satellite orbit have one disadvantage which can be best explained on a model of free pasture. Because the pasture is open to all and free of charge, and because each cattle is a source of income, it is to be expected that everybody keeps his herd on it, and that each herdsman tries to maintain as many cattle as possible. Such an arrangement works well until the number of beast reaches the carrying capacity of the pasture. At this point, the scenario develops following the inherent logic of the commons, as described by Hardin:

"As a rational being, each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously, he asks 'What is the utility to me of adding one more animal to my herd?' This utility has one negative and one positive component:

1) The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal, the positive utility is nearly +1.

2) The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all herdsmen, the negative utility for any particular decision-making herdsman is only a fraction of -1.

Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another; and another... But this is the conclusion reached by each and every rational herdsman sharing a commons.

Therein is a tragedy. Each man is locked into a system that compels him to increase his herd without limit - in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons." [Hardin 1968]

Is that model applicable to the radio frequencies and the geostationary- satellite orbit? Certainly the pasture and the radio spectrum are quite different, but there are some analogies. The spectrum, like the open pasture, cannot be fenced. Until now it has been available (for states) free of charge. It has a limited carrying capacity, the limits resulting from the laws of physics, and the available technology and capital. A portion of spectrum resource used by one system is denied to other systems. If, therefore, we replace the word '*animal'* in the Hardin's text by 'r*adio station'* and '*herdsman'* by '*Administration'*, we obtain a simplified global model of unrestricted use of the spectrum/ orbit resources.

A quantitative analysis of spectrum congestion and resultant transmission capacity loss due to mutual coupling of the links (based on a generalisation of Shannon's law) has shown that the total capacity of a set of radio links tends to zero when their number increases without limits (Struzak 2002). The conclusion is that the concept of free use of the spectrum resources may work well only if the number of the resource users is small in comparison with the resource carrying capacity.

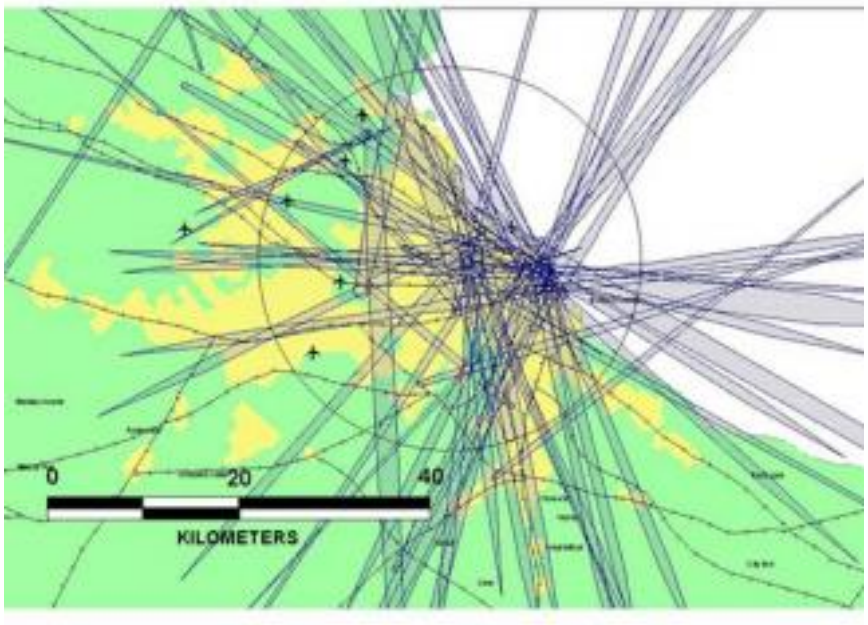


Figure 2. *Service area of the planned LEOSAT-1 satellite system in the region of Buenos Aires (Results of computer simulation). Shadowed areas are excluded from the service because of interference from terrestrial microwave links. They occupy 37% of the 40 km reference circle shown. Exclusion regions due to satellite-generated interference to terrestrial systems are not shown. (Courtesy of T. Hayden).*

Our past indicates that the approach to our resources changes, as does our understanding of their value and social role. We have discovered that many common resources, considered long time as being inexhaustible, have become scarce. Firstly, the commons in food gathering were abandoned. Farmland has been enclosed, and there is no free farmland now. Later, open pastures and free hunting and fishing areas have been restricted. Then, using the commons as a place for waste disposal has been abandoned and restrictions on the disposal of sewage are now widely accepted throughout the world. A concept of environmental protection was developed, and restrictions were also imposed on the pollution of land, water and air. Not so long ago, the radio frequencies and geostationary satellite orbit were added to the list of critical resources.

The issue of rational use, sharing, conservation, and protection of limited common re sources has become an essential element, on national and world-wide scales. When discussing their future, several possible approaches can be indicated: *"We might sell them off as private property. We might keep them as public property, but allocate the right to enter them. The allocation might be on the basis of wealth, by the use of an auction system. It might be on the basis of merit, as defined by some agreed-upon standards. It might be by lottery. Or it might be on a first-come, first served basis... "* [Hardin 1968].

Any of these options implies an organizational framework necessary for coordination and negotiations among the parties interested. For common benefit, these parties have to agree common rules to be observed in sharing the resource, and mechanisms to settle unavoidable conflicts.

Preferences

Which of the approaches listed above is the best one? Each of them can be questionable, dependent on the criteria applied. The final answer results from human preferences of goals and hierarchies of values. In practice, it is often impossible to separate technical aspects of resource sharing from their economical, social and political contexts, and from the interests affected by them. The problem of sharing scarce resources cannot be solved by technical means, without involving systems of human values and ideas. Tradition and past experience play a significant role here:

"Every adoptable set of resource process will be one which is valued by some population in terms of that population's own system of activities. ... Where a resource process involves beliefs and techniques that are incongruous with a people's system of activities, it will not be adopted by that people, however superior it may be by other criteria." [Firey, 1977]

However, in a pluralistic society the goals and hierarchies of values are often inconsistent and conflicting:

"...The hierarchies of values and preferences of each individual are inconsistent among themselves and different individuals and ... groups have different hierarchies of preferences which are partially in conflict with those of other groups and individuals. Furthermore, the capacities of different groups to implement their preferences ... are widely different" [Brooks 1972].

Inconsistency means here that progress toward realization of one value or goal is de structive of another value or goal held by the same individual or group, and the lack of consistency may be not obvious to the individual or group concerned. *Conflicting* goals or values mean such goals or values of two groups that cannot be served by the same policies: what enhances one will degrade the other.

The way in which the spectrum/ orbit resources are used follows the technological, economic, political and social changes in the world. Our past experience shows that societies follow the example of a leading or dominating nation and accept more or less voluntarily its "mode of life" and hierarchy of values.

Competition and Cooperation

The first uses of radio waves were military, to communicate with warships at sea. Soon, however, military secrets were abandoned under the pressure of private business rushing to exploit the “nobody land” of civilian radio. It was at the turn-out of the century that competition in radio communication started. In a liberal environment, without any control, regulation, and negotiations, soon mutual interference began to paralyze the operation of systems. Two tendencies appeared, one diverging and another converging. The diverging one was the competition among the operators, service suppliers and equipment manufacturers. It was leading to separate communication networks, mutual interference, and incompatible equipment. The converging force came from users, who wanted to communicate freely one with another, independently of the service or equipment supplier.

Their pressure forced the service providers and equipment manufacturers to cooperate. The partisans of liberal capitalism would probably say it was the "invisible hand of free market" that forced the cooperation.

Finally, all parties came to a conclusion that coordination of their activities is necessary for common benefit. Such coordination activities started on a national scale, with strong governmental involvement. A global nature of the problem required, however, an international cooperation. Only two years after the first transatlantic wireless communication had astonished the world, the first international conference was called to coordinate the spectrum resource use. It was the so-called "preliminary conference" held in Berlin, in 1903. That conference marked the end of the first period of liberalism and uncontrolled rivalry in radio communications.

There were several separate maritime radio communication networks in operation at that time. However, because of competition, no communication was possible between the networks of different operators, and the following story is a good illustration of the problem. When Prince Henry of Prussia attempted to send President Theodore Roosevelt of the United States a courtesy message via radio while crossing the ocean in 1902, he was refused the service. The shore radio station, operated by the Marconi Company, was forbidden by its owner to deal with a ship station of the German competitor, in spite of the fact that there were no technical obstacles for the two stations to work together. Not without the influence of that incident, the Berlin International Radiotelegraph Conference of 1906 ruled that a communication service with ships must be provided regardless of the system used.

First agreements

The Berlin conference agreed upon the principles of radio spectrum management. One of major steps at the conference was the establishment of the International Bureau in Bern to register the operating frequencies of radio stations to control the spectrum occupancy and avoid mutual interference. It was the first attempt to manage the radio frequency spectrum, worldwide. The register of the occupied frequencies was named later "The Bern List".

International treaties are all part of a world-wide game governments agree to play following certain rules. Agreement is an inevitable ingredient here, and there is nothing to force nations to abide by these rules. And governmental delegations represent interests of their citizens, including private sector interests. If competitive forces are stronger than cooperative ones, no progress could be made.

At the Berlin conference, it was not possible, due to conflict of interests, to reach consensus on issues related to inter-communication. Great Britain and Italy, where Marconi had a strong say, did not agree to final agreements and made reservations. Soon, a test of life showed in full light its tragic consequences. It was the well known disaster of Titanic in April 1912. The Titanic was the most luxurious, most modern, and largest ship at that time, claimed as being unsinkable. During its maiden voyage with richest passengers on the board, it hit an iceberg and sank on the night of 14-15 April 1912, making it one of the deadliest peacetime maritime disasters. The story was revived by the movie under the same title that

won 11 Academy Awards in 1997. Inquiries alleged that another liner was nearby and could have helped had its radio operator been on duty to receive the distress signals of the "Titanic".

Only three months later, and not without the influence of public opinion, the second radio conference was held in London. It finally settled the problem of inter communication between ships on the sea: the reservations were removed. To a large degree, it was under the pressure of public opinion, shocked by the *Titanic* disaster just before the conference.

The World War I interrupted international cooperation for few years. Radio science and technology, harnessed to military applications, got an enormous impetus. When the war finished, all the scientific progress, technical developments and operational experience gained during the war time could be used again in peaceful service for the humanity. In new circumstances, the old international agreements regulating the use of radio waves were not appropriate.

The next international radio conference was called to Washington in 1927. The problem of frequency demand exceeding the available spectrum resource appeared sharply there, and the unending battle of frequencies had started. At that time, spark type transmitters were in use. They occupied wide frequency bands, much wider than needed to transmit the information. (It is interesting to note that modern spread spectrum techniques again use frequency band much wider then minimum necessary to transmit information, but discussion of that issue goes beyond the scope of the lecture.)The demand for a complete outlawing of spark-type transmitters was pressed strongly, but not passed because of conflict interests.

The spectrum shortage problem was settled in Washington by two actions. On the one hand, more stringent technical standards were imposed, to limit the radiation out of the band necessary for transmission of information. On the other hand, the spectrum resource limits defined in old radio regulations were moved to embrace additional portions of spectrum, not yet regulated. That approach has been copied at all later radio conferences.

The drawing up of the first Frequency Allocation Table, regulating the use of the spectrum, was considered as one of the most important results of the Washington conference. Another one was to set up the International Frequency registration Board and International Radio Consultative Committee, CCIR. Its aim was to study technical ad operational issues relevant to radiocommunications and to issue recommendations on them. Later, under the pressure of service and equipment suppliers, administrations allowed the non-governmental sector to participate directly in the work of the ITU-CCIR. In the following years, the involvement of that sector increased. In 1992 one-third of entities participating in the CCIR work were nongovernmental.

Spectrum management

Background

The concept of spectrum management embraces all activities related to planning, allocation, assignment, use, and control of the radio frequency spectrum and satellite orbit resources.

Three major objectives have been shaping spectrum management: minimize conflicts, convey policy goals, and rationalize the use of the spectrum/ orbit resources. An alternative concept involves profit maximization only (Figure 3).

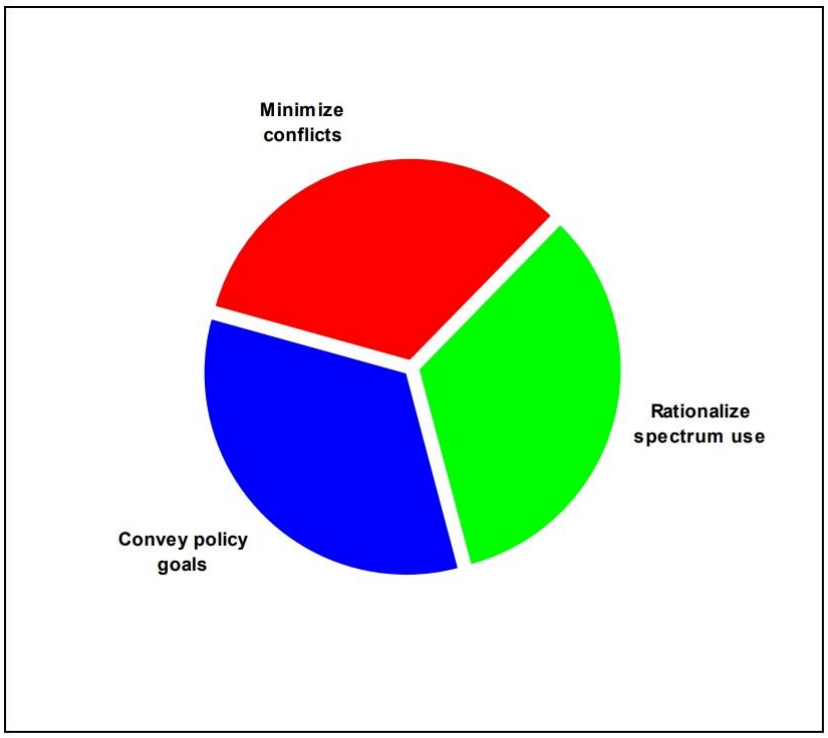


Figure 3. Three major objectives have been shaping spectrum management. An alternative concept involves profit maximization.

The society is composed of various groups, each with its particular interests, goals and views on how to use and manage the available resources (Figure 4). As a consequence of the scarcity, conflicts arise between those who have access to the resources and those who have not. Conflicts arise also between the proponents of competing uses of the spectrum as well as between those who manage the spectrum and those who use it. These conflicts are of various natures: commercial, political, physical interference, etc. [Huang 1993].

For those whose needs have already been satisfied, spectrum management should assure the continuation of the existing status. Any modification would threaten their acquired benefits. On the other hand, for newcomers, the principal aim of spectrum management would be to change the way the spectrum is apportioned and to eliminate obstacles that prevent them to enter the market. What is the best for one

group is not necessarily good for another. The spectrum management rules and regulations tend to reflect the relative balance of powers of the competing interest groups. As demand on the spectrum increases, the management tasks grow more complex.

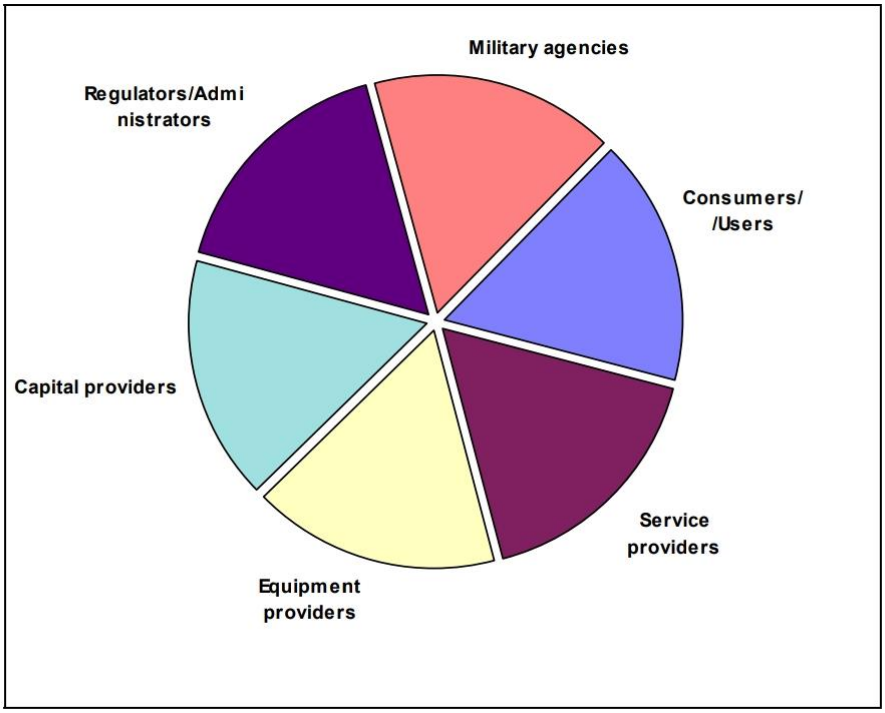


Figure 4. Major players in spectrum management. They are active in every ITU Member States, which involves also national interests and politics.

Few elements add international aspects to spectrum management tasks:

1. The development of international wireless services,
2. The threat of cross-border interference,
3. The pressure of equipment manufacturers and service providers for worldwide markets.

International spectrum management is presently voluntary and the International Telecommunication Union (ITU) creates its framework. The ITU Radio Regulations have been created step-by-step since the very beginning of radio. Each time a serious problem is recognized by the majority of ITU Members, the existing regulations are reviewed at an intergovernmental conference. However, only minimum modifications necessary to solve the problem at hand are agreed at each conference, leaving fundamental principles essentially untouched. One reason is that the process of intergovernmental conferences is often more about the art of politics and public relations than an exercise in economics and engineering, as the ITU Secretary General noted [Tarjanne 1992].

International Telecommunication Union (ITU)

The use of the radio frequency spectrum is now coordinated and regulated world wide through the International Telecommunication Union (ITU). The ITU is a specialized agency of the United Nations since 1947, but its history goes back to 17 May 1865 when the International Telegraph Convention was signed. It is thus the oldest of all international

organizations existing today, but its structure, working methods and regulations have been regularly revised, updated and extended to keep pace with new technologies, new services, and new needs. Since 1906, all uses made of radio are negotiated and regulated at the world level in the framework of the ITU. In 1963, the first World Space Radiocommunication Conference integrated the satellite orbit with the radio frequency spectrum into a combined concept of the spectrum and orbit resources that has entered permanently the ITU agenda.

The purposes of ITU are formulated in the Constitution and Convention which have the treaty status. They include, among others: "... *facilitating peaceful relations, international cooperation among peoples and economic and social development..., effect allocation of bands of the radio-frequency spectrum, the allotment of radio*

frequencies and registration of radio-frequency assignments and any associated orbital positions in the geostationary-satellite orbit in order to avoid harmful interference between radio stations of different countries... coordinate efforts to eliminate harmful interference between radio stations of different countries and to improve the use made of the radio-frequency spectrum and of the geostationary satellite orbit for radio-communication services;..." This activity must, however, not interfere with the principle of sovereignty, and *" ...the sovereign rights of each country to regulate its telecommunications"*.

Allocation deals with frequency bands and services. It means designation of a given frequency band for its use by one or more radiocommunication services or applications, terrestrial or space. Allotment refers to frequency channels and geographic regions. It means designation of a specific radio frequency channel ('radio frequency') for use over a specified geographical area. Assignment deals with frequency channels and radio stations. It means authorization given by an administration for a radio station to use a radio frequency channel. Another major duty of ITU is the coordination of efforts to eliminate harmful interference between radio stations of different countries and to improve the use made of the radio frequency spectrum and satellite orbits. The agreed general rule of rational use of the resources is *"... to limit the number of frequencies and the spectrum used to the minimum essential to provide in a satisfactory manner the necessary services. To that end, [the ITU member countries] shall endeavour to apply the latest technical advances as soon as possible."*

The Constitution and Convention determine also working arrangements and the rights and obligations of the Union's members. The membership includes governments, scientific and industrial establishments, as well as private sector enterprises. It is a relatively new arrangement. Previously, the private sector could not participate directly in the work of the ITU (except for the participation in the work of CCIR and CCITT). The only possibility for private companies was to be a part of governmental delegation. In the time of this writing, the ITU membership consists of 189 Member States and about 700 non-governmental entities. The constitution and convention are reviewed at the Plenipotentiary Conferences called every four years or so. The most recent one took place in Marrakech, Morocco, in 2002. Each ITU member state, big or small, rich or poor, has a single voice, and there is a tradition in the ITU to reach agreement on controversial issues by consensus. One of major

responsibilities of the union is the allocation of bands of the radio-frequency spectrum and registration of radio-frequency assignments and associated orbital characteristics of satellites.

Changes in the world require the policies and structure of ITU to be reviewed time to time. In this connection, the Members of the Union meet, at regular intervals, at a Plenipotentiary Conference. This is the supreme authority which lays down the general policy and structure of the ITU, reviews the Union's work and revises the Convention itself, if it considers this necessary. It also establishes the calendar of all ITU conferences, and sets a limit on expenditure until the next Plenipotentiary Conference. The Plenipotentiary Conferences of 1992 and 1994 have introduced major changes in functioning of the Union, marking the end of one era in the history of the ITU. The "new" ITU follows closer the liberalization trend seen around the world. Its functions have been separated in the three Sectors:

- Telecommunication Development Sector,
- Telecommunication Standardization Sector and
- Radiocommunication Sector.

ITU Radiocommunication Sector

To keep pace with technological, economic, and political changes, the ITU periodically reviews the spectrum management rules. Fig. 5 illustrates the process of global spectrum management in the ITU, in force since 1993. It forms a closed-loop system built around consensus-seeking studies and negotiations. The supporting organizational framework for international spectrum management is concentrated in the ITU Radiocommunication Sector. Its mission is, inter alias, to ensure rational, equitable, and economical use of the radio-frequency spectrum by all radiocommunication services, including those using the geostationary-satellite orbit, to solve international conflicts, and to carry out studies on radiocommunication matters. The mission is accomplished by

- ensuring meeting the specific needs of Members through Radiocommunication Conferences and Radio Regulations
- coordinating efforts to eliminate harmful interference between radio stations of different countries
- making recommendations on technical and operational radiocommunication matters through Radiocommunication Assemblies and Study Groups.
- maintaining Master International Frequency Register
- assisting Administrations in solving problems related to the use of radio frequencies and satellite orbits

The Sector consists of the following organs:

- World and Regional Radiocommunication Conferences
- Radio Regulations Board
- Radiocommunication Assemblies & Study Groups
- Radiocommunication Advisory Group
- Radiocommunication Bureau.

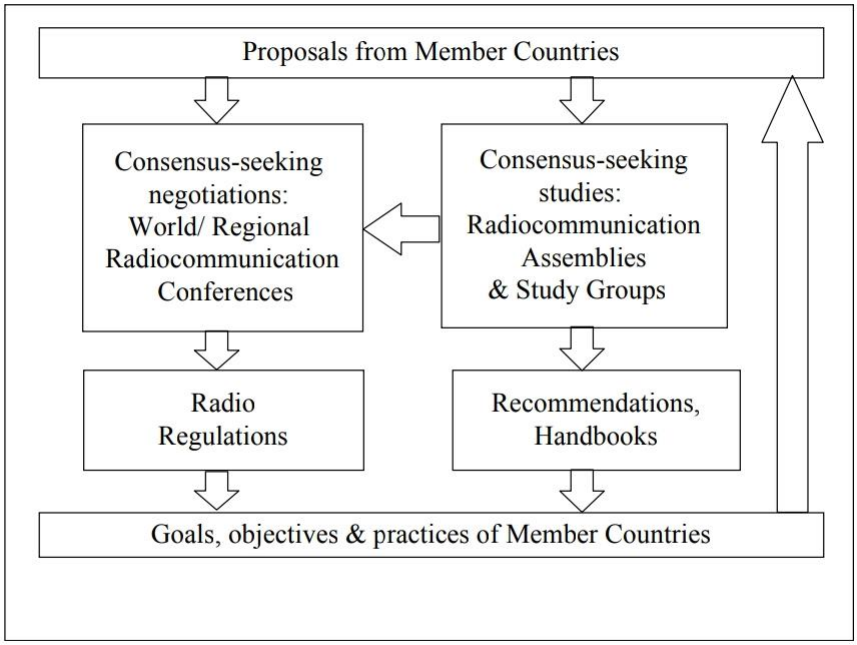


Figure 5. The ITU spectrum management process

ITU Radiocommunication Conferences

As the radio waves do not stop on political borders, international aspects of use of radio waves have been involved since the very beginning. For that reason, radiocommunication conferences have been organized to avoid or to minimize potential conflicts between states exploiting mechanism of multilateral coordination and negotiations. In the early years of radio, an administration was generally required to co-ordinate with one administration only. Later, the spectrum scarcity resulted in a necessity to co-ordinate among three and more Administrations. The negotiations with one may lead to modifying the characteristics of the network. This, in turn, often makes necessary re-negotiations with the other, and even the involvement of a third party, new in the processing. Such an iterative co-ordination and search-for agreement process became absorbing much effort and time and lead to multilateral radio conferences. Following the tradition originated in Berlin, London, and Washington, the use of the radio frequency spectrum continues to be based on negotiations and consensus among all Members of ITU at radio Conferences. The general principles are:

- the radio frequency spectrum and satellite orbits are public resources, to which each country has equitable and free access;

- the use of the spectrum resource is based on mutually agreed regulations and administrative allocation of frequency bands and positions in the geostationary satellite orbit;
- the principles of electromagnetic compatibility (EMC) have to be followed by all parties (this term was introduced later).
- the regulations and frequency allocations are set through the mechanisms of consultations, negotiations, and consensus.

The Radio Conferences review and negotiate the current and expected usage of radio frequencies. They may establish and revise the frequency allocations, operational rules, standards, and relevant procedures. A collection of legal, administrative, operational and technical arrangements agreed by all parties at the Conferences are included into the ITU Radio Regulations. These Regulations are binding on all parties, and only the Conferences have the authority to revise them.

The participants in the Conferences are official governmental delegations of the ITU Member Countries. Each has one voice, independently of its size or economic significance. The Conferences are also open to the United Nations, international organizations, regional telecommunication organizations, intergovernmental organizations operating satellite systems, the specialized agencies of the United Nations, and the International atomic Energy Agency. The national delegations represent interests of all domestic groups, but there is a growing pressure to allow non-governmental entities a more direct involvement. Since 1993, non-governmental entities authorized by their countries to participate in the work of the Radiocommunication Sector are admitted also to radio conferences.

The Radiocommunication Conferences may be world-wide or regional, general or specialized. The general WARCs are authorized to deal with virtually all aspects of spectrum use. The specialized WARCs dealt with particular services and/or particular portions of the spectrum. The regional conferences are held to solve specific spectrum use problems within particular geographic regions. Some Radiocommunication Conferences are convened to negotiate and agree international frequency plans for certain application, geographical regions, and frequency bands which are subject to *a priori* planning. A frequency plan is a table, or more generally, a function that assigns appropriate characteristics to each of the radio stations at hand. It may be one, a few, or all characteristics by which radiocommunications can be distinguished one from another. Examples are: the operating frequency, power radiated, antenna location, height and radiation-pattern, polarization, service area, etc. Initially, in the early days of radio, only the frequency was assigned, and this explains the traditional name "frequency planning".

In *a priori* frequency plans, specific frequency bands (and geographic areas) are reserved for particular applications well in advance of their real use. Individual regions may have various allotment plans for specific services (e.g., broadcasting), within their respective areas. *A*

priori plans make a one-time distribution of the spectrum resource on the basis of the expected or declared needs of all parties interested. That approach has been used, for instance, for the sound and television broadcasting in Europe and in Africa, and for some satellite services. The techniques used for that purpose are discussed in the following sections. Critics of the *a priori* planning indicate that it freezes technological progress. Indeed, technological progress is very fast, and implementation of the plan may require several years. Technology known at the time of creation of the frequency plan may be obsolete at the time of its implementation. Another difficulty is the impossibility to predict future requirements with a needed degree of accuracy. Plans based on unrealistic data have no value at all.

The radio spectrum is available at no cost at international conferences, and there is no mechanism to limit the requirements. Although the ITU Convention calls for minimizing the use of the spectrum resource, *" ... each country has an incentive to overstate its requirements, and there are few accepted or objective criteria for evaluating each country's stated need. In fact, the individual country itself may have only the dimmest perception of its needs over the time period for which the plan is to be constructed ... Under these circumstances, it is easy to make a case that allotment plans are not only difficult to construct, but when constructed will lead to a waste of resources as frequencies and orbit positions are 'warehoused' to meet future, in determinate needs...*" [Robinson 1980].

For the major part of its history, the ITU focused almost exclusively on the technical and operational standards necessary for smooth and interference-free international telecommunications (including tariffs). With the time, some issues related to policy matters and social impacts of telecommunications have been added to its agenda. Recently, the ITU initiated the World Policy Forums (WTPF). At these forums, all ITU members, states and private entities, discuss key policy and regulatory matters trying to elaborate a common position. The final documents agreed at the forum have no binding force, but serve as recommendation to be taken into consideration by the competent ITU body. The first WTPF held in 1996 debated the development and implementation of global mobile personal communications by satellite. The second forum, held in 1998, dealt with accounting rates. For 2003, the ITU is preparing the World Summit on Information Society. One may expect that modern technology will be discussed as one of the means that will contribute to closing the information gap.

Radio Regulations Board

The Radio Regulations Board is an elected collective body that approves technical criteria used by the Radiocommunication Bureau in the applications decisions of radio conferences and in applications of Radio Regulations between the radio conferences. It also provides advice to radio conferences and may perform any additional duties relating to the utilization of frequencies and the use of satellite orbits, within the competence of ITU-R.

1.3.6 ITU-R Study Groups

In addition to the international radio regulations, the ITU produces also recommendations concerning technical and operational matters and accounting rates, but these have no treaty status. They must be followed only if they are explicitly referred to in the Radio Regulations, or are included in the national regulations. The recommendations will not be dealt with here.

More than 1'500 specialists from telecommunication organizations and administrations around the world participate in the work of the eight study groups of the sector. They

- draft the technical bases and regulatory and procedural steps for consideration at radiocommunication conferences
- develop ITU-R recommendations on the technical characteristics of operational procedures for radiocommunication services and systems
- compile handbooks on spectrum management and on emerging radio services and systems

These studies are performed by the ITU-R members on a voluntary basis.

ITU AGREEMENTS

Radio Regulations

The Radio Regulations originated at the International Radio Conference, Atlantic City, 1947. They replaced the Service Regulations established at the first International Radiotelegraph Conference in Berlin in 1906 (and modified thereafter). The original Berlin regulations counted only 12 pages, whereas the current Radio Regulations occupy over 2000 pages, not counting a thick volume of Rules of Procedures. The Rules of Procedures are not part of the treaty, but are necessary for the implementation of its provisions in the ITU headquarters, as approved by the Radio Regulations Board. The provisions of Radio Regulations can be modified only by a competent World Radiocommunication Conference (WRC). Since the Atlantic City conference, they were updated a number of times. These updates embraced not only an increasing sweep of radio frequencies, but also a widening range of services, following the changing needs of member states. Figure 6 shows how the volume of the Radio Regulations increased in response to the growth of various radio systems and rising complexity of interactions among them.

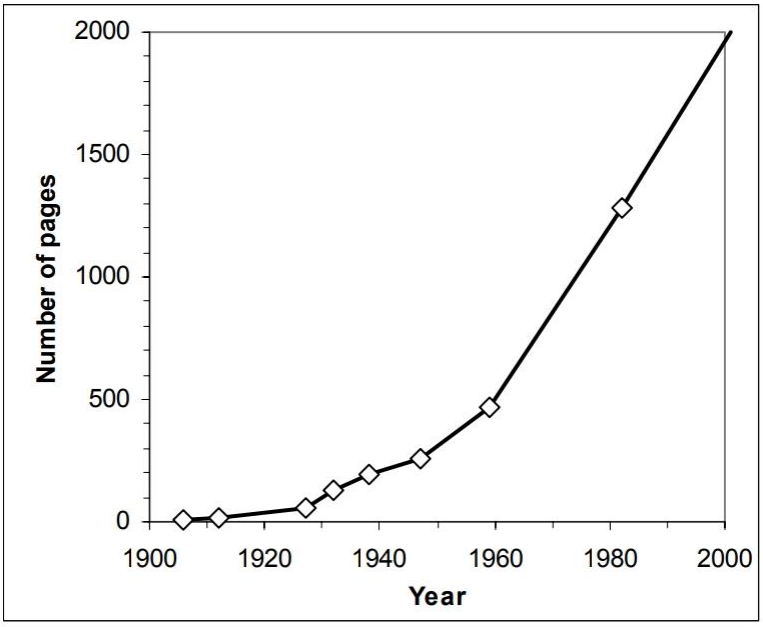


Figure 6. Increase of the volume of Radio Regulations in the years 1906 – 2001.

Space telecommunications issues were included into the Radio Regulations for the first time at the radio conference held in Geneva in 1971. The most recent WRC dealing with satellites was held in Istanbul, Turkey, in 2000; the next one is planned for 2003. The Radio Regulations define the allocation of radio frequencies to specific uses. They also specify operating procedures for stations and restrictions imposed, as well as detailed coordination, examination, notification and recording procedures. The aim is to assure an efficient use of radio frequencies and orbital positions, and international recognition of national frequency assignments. Not all frequency assignments need to be registered internationally. The uses that by their nature cannot cause interference across the border (low-power applications, short-range devices), or are immune to interference and do not require international recognition, do not need to be notified within the ITU. The Radio Regulations contain also frequency allotment plans for a number of services, including plans for broadcasting satellite service.

Orbits

In the case of satellite systems, the space denied involves also elements of satellite orbit. Due to laws of physics, orbits of objects launched into space are open or closed, depending on the object's velocity. Open orbits (parabolas and hyperboles) are orbits of objects that escape the Earth attraction and run away. The velocity necessary for escaping is about 11 km/s at an altitude of 200 km, and decreases at higher altitudes. Objects at lower velocities either circulate the globe periodically as artificial Earth satellites at closed (elliptical) orbits, or fall down to the Earth. The Radio Regulations require the orbital parameters and frequencies of satellites to be registered in the ITU Master International Frequency Register.

These parameters must be kept within tight tolerances during the whole lifetime of the satellite. Usually, the orbital position of satellite must be corrected periodically (e.g. once a

week or once a month) to compensate for the perturbations due to irregularities of gravitational fields of the Earth, and the attraction forces of the Moon and Sun. Geographical region irradiated by the satellite depends on the antenna radiation pattern and satellite position. Both have to be coordinated among the states irradiated by the satellite station. This is to be verified by the ITU using the methods and criteria specified in the Radio Regulations. The regulations forbid irradiating foreign territories without explicit agreement of competent administration, unless the incident power density is sufficiently low.

Synchronous orbits are orbits in which a satellite move in the same direction as the Earth and has the same period of 24 hours (more precisely 23 h 56 min 4.1 s). A synchronous orbit that is circular and lies in the equatorial plane is known as geostationary orbit (GSO), and satellites in it – as geostationary satellites. A satellite in a non-equatorial geosynchronous orbit will, when observed from a fixed point on the Earth, appear to move northward and southward. If the synchronous orbit is not perfectly circular, the difference in angular velocities of the Earth and satellite change in time, and the satellite will appear to move eastward and westward. The combination of these two motions will produce a figure-8 pattern as seen from the Earth.

Of all orbits, the geostationary orbit has generated greatest interest. It is at the altitude of about 36 thousand kilometres (theoretically 35’786 above the Equator or 42164 km from the Earth centre). The distance and direction from any point on the earth to a geostationary satellite do not change in time, except for some fluctuations due to the orbit perturbations. This has significant implications, as the directive antenna used to communicate with a stationary satellite does not need any tracking mechanism. Consequently, its construction is simpler, its reliability is higher, and its cost is lower than that of a comparable antenna for communication with any non geostationary satellite. No other orbit offers comparable benefits.

However, with a fixed distance between neighbouring satellites, the number of possible satellite positions on the GSO is limited. For instance, the satellite separation of two degrees implies maximum of 180 separate satellite positions (as the GSO angular dimension is 360 degrees and 360/2=180). As new satellites are launched in the geostationary orbit every year, old satellites must be moved into other orbits. Some countries that expect to launch geostationary satellites in future worry that there may be no free place for them when they will be ready to launch. They therefore insist to make early reservations of the orbital positions and associated frequency bands they need. This is done in the form of frequency plans discussed in a section below.

A serious shortcoming of the geostationary orbit is that it is not visible from regions in far north and in far south, so that these regions cannot be served by geostationary satellites. To cover these regions, polar, or inclined orbits must be used. If the Earth were not rotating, a satellite in the polar orbit would travel along the same North

South meridian form one geographical pole to another. With East-West rotation of the Earth, the sub-satellite point traces more complex lines over the Earth surface. The same concerns

the inclined orbits. Of all inclined orbits, the most famous is that of the Russian satellite 'Molnya', launched in 1965. This is an elliptic orbit inclined 63.4 degrees in relation to the equatorial plane. Its period is 12 hours, so that the satellite visits the same places at the same hours of the day. With the perigee (the orbital lowest point) of 500 km and apogee (the highest point) of about 39 thousand kilometres, the satellite moves very slowly in the sky near the apogee. Its angular velocity there approached that of the Earth rotation around its axis. The satellite behaves thus like a geostationary satellite, being 'practically geostationary' during 5 to 6 hours. In this orbit, it takes about 11 hours to travel across the north hemisphere and only about one hour to pass over the other hemisphere.

Low Earth orbits (LEO) are orbits in the altitude range 500 to 2'000 km, and Medium Earth Orbit (MEO) are those at altitudes of 8'000-20'000 km above the Earth. Figure 7 shows the difference between LEO satellites that make dozens of revolutions around the Earth per day, and MEO satellite that make few revolutions, and the geostationary satellites that apparently does not move at all. LEO satellites offer lower power requirements and shorter propagation delays than can be achieved geostationary satellites, or MEO satellites. Two LEO groups have emerged, *Little LEO* for data-communications satellites and *Big LEO* for data-and-voice communications, each using pre-assigned frequency ranges. Satellite systems offering true global coverage use polar orbits and a number of 'cooperating' satellites. As an individual non-geostationary satellite can be 'seen' only during a part of its period, another satellite must continue the service on its place. For instance, the Iridium Satellite System uses a constellation of 66 satellites in six orbital planes inclined 86.4 degrees. At time of writing it was the only provider of truly global, truly mobile satellite voice and data solutions with complete coverage of the Earth, including deserts, oceans, and Polar Regions.

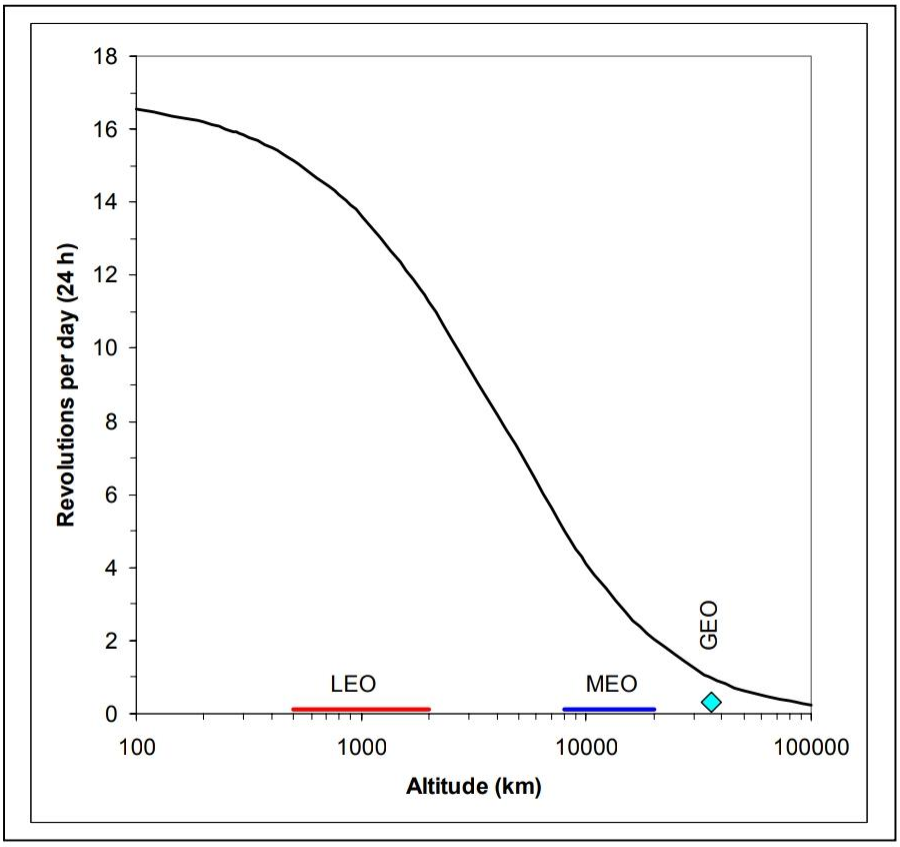


Figure 7. Number of revolutions of satellite versus its altitude above the Earth (circular orbit). LEO: Low Earth Orbit; MEO: Medium Earth Orbit; GEO: Geostationary Orbit.

Services

Radio Regulations are based on a concept of Radiocommunication Service. Such a service is defined as transmission, emission, and/or reception of radio waves for telecommunication purposes. For instance, Table 3 lists satellite services. Some services are active whereas others are passive. Active services use equipments that radiate radio waves. Passive services use non-radiating devices only. Radio Astronomy, considered within the Union as radiocommunication service, is an example of passive service. Passive services that use signals of natural origin, like Radio Astronomy, require special protection, as they cannot choose the operating frequency. The choice has been made by Nature.

Table 3. *Satellite services defined in the Radio Regulations.*

- Aeronautical mobile-satellite (OR) service [*off-route*] Aeronautical mobile-satellite (R) service [*route*]
- Aeronautical mobile-satellite service
- Aeronautical radionavigation-satellite service
- Amateur-satellite service
- Broadcasting-satellite service
- Earth exploration-satellite service
- Fixed satellite service
- Inter-satellite service
- Land-mobile satellite service
- Maritime mobile-satellite service
- Maritime radionavigation-satellite service
- Meteorological-satellite service
- Mobile-satellite service
- Radiodetermination-satellite service
- Radiolocation-satellite service
- Radionavigation-satellite service
- Space operation service
- Space research service
- Standard frequency and time –satellite service

Each service is treated separately. The radio frequency spectrum is insufficient to allocate a separate frequency band for an exclusive use by each radiocommunication service. Some bands must be shared by two or more services. In such a case, one of the services may have the status of primary service whereas the other services have the status of secondary service. Stations of a secondary service shall not cause harmful interference to stations of primary services to which frequencies are already assigned or may be assigned later. They cannot claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or may be assigned later. However, they can claim protection from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned later. When two or more services of equal status have

to use the same frequency band, the principle of seniority applies, known also as the 'first-come, first served' rule. That principle, however does not apply to frequency bands included in the approved frequency plans and other special agreements.

Regions

For the purpose of radio regulations, the world has been divided into three geographical regions (Figure 8). Region 1 includes the whole Europe, Africa, Middle East and northern part of Asia. Region 2 covers the Americas, and Region 3 - the southern part of Asia, Australia and Oceania. In addition, defined are the African Broadcasting Area, European Broadcasting Area, and European Maritime Area. Each region has its individual frequency allocations but some services have worldwide frequency allocations, i.e. identical in all three regions. Global allocations are desirable to avoid incompatibilities in border regions and to create large markets for equipment and services. The divided world does impede trans-regional services and trade: with different frequency allocations, radio designed to work in one region would usually not work in another region. The reasons why such a division was decided have not been disclosed. No physical or technical phenomena justify it. One only may speculate that the original purpose was to protect monopolistic markets in regions of economic and political influence.

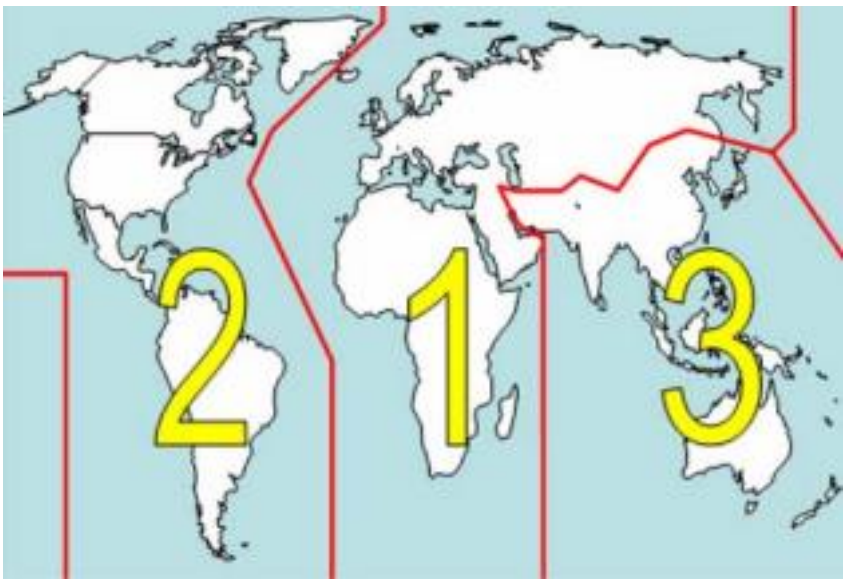


Figure 8. *For the purpose of Radio Regulations, the world has been divided into three geographical regions numbered 1, 2, and 3.*

Frequency Allocations

The radio frequency spectrum has been divided into a number of specific frequency bands allocated to specific services in each of the three regions. A competent conference may allocate a specific frequency band to a service that has convincingly demonstrated its need for that band and that the new allocation will be compatible with the existing uses of that band and adjacent bands. The conference may also modify earlier allotments ('spectrum re-farming'). The frequencies below 9 kHz or above 275 GHz were not allocated at the time of

this writing. The allocations between 9 kHz and 275 GHz are defined in the Table of Frequency Allocations and Footnotes to it (see the Annex). Some of the footnotes specify additional constraints on the use of frequency bands while others provide additional or alternate frequency allocations to individual countries or group of countries. Each use made of frequencies subject specific restrictions. For a given service, the frequency allocations and restrictions may depend on the communication direction. For instance, uplinks and downlinks may use different frequency bands subject different restrictions.

The division of the frequency spectrum into small portions to separate various services has historical justification, but not always matches the needs of modern technology. For instance, the spread-spectrum systems use correlation methods to separate wanted signals from unwanted ones and are, by their very nature, broadband, whereas most of classic systems are narrowband. With narrow frequency bands allocated, potential capabilities of the spread-spectrum systems are sometimes not fully exploited. An Ultra Wideband (UWB) system can use bandwidth of 1.5 GHz or more (fractional bandwidth greater than 0.25) which extends over a number of individual frequency bands defined in the Radio Regulations. UWB proponents claim that their system can co-exists with all of the current services. However, the issue is open, as those dealing with GPS, radioastronomy, and some other passive services do not share that opinion. The issue will be discussed at one of the forthcoming WRCs.

Frequency Plans

The Radio Regulations contain also frequency assignment plans for some services, frequency bands, and regions. Such a plan, if related to space, defines frequency and position of the satellite-born station in the orbit. A variation of the planning process is the allotment plan which specify the uses made over a specific area without defining precise location of stations (as in the assignment plan). Allotment is converted into a specific assignment before bringing it into use. A country may use its assignment without involving full coordination procedures, as necessary coordination had been done earlier, when the plan was negotiated.

Frequency bands and orbital positions included in frequency plans and reserved for use by specific states or group of states. This is sometimes strongly criticized, as wasting precious resources and creating artificial congestion. The reserved frequency bands may remain unused for many years and for various reasons. At the same time, other applications cannot find free frequencies. The Radio Regulations contain the Plan for the Broadcasting-Satellite Service in the frequency bands 11.7-12.2 GHz (in Region 3), 11.7-12.5 GHz (in Region 1) and 12.2-12.7 GHz (in Region 2). The plan, originally produced in 1977, was modified a number of times, last time in 2000. It defines a set of characteristics, such as the satellite positions in the geostationary orbit, frequency channels, and space station antenna pointing and radiation characteristics. It also specifies the procedures for coordination, notification, examination and recording in the Master International Frequency Register. Moreover, it defines power flux-density limits to protect terrestrial services from space-borne interference. Similar frequency plans exist for the associated feeder

links (in the frequency bands 14.-14.8 GHz and 17.3-18.1 GHz in Regions 1 and 3, and 17.3-17.8 GHz in Region 2) and for the fixed-satellite service in the frequency bands 4.500-4800 MHz, 6725-7025 MHz, 10.70-10.95 GHZ, 11.20-11.45 GHz and 12.75-13.25 GHz.

"Forbidden" Frequencies

The Frequency Allocation Table of Radio Regulations allocates some frequency bands for use by passive services such as radio astronomy or Earth exploration satellite service (passive). Table 4 lists these bands. All emissions are prohibited in these frequency bands and the uses made of the adjacent frequency bands (spill-over including) must not extend specific frequency and power limits. The last column of the table identifies the relevant footnote to the Table of Frequency Allocations.

"Free" Frequencies

The Radio Regulations allocates some frequency bands for non-telecommunication purposes. These are known as 'ISM frequencies', 'free-radiation frequencies', or 'non-licensed' bands. They are listed in Table 5. The last column of the table identifies the relevant footnote to the Table of Frequency Allocations. The abbreviation 'ISM' means industrial, scientific, domestic and medical applications. Note that the use of specific ISM bands requires special authorization (RR 5.138). Some ISM bands have been used also by interference-immune communication systems, such as low-power wireless local area networks (WLANs). However, systems operating within these bands are unprotected and must accept interference.

Table 4. *Frequency bands in which all emissions are prohibited.*

Lower Frequency	Upper frequency	Unit	RR Footnote
1400	1427	MHz	5.340
2690*	2700	MHz	5.340
10.68*	10.7	GHz	5.340
15.35*	15.4	GHz	5.340
23.6	24	GHz	5.340
31.3	31.5	GHz	5.340
31.5*	31.8	GHz	5.340
48.94*	49.04	GHz	5.340
50.2*	50.4	GHz	5.340
52.6	54.25	GHz	5.340

86	92	GHz	5.340
100	102	GHz	5.340
109.5	111.8	GHz	5.340
114.25	116	GHz	5.340
148.5	151.5	GHz	5.340
164	167	GHz	5.340
182*	185	GHz	5.340
190	191.8	GHz	5.340
200	209	GHz	5.340
226	231.5	GHz	5.340
250	252	GHz	5.340

**) with some exceptions*

MODULE-IV

INTERNATIONAL INSTITUTIONS RELATING TO TELECOM SECTOR

INTERNATIONAL TELEGRAPH UNION

The **International Telecommunication Union** (**ITU**), originally founded as the **International Telegraph Union** (French: Union Internationale des Télécommunications), is a specialized agency of the United Nations that is responsible for issues that concern information and communication technologies. The ITU coordinates the shared global use of the radio spectrum, promotes international cooperation in assigning satellite orbits, works to improve telecommunication infrastructure in the developing world, and assists in the development and coordination of worldwide technical standards.

ITU also organizes worldwide and regional exhibitions and forums, such as ITU TELECOM WORLD, bringing together representatives of government and the telecommunications and ICT industry to exchange ideas, knowledge and technology. The ITU is active in areas including broadband Internet, latest-generation wireless technologies, aeronautical and maritime navigation, radio astronomy, satellite-based meteorology, convergence in fixed-mobile phone, Internet access, data, voice, TV broadcasting, and next-generation networks.

ITU, based in Geneva, Switzerland, is a member of the United Nations Development Group. Its membership includes 193 Member States and around 700 Sector Members and Associates.

The ITU comprises three sectors, each managing a different aspect of the matters handled by the Union, as well as ITU Telecom:

Radio communication (ITU-R)

Managing the international radio-frequency spectrum and satellite orbit resources is at the heart of the work of the ITU Radio communication Sector (ITU-R).

Standardization (ITU-T)

ITU's standards-making efforts are its best-known – and oldest – activity; known prior to 1992 as the International Telephone and Telegraph Consultative Committee or **CCITT** (from its French name "Comité consultatif international téléphonique et télégraphique")

Development (ITU-D)

Established to help spread equitable, sustainable and affordable access to information and communication technologies (ICT).

INTERNATIONAL TELECOMMUNICATION UNION

The regulation of communications is a complex matter. The size of one recent book containing material relevant largely to UK domestic law is itself sufficient proof of that. There are, of course, two sides to the matter of regulating communications, the rules as to the provision of services (which is what the cited work deals with), and the technical and other requirements within which these services are operated. The purpose of this article is to deal with the second of these, and to outline the structure and role of the International Telecommunication Union (the ITU), which, within the UN family of Specialized Agencies, deals with telecommunications in that second aspect. I am not concerned with communications as a service to be dealt with within the framework of the European Union, the World Trade Organisation or the UK internal market. In dealing with communications it is important to understand the international context. Any communications system has to deal with certain standard problems: how is information coded, what protocols are to be used for different functions, what frequencies are to be used, and so on. As a matter of state sovereignty these are matters which any state can determine, or leave to its communications services to sort out for themselves. But the authority of a state extends only to its own jurisdiction. As soon as there is any question of communications being entered into across jurisdictions, the need for international agreement on such matters becomes obvious. To take an obvious parallel, one can see that it is desirable (but not wholly achieved) that railway trains operate to the same standard bogie measurement if they are part of the same rail network. But the matter goes even beyond that. The laws of physics serve to sanction many of the international arrangements. In particular in the area of radio, interference means that there must be international agreement as to the use of spectrum, as to frequencies and as to power, and that in addition to other questions of protocols and procedures. In brief, the ITU is necessary.

A distinguished architect (possibly Frank Lloyd Wright) held to the principle that, in matters of design, form follows function. That is a principle not to be confined to architecture. It could usefully be adopted by a number of international organisations. The ITU adhered to the principle at intervals throughout its existence, but did not embrace a practice of speedy or continuous change to meet altered function. The ITU's present structure, adopted in December 1992, however, once more complies with the notion.

HISTORY

The ITU is one of the two oldest international organisations still functioning. Historically it can be traced back to the early international agreements of the 1840s in Europe respecting the telegraph which were entered into precisely on the matter of protocols and so on so that services could be established among various German state-lets. In 1865 a more general agreement was arrived at, and in 1868 in Vienna what is recognisably the Union with an official International Bureau was established. In due course the Telephone was added to the competence of the International Telegraph Union. Unfortunately because of the hostility of the wire-service operators to competitive threat, when radio came on the scene a separate institution, the International Radio-Telegraphic Union, was created to deal with the new medium. Although new Radio Union used the services of the Telegraph Union's International Bureau for its administrative requirements, it was not until 1932 that the logical step was

taken and the 'wire' and 'wireless' Unions united to form the International Telecommunication Union. The new Union underwent further metamorphosis, becoming a specialized agency of the United Nations in 1947. The structures then agreed persisted more or less intact for forty years although subject to mutation, and considerable change in the relative balance between the organs of the Union over the years. In particular the development of radio and of its use for space caused a massive increase in the duties and responsibilities of the International Frequency Registration Board which dealt with radio spectrum use.

Dissatisfaction with the structural and organizational ability of the Union to cope with modern requirements grew in the 1980s. A Plenipotentiary Conference of the Union was held in Nice in 1989 in order to revise the then current ITU Convention, that of Nairobi of 1982. The Nice Conference was itself conscious that the swiftly changing telecommunications environment required that the ITU would need to alter its structures and procedures in order to cope. In particular the globalisation of telecommunications, the increased and increasing pace of technological change, the development of the information economy and its interaction with society and societies around the world had rendered the slow mechanisms of the ITU obsolescent if not obsolete. The Nice Conference itself did take some steps towards revising ITU structure but recognised that more radical surgery was necessary. To that end it established a High Level Committee of twenty-one members to review the structure and functioning of the Union.

The High Level Committee went to work with a will, reporting to the Administrative Council of the ITU in April 1991. By the time its Report was available only six countries had ratified the Nice constitutional documents. Notwithstanding, the ITU Administrative Council decided to press ahead with reform, and arranged an Additional Plenipotentiary Conference in Geneva in December 1992. The new arrangements which took legal effect in mid-1994, although in practice many of the new arrangements were adhered to in advance of that date. Further minor changes were made at Kyoto in 1994.

It should be emphasised that the 1992/4 revisions of the ITU were structural. Substantive revision of the law was not undertaken, but at Kyoto there was agreement to embark on a range of studies which will in due course result in further changes to some ITU operations, procedures, requirements, rules and regulations. Simplification where possible is the aim.

THE MODERN ITU

The Constitution and the Convention

Throughout its existence the basic document of the ITU was the various incarnations of a single instrument, the International Telecommunication Convention. Now the basic documentation has been divided into a Constitution (CS) and a Convention (CV). The Constitution comprises constitutional provisions less likely to be amended by successive plenipotentiary conferences. The Convention contains other governmental provisions more likely to change. While this splitting of the material does involve a certain amount of cross-

and repetitive citation for writers and commentators as well as for users, the step is justified. It is a device that has worked satisfactorily in other of the UN family of Agencies, notably in the Universal Postal Union, allowing more structured and coherent discussion of change at conferences since detail and principle are kept separate.

Membership

The membership of the ITU is crucial to understanding both its strengths and weaknesses. There are two memberships, one the fundamental membership of the ITU as such, which is open only to states, the other being membership of individual elements of the ITU, which is open to entities authorised by their individual home states to be admitted as such lesser members. In ITU parlance a distinction is made between 'capital-M Members, and 'small-m' members.

Under the 1992 Constitution, (capital m) Membership of the ITU as such remains open only to States. There is an argument that it is inefficient that major international telecommunications organisation such as INTELSAT, INMARSAT and INTERSPUTNIK with their global responsibilities, and even the territorial and more limited organisations such as EUTELSAT, ARABSAT and PALAPA could not be members or at least associate members of the ITU. They are significantly more important in international telecommunications than many of the small state members of the Union, have the financial resources to make a greater contribution to ITU work than these small states, and could better represent the minnows within the international forum than many of these minnows themselves can - many of the smaller countries do not have sufficiently trained expert staff properly to cope. Last, the interests of the international satellite organisations are not always as well represented within the forums of the ITU as they might be were Membership available to them. That said, States are not keen to have an international organisation of mixed membership. However, as a concession to the sort of argument outlined above, CV art. 19.1 requires the Secretary General of the ITU and the Directors of the Bureaux (parts of the three Sectors to be discussed below) to encourage the enhanced participation of telecommunications entities in the activities of the Union and its working groups, and this is being done. Further Resolution PLEN/7 of the 1992 Geneva Conference instructed the Council and Secretariat to proceed as immediately as practicable to widen and deepen the participation of non-Member entities (that is small-m members) in the work of the Union. This has also been of some effect.

Small-m members may become members of Sectors, working groups and the like. Each must be specifically authorised by its home state. Small-m members pay an annual sum for their participation which depends on the extent of their involvement. These sums go towards the expenses of the Sector or Working Group etc with which they are associated. In addition small-m members, like the State Members, are responsible for their own costs of participation in the work of the ITU.

BASIC PRINCIPLE

The major structural concept implemented in the new constitutional documents is that the substantive work of the Union should be organised in three separate sectors, corresponding to the major functions of the Union. The last institutional traces of the dual origin of the ITU in wire and wireless technologies have therefore disappeared.

The cycle

Complementing these institutional changes, a more rigid programme of conferences is scheduled within a four year cycle corresponding to a new shorter cycle of plenipotentiary conferences. The Plenipotentiary Conference is the point at which the ITU as a whole, its work, plans and progress, was reviewed by its Members, principal officers and staff appointed, and the future considered. Previously, although successive Conventions called for regular meetings of the Union in Plenipotentiary Conference approximately every five years, in fact the period between these conferences varied, and was lengthening. Seven to ten years is a long time in telecommunications, but such was becoming the approximate intervals between some of the ITU plenipotentiaries. The intention of these changes is the promotion of efficiency, cost effectiveness and the need more swiftly to respond to the rapidly changing telecommunications environment. That environment requires speedy decisions, particularly in the area of the setting of international standards.

STRUCTURE

Down to the coming into effect of the reforms in 1994 the ITU comprised seven organs in a federal structure. Three met at intervals -- the Plenipotentiary Conference, Administrative Conferences and the Administrative Council. Five permanent organs were charged with the detailed business of the Union. These were the General Secretariat, the International Frequency Registration Board, the International Radio Consultative Committee (CCIR), and the International Telegraph and Telephone Consultative Committee (CCITT). This pattern has been significantly altered.

Under Art. 7 of the new Constitution the ITU comprises

1. the Plenipotentiary Conference as supreme organ of the Union;
2. Council;
3. world conferences on international telecommunication;
4. the Radio-communication Sector;
5. the Telecommunications Standardization Sector;
6. the Telecommunications Development Sector, and
7. the General Secretariat.

The new structure of ITU combines the activities of its previous bodies into three "pillars" supporting the work mandated by the Plenipotentiary Conference: the Radio-communication Sector, the Telecommunication Standardization Sector, and the Development Sector. Each sector's work is directed by international and regional conferences, supported by a bureau under the administration of a director. The bureau directors are assisted by "Advisory

Groups" that are open to representatives of national telecommunication administrations, authorized organizations, and study groups. The Plenipotentiary Conference also elects the ITU Council, which acts as an inter-sessional administrative body guiding the work of the organization in the four-year intervals between conferences. The organization's General Secretariat, headquartered in Geneva, is administered by a Secretary-General, assisted by a Deputy Secretary-General as well as the directors of Radio-communication Bureau, Telecommunication Standardization Bureau, and the Telecommunication Development Bureau. Yoshio Utsumi of Japan was elected ITU Secretary-General by the Minneapolis Plenipotentiary Conference (October 1998).

Plenipotentiary Conference

The supreme body of the ITU is the Plenipotentiary Conference, in which each member has one vote. Previously, it met at intervals of five or more years—in Atlantic City in 1947, Buenos Aires in 1952, Geneva in 1959, Montreux in 1965, Torremolinos in 1973, Nairobi in 1982, and Nice in 1989. In 1992 the extraordinary Additional Plenipotentiary Conference met in Geneva to fundamentally revamp the organization. The first session of the Plenipotentiary Conference after the restructuring was held in Kyoto, Japan, in September 1994. The Plenipotentiary Conference convened in Minneapolis in 1998.

The Plenipotentiary Conference sets general policies for fulfilling the purposes of the union; receives reports on the organization's activities since the previous conference and takes decisions on those reports; establishes the budget in light of decisions taken by the ITU Council; fixes salary scales; elects member nations to the ITU Council; elects the secretary-general; the deputy secretary-general; the directors of the bureaus of the three sectors, and the members of the Radio Regulations Board; considers and adopts amendments to the constitution and the convention; concludes agreements between ITU and other organizations that may be concluded by the ITU Council. In general the conferences focus on long-term policy issues.

The ITU Council

The ITU Council (formerly called the Administrative Council) traces its history back to the New Jersey Plenipotentiary Conference of 1947. It is composed of 46 member nations elected by the plenipotentiary along a regional formula: the Americas have eight seats, Western Europe has eight seats, Eastern Europe has five seats, Africa has 13 seats, and Asia and Australasia has 12 seats. The council members hold office until the next plenipotentiary, at which time they may be reelected. The ITU Council guides the work of the union between sessions of the plenipotentiary. It approves the budgets of the union and controls its finances. It is responsible for the coordination of ITU's work with other United Nations organizations.

The members of the ITU Council as of 2002 were: Region A (Americas): Argentina, Brazil, Canada, Cuba, Mexico, Suriname, United States, Venezuela; Region B (Western Europe): France, Germany, Italy, Norway, Portugal, Spain, Switzerland, Turkey; Region C (Eastern Europe): Bulgaria, Czech Republic, Poland, Romania, Russia; Region D (Africa): Algeria,

Burkina Faso, Cameroon, Egypt, Ghana, Kenya, Mali, Morocco, Nigeria, Senegal, South Africa, Tunisia, Uganda; and Region E (Asia and Australasia): Australia, China, India, Indonesia, Iran (Islamic Republic of), Japan, Korea (Republic of), Malaysia, Pakistan, Saudi Arabia, Thailand, Vietnam.

The Radio-communications Sector

The Radio-communication Sector has two elements, the Sector which carries out the main responsibilities of this element of the ITU, and the Radio Regulations Board, - a new creation albeit lineally it is the old International Frequency Registration Board.

The other new sector within the ITU is the Radio-communication Sector dealt with under Chapter II (arts. 12-16) of the Constitution and Section 5 (arts. 7-12) of the Convention. Radio regulation is a complex matter and it will suffice here merely to sketch the structure and operating mechanisms of the Sector.

The purpose of the Radio-communication Sector is to ensure 'the rational, equitable, efficient and economical use of the radio frequency spectrum by all radio-communication services, including those using the geostationary satellite orbit, and to carry out studies without limit of frequency range (CS art. 12.1.1). Further, on the basis of its studies the Sector adopts Recommendations on radio-communication matters (CS art. 12.1.1).

The Sector works through world and regional radio-communication conferences, radio-communication assemblies associated with world radio-communication conferences, the Radio Regulations Board, study groups and the Radio-communication Bureau headed by an elected Director. Members of the sector are the administrations of all members of the Union as of right, together with any entity or organisation properly authorised in terms of the Convention.

World radio-communication conferences are normally held every two years although that may be varied through the omission of a conference or the scheduling of an additional one (CS art. 13.2). The powers and duties of world communication conferences are further elaborated in CV art. 7. The general scope of the agenda of a world conference should be established four years in advance and the final agenda established by the Council preferably two years in advance of the conference (CV art. 7.2.2), and is to include any matter the Plenipotentiary Conference directs (CV art. 7.3). A world conference may partially or in exceptional cases completely revise the radio regulations and also deal with any questions of a world-wide character (CS art. 13.1; CV art. 7.2.1). It may instruct the Radio Regulations Board or the Radio-communication Bureau, may put matters on the agenda for future world conferences and refer questions to the Radio-communication Assembly (CV art. 7.2.1.c).

Radio-communication assemblies are normally to be convened every two years to provide the technical basis for the work of world conferences. The assemblies usually act on the basis of the reports of study groups (CV art. 8.2), and deal with and issue recommendations on

questions adopted by its own procedures, or referred to it by a Plenipotentiary Conference by any other Conference, by the Council or by the Radio Regulations Board (CV art. 8.1).

Much of the important work of the Sector is the routine administration of the registration of radio frequency allocations, and of space systems, checking that assignments and systems proposed by Members conform to the requirements of the ITU system and are properly coordinated with those notified by other Members. In this the Sector's Bureau has taken over from the tasks of the former International Frequency Registration Board, and the remaining responsibilities of the Board will be taken by a new animal, the Radio Regulations Board.

World Radio-communication Conferences

World Radio-communication Conferences (WRCs) revise the radio regulations and any associated frequency assignment and allotment plans; address any radio-communication matter of worldwide character; instruct the Radio Regulations Board and the Radio-communication Bureau, and review their activities; and determine questions for study by the Radio-communication Assembly and its study groups in preparation for future Radio-communication Conferences. WRCs are normally convened every two or three years.

Radio-communication Conferences and Assemblies

Every two to three years the Radio-communication Conference and a Radio-communication Assembly meet to review and revise the Radio Regulations on the basis of an agenda adopted by the ITU Council. Radio-communication conferences are open to all ITU member administrations and to the United Nations and its specialized agencies, regional telecommunication organizations, and intergovernmental organizations operating satellite systems. In addition, telecommunication operators authorized by their country to participate in the work of the Radio Sector are admitted to the conferences.

The Radio-communication Assemblies provide the technical basis for the work of the conferences. The assemblies create study groups of experts and decide on the priority, urgency, and time-scale for study of specific issues. The study groups are made up of experts from both administrations and public/private sector entities.

Radio-communication Bureau

The Radio-communication Bureau, or BR, is the executive arm of the Radio-communication Sector, and is headed by an elected director. The director of BR acts as Executive Secretary to the Radio Regulations Board, and is responsible for the coordination of the work of the sector. The BR provides administrative and technical support to radio-communications conferences, assemblies, and study groups; records and registers frequency assignments and orbital characteristics of space services; provides advice to member states on the fair and effective use of the radio-frequency spectrum and satellite orbits, and assists in resolving cases of harmful interference; prepares and edits publications developed within the sector; provides technical information, and works closely with the Telecommunication Development Bureau in assisting developing countries.

Radio Regulations Board

The Radio Regulations Board is a part-time, 12-member body of experts that approves the rules of procedure to register radio frequency assignments and equitable utilization of the geo-stationary satellite orbit. It also investigates complaints by ITU members about frequency interference, and formulates recommendations to resolve such problems. It holds up to four meetings a year in Geneva. The board members, elected at the Plenipotentiary Conference, serve as custodians of international public trust and not as representatives of their respective member states or region, hence they cannot be part of national delegations at conferences. The Radio Regulations Board replaced the former five-member International Frequency Registration Board (IFRB), which was a full time body.

The nine members of the new Radio Regulations Board (RRB) were elected by the Kyoto Plenipotentiary Conference in 1994 (CS art. 8.2.h; CV art. 10.1). Like the members of the predecessor Board, they serve 'not as representing their respective Member States, or a region, but as custodians of an international public trust' (CS art. 14.3.1), a statement that goes right back to the Atlantic City language of 1947. Back then, some had hopes that the notion of 'public trust' would result in the election of members of the original IFRB on merit alone, but, following practice already emergent in the United Nations, a regional distribution of voting power, of appointments and membership of committees was adopted within the ITU generally and that has since continued, affecting the new RRB among all other Sectors. Indeed the requirement that the elected officials of the Union be nationals of different countries and regard be had to 'equitable geographic distribution' (CS art. 9.1.b) accentuates the departure from appointment on pure merit, merit not being, however, irrelevant (CS art. 27.2). In addition some structuring or representational element is present in the RRB, notwithstanding the other language referred to above: 'Each member shall be familiar with the geographic, economic and demographic conditions within a particular area of the world' (CS art. 14.1).

Finally there is the matter of qualification. By CS art. 14.1 members of the Board are to be 'thoroughly qualified in the field of radio-communications' and possess 'practical experience in the assignment and utilization of frequencies' (CS art. 14.1). This is a change. Members of the previous IFRB had to be highly qualified by technical training. Now technical experience has been sidelined. Importantly also the members of the RRB are part-time (CS art. 14.1), a matter which might be thought to detract from their apparent independence, since presumably, given the other requirements as to competence, they may otherwise be employed in telecommunications. In any event, CS art. 14.3.1 provides that a member of the Board will not intervene in decisions concerning his home state, and CS art. 14.3.2 prohibits him seeking or taking instructions from anyone, and from doing anything incompatible with independent Board status. Correlatively CS art. 14.3.3 provides that states Members of the Union are to respect the international character of the duties of members of the Board, and are not to attempt to influence its members.

The Board normally meets up to four times a year and usually at Geneva, at which meetings at least two-thirds of the membership are to be present (CV art. 10.5.2). However, provision

is also made that the Board 'may carry out its duties using modern means of communication' (CV art. 10.5.2). In general the Board seeks unanimity, but if that is not forthcoming it may make a decision by voting, with at least two-thirds of the membership voting in favour (CV art. 10.5.3). Proxy voting is not permitted (CV art. 10.5.3). The RRB Chairman and Vice-Chairman are elected by the Board from its members to serve for one year, the Vice-Chairman succeeding the Chairman (CV art 10.5.2). In the absence of both a temporary Chairman may be elected for a particular meeting (CV art. 10.5.1).

To understand the work of the new Radio Regulations Board, some knowledge of its predecessor is necessary.

The International Frequency Registration Board (IFRB) was introduced by the 1947 Atlantic City reconstruction of the ITU following the Second World War. Under art. 6 of the Atlantic City Convention the IFRB had two essential duties; first, the orderly recording of frequency assignments by states in accordance with the procedures of the Radio Regulations 'with a view to ensuring the formal international recognition thereof', and second, (paraphrased) the providing of advice so as to help make the best use of the radio spectrum. These duties, elaborated in the Radio Regulations and revised and expanded by later plenipotentiary conferences, encapsulate the role played by the IFRB through the next forty-five years.

This is not the place to rehearse the history of those years. Suffice it to say that the IFRB played an integral role in the developing ITU responsibilities. It elaborated procedures for checking assignments notified to it for their compliance with the allocations in the Radio Regulations, for their potential for harmful interference and for conflict with existing stations and services. Its ability to delete unused frequencies from the International Register was not unimportant. Its role in securing compromise between potentially interfering assignments was strategic. The advice gave to Members and the preparatory and advisory work it did for and during successive Radio Conferences was significant. But many of these functions had become routine and have been given to the new Radio-communication Sector. What is left for the RRB is a much reduced remit, albeit a wide-ranging one.

The duties of the RRB listed in the Constitution and Convention are wide-ranging. It approves Rules of Procedure under which registration of frequency assignments is to be made. The Rules can be commented on by Members of the Union, and in the case of a continuing dispute as to their terms, the matter will be put on the agenda of a world radio-communication conference (CS art. 14.2.a). It is also to consider matters which cannot be solved by the application of these Rules by the Director and the Bureau of the Sector once they have been adopted.

The old IFRB had a major role in acting in disputes between administrations in respect of proposed and actual assignments. To an extent this role continues. By CV art. 10.2 the new Board is to consider reports from the Director on cases of harmful interference investigated at the instance of an interested administration, and formulate recommendations on the matter. The Board members also have a duty to take part in an advisory capacity in radio-communication conferences and assemblies. The Chairman and Vice-chairman have a duty to

advise at Plenipotentiary conferences. In all such instances Board members are not to participate in the conference of assembly as part of their national delegations (CV art. 10.3).

In addition to the duties stipulated in the Geneva documents, the Board may have its responsibilities added to by a competent conference, or by the ITU Council with the consent of a majority of members in connection with the work of a competent conference (CS art. 14.2.c). Either route can add to the RRB's remit any matter concerning radio-communication use.

When one looks at the cut-down responsibilities of the new RRB one must ask, is a Board necessary? Ex facie, the answer is 'probably not'. But such a swift answer is to overlook something important - the need that the international system shall be trusted. At the Montreux Plenipotentiary in 1965 the abolition of the IFRB was proposed, on the main ground that it had by then completed compiling the International Master Frequency List thus imposing order out of the wartime chaos, and that the remaining function of recording frequency assignments could be done simply by administrators within the General Secretariat. To an extent that is now occurring, with registration and recording passing to an administrative section within the Sector Bureau, (basically the Specialised Secretariat of the IFRB, renamed!) leaving the role of the Board largely advisory and, it seems, dischargeable by part-timers.

But to have done away entirely with a Board would have been to eliminate something important. The root justification of an IFRB or of an RRB is the instilling and maintenance of confidence in the international radio regulatory system. In 1965 at Montreux it was mainly the developing nations that stood out for the IFRB, perceiving it useful to them as an impartial voice in arguments as to frequency allocation, and as a source of disinterested advice. These justifications continue and have increased with the advent of satellite communications.

The IFRB had many functions. But its most important function was not explicitly listed in its constituent documentation. Fundamentally, the IFRB gave credibility to the international system. Its presence and actions induced confidence, particularly among those countries less able in telecommunications matters. Unless there is a continuing general agreement (faith or belief, indeed) that the international system works, and works reasonably and fairly, the international system might well collapse. The laws of physics make necessary some sort of international system for the avoidance of harmful interference. But that is justification for only a minimal system. The ITU works to a broader frame and in bolder colours than those dictated by mere necessity: but to do so international confidence is required. The IFRB was a major element in the creation of that trust. It is to be hoped that the part-time RRB will continue to sustain confidence. It is a tribute to the IFRB that much that it did has been taken over, and perhaps better carried out by, the new Sectors. The Telecommunication Development Sector has taken on some of the development work which previously sheltered within the IFRB. Objective and dispassionate treatment and advice will come from the Radio-communication Sector, while the Standardisation Sector will also play a confidence-building

role. Nonetheless, the numinous element of a 'tribunal of wise men' is not unimportant. The quality and actions of the appointees are crucial.

The Telecommunication Standardization Sector

The Telecommunication Standardisation Sector (TSS) is dealt with under CS Ch. III (arts. 17-20) and CV Sec. 6 (arts. 13-15), together with the general provisions referred to below.

As noted at the start of this article, the need for standard international procedures, practices, compatibility between equipment, and equipment protocols gave the initial impetus towards international agreement on telecommunication matters. It was quite simply necessary that standards were adopted as common between the different principalities of Germany, so that messages could be passed across borders. Fundamentally the position is no different today. Common standards for equipment and procedures for their operation are essential in the modern international community. Occasionally some questions of 'standard' are left to the decisions of the market place - the collision in video recorder standards between the Betamax and VHS system was abrupt and dispositive. The same may occur in other questions of telecommunications, notably in the area of high definition television. But while some matters can be left to the market place it is surely desirable that many questions of telecommunication standards and procedure are settled internationally by discussion and agreement.

Recommendations and Administrative Regulations established under the ITU as it was formally structured remain in force under the new arrangements until rescinded or replaced (CS art. 54.2).

However, there was a problem to be tackled. In all international standard setting, whether through the ITU or otherwise, political and economic interests play a major and obvious role. ITU procedures were becoming slow and cumbersome. The involvement of the Consultative Committees - the bodies through which such matters used to be dealt with - in other aspects of the ITU's work contributed to a deceleration in standard setting. But there are other international fora through which international standards are set, and there was a risk (some would say already a practice) that the ITU would be by-passed on matters which properly ought to lie within its competence.

That the ITU procedures in standard setting or agreeing were not ideal was known even before the High Level Committee began its work - indeed, it was in part that knowledge that caused the Committee to be given its task. It was intended that the new Standardisation Sector, bringing together the different standardisation elements from the previous ITU structure, would repair and revivify ITU action in the development of international standards. I would like to know from an objective source, how far this intention has been realised.

The TSS is organised and coordinated by a Director (CV art. 15.1) who elected by the Plenipotentiary Conference of the Union. It works through world standardisation conferences, study groups and the Telecommunication Standardisation Bureau. (CS art. 17.2) Members of

the sector are, the administration of all members as of right, together with any entity or organisation authorised to join the Sector (CS art. 17.3). The Sector studies technical, operating and tariff questions and adopts recommendations on such matters with a view to standardisation on a world wide basis (CS art. 17.1.1).

World telecommunications standardisation conferences are convened every four years (CS art. 18.2) with the possibility of intercalating an additional conference should that prove necessary (CS art. 18.2). Dissimilar to the Development or the Radio-communication Sectors, there is no provision for regional standardisation conferences. A World Conference can deal only with specific matters related to telecommunications (CV art. 13.1).

Questions to be studied and on which recommendations may be issued may be generated from within the Sector or referred to it by the Plenipotentiary Conference, other conferences or by the Council (CV art. 13.2.)

World Telecommunication Standardization Assemblies

These assemblies are held every four years to approve, modify, or reject draft standards (called "Recommendations" because of their voluntary character). The conferences set the work program for the study groups that elaborate these recommendations. The Telecommunication Standardization Study Groups are groups of experts in which administrations and public/private sector entities participate. They focus on the standardization of telecommunication services, operation and performance of equipment, systems, networks, services, tariffs, and accounting methods.

Telecommunication Standardization Bureau

The bureau is headed by a director elected by the plenipotentiary. It prepares for assemblies and meetings and processes and publishes information received from administrations about the application of the International Telecommunication Regulations. This information includes international telephone routes, statistics, notifications, and operational bulletins. It also is responsible for updating the documents and data bases of the Telecommunication Standardization Sector.

The Telecommunication Development Sector

The Telecommunication Development Sector (TDS) deals with all telecommunications development matters within the purview of the Union. Chapter IV of the Constitution, (CS arts. 21-24) deals with the broad principles of the TDS, arts. 16-18 of the Convention giving further specification to its activities. The TDS works through world and regional telecommunication development conferences, through study groups and through a Bureau, the Telecommunication Bureau headed by a Director elected by the Plenipotentiary Conference (CS arts. 8.2.g and 21.3.c). Members of the TDS include the administrations of all members of the Union as of right together with any entity or organisation authorised by the appropriate procedures to be a member of the sector (CS art. 21.4).

Telecommunication development conferences are fora for discussion and consideration. They may be held on a world or regional basis, in a cycle of one world conference and such regional conferences as may are desirable in terms of resources and priorities within the four year cycle which the new ITU arrangements have adopted (CS art. 22.3). Such Conferences do not produced final acts, only resolutions, decisions, recommendations or reports. These must, of course, conform with the Constitution, Convention and Administrative Regulations of the Union. The foreseeable financial implications of proposals must be taken into account and conferences should not adopt resolutions and decisions which may cause expenditure above limits set down by Plenipotentiary Conference (CS art. 22.4)

World conferences establish work programmes and guide-lines to give direction and guidance for the Development Sector (CV. art. 16.1.a). Regional Conferences deal with matters specific to the region concerned (CV art. 16.1.b). In their meetings Telecommunication Development Conferences fix objectives and strategies for a balanced world-wide and regional development of telecommunications (CV art. 16.1.c). That is fair enough but it interesting to find the appropriate paragraph goes on to indicate that the conferences should give 'particular consideration to the expansion and modernisation of the networks and services of the developing countries as well as the mobilisation of resources required for the purpose'. 'They shall serve as a forum for the study of policy, organisational, operational, regulatory, technical and financial questions and related aspects, including the identification and implementation of new sources of funding' (CV art. 16.1.c). Again, therefore, we find channels of technical assistance and financial aid being both opened up and existing channels deepened.

The duties of the Director of the Telecommunication Development Bureau are laid out in art. 18 of the Convention.

World and Regional Telecommunication Development Conferences

These conferences fix objectives and strategies for balancing worldwide and regional development in telecommunications. They serve as a forum for studying policy, organization, operation, regulatory, technical, and financial questions related to the needs of developing countries. A World Telecommunication Development Conference is held every four years and a number of Regional Telecommunication Development Conferences are held within that same period. The resolutions, decisions, recommendations, and reports of the conferences are submitted to the plenipotentiary. The development conferences direct the work of the Telecommunications Development Bureau. The conferences also set up study groups on issues specific to developing countries.

The Telecommunication Development Bureau

This body is the administrative arm of the Development Sector. Its duties and responsibilities cover a variety of functions including program supervision, technical advice, collection and processing of relevant information for publication in machine-readable and other formats.

The bureau is headed by an elected director who organizes and manages the work of the Sector.

General Secretariat

The General Secretariat is at ITU headquarters in Geneva, Switzerland. It handles arrangements for ITU conferences and meetings and maintains liaison with member states and with the UN, the specialized agencies, and other international organizations. It also carries out the ITU's extensive publication program. It is headed by the secretary-general. Yoshio Utsumi of Japan was elected ITU Secretary-General by the Minneapolis Plenipotentiary Conference in 1998.

The Secretariat also organizes an international commercial telecommunications exhibition called TELECOM, held in Geneva every four years. It also cosponsors regional telecommunications exhibitions with member administrations (Asia TELECOM, Africa TELECOM, Americas TELECOM, and Europa TELECOM). These trade shows feature a comprehensive display of telecommunication equipment and services, including digital transmission, switching technologies, and digital networks. In conjunction with TELECOM, ITU sponsors a FORUM which deals with emerging trends in telecommunications technology, administration, management, financing, research, and equipment supply.

LAWMAKING: ADMINISTRATIVE REGULATIONS AND THE RADIO REGULATIONS

The ITU has served as a forum for discussions and agreement on technical and procedural matters down through the years. This work was often initiated through conferences and the work of Study Groups of both the International Telephone and Telegraph Consultative Committee (CCITT) and the International Consultative Committee on Radio (CCIR), bodies which obviously had their roots in the technologies of the time they were established as organs of the Union. Arising from these discussions is a body of rules and recommendations the precise legal force of which varies depending upon their provenance. At the highest level the Administrative Regulations (consisting of the International Telecommunication Regulations, and the Radio Regulations, crucial in the operation of radio services), adopted by Administrative Conferences of the Union have the same legal status as the ITU's constituent documents. For Members of the Union, they are Law. Recommendations have a lesser, though not insignificant, status.

In the change-over from the prior form of the Union, it was provided that the Administrative and Radio Regulations as well as the Recommendations of the CCIs, and their Working Groups remain valid under the new regime. These different layers of 'law' contain standards for the operation of telecommunications, and for mechanisms which can affect the operation of telecommunications equipment -- for example, the 'stray' radiation from micro-wave ovens or computer equipment. While different legal standing attaches to different products of the CCIs and now the Sectors, one should not underestimate the effect that even a substantial (let alone a consensus) view formed in one of the many Working Groups can have, especially

given manufacturers' desire for market reasons to follow such advice. Where the product manifests as part of the ITU's Administrative Regulations, these are legal rulings.

It is noteworthy that the Geneva Conference did not take its sword to the Gordian knot of standardisation questions and the varied responsibilities given to the CCIs within the previous ITU structure. By CS art. 17.1.2 the precise responsibility of the Telecommunication Standardisation and the Radio-communication Sectors is subject to continuing review in close cooperation with regard to matters of common interests to both sectors. Duplication of effort (not to say conflict of interest) between the Study Groups of the Telecommunication and Radio-communication Sectors has been foreseen as a possible problem, as it was between the CCITT and the CCIR. CS arts 11.5 and 14.2 therefore provide for continuing review and any desirable reallocation of responsibilities between the Radio-communication and Standardisation Sectors' Study Groups. In the case of a failure to reach timely and effective agreement on such questions, the matter is referred to the Plenipotentiary Conference through the Council. Apart from such interaction between the Sectors themselves, the various decisions of the Kyoto Plenipotentiary Conference, including Resolution 18, have set up mechanisms through which some elimination of duplication, and some boundary setting is occurring. The task is now, however, yet finished.

As indicated above, close cooperation between all three sectors is further called for in CS 12.2, 17.2 and 21.1. In short it is recognised that the problems of standardisation and of radio communication matters are not easily extricable nor indeed in some instances should these matters be separated merely for the purpose of intellectual satisfaction or sterile neatness. Of all the United Nations agencies, the ITU has a history of a pragmatic approach to problems. It is good to see that approach continues.

FINANCE

Finally something must be said about the finances of the Union, as without finance the best structure in the world will not operate (or at least not satisfactorily).

In contradistinction to the usual UN method whereby contributions are assessed on the basis of gross national product, the financing of the ITU relies on each member choosing a class of contribution from a scale of units. This funding method which evolved last century, is under attack (particularly in the ITU) by the developing countries. They prefer the usual UN assessment method which, it has to be said, is more favourable to them, and which affords no discretion to contributors, and therefore is difficult for the major countries to avoid without patently going into arrears of contribution. Yet there is much to recommend the 'contributory unit' concept in what are, after all, organisations with limited financial requirements for their major function, namely the encouragement and facilitation of cooperative international action.

The 1992 Geneva financial arrangements have retained those agreed at Nice in 1989. Twenty-two classes of contribution range from a 40 unit class to a 1/16th (0.0625) unit class - a range in which the minimum is 1/640th of the largest (CV art. 33.1.1).

This is not satisfactory.

The ITU owes its origin and continuing justification to the need for international cooperation to ensure agreement on the best and most efficient arrangements for telecommunications and broadcasting. However, an unwelcome politicisation of the ITU has occurred, with, for example, non-technical (mainly political) considerations being urged to bar delegations from conferences, and the like. In recent years, as noted, there has also arisen an increasing demand that, apart from its technical duties, the ITU should serve a major function as a channel through which technical and other assistance might flow to the developing countries. Down the years from 1947 the egalitarian UN principle of 'one member one vote' has contributed to alterations to the Purposes of the Union, and changes to its structure designed more fully to promote the interest of the less developed world. 'Social and economic development,' coupled with 'technical assistance' have become avowed aims of what was originally established as an agency through which technical arrangements might be arrived at. These purposes have now been given equal standing with the technical purposes of the Union and, as we have seen, a new permanent organ of the Union, the Telecommunications Development Sector has been established. One can applaud the intention of these moves, but a note of caution must also be sounded. Technical development and technology transfer is not the main and overriding purpose for which the ITU exists.

As noted, and like the UPU, the ITU retains an old-fashioned but effective method of financing whereby members select the class of contribution they are to make. Traditionally, developed countries select the larger contribution classes. But why should they continue so to do? Unlike such as INTELSAT and INMARSAT where contribution is linked to voting power, the ITU operates the UN normal 'one-state-one-vote.' In the ITU, however, voting power is becoming grotesquely divorced from its financial implications. The 0.0625 minimum unit class contemplated by CV art. 33.1.1 of the Geneva Convention is 1/640th of the 40 unit class of contribution that the major nations are expected to assume. Many Members pay an eighth, a quarter or a half unit. A small number of Members pay the bulk of the cost of an organisation in which a 0.0625 unit contributor has the same voting weight as a 40 unit contributor. This cannot be permitted to continue.

Conclusion

The future is not unclouded. The primary purpose of the ITU lies in providing a forum, mechanisms and procedures within which international telecommunications can be established and made to work efficiently and with minimal mutual interference. Unwise attempts to wrest the ITU from that purpose by overstressing telecommunications development in the less-developed areas of the world could damage the ITU. A short-sighted abuse of the financial arrangements could be symptomatic. Yet the restructuring has great potential. In the new ITU form has followed function. We may hope that those who live and work within the new architecture find that form effective, efficient, congenial and without too many unpleasances. [38]

ITU-TELECOM

ITU Telecom organizes major events for the world's ICT community. ITU Telecom World 2011 is ITU Telecom's 40th Anniversary with the first event in 1971.

A permanent **General Secretariat**, headed by the Secretary General, manages the day-to-day work of the Union and its sectors.

The basic texts of the ITU are adopted by the ITU Plenipotentiary Conference.[5] The founding document of the ITU was the 1865 International Telegraph Convention, which has since been amended several times and is now entitled the "Constitution and Convention of the International Telecommunication Union". In addition to the Constitution and Convention, the consolidated basic texts include the Optional Protocol on the settlement of disputes, the Decisions, Resolutions and Recommendations in force, as well as the General Rules of Conferences, Assemblies and Meetings of the Union.

The ITU is headed by a Secretary-General, who is elected to a four-year term by the member states at the ITU Plenipotentiary Conference.

At the 17th ITU Plenipotentiary Conference (2006) in Antalya, Turkey, the ITU's member states elected Dr Hamadoun Touré of Mali as Secretary-General of the Union.[6] He was re-elected for a second four-year term at the 18th ITU Plenipotentiary Conference (2010) in Guadalajara, Mexico.

Membership of ITU is open to governments, which may join the Union as Member States, as well as to private organizations like carriers, equipment manufacturers, funding bodies, research and development organizations and international and regional telecommunication organizations, which can join ITU as non-voting Sector Members.

There are 193 member states of the ITU, which includes 192 UN member states (all except Palau) and the Vatican City. The most recent member state to join the ITU is South Sudan, which became a member on 14 July 2011.

The Republic of China (Taiwan) was blocked from membership by the People's Republic of China, but nevertheless received a country code, being listed as "Taiwan, China". The Palestine was admitted as an observer in 2010.

The ITU was the lead organizing agency of the World Summit on the Information Society (WSIS).

In December 2012, the ITU facilitated the World Conference on International Telecommunications 2012 (WCIT-12) in Dubai. WCIT-12 was a treaty-level conference to address International Telecommunications Regulations: international rules for telecommunications, including international tariffs. The previous conference to update the Regulations (ITRs) was held in Melbourne in 1988.

In August 2012, ITU called for a public consultation on a draft document ahead of the conference. It is claimed the proposal would allow government restriction or blocking of information disseminated via the internet and create a global regime of monitoring internet communications – including the demand that those who send and receive information identify themselves. It would also allow governments to shut down the internet if there is the belief

that it may interfere in the internal affairs of other states or that information of a sensitive nature might be shared. Telecommunications ministers from 193 countries attended the conference in Dubai, United Arab Emirates.

Changes to International Telecommunication Regulations:-

The current regulatory structure was based on voice telecommunications, when the Internet was still in its infancy. In 1988, telecommunications operated under regulated monopolies in most countries. As the Internet has grown, organizations such as ICANN have come into existence to manage key resources such as Internet addresses and Domain Names. Some outside the United States believe that the United States exerts too much influence over the governance of the Internet.

Proposed Changes to the Treaty and Concerns:-

Current proposals look to take into account the prevalence of data communications. Proposals under consideration would establish regulatory oversight by the U.N. over security, fraud, traffic accounting as well as traffic flow, management of Internet Domain Names and IP addresses, and other aspects of the Internet that are currently governed either by community-based approaches such as Regional Internet Registries, ICANN, or largely national regulatory frameworks.[19] The move by the ITU and some countries has alarmed many within the United States and within the Internet community.[20][21] Indeed some European telecommunication services have proposed a so-called "sender pays" model that would require sources of Internet traffic to pay destinations, similar to the way funds are transferred between countries using the telephone.[22][23]

The WCIT-12 activity has been attacked by Google, which has characterized it as a threat to the "...free and open internet."

On 22 November 2012, the European Parliament passed a resolution urging member states to prevent ITU WCIT-12 activity that would "negatively impact the internet, its architecture, operations, content and security, business relations, internet governance and the free flow of information online".[25] The resolution asserted that "the ITU [...] is not the appropriate body to assert regulatory authority over the internet".

On 5 December 2012, the lower chamber of the United States Congress passed a resolution opposing U.N. governance of the Internet by a rare unanimous 397–0 vote. The resolution warned that "... proposals have been put forward for consideration at the [WCIT-12] that would fundamentally alter the governance and operation of the Internet ... [and] would attempt to justify increased government control over the Internet ...", and stated that the policy of the United States is "... to promote a global Internet free from government control and preserve and advance the successful Multi stakeholder Model that governs the Internet today." The same resolution had previously been passed unanimously by the upper chamber of the Congress in September.

On 14 December 2012, an amended version of the Regulations was signed by 89 of the 152 countries. Countries that did not sign included the United States, Japan, Canada, Germany, New Zealand, India and the United Kingdom. The Head of the U.S. Delegation, Terry Kramer, said "We cannot support a treaty that is not supportive of the multi stakeholder

model of Internet governance". [28][29][30]The disagreement appeared to be over some language in the revised ITRs referring to ITU roles in addressing unsolicited bulk communications, network security, and a resolution on Internet governance that called for government participation in Internet topics at various ITU forums. Despite the significant number countries not signing, the ITU organization came out with a press release: *"New global telecoms treaty agreed in Dubai".*

2.1.1. WCIT-12 Conference Participation:-

The conference itself was managed by the International Telecommunication Union (ITU). While certain parts of civil society and industry were able to advise and observe, active participation was restricted to member states. The Electronic Frontier Foundation expressed concern at this, calling for a more transparent multi-stakeholder process.[33] Some leaked contributions can be found on the wcitleaks.org web site. Google-affiliated researchers have suggested that the ITU should completely reform its processes to align itself with the openness and participation of other multi stakeholder organizations concerned with the Internet.

2.2. STRUCTURE AND FUNCTIONS OF THE I.T.U:-

Structure of the World Telecommunication Standardization Assembly (Dubai, United Arab Emirates - 2012)

Committee 1 - Steering Committee

Committee 2 - Budget Control

Committee 3 - Working methods of ITU-T

Working Group A of Committee 3 (WG 3A)

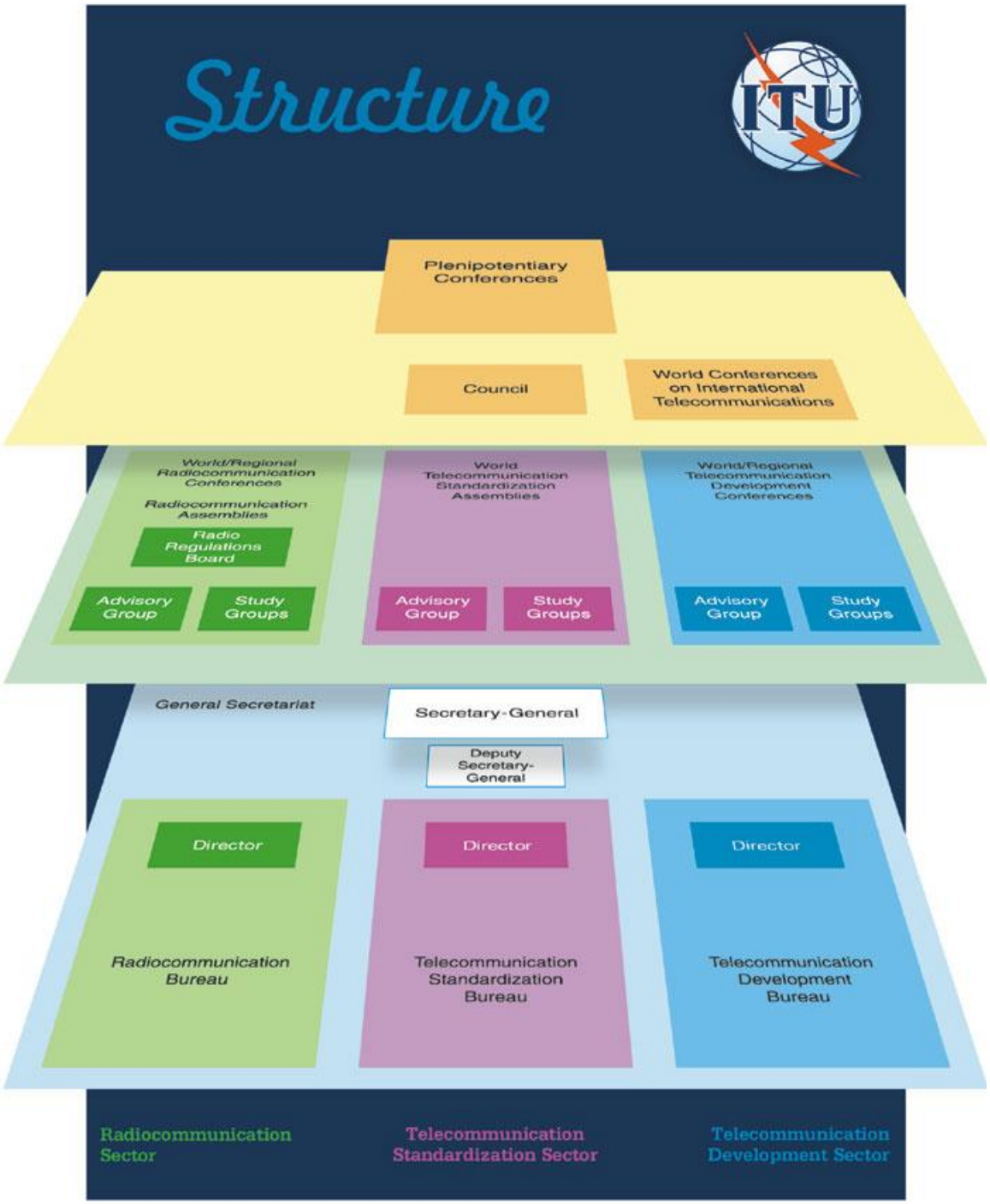
Working Group B of Committee 3 (WG 3B)

Committee 4 – ITU-T work programme and organization

Working Group A of Committee 4 (WG 4A)

Working Group B of Committee 4 (WG 4B)

Committee 5 - Editorial Committee.



ARTICLE 12, Functions and Structure:-

PP-98 1 1) The functions of the Radio communication Sector shall be, bearing in mind the particular concerns of developing countries, to fulfill the purposes of the Union, as stated in Article 1 of this Constitution, relating to radio communication: by ensuring the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radio communication services, including those using the geostationary-satellite or other satellite

orbits, subject to the provisions of Article 44 of this Constitution, and by carrying out studies without limit of frequency range and adopting recommendations on radio communication matters.

80(2) The Radio communication Sector shall work through:

81 a) world and regional radio communication conferences;

82 b) the Radio Regulations Board;

83,PP-98 c) radio communication assemblies;

84 d) radio communication study groups;

84A PP-98 dbis) the radio communication advisory group;

85 e) the Radio communications Bureau, headed by the elected Director.

86 3 The Radio communications Sector shall have as members:

87 PP-98 a) of right, the administrations of all Member States;

88 PP-98 b) any entity or organization which becomes a Sector Member in accordance with the relevant provisions of the Convention. **ARTICLE 13**

Radio communication Conferences and Radio communication Assemblies, A world radio communication conference may partially or, in exceptional cases, completely, revise the Radio Regulations and may deal with any question of a worldwide character within its competence and related to its agenda; its other duties are specified in the Convention.

WORLD TRADE ORGANIZATION

World Trade Organization (WTO) is the only global international organization dealing with the rules of trade between nations. It is guided by a cluster of agreements, negotiated and signed by the bulk of the world's trading nations and endorsed in their parliaments. WTO facilitates the free flow of international trade and establishes a ground to settle the disputes impartially. The WTO is charged with administering the World Trade Agreement (WTA), being a forum for future liberalization negotiations and adjudicating over trade disputes among the member countries. It has a much larger membership, with 145 participant countries.

The WTO assists in the implementation, administration and operation of the WTO Agreement and the Multilateral Trade Agreements, and fosters their objectives. It also provides the framework, for the implementation, administration and operation of the Plurilateral Trade Agreements. The WTO is also a forum for negotiations on multilateral trade relations in matters covered by its various agreements. On the recommendations of its Ministerial Conference, it provides a forum for further negotiations, and a framework for the implementation of their results, on other issues arising in the multilateral trade relations among its Members. It administers the integrated dispute settlement system,

which is a vital element in providing security and predictability to the multilateral trading system, serving to preserve the rights and obligations of the Members of the WTO. The WTO administers the Trade Policy Review Mechanism, which is designed to contribute to greater transparency and understanding of the trade policies and practices of WTO Members. This enhances their improved adherence to the rules, disciplines and commitments of the multilateral trading system, leading to the smoother functioning of the system. A Ministerial Declaration adopted at the Marrakesh Ministerial Meeting recognizes the role of trade liberalization in achieving greater coherence in global economic policy-making.

EVOLUTION OF WORLD TRADE ORGANIZATION

Globalization of economy and the corrosion in the trade policy environment, clearly envisaged that GATT was no longer as relevant to the realities of world of trade as it had been in the 1940s. To begin with, world trade had become very complex and essential than 40 years before, international investment was exploding and trade in services (not covered by the rules of GATT) was of major interest to more and more countries. In other respects, the GATT had been found inadequate. For instance, with respect to agriculture where loopholes in the multilateral system were heavily exploited - and efforts at liberalizing agricultural trade met with little success. The textiles and clothing sector (where an exception to the normal disciplines of GATT) was negotiated in the form of the Multi fibre Arrangement. Even the institutional structure of GATT and its dispute settlement system were giving cause for concern. All these put together motivated the contracting parties of GATT to the initiation of the Uruguay round, which was a land mark trade negotiation round in the history of the world. The final agreement was signed on 15th April 1994 in Marrakesh, Morocco. One of the fundamental agreements embodied in the Uruguay Round Marrakesh Agreement is the establishment of World Trade Organization. The Agreements signed by the member countries at Marrakesh in 1994 include the agreement to establish a World Trade Organization for the purpose of providing legal ground and also to frame the common rules for international trade and commerce. Hence on January 1, 1995 the WTO was formed to replace GATT with increasing effectiveness. World Trade Organization members through the various agreements are bound to operate a non-discriminatory Trading System. Furthermore through these agreements, each country receives guarantees that its exports will be treated fairly and consistently in other countries market. World Trade Organization provides some flexibility to the developing countries in implementing their commitments.

PRINCIPLES AND OBJECTIVES OF WTO

The key objective of WTO is to facilitate and promote world trade among its member states. Objectives are set out in the preamble to the Marrakesh Agreement. These include:

- Raising standards of living;
- Ensuring full employment

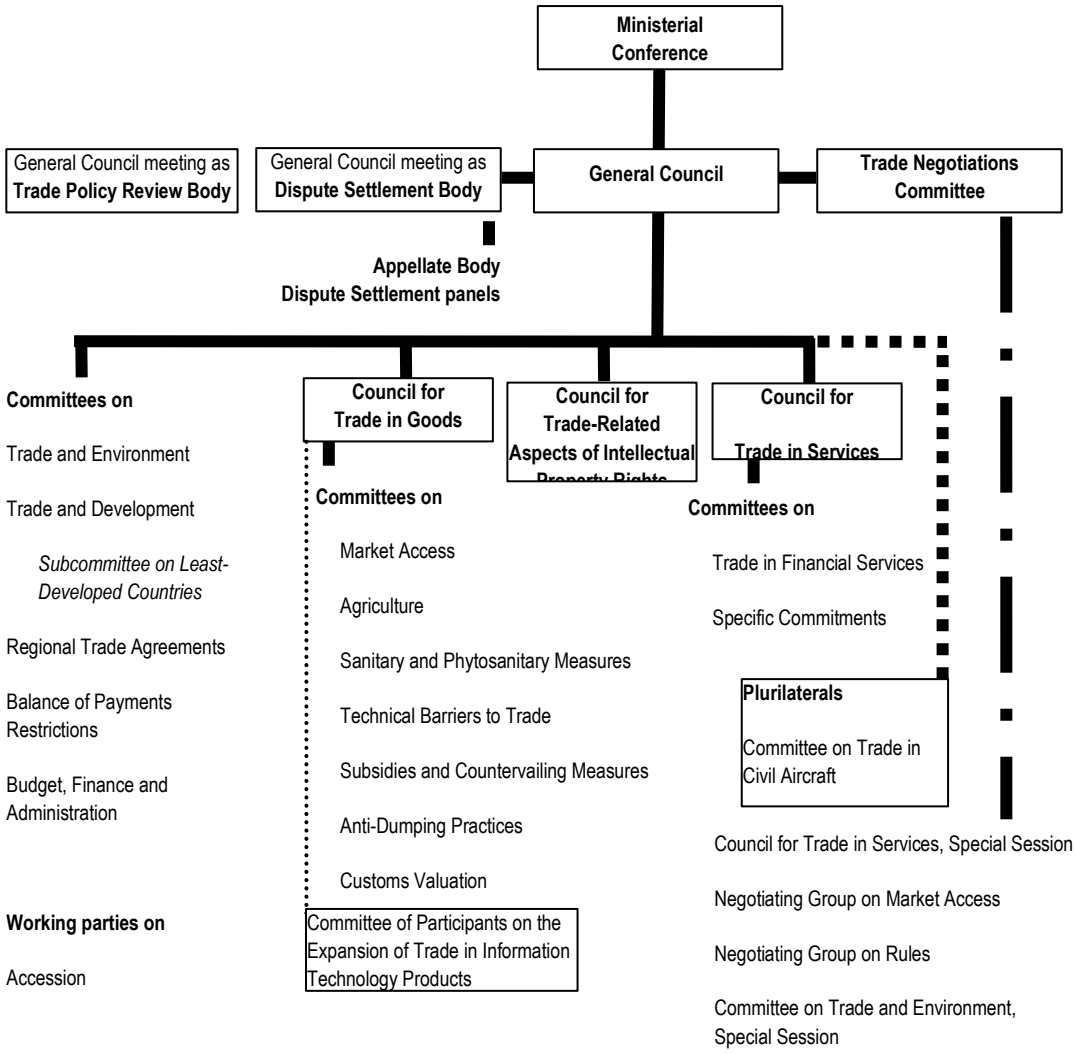
- Ensuring large and steadily growing real incomes and demand; and
- Expanding the production of and trade in goods and services.

These objectives are to be achieved while allowing for the most advantageous use of the world's resources in accordance with the objective of achieving sustainable development, and while seeking to protect and preserve the environment. The preamble also specifically mentions the need to assist developing countries.

The WTO aims to achieve its objectives by reducing existing barriers to trade and by preventing new ones from developing. It seeks to ensure fair and equal competitive conditions for market access, and predictability of access to all traded goods and services by employing certain well-laid principles.

The basic principles of the WTO are:

- Trade without Discrimination
- No Most Favored Nation (MFN) Treatment - no special deals to trading partners, all members of WTO must be treated with the same status
- No National Special Treatment - locals and foreigners are treated equally
- Free Trade
- Predictability through Binding - promising not to raise tariffs is called binding a tariff and binding leads to greater certainty for businesses
- Promoting Fair Competition & Encouraging Development and Economic Reform



[1]The structure of WTO can be represented as:

Figure 11.1

Source: www.wto.org

FIRST LEVEL OF THE WTO STRUCTURE:

The Ministerial Conference

It is composed of international trade ministers from all member countries. This constitutes the governing body of the WTO, responsible for setting the strategic direction of the organization and making all final decisions on agreements under its wings. The Ministerial Conference meets in any case once for every two years. Although voting can take place, decisions are generally taken by consensus, a process that can at times be difficult, particularly in a body composed of 136 very different members.

After the inception of the WTO there were four Ministerial Conferences.

First Ministerial Conference held at Singapore

The First WTO Ministerial Conference was held at Singapore between 9 and 13 December 1996. Ministers for Trade, Foreign, Finance and Agriculture from more than 120 World Trade Organization Member governments and from those in the process of acceding to the WTO participated in Conference. The Conference was the first since the WTO came into force on 1 January 1995. It included plenary meetings and various multilateral, plurilateral and bilateral business sessions. These examined issues related to

- Strengthening of WTO as a forum for negotiation
- Continuance of liberalization of trade within a rule based system
- Assessment of implementation of member's commitments under the WTO Agreements and decisions
- Review the ongoing negotiations and Work Programme;
- Examine developments in world trade; and
- Address the challenges of an evolving world economy.

The Implementation of the Uruguay Round Agreements

The following important decisions were taken regarding the tribulations of Least-Developed Countries and it was agreed to:

– A Plan of Action, including provision for taking positive measures, for example duty-free access, on an autonomous basis, aimed at improving their overall capacity to respond to the opportunities offered by the trading system;

– Seek to give operational content to the Plan of Action, for example, by enhancing conditions for investment and providing predictable and favorable market access conditions for LDCs'(less developed countries) products, to foster the expansion and diversification of their exports to the markets of all developed countries; and in the case of relevant developing countries in the context of the Global System of Trade Preferences; and

– Organize a meeting with UNCTAD and the International Trade Centre as soon as possible in 1997, with the participation of aid agencies, multilateral financial institutions and least-developed countries to foster an integrated approach to assisting these countries in enhancing their trading opportunities.

Agreements were arrived on at a number of provisions calling for future negotiations on Agriculture, Services and aspects of TRIPS, or reviews and other work on Anti-Dumping, Customs Valuation, Dispute Settlement Understanding, Import Licensing, Pre shipment

Inspection, Rules of Origin, Sanitary and PhytoSanitary Measures, Safeguards, Subsidies and Countervailing Measures, Technical Barriers to Trade, Textiles and Clothing, Trade Policy Review Mechanism, Trade-Related Aspects of Intellectual Property Rights and Trade-Related Investment Measures.

Second Ministerial Conference held at Geneva

The Second WTO Ministerial Conference was held in Geneva, Switzerland between 18 and 20 May 1998. Consensus was arrived at on the basic telecommunications and financial services and the implementation of the Information Technology Agreement. The important decisions were arrived at on:

- A mechanism to ensure full and faithful implementation of existing multilateral agreements were to be set up
- Projectionist measures are to be rejected and open and transparent rule based trading system was to be accepted
- It was agreed that The General Council's work programme should encompass the following:

Recommendations concerning:

- The issues, including those brought forward by Members, relating to implementation of existing agreements and decisions;
- The negotiations already mandated at Marrakesh, to ensure that such negotiations begin on schedule;
- Future work already provided for under other existing agreements and decisions taken at Marrakesh
- Recommendations concerning other possible future work on the basis of the work programme initiated at Singapore;
- Recommendations on the follow-up to the High-Level Meeting on Least-Developed Countries;
- Recommendations arising from consideration of other matters proposed and agreed to by Members concerning their multilateral trade relations.

Third Ministerial conference held at Seattle

The Third WTO Ministerial Conference was held in Seattle and ended on December 1999. Major new negotiations were launched to further liberalize international trade and to review some current trade rules. Proposals regarding tariffs, anti-dumping, subsidies, safeguards, investment measures, trade facilitation, electronic commerce, competition policy, fisheries, transparency in government procurement, technical assistance, capacity-building and other development issues, intellectual property protection, and many other

subjects, in addition to agriculture and services were discussed in the conference. A special deal to help least-developed countries gain easier access to richer countries' markets, and to develop further work on technical assistance to least-developed countries under an integrated framework which was set up by the WTO and a number of other organizations in 1997.

This conference turned out to be a failure since the developing nations jointly protested against the lack of transparency and imposition of the views of the rich on the poor countries in the negotiations. It was felt by the Asian, African and Latin American countries that their views were not cared for in the WTO. On the lighter side, it was even claimed by the demonstrators that WTO is no more "World Trade Organization" but "Wrong Trade Organization"

Fourth Ministerial Conference held at Doha, Qatar

The Fourth WTO Ministerial Conference was held in Doha, Qatar from 9 to 14 November 2001. This is a much talked about conference among all the WTO conferences. It was once again confirmed that the multilateral trading system embodied in the World Trade Organization has contributed significantly to economic growth, development and employment throughout the past fifty years. It was decided to with the light of the global economic slowdown as a backdrop, to maintain the process of reform and liberalization of trade policies, thus ensuring that the system plays its full part in promoting recovery, growth and development. This was a round especially for the developing countries.

This round successfully launched a new round of trade and investment liberalization negotiations—the "Doha Development Agenda". For the past half-century the countries of the world have been able to achieve economic growth without resorting to the affluent countries as it was in the 1930s. This was possible due to the rising accomplishments of successive negotiation rounds. The launch of a new round with broad-based agendas and forward-looking efforts by Japan and other countries and regions is a significant achievement.

In Doha a move towards the resolution of implementation issues was made and some of the following concerns were addressed:

- Exclusion of labor
- Protection of interests in agriculture, services and industrial tariffs
- Postponement of negotiations on Singapore issue
- Safeguards in environmental negotiations
- TRIPS and public health
- Emphasis on developmental goals

The preamble of the Ministerial Declaration, speaks about the role trade plays in promoting economic development and the mitigation of poverty. It recognizes the particular problems of developing countries. It speaks of the need for more impartial sharing of the benefits accruing from trade liberalization. It promises to "seek to place their (developing countries) needs and interests at the heart of the Work Programme adopted in this Declaration." It even goes to the extent of stating that the Ministers ought to "attach the utmost importance to the implementation-related issues and concerns raised by Members and are determined to find appropriate solutions to them." The implementation issues are a set of problems within the WTO trade agreements that many countries of the South define as unfair to their interests and development needs and are seeking to change.

MODULE-V

INTERNATIONAL LAW ON IPR RELATING TO SPACE AND TELECOMMUNICATION ACTIVITIES

SPACE ACTIVITIES: NEED FOR IPR PROTECTION

The International legal professionals have been unable to agree on a uniform definition of the outer space although most of them agrees that outer space generally begins at the lowest altitude above sea level at which objects can orbit the earth, approximately 100 km. The United States limits the same boundary to 80 km and in case of re-entry, it's 120 km. The United Kingdom differentiates between airspace and outer space as the highest point at which an aircraft can fly. The initiation of space law began with the launch of the world's first artificial satellite by the Soviet Union in October 1957. Since that time, space law has progressed and assumed more importance as humankind has increasingly come to use and rely on space-based resources. In 1958, upon the request of United States President coupled with Soviet Premier, the United Nations created a Committee on the Peaceful uses of Outer Space (COPUOS) to look into the legal intricacies related to activities in the exploration of outer space. At present, the United Nations Office for Outer Space Affairs (UNOOSA) in particular, is committed towards defining the scope and extent of space law.

Formerly, space activities were predominantly public activities mainly devoted to exploratory and experimental operations and were not commercial. However, in the last decade until now, the character of space activities have fundamentally changed from public to commercial purposes. The outer space treaty provides that the enjoyment of benefits should not be based on the economic background of the nation and particularly, the developing countries should not be forgotten due to the lack of technology. It is the duty of developed countries to provide necessary assistance and make the developing countries equal in terms of reaping benefits.

INTELLECTUAL PROPERTY RIGHTS AND SPACE ACTIVITIES

The outer space activities are described in particularly, by the utilization of sophisticated technology in respect of which protection of intellectual property plays an important role. This is because of the fact that national law principle only applies to the territory of a country and not to outer space. Most of the issues of intellectual property rights in space are related to invention made or used in outer space for which no clear legal provisions are available. Hence, intellectual property rights related to space activities must be analyzed with special reference to patents. The desire to protect and commercialize industrial inventions, trade marks, drawings and copyright beyond the territorial boundaries of the country led to the creation of the Paris Union System in 1883. The Bern Convention of 1886 is another international instrument playing a role in the delicate process of harmonization.

The World Intellectual Property Organization is one of the 16 specialized agencies of the United Nations. This intergovernmental organization was created in 1967 to encourage creative activity and promote the protection of intellectual property throughout the world. It is responsible for the promotion of the protection of intellectual property through cooperation among states and where appropriate, in collaboration with other international organizations. The intellectual property covers a wide range of various creations of human mind. It contributes to better understanding and cooperation among the states for their mutual benefit on the basis of respect for their sovereignty and equality.

1. Space Patents

A patent is a set of exclusive rights granted by a state to an inventor or their assignee for a limited period of time in exchange for a public disclosure of an invention. The patents provide not only protection for the owner but valuable information and inspiration for future generations of researchers and inventors. There are three conditions for the patents:

- An invention must be new
- the invention must involve an inventive step
- Industrial application

The space patents are the special patent issued by a branch of a terrestrial patent office. The space patent would extend in an orderly manner, intellectual property protection to outer space. The space patent is needed because of the following reasons;

- Patents create incentives to invest in new technologies.
- Patents apply only in the geographical territory of the issuing nation.
- Space lies outside the jurisdiction of any nation.
- Technologies particularly useful in space are therefore left out of the investment incentives of a patent system.

The United States Patent law explicitly extends to any space object or component under the jurisdiction or control of the United States but only unless otherwise provide for by international treaty. The section 105 of U.S. Patent Act-35 of the United States Code provides that any invention made, used or sold in outer space on a space object or component thereof under the jurisdiction or control of the United States should be considered to be made, used or sold within the United States except with respect to any space object or component. But provides for itself to be superseded by an international treaty in space. All the International Space Station partner nations have similar provisions that are encoded in the International Space Station Intergovernmental Agreement.

The situation of International Space Station is that the national patent laws have been extended beyond national geography to apply to spacecraft or components according to which nation has jurisdiction or control over the spacecraft or component. However, this means one nation's patent laws ends and another's begins from one component of the International Space Station to another. This is problematic because of the following reasons;

- It leaves room for much uncertainty and conflicts of interpretation regarding what nation "controls" a space object.
- Especially with privately built launched and owned space objects.
- It has uncertain application to planetary bodies which are not subject to claims of national sovereignty under the Outer Space Treaty.

This difficulty has left an intellectual property law vacuum in space which a Space Patent Treaty could possibly eliminate by;

- Returning to the "natural" concept of space as geographically separate from earthbound nations.
- By agreeing on a single system to apply to space and other planetary bodies to which the signatories of the treaty are bound in lieu of their national patent laws.

The space patents would be the only recognized patents in space. This would decide any conflicting patent claims where two patents from two nations cover essentially the same technology. It can also determine the copycats that shop around for a nation where the inventor does not have a patent and build at launch and otherwise infringing item. There will be decrease in expenses incurred by inventors in acquiring patent protection from multiple nations.

2. Industrial designs

An industrial design is the ornamental or aesthetic aspect of an article. The owner of the registered industrial design has the exclusive right against unauthorized copying or imitation of the design by third parties. Such an exclusive right helps to ensure a fair return on investment but also benefits consumers and the public at large by promoting fair competition and honest trade practices, encouraging creativity and promoting more aesthetically attractive products. The inventions and trademarks counting data and products are important issues of intellectual property rights in space. The United States, Canada and the Philippines are the only countries in the world which relate a first-to-invent system; the rest of the world applies first-to-file system to prove first invention resulting in the right to protection. One of the prime policies of National Aeronautics and Space Administration was to encourage the commercialization of technology. Number of joint agreements indicates the continuous exertion to guarantee more proprietary rights protection for private aerospace industries.

3. Copyright and neighboring rights

The copyright is a form of intellectual property that gives the author of an original work exclusive right for a certain time period in relation to that work including its publication, distribution and adaptation after which time the work is said to enter the public domain. The original creators of works protected by copyright and their heirs have certain basic rights. They hold the exclusive right to use or authorize others to use the work on agreed terms. The European Centre for Space Law took up the study of protection of remote sensing data in 1989. The study indicated clearly that existing copyright laws did not offer adequate protection and that additional actions were needed.

4. Trade Secret

Most businesses have trade secrets and like other forms of intellectual property rights they are valuable commercial assets that should be protected. But in most cases the true value of trade secret will not be known until it has been lost to a competitor. The space station is ultimately

expected to become the heart of outer space manufacturing and to the extent that non-patentable industrial processes are used in outer space. The problem of protecting non-patentable proprietary matter in the multi-national space station would remain. The problem becomes complex when one considers the difficulty inherent in maintaining secrecy in the cramped quarters of the station as well as the probability that manufacturing processes might be carried out in more than one module, where the modules may be under the registries of different nations.

The globalization of space activities is one of the prime reasons for the recent issues of intellectual property rights in space. For instance, with the International Space Station, more and more space activities are operated under international cooperation schemes which include various players under different constituencies from different countries. This certainly burdens the need of simple, uniform and reliable international legal framework.

The progressive development and codification of international law constitutes one of the principal responsibilities of the United Nations in the legal field. Through continuous efforts of the United Nations Committee on the Peaceful Uses of Outer Space and its Legal Subcommittee, a number of significant contributions to the law of outer space have been made.

LEGAL REGIME PERTAINING IPR

The intellectual property rights have engrossed a considerable amount of interest on an international scale since the end of the last century. The international space law has been formulated both within the United Nations framework and outside the United Nations structure through bilateral and multilateral agreements. The underlying principle for all convention treaties and agreements on intellectual property rights law has been to ensure that there are uniform intellectual property standards across the world.

a. The Paris Convention for the Protection of Industrial Property, 1883

The Paris Convention for the Protection of Industrial Property which is the fundamental international treaty in the field of industrial property does not expressly consider the subject of inventions in outer space. It provides only national treatment principles and the right of priority and common rules. According to article 4bis of the convention, the patents granted in different member states for the same invention are independent of each other. This indicates that the granting of a patent for a given invention in one member state does not oblige other member states to grant a patent for the same invention. Hence, there is no provision in this convention expressly dealing with the intellectual property in space or other celestial bodies.

b. The Berne Convention for the Protection of Literary and Artistic Works, 1886

The preamble of Berne Convention for the Protection of Literary and Artistic Works states as follow; “the countries of the union being equally animated by the desire to protect, in as effective and uniform manner as possible, the rights of authors in their literary and artistic works”. But like Paris Convention, the Berne Convention also does not expressly consider the question of intellectual property rights in outer space.

c. The World Intellectual Property Organization Copyright Treaty, 1996

The international copyright community was with the strategy of guided development rather than trying to establish new international norms. The World Intellectual Property Organization worked continuously formulating guiding principles and model provisions. But this guidelines and model provisions could not cope with the requirements of new technological development.

d. The Agreement on Trade-Related Aspects of Intellectual Property Rights

The TRIPS agreement does not specifically address the question of outer space. It only provides national treatment principle and in case of any advantage, favor, privilege or immunity granted by a member to the nationals of any other country should be accorded immediately and unconditionally to the nationals of all other members.

e. The Patent Cooperation Treaty, 1970

The Patent Cooperation Treaty of 1970 is an agreement for international cooperation in the field of patents. This treaty was one of the most significant progresses in intellectual property rights since the adoption of Paris Convention in 1883. It is however largely a treaty for rationalization and cooperation with regard to the filing, searching, examination of patent applications and the dissemination of the technical information. The Patent Cooperation Treaty of 1970 does not provide for the grant of international patents with regard to the space activities. This treaty was nothing but it complements the Paris Convention.

INTELLECTUAL PROPERTY RIGHTS IN SPACE-A PERSPECTIVE OF DEVELOPING COUNTRIES

In World Trade Organization, about two thirds of the members are developing countries. The developing countries have been playing a vital role in World Trade Organization because of their numbers. They are becoming more important in the global economy and increasingly look to trade as a vital tool in their development efforts. The developing countries are a highly diverse group often with very different views and concerns. Hence, developing countries plays a imperative role in the development of world's economy and their perspectives cannot be denied.

The space technology and its application are increasingly becoming an important component of sustainable agenda of a nation. But the prohibitive cost, inherent risks and lack of access to technology has caused major set back for the developing countries and the third world nations to reap the benefits. This situation is been aggravated by political and economic challenges posed by the geo-political realities. The developing countries concession like export control measures, technology support etc are driven by commercial motives.

The third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, held in Vienna in 1999, organized a workshop on intellectual property rights in space to address the possible conflicts in intellectual properly rights regime and United Nations treaties relating to outer space. This workshop recommended the need for protection of

intellectual property rights in view of growing commercialization and privatization of space related activities. It was strongly recommended that the legal principles developed by the United Nations in the forms of treaties and declaration should be given due considerations. Basically, it would be appropriate to emphasize that while the need for establishment and deployment of a unified and uniform intellectual property protection regime for space is justifiable, the interests of the developing countries are not to be compromised.

INTELLECTUAL PROPERT RIGHTS & SPACE ACTIVITIES: AN INDIAN PERSPECTIVE

Currently, India is one of the six countries with domestic satellites in orbit. The Indian space programme has accomplished a lot in the past few decades and still progressing at an impressive rate. India could be recognized in the international field as one of the major space faring nations which in turn opened up global opportunities and demand for Indian services. There is the global marketing of Indian Remote Sensing data. Though the space activities are on high, there is no space legislation in India. The time has come for the preparation of appropriate legal framework keeping in view the recent national and global developments which include the active involvement of the private sector and commercialization of space activities. The article 51 of the Constitution imposes the obligation on the part of state to strive for the promotion of international peace and security.

The article 245 empowers parliament and state legislatures to enact laws. It enumerates three lists of subjects under the seventh schedule including the Union list, the State list and the Concurrent list. The space as a subject is not expressly mentioned in any list. This was because the space activities started in India in early 1960s. But by virtue of entry 97 of list I read with article 248, the parliament retains residuary legislative power in respect of any matter not enumerated in any of the three lists. Hence, parliament can exercise the power and enact the space legislation. The India is a party to all important space treaties which forms the main body of international space law like the Space Treaty 1967, the Rescue Agreement of 1968, the Liability Convention of 1972, the Registration Convention of 1975 and the Moon Agreement of 1979.

In the case of The secretary of Ministry of Information and Broadcasting v. Cricket Association of Bengal and Others , ruled that access to air is part of the fundamental rights of citizens under the article 19(1) and right to broadcast is also enshrined under the article 19(2) of the Constitution with reasonable restrictions placed in allocation of frequencies, etc. by the government. Justice Jeevan Reddy delivering the majority opinion observed:

“It is no longer possible for any government to control or manipulate the news, views and information available to its people. No nation can remain a fortress or an island in itself any longer”.

The judgment directed the government to set up an independent authority to regulate its use of airways which is a public property for its optimum usage. The Indian space programme has been encouraging transfer of technologies to Indian industry in support of various space objects. Hence, the protection of intellectual property rights is important to safeguard the

interests of technological development agencies on the one hand and those of the technology licenses on the other. The Indian Space Research Organization has provided the necessary support within the organization to identify and obtain patents, copyrights and trade mark registration.

The Indian Space Research Organization sights that though there are existing technologies, the states which wish to establish autonomous programme still need to develop the technologies. The intellectual property laws should enable the states to develop the technologies. The organization perceives that the very concept of introducing intellectual property would amount to revelation of technology to the world at large. Hence, it is important to discontinue from obtaining any components of intellectual property rights. If there is a patent for a certain invention, it would prevent the use of the invention by another even if independently conceived and developed.

Till now, there is no specific legislation with regard to space activities in India. First there is need of enacting the legislation with regard to space activity and then come to the question of intellectual property rights in space.

EXISTING ISSUES NEED TO BE ADDRESSED

The intellectual property rights are of ever growing importance to major activities around the world. It is increasingly used as weapon to monopolize the trade activities. In view of the general principles under international intellectual property law and international space law as analyzed above, various issues have to be addressed.

Applicability of national or regional intellectual property law in outer space

The national and regional laws on the protection of intellectual property are applicable only to the territory of the relevant country or region. The treaty under World Trade Organization tries to achieve certain level of harmonization among these laws. However, there are considerable differences which lead to a different level of intellectual property protection in the territory of each country. According to the Berne Convention, it applies to authors who are nationals of one of the countries of the Berne Union or who have habitual residence in on of those countries. Hence, the jurisdiction as far as intellectual property is concerned should be clearly defined, particularly where more than one country is involved in the launching of the elements of a space station.

The enforcement of intellectual property rights in outer space

With the different national and regional law of intellectual property law, the enforcement of intellectual property rights in outer space is very difficult. The primary concerns about the enforcement of intellectual property in outer space may relate to the manufacturing and use of patented inventions as well as the use of copyrighted products in outer space. The national law that will resolve which court is competent to decide intellectual property disputes in case of boundary disputes. But in case of cross-border litigation, the situation is more difficult. Basically, the matters of jurisdiction, applicable law, recognition and enforcement of foreign judgments are subject to a country’s national rules of private international law.

The Role of arbitration and mediation

With the recent trends of space activities involving intellectual property rights and the increase in the number of international commercial contracts regarding space activities has increased the disputes among the nations. Taking into account of the origin and nature of disputes, the mediation, arbitration or any other alternative dispute resolution procedures could be helpful. Though alternative dispute resolution is advantageous in nature but sometimes the court litigation is preferable. Further, the court judgment is preferable in order to clarify its rights.

The Synergy with other international obligations and morality

Whether the protection and enforcement of intellectual property rights may conflict with fundamental principles laid down in the Outer Space Treaty 1967 is an important issue. There is need of resolving an issue concerning the freedom of exploration and use of outer space on the one hand and the possibility of excluding others from accessing to outer space by way of obtaining intellectual property rights on the other. This issue is the only reason why certain countries have extended intellectual property protection to such databases through a sui generis regime.

The ownership and entitlement

The teamwork among the nations is significant in determining ownership and entitlement of intellectual property rights to use the objects protected. The ownership of technology resulting from joint development is often determined by the terms of the joint agreement itself. Therefore, when inventions or other objects of intellectual property are expected to be produced in the execution of the joint activities, it is always better to agree upon the issues before entering into agreement. Presently, many national laws require that an inventor should first apply for patent protection in the state of which the inventor is residing or in the state in which the invention was made. If such conditions of sticking on place and resident of inventors are imposed in international space station, it might have a negative effect on the sharing of elements for research and on the collaboration of researchers from different countries.

Invention Protection in Relation to Outer Space Activities

The industrial property plays a crucial role for a logical development of space activities and through huge investments; it has been made to carry out the space station project as well as other space programs. Therefore, it is important to assess the legal regime for the protection of technology use and new inventions in an outer space. The experts have predicted that inventions will be made in space within the 21st century. The jurisdiction in an outer space is also rather an unclear situation.

To protect the exclusive rights of inventors, there is need of establishing a special international legal regime for a governing of Intellectual Property Rights in an outer space. The intergovernmental agreement on the International Space Station was signed on 29 September 1988 by the United States of America, Japan, Canada and ten other European

Space Agency member states. The rationale of the Intergovernmental Agreement was to establish a long-term international cooperation framework among the partners for a development and a utilization of a civil international space station for peaceful purposes.

CONCLUSION & SUGGESTIONS

One of the main reasons for remaining many issues concerning space law unresolved is flexibility of the system of space laws that allow for changing interpretations and definitions. The recent trend is that most of spaces program have migrated from government owned and controlled projects to profitable commercial ventures. It is expected that technical inputs as well as financial contributions from the private sector will become more and more important in the context of future development of outer space activities. It is very likely that intellectual property protection will be one of the key factors for the establishment of the institutional and regulatory environment that supports further development of space business. This study appears that many of the practical difficulties that arise from the commercial application of space technologies stem from the very principle of territoriality and differences among national intellectual property law. The rules concerning licensing contracts and the protection of confidential information vary in each country and the enforceability of a court judgment in respect of an international dispute is not always same and certain. The difference among national intellectual property laws not only affect the space business but also other business which expands at the international level.

One of the prime issues is the absence of exhaustive legal certainty as to how the territorial jurisdiction under intellectual property law could apply to extraterritorial activities on a spacecraft which is subject to nationality jurisdiction. The practice is that a registered space objects are treated as quasi-territory for the purposes of intellectual property under a number of international agreements with respect to international space projects. This has caused a collage of national intellectual property laws each of which could only be applicable on a relevant registered object which implies that in the case of international cooperation activities, a complex segmentation of the international space station or platform cannot be avoided. The lack of a comprehensive global agreement leads to the situation that an agreement would have to be concluded among the parties in each single case of international cooperation.

The legal certainty is an essential factor for the space industry. Even the existing legal regime has practically failed to cope with the existing emerging issues of intellectual property rights and space activities. Hence, recognizing the complexities in overcoming the existing national and territorial legal framework, the best solution is to declare space and its accessories as a single territory with a single uniform law and universal enforcement body. A simple and reliable international legal framework would facilitate maximizing the collective utilization of public and private resources in the area of space technology for the benefit of all nations.

Realistically, new challenges for space law will be ever present. This requires the current laws and a regulation to be modified as space activities develops. The upcoming legislation should be enacted addressing following emerging issues;

a. How nations will resolve the issues of property rights on the space by the fact that treaty provisions prohibit states from declaring sovereignty in space?

b. In what ways the nations can balance the requirements of no harm to the space environment and commercial interests which may disturb the pristine territory?

c. What are the possible ways for the nations to adopt safety regulations for human beings in space?

d. How can civil government and commercial cooperative international space programs develop in the most advantageous way?

The contemporary demonstration of increasing commercial activity in outer space is rapidly creating a concrete need for patent protection in outer space ventures. The developing countries also demands that they should not be discrimination based on the economic background and everyone is equal to the reap properties of common mankind.

"The more international space cooperation is spread out, the more benefits will be distributed to the greatest number of countries".

INTERNATIONAL CONVENTIONS RELATING TO INTELLECTUAL PROPERTY AND OUTER SPACE

A. International principles concerning intellectual property

(1) Paris Convention for the Protection of Industrial Property

The Paris Convention for the Protection of Industrial Property (hereinafter referred to as the "Paris Convention"), which is the basic international treaty in the field of industrial property, does not expressly consider the question of inventions in outer space. However, it contains provisions establishing the national treatment principle (Article 2), the right of priority (Article 4) and common rules, including certain measures for the enforcement of intellectual property rights, which all the Member States must follow.

As regards patents, patents granted in different Member States for the same invention are independent of each other (Article 4*bis*: independence of patents obtained for the same invention in different countries). This means that, on the one hand, the granting of a patent for a given invention in one Member State does not oblige other Member States to grant a patent for the same invention; on the other hand, a patent for a given invention cannot be refused, revoked or terminated in a Member State on the grounds that a patent applied for in another Member State for the same invention has been refused or has lost its effect in the latter State. Article 6 provides a similar rule with respect to registered marks.

Of particular interest with respect to outer space activities is Article 5*ter*, which provides that there is no infringement of the rights of a patentee in the case of:

(i) the use on board vessels of other countries of the Paris Union of devices forming the subject of the patent in the body of the vessel, in the machinery, tackle, gear and other

accessories, when such vessels temporarily or accidentally enter the water of the said country, provided that such devices are used there exclusively for the needs of the vessel;

(ii) the use of devices forming the subject of the patent in the construction or operation of aircraft or land vehicles of other countries of the Paris Union, or of accessories of such aircraft or land vehicles, when those aircraft or land vehicles temporarily or accidentally enter the said country.

(2) Berne Convention for the Protection of Literary and Artistic Works

The Berne Convention for the Protection of Literary and Artistic Works (hereinafter referred to as the "Berne Convention") is the basic treaty in the field of copyright and related rights. As the Paris Convention, the Berne Convention does not expressly consider the question of intellectual property rights in outer space. However, it contains provisions establishing basic principles such as national treatment, the "independence" of protection and the principle of automatic protection, i.e., copyright protection may not be subject to any formality.

(3) WIPO Copyright Treaty (WCT)

The WCT provides, among other things, for the protection of (i) computer programs, whatever may be the mode or form of their expression, and (ii) the compilation of data or other material ("databases") in any form, which by reason of the selection or arrangement of their contents constitute intellectual creations. In particular, Article 8 assures the authors' right to enjoy the exclusive right of authorizing any communication to the public of their works, including the making available to the public of their works in such a way that members of the public may access these works from a place and at a time individually chosen by them. This Article is also applicable to transmissions to and from a spacecraft.

(4) The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement)

The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) does not specifically address the question of outer space as such. In addition to the principle of national treatment in Article 3, Article 4 provides that, in principle, any advantage, favor, privilege or immunity granted by a Member to the nationals of any other country shall be accorded immediately and unconditionally to the nationals of all other Members ("most-favoured-nation treatment").

Further, according to Article 27.1, patents must be available and patents rights enjoyable without discrimination as to the place of invention. Therefore, national law has to ensure that, with respect to inventions created in outer space, patents must be granted and enforceable in the territory in which it applies under the same conditions applicable to inventions created elsewhere.

B. International principles concerning outer space

The main body of current international space law is contained in five international agreements:

- Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies (1967 Outer Space Treaty);
- Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects launched into Outer Space (1968 Rescue Agreement);
- Convention on International Liability for the Damage Caused by Space Objects (1972 Liability Conventions);
- Convention on registration of Objects Launched into Outer Space (1975 Registration Convention); and
- Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (1979 Moon Agreement).

None of those agreements contains a provision expressly dealing with intellectual property.

However, since it may assist in examining whether the general rules on intellectual property protection need adaptation or exceptions for the purposes of outer space activities, the following general principles under international space law are highlighted:

(1) Outer Space Treaty

Article I of the Outer Space Treaty provides the so-called "space benefits" clause according to which the exploration and use of outer space should be carried out "for the benefit and interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind." Further, it states that outer space should be "free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law" and that there should be "free access to all areas of celestial bodies." Article II provides for so-called "non-appropriation of space", according to which outer space is "not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."

While non-appropriation of outer space has been agreed, Article VIII of the Outer Space Treaty establishes the principle that the State of registration has jurisdiction and control over space objects as well as personnel launched into outer space. It states that:

"A State to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body. Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth. Such objects or component parts found beyond the

limits of the State party to the Treaty on whose registry they are carried shall be returned to that State Party, which shall, upon request, furnish identifying data prior to their return."

(2) Registration Convention

Article II of the Registration Convention provides that the launching State shall register the space object by means of an entry in an appropriate registry which it should maintain. The term "launching State" is defined in Article I(a) as "a State which launches or procures the launching of a space object" or "a State from whose territory or facility a space object is launched." According to Article I(b), the term "space object" includes component parts of a space object as well as its launch vehicle and parts thereof. Further, where there are two or more launching States in respect of a space object, they should jointly determine which one of them should register bearing in mind the provisions of Article VIII of the Outer Space Treaty, and without prejudice to appropriate agreements among the launching States on jurisdiction and control over the space object and over any personnel thereof. Article VII of the Registration Convention provides the possibility of an international intergovernmental organization registering its space objects under certain conditions.

(3) Declaration by the United Nations Committee on the Peaceful Uses of Outer Space on International Cooperation in the Exploration and Use of the Outer Space for the Benefit and the Interest of All States, Taking into Particular Account the Needs of Developing Countries.

An explicit reference to intellectual property rights is made in the Declaration by the United Nations Committee on the Peaceful Uses of Outer Space on International Cooperation in the Exploration and Use of the Outer Space for the Benefit and the Interest of All States, Taking into Particular Account the Needs of Developing Countries, which was adopted in 1996. Its second paragraph states:

"States are free to determine all aspects of their participation in international cooperation in the exploration and use of outer space on an equitable and mutually acceptable basis. Contractual terms in such cooperative ventures should be fair and reasonable and they should be in full compliance with the legitimate rights and interests of the parties concerned as, for example, with intellectual property rights."

RECENT ACTIVITIES RELATING TO OUTER SPACE AND INTELLECTUAL PROPERTY

In 1997, WIPO conducted a study, with the help of consultants from Europe, Japan and the United States of America, on the possible need for rules and/or principles for the protection of industrial property, in particular inventions, which are created or used in outer space. The discussion focused exclusively on international industrial property law questions. More general international law issues, for example, the question of territory and jurisdiction, the legal issues relating to the cooperation activities between space faring nations, and the legal questions arising between a regional space agency and its member States, were not examined.

The consultants raised, in particular, the following issues:

(a) clarification on the principle of Article 5*ter* of the Paris Convention;

(b) whether Member States of WIPO should clarify that the laws applicable to inventions in the territory of a country will also apply in the spacecraft registered by (under jurisdiction of) the said country;

(c) standardization of contractual clauses on the protection of inventions and confidential information, which are created or used in international cooperative agreements between the space faring nations.

However, the study came to the conclusion that, for the time being, there was no need for special international legislative provisions concerning the protection of inventions created or used in outer space, but that it is desirable that the International Bureau of WIPO give information on the existing protection of such inventions to interested States and organizations.

In July 1999, a Workshop on Intellectual Property Rights in Space was held in conjunction with the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), which was a major intergovernmental conference for the purposes of creating a blueprint for the peaceful use of outer space in the 21st century. The recommendations made by the Workshop were amended and adopted by the plenary of the Conference, and included in the Report of the Conference as follows:

"(a) More attention should be paid to the protection of intellectual property rights, in view of the growth in the commercialization and privatization of space-related activities. However, the protection and enforcement of intellectual property rights should be considered together with the international legal principles developed by the United Nations in the form of treaties and declarations, such as those relating to the principle of non-appropriation of outer space, as well as other relevant international conventions;

"(b) The feasibility of harmonizing international intellectual property standards and legislation relating to intellectual property rights in outer space should be further explored with a view to enhancing international coordination and cooperation at the level of both the State and the private sector. In particular, the possible need for rules or principles covering issues such as the following could be examined and clarified: applicability of national legislation in outer space; ownership and use of intellectual property rights developed in space activities; and contract and licensing rules;

"(c) All States should provide appropriate protection of intellectual property rights involving space-related technology, while encouraging and facilitating the free flow of basic science information;

"(d) Educational activities concerning intellectual property rights in relation to outer space

Following the UNISPACE III, at the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space (COPUOS), some delegations proposed that intellectual property issues be included on the agenda to be considered by the Subcommittee. Such a proposal, however, did not find enough support by the Subcommittee Members. Although priority has been given to other activities due to the absence of any proposal by the member States concerning intellectual property in outer space, the International Bureau of WIPO has attended meetings and provided lectures on this topic on an ad hoc basis.

IPR ISSUES AND SPACE ACTIVITIES

Applicability of national/regional intellectual property law in outer space

As described above, national (and regional) laws on the protection of intellectual property in general apply only to the territory of the relevant country (or region). Thus, the acquisition and enforcement of intellectual property in a particular territory are governed by the applicable national (regional) intellectual property law. In other words, protection of intellectual property is subject to the applicable territorial legal framework. The treaties under the auspices of WIPO as well as the TRIPS Agreement have achieved a certain level of harmonization among national/regional laws. However, there still remain considerable differences among national/regional intellectual property laws which lead to a different level of intellectual property protection in the territory of each country (region).

On the other hand, one of the most important principles under international space law is the non-appropriation of outer space by any country (Article II of the Outer Space Treaty). The Outer Space Treaty, however, makes a distinction between "outer space *as such*" and "an object launched into outer space". As far as an object launched into outer space is concerned, in accordance with Article VIII of the Outer Space Treaty, the State on whose registry such an object is carried shall retain jurisdiction and control over that object, and over any personnel thereof. Further, the Registration Convention introduces a rule regarding who should register a space object. According to that Convention, a "launching State", which is a State that launches or procures the launching of a space object or a State from whose territory or facility a space object is launched, should register the space object with an appropriate registry. Where there are two or more launching States, they should determine among themselves which one of them should register the object, without prejudice to appropriate agreements concluded among the launching States on jurisdiction and control over the space object and over any personnel thereof. Therefore, according to international space law, the country of registry retains jurisdiction and control over the space object and over any personnel thereof unless otherwise agreed among the launching States. In other words, jurisdiction and control over the space object and its personnel is determined by the nationality (registering State) of the space object.

The question arises whether the territorial jurisdiction under intellectual property law permits the extension of each national (and regional) law to the objects which the respective country has registered and launched into outer space. In this respect, a distinction, however, should be made between activities carried out in outer space and activities relating to outer space

which are carried out on the territory of a country or on the territories of several countries. Following the general principle of territoriality of intellectual property rights, the acquisition and enforcement of intellectual property rights related to intellectual creations which were made in outer space but which are used in one or more territories on Earth are, in general, governed by the national (or regional) intellectual property law of the country or countries concerned. Therefore, a separate consideration as to the applicability of general intellectual property rules may be needed only in so far as activities are carried out in outer space, regardless of the place where the invention was made.

The United States of America is the only country that has enacted an explicit provision establishing a link between the three key elements: inventions, jurisdiction and territory. Section 105 of 35 U.S.C. (Inventions in outer space) reads as follows:

"(a) Any invention made, used, or sold in outer space on a space object or component thereof under the jurisdiction or control of the United States shall be considered to be made, used or sold within the United States for the purposes of this title, except with respect to any space object or component thereof that is specifically identified and otherwise provided for by

an international agreement to which the United States is a party, or with respect to any space object or component thereof that is carried on the registry of a foreign state in accordance with the Convention on Registration of Objects Launched into Outer Space.

"(b) Any invention made, used or sold in outer space on a space object or component thereof that is carried out on the registry of a foreign state in accordance with the Convention on Registration of Objects Launched into Outer Space, shall be considered to be made, used or sold within the United States for the purposes of this title if specifically so agreed in an international agreement between the United States and the state of registry."

Therefore, the patent law of the United States of America provides quasi-territorial effect on a space object that is carried on the registry of the United States of America, unless otherwise agreed by an international agreement.

In other countries, there is no explicit statutory provision of this kind, except that, by virtue of the ratification of the 1988 Intergovernmental Agreement, German intellectual property law is applicable to the ESA-registered elements. Some argue that, in the absence of an explicit legal provision, the applicability of national intellectual property law on space objects registered by that State is doubtful. Some others are of the opinion that in consideration of the broad concept of territoriality according to which national patent law may be applicable on ships which fly that State's flag on the high seas and on aircrafts which are registered by that State, the national patent law might be applicable by way of analogy to space objects registered in that State, even if the national patent law does not expressly provide such applicability to space objects. It should be noted that, in order to clarify this uncertainty in Europe, the Proposal for the Council Regulation on the Community Patent, issued by the European Commission (document COM(2000) 412), provides that the Regulation should apply to inventions created in outer space, which are under the jurisdiction and control of one or more member States in accordance with international law.

A similar kind of legal uncertainty also exists in the field of trademarks and industrial designs.

As regards copyright protection, the determination of jurisdiction of a spacecraft is less important, because it is the author's nationality which, in the first place, determines the status of the work as regards its protection. According to Article 3(1)(a) and (2) of the Berne Convention, the Convention applies to authors who are nationals of one of the countries of the Berne Union or who have habitual residence in on of those countries. Only in the case of non-protected authors, the place of the first publication is of importance (Article 3(1)(b) of the Berne Convention). However, since publication normally involves a significant number of copies, it is not likely to occur in outer space, at least in a near future. This would mean, for example, that if a database is created on a spacecraft, its status as regards protection under the Berne Convention will depend on the nationality of its creator.

The determination of the jurisdiction as far as intellectual property is concerned should be clearly defined, particularly where more than one country is involved in the launching of the elements of a space station. A good example of how a joint government administration can lead to a specific agreement on jurisdiction and control over the elements of an international space station is the Agreement on Cooperation in the Detailed Design, Development and Operation and Utilization of the Permanently Manned Civil Space Station among the governments of the United States of America, the Member States of the European Space Agency (ESA), Japan and Canada (the Intergovernmental Agreement (IGA)), concluded in 1988. Although the 1988 IGA was upgraded by the Agreement Concerning Cooperation on Civil International Space Station, concluded in 1998, which included the participation of the Russian Federation to the cooperation project, both Agreements contain, in Article 21, a provision establishing an intellectual property regime for the international space station.

In principle, Article 21.2 of the IGA stipulates that, for the purposes of intellectual property law, an activity occurring in or on a Space Station flight element should be deemed to have occurred only in the territory of the Partner State of that element's registry. As regards the European Partner States, a separate rule is necessary, since the European Partner States delegate to the ESA the responsibility to register the ESA flight elements. Article 21.2 of the IGA provides that, for the purposes of intellectual property law, any European Partner State may deem the activity to have occurred within its territory for ESA registered elements. Thus, with respect to all types of intellectual property law, the principle of quasi-territoriality is implemented on the Space Station, though ESA registered elements could be considered as a "common territory" of the European Partner States.

The prerequisite for the applicability of the principle of quasi-territoriality is the registration of "all" the space objects which might have a connection with intellectual property, that is, not only the spacecraft and the elements of the space station, but also, for example, an advertisement panel in outer space which might bare a trademark. It was reported that the current Registration Convention raised some practical difficulties, such as a different interpretation of the definition of the term "space object" and the accuracy of the registration carried out by the Contracting States. Further, the Registration Convention does not contain a

provision regarding changes of ownership of the registered space object, which was probably not foreseen at the time the Convention was concluded.[5]

Although the maritime law also applies the quasi-territorial principle to ships and to ships on the high sea, in the case of the international space station, each segment, to which the intellectual property law of each registered State applies, is located in proximity. Such a physical proximity might highlight the differences among national intellectual property laws. For example, the use of a certain invention, or a certain mark, could be considered as an infringement of a patent, or a trademark, in one segment while no problem would arise in the neighboring segment.

Enforcement of intellectual property rights in outer space

As described above, enforcement of intellectual property rights relating to intellectual creations which were made in outer space but which are used in one or more territories on Earth are, in general, governed by the national (or regional) law of the country or countries concerned. As regards satellite broadcasting, inasmuch as a satellite transmitting signal is merely a conduit for Earth-based receivers, this would seem to constitute use on Earth, not in outer space.

Adopting the quasi-territoriality principle to a space object would mean that matters of jurisdiction as well as questions of applicable law with respect to such a space object are subject to the national law of the registry country of the space object. Provided that any intellectual property infringed in outer space is treated as if infringement had occurred within the territory of the particular country, the same level of enforcement in that country should be available in respect of inventions, signs and creations used in outer space. At least within a foreseeable future, activities of human beings in outer space would be confined to activities in a space station or physically connected to the space station. Therefore, the primary concerns about the enforcement of intellectual property in outer space may relate to the manufacturing and use of patented inventions as well as the use of copyrighted products, such as software, in outer space. As regards registered signs such as trademarks, in the future, it is not excluded that those signs would be unlawfully used on an advertisement panel set-up in outer space or, once space tourism becomes a reality, that space souvenirs sold in outer space might carry those signs.

For disputes arising within the boundaries of a country, it is a national law that will determine which court is competent to decide intellectual property disputes, including intellectual property infringement cases and validity of registered intellectual property rights.

In case of cross-border litigation, the situation is more complicated. Generally, matters of jurisdiction, applicable law and recognition and enforcement of foreign judgements are subject to a country's national rules of private international law. Since harmonization in this respect is still limited, a whole set of national private international laws coexist, and cross border litigation often requires a complex analysis of questions of jurisdiction.

Nevertheless, in general, a number of jurisdiction laws set forth the complementary concepts of "general jurisdiction" and "special jurisdiction". General jurisdiction is based primarily on the "*actor sequitur forum rei*" principle, the idea behind which is that the plaintiff must bring suit against the defendant in the State of his domicile, habitual residence or principal place of business. Special jurisdiction rules focus more on the issue at stake, and refer jurisdiction in intellectual property matters, for example, to the place where a registration or deposit has been made, or in cases of intellectual property infringements considered as tort, where the harmful event took place or the damage occurred.

At the international level, a widely accepted multilateral instrument which covers jurisdiction and the enforcement of foreign judgements (including intellectual property disputes) does not yet exist. On a regional scale, in Europe, the fundamental instrument on jurisdiction is the Council Regulation 44/2001 on Jurisdiction and the Recognition and Enforcement of Judgements in Civil and Commercial Matters (Brussels I). As regards intellectual property litigation, Brussels I distinguishes between proceedings concerned with the registration or validity of patents, trademarks, designs and other intellectual property rights which require registration or deposit, and jurisdiction in other disputes involving intellectual property rights. Disputes involving the registration and validity of registered intellectual property rights are under exclusive jurisdiction of the courts of the Member State in which the deposit or registration has been applied for or has taken place. For other types of intellectual property disputes, it provides that the general and special jurisdiction rules of Brussels I apply. According to the Brussels I, general jurisdiction is based on the defendant's domicile in a Member State, irrespective of the defendant's nationality. Further, in matters relating to a contract, the courts of the place where the contractual obligation in question was to be performed and, in cases of tort, the courts of the place where the harmful event occurred or may occur have special jurisdiction.

As a part of contractual agreement, parties of a contract may determine, for example, a specific court, or the courts of a specific country, to have jurisdiction over disputes arising between them in connection with that contract. Such "choice of court clauses" are particularly common in international commercial agreements. Despite the prevalence in contracts, national systems vary considerably as to the prerequisites of choice of court clauses. While a number of countries place strict formalities on the acceptance of such clauses, such as the identification of a particular court, other countries also limit the possibility of choice of court clauses to business-to-business contracts, or provide special requirements and limitations for clauses involving consumers. In order to harmonize at least some of those issues, and to create greater predictability and reliability in this field, a draft Convention on choice of court agreements has been discussed under the auspices of the Hague Conference on Private International Law. In this context, the discussion on intellectual property matters focuses, in particular, on the question as to which intellectual property rights should be covered by the Convention.

Under the IGA, since the ESA elements are treated as if it were a "common" territory of the European Partner States, each of them could enforce its intellectual property law. In terms of enforcement of intellectual property rights, therefore, it needs certain additional

rules regarding the intellectual property which is protected in more than one European Partner State. The question arises whether a single act that occurred in or on an ESA-registered element constitutes infringement of the same intellectual property rights owned by the same owner in more than one European Partner State. Could the right holder be entitled to compensation in accordance with each national law of the European Partner States concerned for a single act that occurred in or on the ESA registered-element? According to Article 21(4) of the IGA, where a person or entity owns intellectual property which is protected in more than one European Partner State, that person or entity could bring the proceedings against infringement only in one country.

Another question arises where the intellectual property right was granted with respect to the same subject matter in more than one European Partner State, and was transferred to another party in some, but not all, of those European Partner States. Could each right holder be entitled to compensation in accordance with the national law of the European Partner State concerned for the single act that occurred in or on the ESA registered-element? Article 21(4), second sentence provides that, where the same act of infringement in or on the ESA-registered element gives rise to actions by different intellectual property owners by virtue of more than one European Partner State's deeming the activity to have occurred in its territory, a court may grant a temporary stay of proceedings in a later-filed action pending the outcome of the earlier-filed action. Thus, the court has the discretion of deciding for an order of a temporary stay of the proceedings. However, in accordance with Article 21(4), third sentence, where more than one action is brought by different right owners, satisfaction of a judgement rendered for damages in any of the actions should bar further recovery of damages in any pending or future action of infringement based upon the same act of infringement. Therefore, from the viewpoint of intellectual property owners, much depends on the quick expedition of litigation in the different States.

In addition, enforcement of intellectual property rights in or on the ESA-registered elements may require further adjustment to the traditional "territorial" concept of intellectual property rights as far as licensing agreements are concerned. For example, a licensee x under the national law of European Partner State X in relation to a certain patent in the State X and a licensee y under the national law of another Partner State Y in relation to the same patent registered in the State Y may not be the same party. Do both licensees x and y have a right to use the patented technology in accordance with the terms and conditions of the licensing agreements in or on the ESA-registered elements in outer space? Where a patent with respect to the same subject matter is owned by a third party z in another European Partner State Z, could the owner z prevent the licensees x and y from using the patented technology in or on the ESA-registered elements by virtue of assuming that the patented technology is used in the territory of the State Z without the owner's consent? In order to answer those questions, Article 21(5) of the IGA provides that no European Partner State may refuse to recognize a license for the exercise of any intellectual property right if that license is enforceable under the law of any European Partner State, and compliance with the conditions of such license should also bar recovery for infringement in any European Partner State. Thus, it seems that a non-exclusive licensee in any of the European Partner States

could use the licensed subject matter in or on the ESA-registered elements in accordance with the terms and conditions of the licensing agreement, without being in conflict with other licensees and right holders in other European Partner States.

In sum, as regards the elements registered by the ESA, the IGA intends to provide practical solutions to bridge the "national territory" approach adopted in respect of the enforcement of intellectual property rights on Earth and the assumption that the ESA registered elements are deemed to be a "common territory" of all European Partner States. In addition to the fact that such an adjustment creates another layer of complexity,[7] some argue that it is not clear how an injunction issued by a national court could be executed on the space station in view of the fact that the ESA and its staff members enjoy the legal privileges and immunities provided for in the ESA Convention.[8] It is also pointed out that, since Article 21(4) of the IGA concerns the same subject matter protected in more than one European Partner State, the identification of the same subject matter may not always be straightforward, in particular with respect to patents with claims drafted differently.[9] Further, in addition to the general difficulties found in the enforcement of intellectual property at the international level, in outer space, it would be more difficult to detect infringing activities and to provide evidence for the alleged infringement.

It should be noted that, in the field of patents, many national laws provide that the rights conferred by a patent should not extend to the use of patented subject matter for the purposes of non-commercial experimentation and research. What constitutes "non-commercial" activities and the definition of the term "experimentation and research" differ from one country to another. The underlying objective of such an exception, however, is to provide a balance between the patentee who obtains exclusive rights and third parties who wish to test the reproducibility and usefulness of the patented invention or who wish to further develop the technology by way of experimenting with the patented subject matter. Since many activities in outer space could be characterized as experimental and research activities, certain uses of patented technology in outer space may fall under the experiment and research exemption, depending on the scope of the experiment and research exemption clause under the national law.

Role of arbitration and mediation

By their nature, outer space activities often involve intellectual property rights registered in one or more jurisdictions. Inevitably, the increase in the number of international commercial contracts regarding space activities also increases the likelihood of disputes arising. Considering the origin and nature of such disputes, mediation, arbitration or other alternative dispute resolution (ADR) procedures may offer advantages that are particularly relevant to space activities, namely:

(i) *A single procedure*. Through ADR, the contractual parties can agree to resolve in a single procedure a dispute involving intellectual property rights that are protected in a number of different countries, thereby avoiding the expense and

complexity of litigation in any jurisdiction(s) that may apply and the risk of inconsistent results.

(ii) *Party autonomy*. Because of its private nature, ADR affords parties the opportunity to exercise greater control over the way their dispute is resolved than would be the case in court litigation. In contrast to court litigation, the parties themselves may select the most appropriate decision-makers for their dispute. The choice of an arbitrator or mediator with relevant technology expertise may be particularly useful where sophisticated technology is involved. In addition, the parties may choose the applicable law, place and language of the proceedings. Increased party autonomy can also result in a faster process, as parties are free to devise the most efficient procedures for their dispute. This can result in material cost savings[10].

(iii) *Neutrality*. ADR can be neutral to the law, language and institutional culture of the parties, thereby avoiding any home court advantage that one of the parties may enjoy in court-based litigation, where familiarity with the applicable law and local processes can offer significant strategic advantages.

(iv) *Confidentiality*. ADR proceedings are private. Accordingly, the parties can agree to keep the proceedings and any results confidential. This allows them to focus on the merits of the dispute without concern about its public impact. Confidentiality may be of special importance where commercial reputations and technological secrets are involved.

(v) *Finality of Awards*. Unlike court decisions, which can generally be contested through one or more rounds of litigation, arbitral awards are not normally subject to appeal.

(vi) *Enforceability of Awards*. The United Nations Convention for the Recognition and Enforcement of Foreign Arbitral Awards of 1958 generally provides for the recognition of arbitral awards on par with domestic court judgments without review on the merits. This greatly facilitates the enforcement of awards across borders.

There are, of course, circumstances in which court litigation is preferable to ADR. For example, ADR's consensual nature makes it less appropriate if one of the two parties is extremely uncooperative, which may occur in the context of an extra-contractual infringement dispute. In addition, a court judgment will be preferable if, in order to clarify its rights, a party seeks to establish a public legal precedent rather than an award that is limited to the relationship between the parties. In any event, it is important that potential parties and their advisors are aware of their dispute resolution options in order to be able to choose the procedure that best fits their needs when they negotiate complex international agreements.

Synergy with other international obligations and morality

As prescribed in Articles I and II of the Outer Space Treaty, the exploration and use of outer space for the benefit of mankind and the non-appropriation of outer space by any nation are fundamental principles under international space law. Although the participation of the private sector in space activities is increasingly visible today, these principles are still valid.

While recognizing the importance of intellectual property for the exploration of outer space and the further development of science and technology, questions have been raised as to whether the protection and enforcement of intellectual property rights may conflict with fundamental principles laid down in the Outer Space Treaty.

One of the issues concerns the access to knowledge and information derived from space activities. In view of Article I, paragraph 1 of the Outer Space Treaty which stipulates that exploration and use of outer space "must be effected for the good and in the interest of all countries, regardless of their state of economic and scientific development, being the attribute of all mankind", it has been argued that the knowledge and information resulting from space activities should be available to all countries, in particular, to developing countries. For example, earth observation data may be useful in the areas which are critically important for all nations, such as agriculture, natural resources, protection of the environment as well as the prevention and intervention in the event of natural disasters.

Another issue concerns the freedom of exploration and use of outer space on the one hand and the possibility of excluding others from accessing to outer space by way of obtaining intellectual property rights on the other. Today, there is general agreement that the notions of propriety rights over space objects and of appropriation of outer space *as such* should be clearly distinguished. However, it is pointed out that, in certain cases, protection of intellectual property may hamper the development of subsequent research, especially in the case of intelligent orbits for which the necessary technology has been patented. Since these orbits are elliptical and quasi-geostationary, but located outside the equatorial zone, their characteristics of not requiring limited frequencies provide significant advantages for the application to telecommunication. It is argued that such a patent that would cover a system or a method of satellite communication using these orbits would have the effect of limiting the access to those orbits by third parties.

The World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), which is an advisory body of United Nations Educational, Scientific and Cultural Organization (UNESCO), looked into the issues relating to the ethical dimension of outer space activities, and adopted Recommendations at its second session, held from December 17 to 19, 2001. The COMEST believes that every space policy must be based on the concept of mutual and reciprocal benefits, while safeguarding fair competition and the principle of return on investment. It emphasizes the importance of the role that ethics must play in the choice of a specific project and its long-term assessment from the viewpoint of human security and economic criteria.

In connection with the intellectual property issues, the COMEST recommends:

"To take all appropriate measures to provide researchers with free access to scientific data in order to guarantee sharing of knowledge with a view to promote scientific progress; to place scientific outer space data at the disposal of the developing countries; to foster the definition of procedures to permit sharing of the resulting benefits, bearing in mind the legitimate interests of these countries and acting in the most equitable and balanced manner possible."

It further recommends:

"To pursue reflection with a view to reaching an agreement on the management of intellectual property in manned stations and more broadly in the field of outer space industry, notably as to the eligibility for patenting of products or processes produced in orbital stations or associated with on-board materials or vehicles."

It should be noted that many national patent laws take into account the ethical concerns. They contain a provision according to which inventions the commercial exploitation of which is necessary to protect public order or morality are not patentable.[14] Further, with respect to the enforcement of patent rights, in order to prevent the abuses which might result from the exercise of the exclusive rights conferred by a patent, many national laws provide that a non voluntary license may be granted to a third party or the government without the owner's consent. The owner, however, should be paid adequate remuneration. A similar non voluntary license may be granted in the cases where the non-voluntary license is deemed necessary due to a national emergency or other circumstances of extreme urgency.

However, national patent laws obviously do not address all the public policy issues. The determination of the patentability of an invention is essentially based on a technical evaluation of the invention in view of existing technical art, such as the determination of novelty, inventive step (non-obviousness) and industrial applicability (utility). It is other laws that regulate and control the commercial exploitation of patented inventions from the viewpoint of public welfare. For example, in order to safeguard the quality and safety of pharmaceutical products and certain chemical products, those products, whether they are patented or not, are subject to strict marketing approval processes before commercial exploitation. Many products, from daily goods to high technology products, should comply with various quality standards and safety standards for their commercial exploitation. Thus, patent law is not deemed to be a major legal instrument to monitor and control issues such as public security and welfare. In any event, a patent does not confer a positive exclusive right to exploit or market the patented invention. Such a consideration is reflected in Article 4*quater* of the Paris Convention, which provides that the grant of a patent should not be refused and a patent should not be invalidated on the ground that the sale of the patented product or of a product obtained by means of a patented process is subject to restrictions or limitations resulting from the domestic law.

Under the national laws on copyright of most countries, databases that constitute an intellectual creation by reason of the selection or arrangement of its contents are protected. It is to be noted, however, that the threshold of originality that is required to

qualify for copyright protection differs from country to country. While a particular kind of database might be protected under copyright in some countries, a similar database might not qualify for copyright protection in other countries. This means that copyright protection might not be available for certain databases, depending on the level of originality required under the copyright law of a particular jurisdiction, even if substantial investments have been made to produce them. Databases that contain comprehensive information without selection in a straightforward manner, such as alphabetical or numerical order, may not be protected under copyright in all countries. This is why certain countries have extended intellectual property protection to such databases through a *sui generis* regime. Other models of protection are also available, such as unfair competition or misappropriation laws.

Copyright protection of original databases is well established and harmonized through international treaties to that effect, such as the Berne Convention, the TRIPS Agreement and the WCT. However, there are no international norms on protection of non-original databases.

At regional level, the Directive 96/9/EC of the European Parliament and of the Council of March 11, 1996, on the legal protection of databases grants a "*sui generis*" right to database makers to protect their investment of time, money and effort to establish a database, regardless of whether the database is in itself innovative. At national level, the copyright law of Mexico and the Korean Copyright Act of 2003 contain provisions on protection of non original databases.

Interpretation of Article 5*ter* of the Paris Convention

As described in paragraph 24 above, Article 5*ter* of the Paris Convention provides for certain limitations on the exclusive rights conferred by a patent in the public interest in guaranteeing freedom of transport. In principle, if ships, aircraft or land vehicles temporarily visit foreign countries and have patented invention on board, licenses on patents in force in these countries are not required in order to avoid infringing such patents (doctrine of temporary presence).

The question arises whether the doctrine of temporary presence applies to spacecraft. It can be argued that, since Article 5*ter* of the Paris Convention only mentions vessels, aircraft or land vehicles, space objects do not fall under this provision; therefore the temporary presence of elements of a space station for the purpose of launching or return in a foreign country will not automatically be exempted from patent infringement. According to this argument, in the context of international cooperation, if the transport of payloads or flight elements of country X depends on launchers registered by country Y, the space agency of country X might infringe patents enforced in country Y due to the fact that the nationality of the launchers is country Y.

In order to clarify this question, the IGA shed some light on the temporary presence of an article in relation to outer space activities in Article 21(6). According to that Article, the temporary presence in the territory of a Partner State of any article, including the components of flight elements, in transit between any place on Earth and any flight element

of the Space Station registered by another Partner State or ESA should not in itself form the basis for any proceedings in the first Partner State for patent infringement. Thus the transport of patented articles to or from the Space Station through a launching site would not infringe patents enforceable in the country of the launching site.

Ownership and entitlement

The principles for determining ownership of intellectual property and entitlement to use objects protected by intellectual property rights are the same for cooperative space efforts as for cooperative projects on the ground. Ownership of technology resulting from joint development is often determined by the terms of the joint agreement itself. Thus, when inventions or other objects of intellectual property are expected to be produced in the execution of the joint activities, it is advisable that the following issues be agreed upon beforehand: (i) the extent to which any inventions or other technology developed during the joint activity will not be published or disclosed before patents are applied for, or before all parties agree to publish or disclose the technology; (ii) the entitlement to rights; and (iii) the entitlement to benefit from any technology developed during that activity. Similarly, the partners to a joint project should agree on a system that suits their interests for the purposes of protecting confidential information shared by them in a cooperative international project.

Further, in general, the development of distinct public-sector intellectual property management skills and policy mechanisms are important for effective deployment of public funds. In particular, since space activities are largely supported by public investment and other public resources, establishing policies for managing intellectual property from public funded research is essential for successful public-private partnership models.

As a separate issue, currently, many national laws require that an inventor should first apply for patent protection in the State of which the inventor is a resident or in the State in which the invention was made. This is due to the concern that, without such a measure, inventions involving national security might be disclosed in foreign countries by way of filing patent applications abroad. If such a requirement is imposed in relation to international cooperation activities in an international space station, it might have a negative effect on the sharing of elements for research and on the collaboration of researchers from different countries. Thus, in Article 21(3), the IGA states that, in respect of an invention made in or on any Space Station flight element by a person who is not its national or resident, a Partner State should not apply its law concerning secrecy of inventions so as to prevent the filing of a patent application (for imposing a delay or requiring prior authorization) in any other Partner State that provides for the protection of the secrecy of patent applications containing information that is classified or otherwise protected for national security purposes. Therefore, despite the general principle in Article 21(2) of the IGA that activities carried out in the Space Station flight element should be deemed to have occurred in the territory of the Partner State of that element's registry, the rule concerning secrecy of inventions for the purposes of national security should not apply to an inventor who is not the national or resident of that State.

However, in accordance with Article 21(3), second sentence, once the inventor has filed a patent application with the Office of a particular country, the provisions concerning secrecy of inventions for the purposes of national security of that country may apply to that application.

Copyright issues in cyber space

1. Linking: "Linking" allows a website user to visit another website on the Internet without leaving that particular website. By clicking on a word or image in one web page, the user can view another Web page somewhere else in the world, or on the same server as the original page. Linking may damage the rights or interests of the owner of the page that is linked to in two ways:

    - linked-to sites can lose income as their revenues are often tied to the number of viewers who visit their home page, and;

    - it may create the impression in the minds of users that the two linked sites endorse each other or are somehow linked to each other.

For example, A makes a homepage for his website, and on the homepage he places some advertisements, from which he can make some money and it contains links to various subordinate pages. Then, B creates his website, which contains links to A's subordinate pages. This is called deep linking. Because of this, the website visitors to B's site will be able to gain access to A's material, without even visiting or seeing A's advertisements.

Copyright infringement occurs when one site contains links to copyrighted materials contained in another site against the wishes and knowledge of the copyright owner. Though the person who provides the link may not be making copies themselves, some courts have found the link provider to be partially responsible for copyright infringement.

In *Shetland Times, Ltd. v. Jonathan Wills and Another*, the Shetland News's "deep link" to embedded pages of the Shetland Times's web site, through the use of Times' web site's news headlines, was held to be an act of copyright infringement under British law and an injunction was issued for the same.

1. Inlining: "Inlining" is the process of displaying a graphic file on one website that originates at another. In inlining, a web site user at a certain site can, without leaving that site, view a particular video featured on some other site.

2. Framing: "Framing" is the process of allowing a user to view the contents of one website while it is framed by information from another site. Framing may trigger a dispute under copyright and trademark law, because a framed site alters the appearance of the content and creates the impression that its owner endorses or is associated with the framer.

Legality Of Metag-ing, Linking & Framing

The Internet as we experience is witness a major change with the process of constant development. It has to be ascertained that the magnitude of development paves way for the force to attract malware and malicious activities. Like all client based industry the biggest asset for the internet industry is the user base. Depending on the amount of understanding the user posses, they fall prey to the traps laid down to various kinds of cyber crimes. Despite being in disguise of useful information, trails like meta-taging, linking and framing are the shadows which follow the user without reveling the identity, which upon refining comes out to be a different pretext altogether. The voluminous increases in types of crimes have further boosted the number of victims which fall prey to internet activities. The success-rate of meta-taging, linking and framing is higher from other crimes making them the most practiced events, which pave way to a lot of legal actions as well. Despite having been in existence and recognition for a long time now, a binding statute is yet to be made to govern the atrocities these activities are capable of, though there have been case laws which speak about the necessary course of actions, but they fail to lay down concrete measures. The most affected are the innocent companies which fall prey to the trap mechanism, primarily targeting their Intellectual Property mostly Trademark, Goodwill, and Copyright.

LINKING

"A "link" is a set of commands in Hypertext Markup Language (HTML) that when actuated by right-clicking a mouse directs your browser to another page. The new page could be in the website you're viewing or it could be a page in another website.

Three other well known type of links are: "intra-page, intra-system, and inter-system. Intra-page links connect different parts of the same document. For example, a long document may have a link at the end which takes the user back to the beginning. Intra-system links connect different documents on the same server. An intra-system link on a university's server might connect the home pages of two different departments. An intersystem link connects documents on different servers. Thus, a document concerning intellectual property law on a university's server might be connected to the home page of the Governments Patent Office"

Some relevant cases in order to provide on a general perspective for linking:

Shetland Times, Ltd. v. Jonathan Wills and Another,[1] is considered the first "linking" case; "the issue presented in Shetland Times was whether the Shetland News's ("News") "deep link" to embedded pages of the Shetland Times's ("Times") web site, through the use of Times' web site's news headlines, was an act of copyright infringement under British law. The matter settled on the day of trial, shortly after the court had issued a preliminary injunction precluding the deep link. Although much discussed, this opinion has proved to be of little legal significance, in part because of the extremely low evidentiary standard applied by the court."

Nottinghamshire County Council v. Gwatkin,[2] "the Nottingham shire County Council filed suit against three British journalists and a web site operator claiming that their Internet posting of a long suppressed government report critical of Nottingham's Social Services

Department's investigation into allegations of Satanism and child abuse in the late 1980s infringed on the Council's copyright to the report."

One of the most well known cases it was *Ticket master v. Microsoft* - The first major case involving the practice of deep linking involved Microsoft's use of deep links from its "Sidewalk" web guides. These web guides spotlighted, among other things, upcoming events in a particular area, and would provide deep links to information on specific events on interior pages of the Ticket master web site. At that time, Ticket master had recently signed an agreement to provide event information and ticket-ordering links to a competing web guide service, City Search. Through this agreement, City Search was paying Ticketmaster for what Microsoft was taking for free. Tickemaster filed suit against Microsoft on April 28,1997, arguing that Microsoft's practices devalued Ticketmaster's site by bypassing its home page.

In addition most of copyright laws are clear about the fact of qualifying as infringer to anyone who breaks up or violates any of the right that the law has protected as the consequence of the authorship. Facing the facts, there is not a unique position about if all linking process involves a copyright infringement. In that sense is necessary to recall some cases in law as *Sony Corp. of America v. Universal City Studios, Inc.* Where the test was if the device had some legal use. In this sense the opinion of Edward A. Cavazos and Coe F. Miles in the case of Dilbert cartoons is "If the link in question is an auto-load link, however, it may be the case that the link looks and functions more like a "means to infringe" or that the linking party so substantially participates in the user's acts that the linking party can be deemed a participatory infringer.

FRAMING

Framing is a method of splitting one window into two or more screens. A web page can be inserted into a frame, and that portion of the screen will remain static as a user moves through other web pages. This method is called "framing," because it allows a webmaster to send an individual through numerous web pages while retaining the appearance and the utility of the frame inserted.

Most of the "Intellectual Property in Cyberspace" pages utilize frames. The pages in this technical primer have been set to open outside of the frames." Technically explained, a framing process works as follow: "The frames may contain either highlighted URL addresses of other Web pages that are intended to be "selected" by the framing page user or other pages within the same Web site.

LEGALITY OF FRAMING

Nevertheless the most accepted legal concept is that framing can cause consumer confusion and thereby violating trademarks laws and under particular laws can be unfair competition. The problem with a finding of copyright infringement of a literary work where such links are concerned is similar to that raised in respect of meta-tags because these hypertext links are likely to contain only relatively short phrases. The case of Shetland Times is unlikely to be

helpful as it was only an interim decision and thus decided on a lower standard of proof. An example of such a pictorial link would be that found in *Ticketmaster Corp v Microsoft Corp* where the link from the defendant's web site to the plaintiff's site comprised the plaintiff's logo.98 In that case, the plaintiff sold and marketed tickets to various entertainment events through its web site 'http://www.ticketmaster.com' on the internet. The home page of the plaintiff displayed advertisements, products and services of other parties with which the plaintiff had contracts, thus providing it with an important source of revenue. The defendant set up a web site 'http://seattle.sidewalk.com' and initially entered into negotiations with the plaintiff to have hyperlinks from their Seattle Sidewalk site to the plaintiff's Ticketmaster site. When the negotiations failed, the defendant established the links anyway.

META-TAGGING

Every domain name can be translated to any IP address and there is no logical connection between an individually selected domain name and the IP address. The value of a simple and memorable domain name is incalculable to a business and has no doubt fuelled the aforementioned litigation over domain names. Very often, a customer who is unsure about a company's domain name will often guess that the domain name is also the company's name.

TRADE MARK INFRINGEMENT

The cause of action of choice at present however appears to be that of trade mark infringement. In *Playboy Enterprises Inc v Calvin Designer Label*, Legge J found that the plaintiff 'is likely to succeed on the merits in proving inter alia trademark infringement ... in Defendants' ... repeated use of the PLAYBOY trademark in machine readable code in Defendants' Internet Web pages, so that the PLAYBOY trademark is accessible to individuals or Internet search engines which attempt to access Plaintiff under Plaintiff's PLAYBOY registered trade mark.'

In *Instituform Technologies Inc v National Envirotech Group* LLC, the parties settled under terms that permanently enjoined the defendant from using the plaintiff's trademarks as meta-tags in their web site. Other cases followed, culminating in the Ninth Circuit Court of Appeal's decision in *Brookfield Communications Inc v West Coast Entertainment Corp* in which the Ninth Circuit issued a preliminary injunction against the defendant from, inter alia, using 'moviebuff.com' in meta-tags on its web site as such use was likely to infringe the plaintiff's trade mark 'MovieBuff'.

COPYRIGHT INFRINGEMENT

There are various intellectual property regimes which are potentially available to a plaintiff in a litigation involving meta-tags. Copyright is one such possibility which cannot be discounted in the light of the extremely unconvincing reasoning of the English Court of Appeal in the case of *Exxon Corporation v Exxon Insurance Consultants International Ltd*.

In that case, the plaintiff sought to restrain the defendant from infringing the plaintiffs' alleged copyright in their corporate name 'Exxon'. The English Court of Appeal dismissed the plaintiff's action on the basis that the word 'Exxon' was not a 'literary work' in which

copyright could subsist. Stephenson LJ was of the view that 'a literary work [is] something which is intended to afford either information or instruction, or pleasure in the form of literary enjoyment'. The Court of Appeal found that the word 'Exxon' provided no information, instruction or pleasure and thus, copyright did not subsist in the word. Accordingly, the plaintiff's action failed. The result achieved by the courts is not doubted by the majority of commentators.

The preferable justification for denying copyright in such cases would be the *maxim de minimis non curat lex*; Unless this is so, the useful working rule that simplicity and brevity are not bars to copyright could easily be carried too far, creating monopolies over any two alphabets joined together. Such an interpretation of the phrase 'literary work' would be wholly alien to its natural meaning in ordinary parlance; hence the need for the *maxim of de minimis non curat lex* to restrict the ambit of 'literary work' within reasonable limits. If the maxim were embraced by the courts to rationalize the Exxon case, it is unlikely that any action in copyright infringement can be sustained in respect of disputes concerning meta-tags which are independently created by the web author.

CONCLUSION

The evolving times have created a dire need for a reform to address and handle all the challenging scenarios at hand. The biggest obstacle is to identify and try to mould the present conventional laws and try to address the problem under the umbrella of the same. The distinction at both national and international level regarding the absence of absolutely applicable laws is a striking factor.

It must be taken into account that apart from the threats possessed by the acts of framing, linking and meta-tagging; the biggest challenge lies in form to the impact which is given to the intellectual property when incidents relating to these occur. The intellectual property in either of the forms is irrevocably hurt and being very fragile upon being hurt once the damage caused is irreversible.

Trademark issues in cyber space

A domain name dispute is a conflict that arises when more than one individual believe they have the right to register a specific domain name. A “domain name dispute” arises when a domain name similar to a registered trademark is registered by another individual or organization who is not the owner of registered trademark. All domain name registrars must follow the ICANN‘s Uniform Domain-Name Dispute-Resolution Policy (UDRP).

- Cyber squatting: Cyber squatting is a kind of Domain name dispute. It includes registering, selling or using a domain name with the intent of profiting from the goodwill of someone else’s trademark.

Yahoo! Inc v. Akash Arora & Anr (1999 IIAD Delhi 229) the defendants were using “yahooindia.com” for providing internet services. The petitioner here was the owner of the trademark “Yahoo!” and had registered its domain name with different countries like “yahoo.in” for India. Hence, the domain name “yahooindia.com” could be mistaken as an

extension of “Yahoo!”. The Court treated the matter as passing off and granted an injunction restraining the defendant from using the domain name “yahooindia.com”.

- Mate-tags: Meta tagging is a technique in which a word is inserted in the keywords field of the site in order to increase the chances of a search engine returning the site, even though the site may have nothing to do with the word which was inserted. Trademark infringement occurs when companies include in their own websites meta tags containing the names or descriptions of other companies. For example, Coca Cola used the keyword “Pepsi” in its meta tags, now the web surfers who used search engines in order to obtain information about Pepsi would be directed to Coca Cola’s web site due to these meta tags.

As happened in the case Oppedahl & Larson v. Advanced Concepts (D. Colo. Feb. 6, 1998), the law firm of Oppedahl & Larson, owner of the domain name <patents.com>, filed a trademark infringement action against three companies and the corresponding ISPs after discovering that the companies inserted the words “Oppedahl” and “Larson” in the keywords field of their web pages in order to draw traffic to their sites.

Cybersquatting: What It Is and What Can Be Done About It

If you own a trademark and find that someone is holding it hostage as a domain name until you pay a large sum for it, you may be the victim of cybersquatting. Learn what to do if this happens to you.

What Is Cybersquatting?

Cybersquatting is registering, selling or using a domain name with the intent of profiting from the goodwill of someone else's trademark. It generally refers to the practice of buying up domain names that use the names of existing businesses with the intent to sell the names for a profit to those businesses.

The History of Cybersquatting

The practice that's come to be known as cybersquatting originated at a time when most businesses were not savvy about the commercial opportunities on the Internet. Some entrepreneurial souls registered the names of well-known companies as domain names, with the intent of selling the names back to the companies when they finally woke up. Panasonic, Fry's Electronics, Hertz and Avon were among the "victims" of cybersquatters. Opportunities for cybersquatters are rapidly diminishing, because most businesses now know that nailing down domain names is a high priority.

Recognizing Cybersquatting

How do you know if the domain name you want is being used by a cybersquatter? Follow these steps to find out.

Check where the domain name takes you**.** As a general rule, first check to see if the domain name takes you to a website. If it does *not* take you to a functioning website, but instead takes

you to a site stating "this domain name for sale," or "under construction," or "can't find server," the likelihood increases that you are dealing with a cybersquatter. The absence of a real site may indicate that the domain name owner's only purpose in buying the name is to sell it back to you at a higher price.

Of course, absence of a website does not always mean the presence of a cybersquatter. There may also be an innocent explanation and the domain name owner may have perfectly legitimate plans to have a website in the future.

If the domain takes you to a functioning website that is comprised primarily of advertisements for products or services related to your trademark, you may also have a case of cybersquatting. For example, if your company is well-known for providing audio-visual services and the website you encounter is packed with ads for other company's audio-visual services, the likelihood is very strong that the site is operated by a cybersquatter who is trading off your company's popularity to sell Google ads to your competitors.

If the domain name takes you to a website that appears to be functional, has a reasonable relation to the domain name, but does not compete with your products or services, you probably aren't looking at a case of cybersquatting. For example, if your trademark is "Moby Dick" for fine art dealing with whaling, and the website you encounter (www.mobydick.com) is for road cleaning machines, you do not have a case of cybersquatting. You may, under certain circumstances, have a case of trademark infringement. (For more information, see Nolo's article What to Do If the Domain Name You Want Is Taken.)

Contact the domain name registrant. Before jumping to any conclusions, contact the domain name registrant. To find the name and address of a domain name owner, you can use the "WHOIS Lookup" at whois.net. Find out whether there is a reasonable explanation for the use of the domain name, or if the registrant is willing to sell you the name at a price you are willing to pay.

Pay, if it makes sense**.** Sometimes, paying the cybersquatter is the best choice. It may cheaper and quicker than filing a lawsuit or initiating an arbitration hearing.

What You Can Do to Fight a Cybersquatter

A victim of cybersquatting in the United States has two options:

- sue under the provisions of the Anticybersquatting Consumer Protection Act (ACPA), or
- use an international arbitration system created by the Internet Corporation of Assigned Names and Numbers (ICANN).

Trademark experts consider the ICANN arbitration system to be faster and less expensive than suing under the ACPA, and the procedure does not require an attorney.

Using the ICANN Procedure

In 1999, ICANN adopted and began implementing the Uniform Domain Name Dispute Resolution Policy (UDNDRP), a policy for resolution of domain name disputes. This international policy results in an arbitration of the dispute, not litigation. An action can be brought by any person who complains (referred to by ICANN as the "complainant") that:

- a domain name is identical or confusingly similar to a trademark or service mark in which the complainant has rights
- the domain name owner has no rights or legitimate interests in the domain name, and
- the domain name has been registered and is being used in bad faith.

All of these elements must be established in order for the complainant to prevail. If the complainant prevails, the domain name will be canceled or transferred to the complainant. However, financial remedies are not available under the UDNDRP. Information about initiating a complaint is provided at the ICANN website.

Suing Under the ACPA

The Anticybersquatting Consumer Protection Act (ACPA) authorizes a trademark owner to sue an alleged cybersquatter in federal court and obtain a court order transferring the domain name back to the trademark owner. In some cases, the cybersquatter must pay money damages.

In order to stop a cybersquatter, the trademark owner must prove all of the following:

- the domain name registrant had a bad-faith intent to profit from the trademark
- the trademark was distinctive at the time the domain name was first registered
- the domain name is identical or confusingly similar to the trademark, and
- the trademark qualifies for protection under federal trademark laws -- that is, the trademark is distinctive and its owner was the first to use the trademark in commerce.

Defenses to ACPA lawsuits. If the accused cybersquatter demonstrates that he had a reason to register the domain name other than to sell it back to the trademark owner for a profit, then a court will probably allow him to keep the domain name.

MODULE-VI

SPACE TECHNOLOGY, TELECOMMUNICATIONS AND IPR LAWS IN INDIA

IPR PROTECTION LAWS IN INDIA

In today's globalized scenario of expanding multilateral trade and commerce, it has become inevitable for any country to protect its intellectual property by providing statutory rights to the creators and inventors and thus help them fetch adequate commercial value for their efforts in the world market.

This innovative and creative capacity is protected under the intellectual property system of WTO. Recognizing this fact, India as a founder member of WTO has ratified the Agreement on Trade Related Intellectual Property Rights (TRIPS). As per the agreement, all member countries including India are to abide by the mutually negotiated norms and standards within the stipulated timeframe. Accordingly, India has set up an Intellectual Property Right (IPR) regime, which is WTO compatible and is well established at all levels whether statutory, administrative or judicial.

The Government has taken a comprehensive set of initiatives to streamline the intellectual property administration in the country in view of its strategic significance. In the Ministry of Commerce and Industry, the office of the 'Controller General of Patents, Designs and Trade Marks (CGPDTM)' has been set up under the Department of Industrial Policy and Promotion.

It administers all matters relating to patents, designs, trademarks and geographical indications and also directs and supervises the functioning of :-

- The Patent Office (including Designs Wing)
- The Patent Information System (PIS)
- The Trade Marks Registry (TMR), and
- The Geographical Indications Registry (GIR)

Besides, a 'Copyright Office' has been set up in the Department of Education of the Ministry of Human Resource Development, to provide all facilities including registration of copyrights and its neighbouring rights.

As far as issues relating to layout design of integrated circuits are concerned, 'Department of Information Technology' in the Ministry of Information Technology is the nodal organisation. While, 'Protection of Plant Varieties and Farmers' Rights Authority' in Ministry of Agriculture administers all measures and policies relating to plant varieties.

For complementing the administrative set up, several legislative initiatives have been taken. It includes, the Trade Marks Act, 1999; the Geographical Indications of Goods (Registration and Protection) Act 1999; the Designs Act, 2000; the Patents Act, 1970 and its subsequent amendments in 2002 and 2005; Indian Copyright Act, 1957 and its amendment Copyright (Amendment) Act, 1999; Semiconductor Integrated Circuit Layout Design Act, 2000; as well as the Protection of Plant varieties and Farmer's Rights Act,2001

LAWS RELATING TO COPYRIGHTS AND RELATED RIGHTS

The umbrella legislation relating to copyright is the Copyright Act,1957. According to the Act, the term 'copyright' means the exclusive right to do or authorise the doing of a 'work' or a substantial part of it. The term 'work' used here means:-

- A literary work:- it includes computer programmes, tables , compilations and computer databases.
- A dramatic work:- it includes any piece of recitation, choreographic work or entertainment in dumb show, the scenic arrangement or acting, whose form is fixed in writing or otherwise.
- A musical work:- it includes works of music, any graphical notation of such work but does not include any words or action intended to be sung, spoken or performed with the music.
- An artistic work:- it means a painting, a sculpture, a drawing (including a diagram, map, chart or plan),an engraving or a photograph, whether or not they possess artistic quality. It also includes a work of architecture and any other work of artistic craftsmanship.
- A cinematographic film:- it means any work of visual recording on any medium produced through a process from which a moving image may be produced by any means.
- A sound recording:- it means recording of sounds from which sounds may be produced regardless of the medium by which sounds are produced.

Here, the 'Related rights or Neighbouring rights' are the rights of performers (eg actors, singers and musicians), producers of phonograms (sound recordings) and broadcasting organizations.

The Act is administered by the Department of Higher Education in the Ministry of Human Resource Development. A Copyright Board is established under the Act. The Board is entrusted with the task of adjudication of disputes pertaining to copyright registration, assignment of copyright, grant of licences in respect of works withheld from public, unpublished Indian works, production and publication of translations and works for certain specified purposes. The Act, set up a Copyright Office under the control of Registrar of Copyrights, for the registration of Copyrights.

The main provisions of the Act are:-

- There shall be established for the purposes of this Act an office to be called as the 'Copyright Office'. The Copyright Office shall be under the immediate control of the Registrar of Copyrights who shall act under the superintendence and direction of the Central Government. Also, the Central Government shall constitute a 'Copyright Board'.

- There shall be kept at the Copyright Office a register in the prescribed form to be called as the 'Register of Copyrights' in which may be entered the names or titles of works and the names and address of authors, publishers and owners of copyright and such other particulars as may be prescribed.

- The author or publisher of, or the owner of or other person interested in the copyright in any work may make an application in the prescribed form accompanied by the prescribed fee to the Registrar of Copyrights for entering particulars of the work in the Register of Copyrights.

- The register of Copyrights and indexes thereof kept under this Act shall at all reasonable times be open to inspection, and any person shall be entitled to take copies of, or make extracts from, such register or indexes on payment of such fee and subject to such conditions as may be prescribed.

- The Register of Copyright shall be prima facie evidence of the particulars entered therein and documents purporting to be copies of any entries therein, or extracts therefrom certified by the Registrar of Copyrights and sealed with the seal of the Copyright Office shall be admissible in evidence in all courts without further proof or production of the original.

- Copyright shall subsist in any literary, dramatic, musical or artistic work (other than a photograph) published within the lifetime of the author until sixty years from the beginning of the calendar year next following year in which the author dies. Also, in the case of a literary, dramatic, musical or artistic work (other than photograph), which is published anonymously, copyright shall subsist until sixty years from the beginning of the calendar year next following the years in which the work is first published.

- The owner of the copyright in an existing work or the prospective owner of the copyright in a future work may assign to any person the copyright either wholly or partially and either generally or subject to limitations and either for the whole term of the copyright or any part thereof. However, in the case of the assignment of copyright in any future work, the assignment shall take effect only when the work comes into existence.

- If at any time during the term of copyright in any Indian work which has been published or performed in public, a complaint is made to the Copyright Board that the owner of copyright in the work:- (i) has refused to republish or allow the republication of the work or has refused to allow the performance in public of the work, and by reason of such refusal the work is withheld from the public; or (ii) has refused to allow communication to the public by broadcast of such work or in the case of a sound recording, the work recorded in such sound recording, on terms which the complainant considers reasonable.

- Then, the Copyright Board, after giving to the owner of the copyright in the work reasonably opportunity of being heard and after holding such inquiry, as it may deemed

necessary, may, if it is satisfied that the grounds for such refusal are not reasonable, direct the Registrar of Copyrights to grant to the complainant a licence to republish the work, perform the work in public or communicate the work to the public by broadcast, as the case may be, subject to payment to the owner of the copyright of such compensation and subject to such other terms and conditions as the Copyright Board may determine, and thereupon the Registrar of Copyrights shall grant the licence of the complainant in accordance with the direction of the Copyright Board, on payment of such fees, as may be prescribed.

- The Central Government may, by order published in the Official Gazette, direct that all or any provisions of this Act, shall apply:-

  a) To work first published in any territory outside India to which the order related in like manner as if they were first published within India;

  b) To unpublished works, or any class thereof, the authors whereof were at the time of the making of the work, subjects or citizens of a foreign country to which the order relates, in like manner as if the authors were citizens of India;

  c) In respect of domicile in any territory outside India to which the order relates in like manner as if such domicile were in India;

  d) Tto any work of which the author was at the date of the first publication thereof, or, in case where the author was dead at the date, was at the time of his death, a subject or citizens of foreign country to which the order relates in like manner as if the author was a citizen of India at that date or time.

Copyright in a work shall be deemed to be infringed:-

a) When any person, without a licence granted by the owner of the Copyright or the Registrar of Copyrights under this Act or in contravention of the conditions of a licence so granted or of any conditions imposed by a competent authority under this Act:- (i) does anything, the exclusive right to do which is by this Act conferred upon the owner of the copyright; or (ii) permits for profit any place to be used for the communication of the work to the public where such communication constitutes an infringement of the copyright in the work, unless he was not aware and had no reasonable ground for believing that such communication to the public would be an infringement of copyright; or

b) When any person:- (i) makes for sale on hire, or sells or lets for hire, or by way of trade displays or offers for sale or hire; or (ii) distributes either for the purposes of trade or to such an extent as to affect prejudicially the owner of the copyright; or (iii) by way of trade exhibits in public; or (iv) imports into India, any infringing copies of the work.

Every broadcasting organisation shall have a special right to be known as 'broadcast reproduction right' in respect of its broadcasts. The broadcast reproduction right shall subsist until twenty-five years from the beginning of the calendar year next following the year in which the broadcast in made.

Where any performer appears or engages in any performance, he shall have a special right to be known as the 'performer's right' in relation to such performance. The performer's right shall subsist until twenty-five years from the beginning of the calendar year next following the year in which the performance is made.

No broadcast reproduction right or performer's right shall be deemed to be infringed by:-

a) The making of any sound recording or visual recording for the private use of the person making such recording, or solely for purposes of bona fide teaching or research; or

b) The use, consistent with fair dealing, of excerpts of a performance or of a broadcast in the reporting of current events or for bona fide review, teaching or research; or

c) Such other acts, with any necessary adaptations and modifications, which do not constitute infringement of copyright under the Act.

Where any offence under this Act has been committed by a company, every person who at the time the offence was committed was in charge of, and was responsible to the company for, the conduct of the business of the company, as well as the company, shall be deemed to be guilty of such offence and shall be liable to be proceeded against and punished accordingly.

LAWS RELATING TO PATENTS

The umbrella legislation relating to patents is the Patents Act, 1970. The term 'patent' is defined as a monopoly right which is granted to a person who has invented a new and useful article, or an improvement of existing article, or a new process of making an article. It consists of an exclusive right to manufacture the new invented article or manufacture an article according to the invented process for a limited period. Inventions that consist of products or new alloy is called product invention and the corresponding patent to this is referred to as 'product patent'. Whereas, inventions that consists of process or processes of making a known or new alloy is a process invention and patent for this is called a 'process patent'. This Act only provided for process patent and for product like food, pharmaceutical and chemicals, the inventors were granted only EMR (exclusive marketing rights). Patent system in India is administered under the superintendence of the Controller General of Patents, Designs, Trademarks and Geographical Indications. The Office of the Controller General functions under the Department of Industrial Policy and Promotion, Ministry of Commerce and Industry. The Controller General directs and supervises the functioning of the Patent Office and the Patent Information System (PIS). The Patent Office performs the statutory duties in connection with the grant of patents for new inventions under the Patents Act. The Head Office of Patents is at Kolkata with branches at Mumbai, Chennai and Delhi. The branches deal with the applications for patents originating within their respective territorial jurisdiction. The Patent Information system (PIS) at Nagpur has been functioning as patent information base for the users. The PIS maintains a comprehensive collection of patent specification and patent related literature, on a world-wide basis and provides technological information contained in patent or patent related literature through search

services and patent copy supply services to various users of R&D establishments , Government offices, private industries, business, inventors and other users within India.

The Controller General of Patents, Designs and Trade Marks appointed under the Trade and Merchandise Marks Act, 1958, shall be the Controller of Patents for the purposes of this Act. Also, there shall be a 'patent office' for the purpose of facilitating the registration of patents at such places as the Central Government may specify.

There shall be kept at the patent office a 'register of patents' wherein shall be entered:-

- The names and addresses of grantees of patents;
- Notifications of assignments, extensions, and revocations of patents; and
- Particulars of such other matters affecting the validity or proprietorship of patents as may be prescribed.

An application for a patent for an invention may be made by any of the following persons:-

- By any person claiming to be the true and first inventor of the invention;
- By any person being the assignee of the person claiming to be the true and first inventor in respect of the right to make such an application;
- By the legal representative of any deceased person who immediately before his death was entitled to make such an application.

The following are not inventions within the meaning of this Act:-

- An invention which is frivolous or which claims anything obvious contrary to well established natural laws;
- An invention the primary or intended use of which would be contrary to law or morality or injurious to public health;
- The mere discovery of a scientific principle or the formulation of an abstract theory;
- The mere discovery of any new property of new use for a known substance or of the mere use of a known process, machine or apparatus unless such known process results in a new product or employs at least one new reactant;
- A substance obtained by a mere admixture resulting only in the aggregation of the properties of the components thereof or a process for producing such substance;
- The mere arrangement or re-arrangement or duplication of known devices each functioning independently of one another in a known way;
- A method or process of testing applicable during the process of manufacture for rendering the machine, apparatus or other equipment more efficient or for the

improvement or restoration of the existing machine, apparatus or other equipment or for the improvement or control of manufacture;

- A method of agriculture or horticulture;
- Any process for the medicinal, surgical, curative, prophylactic or other treatment of human beings or any process for a similar treatment of animals or plants to render them free of disease or to increase their economic value or that of their products.

Every application for a patent shall be for one invention only and shall be made in the prescribed form and filed in the patent office. Every application shall state that the applicant is in possession of the invention and shall name the owner claiming to be the true and first inventor; and where the person so claiming is not the applicant or one of the applicants, the application shall contain a declaration that the applicant believes the person so named to be the true and first inventor. Every such application shall be accompanied by a provisional or a complete specification.

Where an application for a patent (not being a convention application) is accompanied by a provisional specification, a complete specification shall be filed within twelve months from the date of filing of the application, and if the complete specification is not so filed the application shall be deemed to be abandoned. Every complete specification shall:-

- Fully and particularly describe the invention and its operation or use and the method by which it is to be performed
- Disclose the best method of performing the invention which is known to the applicant and for which he is entitled to claim protection; and
- End with a claim or claims defining the scope of the invention for which protection is claimed.

At any time within four months from the date of advertisement of the acceptance of a complete specification under this Act (or within such further period not exceeding one month in the aggregate as the Controller may allow on application made to him in the prescribed manner before the expiry of the four months aforesaid) any person interested may give notice to the Controller of opposition to the grant of the patent on any of the following grounds, namely: -

- That the applicant for the patent or the person under or through whom he claims, wrongfully obtained the invention or any part thereof from him or from a person under or through whom he claims;
- That the invention so far as claimed in any claim of the complete specification has been published before the priority date of the claim:- (i) in any specification filed in pursuance of an application for a patent made in India on or after the 1st day of January, 1912; or (ii) in India or elsewhere, in any other document.
- That the invention so far as claimed in any claim of the complete specification is claimed in a claim of a complete specification published on or after the priority date

of the applicant's claim and filed in pursuance of an application for a patent in India, being a claim of which the priority date is earlier than that of the applicant's claim;

- That the invention so far as claimed in any claim of the complete specification was publicly known or publicly used in India before the priority date of that claim.
- That the invention so far as claimed in any claim of the complete specification is obvious and clearly does not involve any inventive step;
- That the subject of any claim of the complete specification is not an invention within the meaning of this Act, or is not patentable under this Act;
- That the complete specification does not sufficiently and clearly describe the invention or the method by which it is to be performed;
- That in the case of a convention application, the application was not made within twelve months from the date of the first application for protection for the invention made in a convention country by the applicant or a person from whom he derives title, etc.

Where any such notice of opposition is duly given, the Controller shall notify the applicant and shall give to the applicant and the opponent an opportunity to be heard before deciding the case.

Where a complete specification in pursuance of an application for a patent has been accepted and either:- (i) the application has not been opposed and the time for the filing of the opposition has expired; or (ii) the application has been opposed and the opposition has been finally decided in favour of the applicant; or (iii) the application has not been refused by the Controller by virtue of any power vested in him by this Act; then the the patent shall, on request made by the applicant in the prescribed form, be granted to the applicant or, in the case of a joint application, to the applicants jointly, and the Controller shall cause the patent to be sealed with the seal of the patent office and the date on which the patent is sealed shall be entered in the register.

The term of every patent granted and the term of every patent which has not expired and has not ceased to have effect under this Act, shall be twenty years from the date of filing of the application for the patent.

Where an application is made for a patent in respect of any improvement in or modification of an invention described or disclosed in the complete specification filed thereof and the applicant also applies or has applied for a patent for that invention or is the patentee in respect thereof, the Controller may, if the applicant so requests, grant the patent for the improvement or modification as a patent of addition. A patent of addition shall be granted for a term equal to that of the patent for the main invention.

At any time after the expiration of three years from the date of the sealing of a patent, any person interested may make an application to the Controller alleging that the reasonable requirements of the public with respect to the patented invention have not been satisfied or that the patented invention is not available to the public at a reasonable price and praying for the grant of a compulsory licence to work the patented invention.

If any person fails to comply with any direction given under the Act or makes or causes to be made an application for the grant of a patent in contravention of the Act, he shall be punishable with imprisonment or with fine or with both.

This Act has been amended by the Patents (Amendment) Act, 2002 and the Patents (Amendment) Act, 2005 to take care of India's obligations under the TRIPS Agreement. After the amendments, product patent (instead of process patent) is being granted for food, pharmaceutical and chemical products. Also, along with post grant opposition to patents, pre-grant opposition is also permissible.

LAWS RELATING TO TRADEMARKS

The Trade Marks Act,1999 has been enacted to amend and consolidate the law relating to trade marks, to provide for registration and better protection of trade marks for goods and services and for the prevention of the use of fraudulent marks. It repealed the earlier Trade & Merchandise Marks Act, 1958. According to the Trade Marks Act,1999, the term 'trade mark' means "a mark capable of being represented graphically and which is capable of distinguishing the goods or services of one person from those of others and may include shape of goods, their packaging and combination of colours".

Under the Act, the Controller-General of Patents, Designs and Trade Marks under Department of Industrial Policy and Promotion, Ministry of Commerce and Industry is the 'Registrar of Trade Marks'. The Controller General of Patents, Designs & Trade Marks directs and supervises the functioning of the Trade Marks Registry (TMR). The 'Trade Marks Registry' administers the Trade Marks Act, 1999 and the Rules thereunder. TMR acts as a resource and information centre and is a facilitator in matters relating to trade marks in the country. The main function of the Registry is to register trade marks which qualify for registration under the Act and Rules.

The main provisions of the Act are:-

The Central Government may, by notification in the Official Gazette, appoint a person to be known as the 'Controller-General of Patents, Designs and Trade Marks', who shall be the Registrar of Trade Mark for the purpose of this Act. Also, there shall be a 'Trade Marks Registry' at such place as the Central Government may specify, and for the purpose of facilitating the registration of trade marks.

For the purposes of this Act, a record called the 'Register of Trade Mark' shall be kept at the head office of the Trade Marks Registry, wherein shall be entered all registered trade mark with the names, addresses and description of the proprietors, notifications of assignment and transmissions, the name, addresses and description of registered users, conditions, limitations and such other matters relating to registered trade mark as may be prescribed.

The Register shall classify goods and services, as far as may be, in accordance with the International classification of goods and services for the purposes of registration of trade marks. Any question arising to the class within which any goods or services falls shall be determined by the Register whose decision shall be final.

Absolute grounds for refusal of registration of trade marks:-

1. Which are devoid of any distinctive character (that is not capable of distinguishing the good or services of one person from those of another person);

2. Which consist exclusively of marks or indications which may serve in trade to designate the kind, quality, quantity, intended purpose, values, geographical origin or the time of production of the goods or rendering of the service or other characteristics of the goods or service;

3. Which consist exclusively of marks or indications which have become customary in the current language or in the bona fide and established practices of the trade;

4. If it consists exclusively of shape of goods:- (i) which results from the nature of the goods themselves; or (ii) which is necessary to obtain a technical result; or (iii) which gives substantial value of the goods.

Relative grounds for refusal of registration of trade marks:-

- Existence of a likelihood of confusion on the part of the public due to:- (i) its identity with an earlier trade mark and similarity of goods or services covered by the trade mark; or (ii) its similarity to an earlier trade mark and the identity or similarity of the goods of services covered by the trade mark.

- If its use in India is liable to be prevented:- (i) by virtue of any law, in particular the law of passing off protecting an unregistered trade mark used in the course of trade; or (ii) by virtue of law of copyright.

Any person claiming to be the proprietor of a trade mark used or proposed to be used by him, who is desirous of registering it, shall apply in writing to the Registrar in the prescribed manner for the registration of his trade mark. A single application may be made for registration of a trade mark for different classes of goods and services and fee payable thereof shall be in respect of each such class of goods or services.

Any person may, within three months from the date of the advertisement or re-advertisement of an application for registration or within such further period, not exceeding one month in the aggregate, give notice in writing in the prescribed manner to the Registrar, of opposition to the registration. The Registrar shall serve a copy of the notice on the applicant for registration and, within two months from the receipt by the applicant of such copy of the notice of opposition, the applicant shall send to the Registrar in the prescribed manner a counter-statement of the grounds on which he relies for his application, and if he does not do so he shall be deemed to have abandoned his application. The Registrar shall, after hearing the parties, if so required, and considering the evidence, decide whether and subject to what conditions or limitations, if any, the registration is to be permitted, and may take into account a ground of objection whether relied upon by the opponent or not.

The registration of trade mark, after the commencement of this Act, shall be for a period of ten years, but may be renewed from time to time in accordance with the provisions of the Act. The Registrar shall, on application made by the registered proprietor of a trade mark in the prescribed manner and within the prescribed period and subject to payment of the prescribed fee, renew the registration of the trade mark for a period of ten years from the date of expiration of the original registration or of the last renewal of registration, as the case may be.

Grounds for infringement of registered trade marks are:-

- By any advertising of that trade mark if such advertising:- (i) takes unfair advantage of and is contrary to honest practices in industrial or commercial matters; or (ii) is detrimental to its distinctive character; or (iii) is against the reputation of the trade mark.

- By a person who, not being a registered proprietor or a person using by way of permitted use, uses in the course of trade, a mark which:- (i) is identical with or similar to the registered trade mark; and (ii) is used in relation to goods or services which are not similar to those for which the trade mark is registered; and (iii) the registered trade mark has a reputation in India and the use of the mark without due cause takes unfair advantage of or is detrimental to, the distinctive character or repute of the registered trade mark.

- By a person if he uses such registered trade mark, as his trade name or part of his trade name, or name is his business concern or part of the name, of his business concern dealing in goods or services in respect of which the trade mark is registered.

- Where the distinctive elements of a registered trade mark consists of or include words, the trade mark may be infringed by the spoken use of those words as well as by their visual representation.

- By a person who applies such registered trade mark to a material intended to be used for labelling or packaging goods, as a business paper, or for advertising goods or services, provided such person, when he applied the mark, knew or had reason to believe that the application of the mark was not duly authorised by the proprietor or a licensee.

Any person who:- (i) falsifies any trade mark; or (ii) falsely applies to goods or services any trade mark; or (iii) makes, disposes of, or has in his possession, any die, block, machine, plate or other instrument for the purpose of falsifying or of being used for falsifying, a trade mark; or (iv) applies any false trade description to goods or services; or (v) tampers with, alters or effaces an indication of origin which has been applied to any goods to which it is required to be applied under the Act, shall be punishable with imprisonment and with fine.

LAWS RELATING TO INDUSTRIAL DESIGNS

The Designs Act, 2000 has been enacted to consolidate and amend the law relating to registration and protection of new and original industrial designs. It repealed and replaced the Designs Act, 1911. According to the Designs Act,2000, the term 'design' means "only the features of shape, configuration, pattern, ornament or composition of lines or colours applied to any article whether in two dimensional or three dimensional or in both forms, by any industrial process or means, whether manual, mechanical or chemical, separate or combined, which in the finished article appeal to and are judged solely by the eye; but does not include any mode or principle of construction or anything which is in substance a mere mechanical device, and does not include any trade mark as defined in the Trade and Merchandise Marks Act, 1958 or property mark as defined in the Indian Penal Code or any artistic work as defined in the Copyright Act, 1957".

Under the Act, the Controller-General of Patents, Designs and Trade Marks under Department of Industrial Policy and promotion, Ministry of Commerce and Industry is the Controller of Designs. The Controller General of Patents, Designs & Trade Marks directs and supervises the functioning of 'Industrial Designs Wing'. The registration of industrial designs under the Designs Act is done by the 'Industrial Designs Wing' of the Head Office of Patents located at Kolkata.

The 'Controller General of Patents, Designs and Trade Marks' appointed under the Trade and Merchandise Marks Act, 1958 shall be the Controller of Designs for the purposes of this Act.

The Controller may, on the application of any person claiming to be the proprietor of any new or original design not previously published in any country and which is not contrary to public order or morality, register the design under the Act. Every application shall be in the prescribed form and shall be filed in the Patent Office in the prescribed manner and shall be accompanied by the prescribed fee. A design may be registered in not more than one class, and, in case of doubt as to the class in which a design ought to be registered, the Controller may decide the question.

Prohibition of registration of those designs which:-

- Are not new or original; or
- Have been disclosed to the public anywhere in India or in any other country by publication in tangible form or by use or in any other way prior to the filing date, or where applicable, the priority date of the application for registration; or
- Are not significantly distinguishable from known designs or combination of known designs; or
- Comprise or contain scandalous or obscene matter.

The Controller shall grant a certificate of registration to the proprietor of the design when registered. Also, there shall be kept at the Patent Office a book called the 'register of designs', wherein shall be entered the names and addresses of proprietors of registered designs, notifications of assignments and of transmissions of registered designs, and such other matter as may be prescribed

When a design is registered, the registered proprietor of the design shall, subject to the provisions of this Act, have copyright in the design during ten years from the date of registration. If, before the expiration of the said ten years, application for the extension of the period of copyright is made to the Controller in the prescribed manner, the Controller shall, on payment of the prescribed fee, extend the period of copyright for a second period of five years from the expiration of the original period of ten years.

The Controller shall, as soon as may be after the registration of a design, cause publication of the prescribed particulars of the design to be published in such a manner as may be prescribed and thereafter the design shall be open to public inspection. During the existence of copyright in a design, any person on furnishing such information as may enable the Controller to identify the design and on payment of the prescribed fee may inspect the design in the prescribed manner. Also, any person may, on application to the Controller and on payment of such fee as may be prescribed, obtain a certified copy of any registered design.

Any person interested may present a petition for the cancellation of the registration of a design, at any time after the registration of the design, to the Controller on any of the following grounds:- (i) that the design has been previously registered in India; or (ii) that it has been published in India or in any other country prior to the date of registration; or (iii) that the design is not a new or original design; or (iv) that the design is not registrable under this Act; or (e) it is not a design as defined under the Act. The Controller may at any time refer any such petition to the High Court, and the High Court shall decide any petition so referred.

The exhibition of a design, or of any article to which a design is applied, at an industrial or other exhibition to which the provisions of the Act have been extended by the Central Government by notification in the Official Gazette, or the publication of a description of the design, during or after the period of the holding of the exhibition, or the exhibition of the design or the article or the publication of a description of the design by any person else-where during or after the period of the holding of the exhibition, without the privity or consent of the proprietor, shall not prevent the design from being registered or invalidate the registration thereof, subjected to the conditions that:- (i) the exhibitor exhibiting the design or article, or publishing a description of the design, gives to the Controller previous notice in the prescribed form; and (ii) the application for registration is made within six months from the date of first exhibiting the design or article or publishing a description of the design.

During the existence of copyright in any design it shall not be lawful for any person:-

- For the purpose of sale to apply or cause to be applied to any article in any class of articles in which the design is registered, the design or any fraudulent or obvious imitation thereof, except with the license or written consent of the registered proprietor, or to do anything with a view to enable the design to be so applied; or

- To import for the purposes of sale, without the consent of the registered proprietor, any article belonging to the class in which the design has been registered, and having applied to it the design or any fraudulent or obvious imitation thereof; or

- Knowing that the design or any fraudulent or obvious imitation thereof has been applied to any article in any class of articles in which the design is registered without the consent of the registered proprietor, to publish or expose or cause to be published or exposed for sale that article.

Where an application for a design has been abandoned or refused, the application and any drawings, photographs, tracings, representations or specimens left in connection with then application shall not at any time be open to public inspection or be published by the Controller.

If any person acts in contravention of the Act, he shall be liable for every contravention to pay to the registered proprietor of the design a sum not exceeding certain prescribed amount as a contract debt, or if the proprietor elects to bring a suit for the recovery of damages for any such contravention, and for an injunction against the repetition thereof, to pay such damages as may be awarded and to be restrained by injunction accordingly.

LAWS RELATING TO LAYOUT DESIGNS OF INTEGRATED CIRCUITS

The Semi-Conductor Integrated Circuits Layout-Design Act,2000 has been enacted to provide for the protection of semiconductor integrated circuits layout-designs and for matters connected therewith or incidental thereto. According to the Act, the term 'layout-design' means "a layout of transistors and other circuitry elements and includes lead wires connecting such elements and expressed in any manner in a semiconductor integrated circuit". Here, the term 'semiconductor integrated circuit' means "a product having transistors and other circuitry elements which are inseparably formed on a semiconductor material or an insulating material or inside the semiconductor material and designed to perform an electronic circuitry function".

The Act is implemented by the Department of Information Technology, Ministry of Information Technology. The Act is applicable for Integrated Circuits Layout-Design IPR applications filed at the Registry in India. The Semiconductor Integrated Circuits Layout-Design Registry (SICLDR) is the office where the applications on Layout-Designs of integrated circuits are filed for registration of created IPR. The Registry has jurisdiction all over India.

The main provisions of the Act are:-

The Central Government may, by notification in the Official Gazette, appoint a person to be known as the 'Registrar of Semiconductor Integrated Circuits Layout-Design' for the purposes of this Act. Also, there shall be a 'Semiconductor Integrated Circuits Layout-Design Registry' for the purposes of facilitating the registration of layout-designs at such places as the Central Government may specify.

For the purposes of this Act, a record called the 'Register of Layout-Designs' shall be kept at the head office of the Semiconductor Integrated Circuits Layout-Design Registry, wherein shall be entered all registered layout-designs with the names, addresses and descriptions of the proprietor and such other matters related to the registered layout-designs as may be prescribed.

Prohibition of registration of those layout-designs which:-

- Are not original; or
- Have been commercially exploited anywhere in India or in a convention country; or
- Are not inherently distinctive; or
- Are not inherently capable of being distinguishable from any other registered layout-design.

A layout-design shall be considered to be original if it is the result of its creator's own intellectual efforts and is not commonly known to the creators of layout-designs and manufacturers of semiconductor integrated circuits at the time of its creation. Any person claiming to be the creator of a layout-design, who is desirous of registering it, shall apply in writing to the Registrar in the prescribed manner for the registration of his layout-design. Every application shall be filed in the office of the Semiconductor Integrated Circuits Layout-Design Registry within whose territorial limits, the principal place of business of the applicant is situated in India .

When an application for registration of a layout-design has been accepted, the Registrar shall, within fourteen days after the date of acceptance, cause the application as accepted to be advertised in the prescribed manner.

Any person may, within three months from the date of the advertisement or re-advertisement of an application for registration or within such further period, not exceeding one month in the aggregate give notice in writing in the prescribed manner to the Registrar, of opposition to the registration. The Registrar shall serve a copy of the notice on the applicant for registration and, within two months from the receipt by the applicant of such copy of the notice of opposition, the applicant shall send to the Registrar in the prescribed manner a counter-statement of the grounds on which he relies for his application and if he does not do so, he shall be deemed to have abandoned his application.

Also, where registration of a layout-design is not completed within twelve months from the date of the application by reason of default on the part of the applicant, the Registrar may, after giving notice to the applicant in the prescribed manner, treat the application as abandoned unless it is completed within the time specified in that behalf in the notice.

The registration of a layout-design shall be only for a period of ten years counted from the date of filing an application for registration or from the date of first commercial exploitation anywhere in India or in any country, whichever is earlier.

A registered layout-design is infringed by a person who, not being the registered proprietor of the layout-design or a registered user thereof:-

- Does any act of reproducing, whether by incorporating in a semiconductor integrated circuit or otherwise, a registered layout-design in its entirety or any part thereof, which is not original within the meaning of the Act.

- Does any act of importing or selling or otherwise distributing for commercial purposes a registered layout-design or a semiconductor integrated circuit, incorporating such registered layout-design or an article incorporating such a semiconductor integrated circuit, containing such registered layout-design for the use of which such person is not entitled under the Act.

Any person who contravenes knowingly and wilfully any of the provisions of the Act or falsely represent a layout-design as registered, shall be punishable with imprisonment or with fine or with both.

LAWS RELATING TO PLANT VARIETIES

The Plant Varieties and Farmers' Right Act,2001 has been enacted to provide for the establishment of an effective system for protection of plant varieties, the rights of farmers and plant breeders and to encourage the development of new varieties of plants. According to the Act, the term 'variety' means "a plant grouping except micro organism within a single botanical taxon of the lowest known rank, which can be:- (i) defined by the expression of the characteristics resulting from a given genotype of that plant grouping; (ii) distinguished from any other plant grouping by expression of at least one of the said characteristics; and (iii) considered as a unit with regard to its suitability for being propagated, which remains unchanged after such propagation; and includes propagating material of such variety, extant variety, transgenic variety, farmers 'variety and essentially derived variety".

The Central Government has established the 'Protection of Plant Varieties and Farmers' Rights Authority' in Ministry of Agriculture to administer the various provisions of the Act and take

measures to promote the development of new varieties of plants and to protect the rights of the farmers and breeders. The Central Government has also established the 'Plant Varieties Registry' which shall be located in the head office of the Authority. The Authority is empowered to appoint a Registrar-General of plant varieties and other Registrars for the purpose of registration of plant varieties.

The Central Government shall, by notification in the Official Gazette, establish an Authority to be known as the 'Protection of Plant Varieties and Farmers ʾRights Authority' for the purposes of this Act. Also, there is a 'Plant Varieties Registry' for the purpose of facilitating the registration of varieties at such places, as the Authority may think fit.

For the purposes of this Act, a Register called the 'National Register of Plant Varieties' shall be kept at the head office of the Registry, wherein shall be entered the names of all the registered plant varieties with the names and addresses of their respective breeders, the rights of such breeders in respect of the registered varieties, the particulars of the denomination of each registered variety, its seed or other propagating material along with specification of salient features thereof and such other matters as may be prescribed.

- An application to the registrar for registration of any variety shall be made by:-
- Any person claiming to be the breeder of the variety; or
- Any successor of the breeder of the variety; or
- any person being the assignee of the breeder of the variety in respect of the rights to make such application; or
- Any farmers or group of farmers or community of farmers claiming to be the breeder of the variety; or
- Any person authorized in the prescribed manner by a person specified above to make application on his behalf; or
- Any university or publicly funded agricultural institution claiming to be the breeder of the variety.

A new variety shall be registered under this Act, if it conforms to the criteria of novelty, distinctiveness, uniformity and stability (DUS) . While, an extant variety shall be registered under this Act within a specified period if it conforms to such criteria of distinctiveness, uniformity and stability as shall be specified under the regulations.

A new variety shall be deemed to be -

- Novel, if, at the date of filing of the application for registration for protection, the propagating or harvested material of such variety has not been sold or otherwise disposed of by or with the consent of its breeder or his successor for the purposes of exploitation of such variety - (i) in India, earlier than one year; or (ii) outside India, in

the case of trees or vines earlier than six years, or in any other case, earlier than four years.

- Distinct, if it is clearly distinguishable by at least one essential characteristic from any other variety whose existence is a matter of common knowledge in any country at the time of filing of the application.
- Uniform, if subject to the variation that may be expected from the particular features of its propagation it is sufficiently uniform in its essential characteristics.
- Stable, if its essential characteristics remain unchanged after repeated propagation or, in the case of a particular cycle of propagation, at the end of each such cycle.

A new variety shall not be registered under this Act if the denomination given to such variety:-

- Is not capable of identifying such variety; or
- Consists solely of figures; or
- Is liable to mislead or to cause confusion concerning the characteristics, value identity to such variety of the identity of breeder of such variety; or
- Is not different from every denomination which designates a variety of the same botanical species or of a closely related species registered under this Act; or
- Is likely to deceive the public or cause confusion in the public regarding the identity of such variety; or
- Is likely to hurt the religious sentiments respectively of any class or section of the citizens of India; or
- Is prohibited for use as a name or emblem for any of the purposes mentioned in the Emblems and Names (Prevention of Improper Use) Act, 1950; or
- Is comprised of solely or partly of geographical name.

Every applicant shall assign a single and distinct denomination to a variety with respect to which he is seeking registration under this Act in accordance with the regulations. The Authority shall, having regard to the provisions of any international convention to treaty to which Indian has become a party, make regulations governing the assignment of denomination to a variety.

Every application for registration shall:-

- Be with respect to a variety;
- State the denomination assigned to such variety by the applicant;

- Be accompanied by an affidavit sworn by the applicant that such variety does not contain any gene or gene sequence involving terminator technology;
- Be in such form as may be specified by regulations;
- Contain a complete passport data of the parental lines from which the variety has been derived along with the geographical location in India from where the genetic material has been taken and all such information relating to the contribution, if any, of any farmer, village community, institution or organization in breeding, evolving or developing the variety;
- Be accompanied by a statement containing a brief description of the variety bringing out its characteristics of novelty, distinctiveness, uniformity and stability as required for registration;
- Be accompanied by such fees as may be prescribed;
- Contain a declaration that the genetic material or parental material acquired for breeding, evolving or developing the variety has been lawfully acquired; and
- Be accompanied by such other particulars as may be prescribed.

Every applicant shall, along with the application for registration made under this Act, make available to the Registrar such quantity of seed of a variety for registration of which such application is made, for the purpose of conducting tests to evaluate whether seeds of such variety along with parental material conform to the standards as may be specified by regulations. The applicant shall deposit such fees as may be prescribed for conducting tests so referred.

Any person may, within three months from the date of the advertisement of an application for registration on payment of the prescribed fees, give notice in writing in the prescribed manner, to the Registrar of his opposition to the registration. The opposition may be made on any of the following grounds:-

- That the person opposing the application is entitled to the breeder's right as against the applicant; or
- That the variety is not registerable under this Act; or
- That the grant of certificate of registration may not be in public interest; or
- That the variety may have adverse effect on the environment.

The Registrar shall serve a copy of the notice of opposition on the applicant for registration and, within two months from the receipt by the applicant of such copy of the notice of opposition, the applicant shall send to the Registrar in the prescribed manner a counter-statement of the grounds on which he relies for his application, and if he does not do so, he shall be deemed to have abandoned his application.

The certificate of registration issued under the Act shall be valid for nine years in the case of trees and vines and six years in the case of other crops and may be reviewed and renewed for the remaining period on payment of such fees as may be fixed by the rules made in this behalf subject to the condition that the total period of validity shall not exceed:-

- In the case of trees and vines, eighteen years from the date of registration of the variety;
- In the case of extant variety, fifteen years from the date of the notification of that variety by the Central Government under the Seeds Act, 1966; and
- In other cases, fifteen years from the date of registration of the variety.

No registration of a variety shall be made under this Act in cases where prevention of commercial exploitation of such variety is necessary to protect public order or public morality or human, animal and plant life and health or to avoid serious prejudice to the environment.

Under the Act, the farmers 'rights are:-

- A farmer who has bred or developed a new variety shall be entitled for registration and other protection in like manner as a breeder of a variety;
- The farmers' variety shall be entitled for registration;
- A farmer who is engaged in the conservation of genetic resources of land races and wild relatives of economic plants and their improvement through selection and preservation shall be entitled in the prescribed manner for recognition and reward from the Gene Fund.
- A farmer shall be deemed to be entitled to save, use, sow, re-sow, exchange, share or sell his farm produce including seed of a variety protected under this Act in the same manner as he was entitled before the coming into force of this Act.

At any time, after the expiry of three years from the date of issue of a certificate of registration of a variety, any person interested may make an application to the Authority alleging that the reasonable requirements of the public for seed or other propagating material of the variety have not been satisfied or that the seed or other propagating material of the variety is not available to the public at a reasonable price and pray for the grant of a compulsory licence to undertake production, distribution and sale of the seed or other propagating material of that variety. The duration of the compulsory licences may vary from case to case keeping in view the gestation periods and other relevant factors but in any case it shall not exceed the total remaining period of the protection of that variety.

A right established under this Act is infringed by a person:-

- Who, not being the breeder of a variety registered under this Act or a registered agent or a registered licensee of that variety, sells, exports, imports or produces such variety without the permission of its breeder or within the scope of a registered licence or

registered agency without permission of the registered licensee or registered agent, as the case may be;

- Who uses, sells, exports, imports or produces any other variety giving such variety, the denomination identical with or deceptively similar to the denomination of a variety registered under this Act in such manner as to cause confusion in the mind of general people in identifying such variety so registered.

Any person who applies any false denomination to a variety or indicates the false name of a country or place or false name and address of the breeder of a variety registered under this Act in the course of trading such variety, shall be punishable with imprisonment or with fine or with both.

LAWS RELATING TO GEOGRAPHICAL INDICATIONS (GIS)

The Geographical Indication of Goods (Registration and Protection) Act,1999 has been enacted to provide for the registration and better protection of geographical indications relating to goods. According to the Act, the term 'geographical indication' (in relation to goods) means "an indication which identifies such goods as agricultural goods, natural goods or manufactured goods as originating, or manufactured in the territory of a country, or a region or locality in that territory, where a given quality, reputation or other characteristic of such goods is essentially attributable to its geographical origin and in case where such goods are manufactured goods, one of the activities of either the production or of processing or preparation of the goods concerned takes place in such territory, region or locality, as the case may be".

Under the Act, the Controller-General of Patents, Designs and Trade Marks under Department of Industrial Policy and promotion, Ministry of Commerce and Industry is the 'Registrar of Geographical indications'. The Controller General of Patents, Designs & Trade Marks directs and supervises the functioning of the Geographical Indications Registry (GIR).

The main provisions of the Act are:-

The 'Controller-General of Patents, Designs and Trade Marks' appointed under the Trade Marks Act, 1999, shall be the Registrar of Geographical Indications. Also, there shall be a 'Geographical Indications Registry' for the purpose of facilitating the registrations of geographical indications, at such place as the Central Government may, by notification in the Official Gazette, specify.

For the purposes of this Act, a record called the Register of Geographical Indications shall be kept at the Head office of the Geographical Indications Registry, wherein shall be entered all registered geographical indications with the names, addresses and descriptions of the proprietors, the names, addresses and descriptions of authorised users and such other matters relating to registered geographical indications as may be prescribed.

A Geographical Indication may be registered in respect of any or all of the goods, comprised in such class of goods as may be classified by the Registrar and in respect of a definite territory of a country, or a region or locality in that territory, as the case may be. The Registrar shall classify the goods, as far as may be, in accordance with the International classification of goods for the purposes of registration of geographical indication.

Prohibition of registration of those geographical indications:-

- The use of which would be likely to deceive or cause confusion; or
- The use of which would be contrary to any law for the time being in force; or
- Which comprises or contains scandalous or obscene matter; or
- Which comprise or contains any matter likely to hurt the religious susceptibilities of any class or section of the citizens of India; or
- Which would otherwise be disentitled to protection in a court; or
- Which are determined to be generic names or indications of goods and are, therefore, not or ceased to be protected in their country of origin, or which have fallen into disuse in that country; or
- Which although literally true as to the territory, region or locality in which the goods originate, but falsely represent to the persons that the goods originate in another territory, region or locality, as the case may be.

Any association of persons or producers or any organization or authority established by or under any law for the time being in force representing the interest of the producers of the concerned goods, who are desirous of registering a geographical indication in relation to such goods, shall apply in writing to the Registrar in such form and in such manner and accompanied by such fees as may be prescribed for the registration of the geographical indication. A single application may be made for registration of a geographical indication for different classes of goods and fee payable thereof shall be in respect of each such class of goods.

The application shall contain:-

- Statement as to how the geographical indication serves to designate the goods as originating from the concerned territory of the country or region or locality in the country, as the case may be, in respect of specific quality, reputation or other characteristics of which are due exclusively or essentially to the geographical, environment, with its inherent natural and human factors, and the production, processing or preparation of which takes place in such territory, region or locality, as the case may be;
- The class of goods to which the geographical indication shall apply;
- The geographical map of the territory of the country or region or locality in the country in which the goods originate or are being manufactured;
- The particulars regarding the appearance of the geographical indication as to whether it is comprised of the words or figurative elements or both;

- A statement containing such particulars of the producers of the concerned goods, if any, proposed to be initially registered with the registration; and

Any person may, within three months from the date of advertisement or re advertisement of an application for registration or within such further period, not exceeding one month, in the aggregate, give notice in writing in the prescribed manner to the Registrar, of opposition to the registration. The Registrar shall serve a copy of the notice on the applicant for registration and, within two months from the receipt by the applicant of such copy of the notice of opposition, the applicant shall send to the Registrar in the prescribed manner a counter-statement of the grounds on which he relies for his application, and if he does not do so, he shall be deemed to have abandoned his application.

The registration of a geographical indication shall be for a period of ten years, but may be renewed from time to time in accordance with the provisions of the Act. The registration of an authorised user shall be for a period of ten years or for the period till the date on which the registration of the geographical indication in respect of which the authorised user is registered expires, whichever is earlier.

A registered geographical indication is infringed by a person who, not being an authorised user thereof:-

- Uses such geographical indication by any means in the designations or presentation of goods that indicates or suggests that such goods originate in a geographical area other than the true place of origin of such goods in a manner which misleads the persons as to the geographical origin of such goods; or

- Uses any geographical indication in such manner which constitutes an act of unfair competition including passing off in respect of registered geographical indication;

- Uses another geographical indication to the goods which, although literally true as to the territory, region or locality in which the goods originate, falsely represents to the persons that the goods originate in the territory, region or locality in respect of which such registered geographical indication relates.

Any person who:- (i) falsifies any geographical indication; or (ii) falsely applies to goods any geographical indication; or (iii) makes, disposes of, or has in his possession, any die, block, machine, plate or other instrument for the purpose of falsifying or of being used for falsifying, a geographical indication; or (iv) tampers with, alters or effaces an indication of origin which has been applied to any goods to which it is required to be applied under the Act, shall be punishable with imprisonment and with fine.

PROTECTION OF UNDISCLOSED INFORMATION (TRADE SECRETS OR KNOWHOW)

Knowhow is another important form of intellectual property generated by R&D institutions that does not have the benefit of patent or copyright protection. Such know-how is kept undisclosed as trade secrets. A Trade Secret or undisclosed information is any information that has been intentionally treated as secret and is capable of commercial application with an economic interest. It protects information that confers a competitive advantage to those who possess such information, provided

such information is not readily available with or discernible by the competitors. They include technical data, internal processes, methodologies, survey methods ,a new invention for which a patent application has not yet been filed, list of customers, process of manufacture, techniques, formulae, drawings, training material, source code, etc. It therefore becomes imperative to strengthen the confidentiality around the trade secret by ensuring that contractual obligations are enforced on persons who are allowed to use the trade secret, especially, when it is licensed to a third party.

Since there is no documentary evidence such as a Letters Patent or a Copyright registration or a Trademark Registration to prove that the trade secret was originally created by the proprietor, it is essential to maintain proof of creation of trade secret either by mailing the information to oneself and retaining postmarked and sealed envelope or by depositing a copy of the information with a third party that would maintain a dated copy.

Trade secret remains confidential for indefinite period of time as per the will of the proprietor provided the security and its confidentiality is not breached. There is no specific legislation regulating the protection of trade secrets in India. India follows common law approach of protection and all matters relating to it are generally covered under the Contract Act, 1872. So, if the information constituting trade secret is leaked, legal action can be brought against the parties who have leaked it under the Law of Contracts. However, in such a case the protection of trade secret will be lost and it becomes available in public domain.

NEED FOR IPR PROTECTION REGIME FOR SPACE ACTIVITIES OF INDIA

IMPORTANCE OF IPR IN SPACE REGIME

Despite the fact that space technology is always one of the most advanced technical area, and outer space activities are, in fact, the fruit of intellectual creations, it is only in recent years that intellectual property protection in connection with outer space activities has raised wider attention. The most important reason is that the space activities are increasingly now shifting from state owned activities to private and commercial activities. These activities include remote sensing from space, direct broadcasting and research and manufacturing in micro-gravity environments. Thus not only commercialization is increasing but also privatization of agencies is equally increasing and these non-governmental entities are more conscious of their property which is both in tangible and intangible forms. Further, today Government agencies are collaborating with the private enterprises for space activities due to financial and technical resources. More licensing contracts are concluded between governmental space agencies and private companies. Such private financing has to be motivated by the expectation that the R&D investment could be recovered in the future. Thus, the intellectual property rights protection in outer space activities definitely bears a positive effect on the participation of the private sector in the development of outer space activities.

Secondly, Globalization of space activities is another reason for growing importance of intellectual property rights protection in space. In case of International Space Station (ISS), more and more space activities are operated under international cooperation schemes. Consequently, there is a need for a simple, uniform and reliable international legal framework. Although national intellectual property laws are well harmonized but different national laws still apply different principles. Therefore, there is a huge need for a uniform legal regime which deals with protection of intellectual property rights in space activities.

Thirdly, due to the advancement of space technology, new business possibilities are emerging. For example, although it is still a dream for the general public, the development of space transportation technology has been clearing the way to space tourism. Up to now, when discussing intellectual property rights protection for space activities, the primary concerns are related to patent protection of inventions created or used in outer space, or copyright protection of databases using data acquired through space activities. If the space tourism becomes reality, the protection of trademarks and industrial design in outer space may also become an important issue.

Therefore, the importance of having a legal regime that protects IPR in space activities cannot be overemphasized. The absence of such regime decreases the efficient international cooperation among states and other entities engaged in space research. IPR protection intends to stimulate the creativity of the human mind for the benefit of the public in such a way that the creator and the investor will be encouraged to be more active in space research and exploration.

APPLICATION OF NATIONAL/REGIONAL INTELLECTUAL PROPERTY LAW IN OUTER SPACE

National and regional laws on the protection of intellectual property generally apply only to the territory of the relevant country. Thus, the enforcement of intellectual property in a particular country is governed by the applicable national intellectual property law. Though WIPO treaties and Trade related aspect of intellectual property rights have achieved certain level of harmonisation among various national intellectual property laws but still considerable differences among national/regional intellectual property laws remain which lead to a different level of intellectual property protection in the territory of each country. On the other hand, one of the most important principles under international space law is the non-appropriation of outer space by any country (Article II of the Outer Space Treaty). The Outer Space Treaty, however, makes a distinction between "outer space as such" and "an object launched into outer space". As far as an object launched into outer space is concerned, in accordance with Article VIII of the Outer Space Treaty, the State on whose registry such an object is carried shall retain jurisdiction and control over that object, and over any personnel thereof. Further, the Registration Convention introduces a rule regarding who should register a space object. According to that Convention, a "launching State", which is a State that launches or procures the launching of a space object or a State from whose territory or facility a space object is launched, should register the space object with an appropriate registry. Where there are two or more launching States, they should determine among themselves which one of them should register the object, without prejudice to appropriate agreements concluded among the launching States on jurisdiction and control over the space object and over any personnel thereof.

Therefore, according to international space law, the country of registry retains jurisdiction and control over the space object and over any personnel thereof unless otherwise agreed among the launching States. In other words, jurisdiction and control over the space object and its personnel is determined by the nationality (registering State) of the space object.

At the same time a question arises whether the territorial jurisdiction under intellectual property law permits the extension of each national law to the objects which the respective country has registered and launched into outer space. In this respect, two situations arises-

First, which law should apply if the activities are carried out in outer place, regardless of the place where the invention was made? Second, which law should apply if activities are made in outer space but are carried out in or used in one or more countries? In case of second situation National Intellectual property law of the concerned country or countries will apply but in case of first situation till now there is no law. Therefore, a separate consideration as to the applicability of general intellectual property rules may be needed only in so far as activities are carried out in outer space, regardless of the place where the invention was made.

The United States of America is the only country that has enacted an explicit provision establishing a link between the three key elements: inventions, jurisdiction and territory. Section 105 of 35 U.S.C. (Inventions in outer space) reads as follows:

(a) "Any invention made, used, or sold in outer space on a space object or component thereof under the jurisdiction or control of the United States shall be considered to be made, used or sold within the United States for the purposes of this title, except with respect to any space object or component thereof that is specifically identified and otherwise provided for by an international agreement to which the United States is a party, or with respect to any space object or component thereof that is carried on the registry of a foreign state in accordance with the Convention on Registration of Objects Launched into Outer Space."

(b) "Any invention made, used or sold in outer space on a space object or component thereof that is carried out on the registry of a foreign state in accordance with the Convention on Registration of Objects Launched into Outer Space, shall be considered to be made, used or sold within the United States for the purposes of this title if specifically so agreed in an international agreement between the United States and the state of registry."

Therefore, the patent law of the United States of America provides quasi-territorial effect on a space object that is carried on the registry of the United States of America, unless otherwise agreed by an international agreement.

In other countries, there is no explicit statutory provision of this kind, except that, by virtue of the ratification of the 1988 Intergovernmental Agreement, German intellectual property law is applicable to the ESA-registered elements. Some argue that, in the absence of an explicit legal provision, the applicability of national intellectual property law on space objects registered by that State is doubtful. Some others are of the opinion that in consideration of the broad concept of territoriality according to which national patent law may be applicable on ships which fly that State's flag on the high seas and on aircrafts which are registered by that State, the national patent law might be applicable by way of analogy to space objects registered in that State, even if the national patent law does not expressly provide such applicability to space objects. It should be noted that, in order to clarify this uncertainty in Europe, the Proposal for the Council

Regulation on the Community Patent, issued by the European Commission, provides that the Regulation should apply to inventions created in outer space, which are under the jurisdiction and control of one or more member States in accordance with international law.

A similar kind of legal uncertainty also exists in the field of trademarks and industrial designs. As regards copyright protection, the determination of jurisdiction of a spacecraft is less important,

because it is the author's nationality which, in the first place, determines the status of the work as regards its protection. According to Article 3(1)(a) and (2) of the Berne Convention, the Convention applies to authors who are nationals of one of the countries of the Berne Union or who have habitual residence in one of those countries. Only in the case of non-protected authors, the place of the first publication is of importance (Article 3(1)(b) of the Berne Convention). However, since publication normally involves a significant number of copies, it is not likely to occur in outer space, at least in a near future. This would mean, for example, that if a database is created on a spacecraft, its status as regards protection under the Berne Convention will depend on the nationality of its creator.

NEED FOR HARMONISATION BETWEEN INTELLECTUAL PROPERTY LAWS AND SPACE LAW

It is known that the regime of intellectual property is governed by the territorial or national laws of respective countries and certain level of harmonisation among these national laws are achieved under the auspices of WIPO and WTO/TRIPS regimes. Under these circumstances, extension of these laws to space, a province of all mankind and having potential for abundant opportunities, deserve a re-examination in view of its ability to undermine global space efforts.

Thus now it is very much necessary to establish and develop a unitary/uniform and harmonized IP protection regime for space for the interest of the developing countries. Outer space adds many new legal dimensions to the IP rights such as application of terrestrial based national laws in outer space for acquisition and enforcement of rights, ownership of rights and entitlements for use in joint activities, settlement of disputes and compliance to international obligations.

Some developments are taking place at national, regional and multinational levels, to extend the applicability of terrestrial based IP laws in the outer space. Only USA amended its patent laws extending its territorial jurisdiction to space. Relevant provisions for the applicability of domestic IPR law to Space Activities exist only in US law today, found within the US Space Bill and the NASA act. The US Space Bill extends the applicability of US patent law into Outer Space. The NASA act includes a provision to consider a "space object" as a vehicle.

EXCERPT FROM THE US SPACE BILL

" Any invention made, used or sold in outer space on a space object or component thereof under the jurisdiction or control of the United States shall be considered to be made, used or sold within the United States for the purposes of this title , except with respect to any space object or component thereof that is specifically identified and otherwise provided for by an international agreement to which the United States is a party, or ... carried on the registry of a foreign state in accordance with the Convention of Registration of Objects Launched into Outer Space."

Likewise, the Commission of the European Communities includes a proviso in their Community Patent system, which is as follows:

"Article 3.2: This regulation shall apply to inventions created or used in outer space, including on celestial bodies or on spacecraft, which are under the jurisdiction and control of one or more Member states in accordance with international law"

Some revisions in the French Patent Law are also contemplated to accommodate the outer space inventions. Lack of harmony in these recent developments might hurt cooperative space efforts. Therefore, the need for a harmonized IP regime for space activities cannot be over emphasized. However some international steps had been taken up in this direction. In 1997 WIPO conducted a study which concluded that there was no immediate need for any special international legislation to protect the inventions created or used in outer space. But it was desired that the International Bureau of WIPO could give information on the existing protection of such inventions to interested States and organisations.

Later in July 1999, in conjunction with the Third United Nations Conference on Exploration and Peaceful Uses of Outer Space (UNISPACE III), a Workshop on Intellectual Property Rights in Space was held which gave some specific recommendations. The recommendations made by the Workshop were amended and adopted by the plenary of the Conference, and included in the Report of the Conference as follows:

a) More attention should be paid to the protection of intellectual property rights, in view of the growth in the commercialization and privatization of space-related activities. However, the protection and enforcement of intellectual property rights should be considered together with the international legal principles developed by the United Nations in the form of treaties and declarations, such as those relating to the principle of non-appropriation of outer space, as well as other relevant international conventions.

b) The feasibility of harmonizing international intellectual property standards and legislation relating to intellectual property rights in outer space should be further explored with a view to enhancing international coordination and cooperation at the level of both the State and the private sector. In particular, the possible need for rules or principles covering issues such as the following could be examined and clarified: applicability of national legislation in outer space; ownership and use of intellectual property rights developed in space activities; and contract and licensing rules

c) All States should provide appropriate protection of intellectual property rights involving space-related technology, while encouraging and facilitating the free flow of basic science information

d) Educational activities concerning intellectual property rights in relation to outer space activities should be encouraged.

It came up during the deliberations that further progress in this regard would be pursued through the Legal sub-committee of the UN-Committee on the Peaceful Uses of Outer Space (UNCOPUOS).

While advocating for a harmonised legal regime, one should give due respects to international obligations. Full compliance with the founding principles of the space law that are embodied in various treaties and principles would be inevitable. In this context, the recommendations of the World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), an advisory body of UNESCO, that looked into the issues relating to the ethical dimensions of outer space activities, were adopted at its second session held from December 17 to 19, 2001. It argued that every space policy must be based on the concept of mutual and reciprocal benefits while safeguarding fair competition and the principle of return on investment. It recognises that the importance of ethics in the choice of a specific project and its long term assessment from the viewpoint of human security and economic criteria.

Two very interesting concepts namely, Harmonisation of legislations internationally and Globalisation of jurisdiction in outer space activities are advocated by Bradford Lee Smith. The proposition under Globalisation for single worldwide legislation for space activities in the form of a treaty under the auspices of UNCOPUOS deserves consideration. In this proposal, the total system of patent administration could be managed under the auspices of WIPO through its Patent Co-operation Treaty (PCT) with a new country code as "Space Patent". It is further articulated that a dispute settlement mechanism also could be set up under WIPO, in the form of a board that is empowered to arbitrate on patent related disputes in the area of space. WIPO suggests a broad debate on the long term prospects of space activities, so as to avoid any legal complexities and to strengthen the co-operative space efforts. It asserts that this effort would result in progressive development of a less ambiguous and better co-ordinated international intellectual property framework, which would further promote collective utilization of public and private resources in the area of space technology for the benefit of all nations.

SPACE LEGISLATION IN INDIA

India, like many others countries, has not enacted any space legislation. Therefore, the absence of domestic space legislation as a major lacuna in the Indian Legal System when compared to other developed and developing countries and suggest the drafting of a comprehensive and futuristic domestic enactment on outer space activities.

India is a party to all international space treaties, which form the main body of international space law. India has also played a significant role to adopt 5 sets of legal principles by the U.N General Assembly Resolutions, which provide for the application of international law and promotion of international cooperation and understanding in space activities. It is also under an obligation to give effects to the various rules contained in these norms through the medium of appropriate legislation in the domestic field. All the areas which directly or indirectly related with space activities under the Indian Constitution fall within the domain of the Union by virtue of a series of entries in List I of the seventh schedule to the Constitution of India. Thus it is for the Parliament of India to take the starting step in the direction of enacting a law for India for the purpose of the effective regulation of various aspects of India's space policy. Because of recent national and global developments, active involvement of the private sector and commercialisation of space activities and the agreements made nationally and globally with various agencies, governments, international and intergovernmental organisations, there is a huge need of space law in India.

The second most important reason for a space law in India is that now the Indian space activities have become vastly diversified and have come to stay, having successfully demonstrated their implicational capabilities, there is a need to redefine and formalize the existing set up of institutional mechanism, and to facilitate inter-departmental coordination, making it a legal norm.

Thirdly, there is a need to clarify applicable legal norms and rules relating to both public laws and private law aspects of space activities, as demonstrated by the experience of developed countries like USA. The public laws deals with competence of authorities in the space field, legal status of space objects, control of space activities, control over space industries, dispute settlement and jurisdiction of courts and security aspects of space activities and installation. On the other hand, Private Laws include fair trade practices, company law, insurance and indemnity, securities, contracts and specific performances, torts, personal property, patents, copyrights and other intellectual property rights etc.

Fourthly commercialisation of the space activities is in the process of establishing a vast space activities and vast space market where India plans to and has already begun to sell, its space products. Thus the question of Antrix corporation-industry relationships, private participation in space activities both in India and in international ventures, transfer of technology and products marketing may need to clarify. So, it is the need of the hour that India should enact domestic space legislation keeping in view of the dramatic changes that are taking place in the domestic as well as international spheres.

Therefore, there is need for India to enact a National Space Legislation as soon as possible. India needs to critically and objectively address all legal and commercial issues related to domestic and international space activities before enactment of space laws. The associated regulatory risks in grant of authorizations, licenses, permits and approvals for communication satellite operations are required to be minimized by properly defining the guidelines and procedures. A well-defined space law shall enable better capitalization and optimization of existing infrastructure and resources by:

(i) Promoting orderly and organized growth of space business by providing recognition and legitimacy to on-going space programs;

(ii) Providing opportunity to potential space operators, domestic and international;

(iii) Promoting development of indigenous technology matching international standards;

(iv) Providing mechanism for enforcement and prevention of misuse of space activities; and

(v) Providing stringent punishment for violators of space law.

India needs to critically and objectively study the provisions contained in the space laws of other countries and also US Space Laws, Commercial Space Act, 1998; Land Remote Sensing Policy Act, of 1992, Inventions in outer space etc. to frame and adopt its own space laws. The Indian domestic space law must include following provisions for peaceful use of outer space for the benefit of all mankind worldwide and aimed at welfare and security of India and also

i. Provide for aeronautical and space activities to be controlled by a civilian agency except those associated for development of weapons systems, military operations, or the defence of India

ii. Promote commercial use of space

iii. Promote development and operation of vehicles capable of carrying instruments, equipment, supplies, and living organisms through space;

iv. Provide for licensing norms for space entrepreneurs associated with various commercial activities and applications;

v. Protect property rights in inventions and stipulate provisions on environment safety;

vi. Provide for promotion and management of autonomous educational institutions of international standards for nurturing space professionals; (vii) Provide for liability provisions and include insurance and indemnification matters;

vii. Provide for international co-operation in promoting public safety and space business; and

viii. Provide for co-operation with defence machinery.

Therefore the proposed legislation should provide for Creation of National Space Agency, Licensing and Certification of space activities, Economic conditions of space activities, a provision on space infrastructure, space safety and space liability, space insurance, international cooperation and protection of intellectual property rights in outer space. This draft should be a convergence of divergent regulations in order to bring a comprehensive and harmonious space legislation that would be beneficial for our Nation.

CONCLUSION

Space, the "common Heritage of Mankind", promises ample opportunities for many joint venture programmes involving multi state partners and private entrepreneurs for various innovative applications towards the cause of humankind.

The IP rights acquires certain special dimensions in the outer space particularly inventions made therein. The conflicts between Intellectual Property Laws and Space Law regime could be resolved through a harmonized system which could be developed by the international IPR and

Space Law community under the auspices of UN Bodies like UN COPUOS and WIPO. Such a harmonised system of IPR regime for the outer space should fully comply with the basic principles of international space law and such other international obligations. Further it is strongly recommended that the harmonized system takes into account the interests of developing countries as well and promotes moral and ethical usage of the Outer Space for the benefit of the entire humanity.

RELATIONS OF IPR WITH SPATIAL DATA

The spatial data are taken from earth through satellites orbiting in outer space. There are different satellites having different in-built sensors (electronic eye) for taking imageries of earth. Basically every satellite takes the help of electromagnetic scattering. But the LANDSAT, SPOT, IRS which owned by USA, France and India respectively have different mechanism for acquisition of imagery from earth. All these remote sensing satellite system gather raw data which have no copyright value itself but the technological process to acquire the data is under patent regime because every satellite system uses its own technique. Even when the data are disseminated, it follows the different procedure for different satellite system. The role of trademark has small significance because the trademark is with the outer body of EO satellites. But when we are discussing about quality of imageries, we are using the words like 'SPOT imagery 'or 'IRS imageries 'etc. It is nothing but mentioning the trademarks. Trade Secrets are there but it is very difficult to pin point them from outside. Copyright comes with the processed data or value added data prepared from raw data. The following paragraph deals with the nexus of copyright with spatial data.

The spatial data contain information, question arises relating to its ownership, authorized use, future use and implied quality. One of the most important questions concerns whether or not those data can be protected by intellectual property rights? Closely related to this question is whether these rights can

exist in data generated with public money? In this respect rules and regulations regarding access to and licensing of public remote sensing data are of interest.

From the nature of IP, it is clear that protection of remote sensing data as such, must be sought in copyright protection. In this respect, it must be noted that copyright does not extend to raw data, but only to enriched data. In the same sense, copyright does not extend to ideas, but only to the form of expression of ideas. In relation to IP and spatial data, another question is important: whether or not the data were created with public money. The rule is different from one country to another. In some European countries, the government claims the copyright of data made by public money but in USA the federal government has no such rights which they create.

OWNERSHIP OF DATA

The copyright is related with ownership of data. Issues of ownership of data must be addressed, before, during and after the work. The data audit at the before stage would need to set out where the data are coming from and who owns the IPR in the data and what use rights might be available either as public domain data or as licensed data. One example is the use of remotely sensed images from SPOT (a commercial organization) to be integrated with U.S. public domain Landsat 7 (ENVISAT in future) imagery is illustrative of emerging complexities. At the during stage of using and amalgamating the data, invariably 'new 'derivative data sets emerge and the management of the IPR for these have to be considered so that consortia members are clear as to ownership, use and later dissemination of the data. At the final after stage, when the project is completed, the question of who owns the information resulting from the investigation will arise. The data so developed can prove economically valuable to farmers, the government as well as to the researchers and consultants. Having a clear policy as to who has the ownership of the data is thus very important. The policy would also spell out who has rights of release, on what conditions, and how costs are either to be recovered or shared.

REQUIREMENT OF IPR REGIME IN INDIA:

This is a very important and serious concern in the present context. But the discussion will be confined for India only. The full potential of satellite based earth observation could not be utilized only from the Government support. Commercialisation is must for further development of the geospatial industry in India. Perhaps the Association of Geospatial Industry (AGI) established last year was the indication of this trend. So many private bodies are interested in this domain. Everybody would like to promote their business in their own way but purpose is to occupy the front position in the industry. This competition should be healthy as well as legal. So if IPR protects the enhanced data created by these private bodies individually, then more private bodies will be interested and finally the number of data enhancement firms will be increased.

Indirectly it will increase the market of raw data. Hence the benefits are in two ways.

Competition from foreign remote sensing systems thrusts IPR regime because legal protection of enhanced data is necessary. The French SPOT system and European Space Agency's ERS-1 compete with USA's Landsat in international market and domestic market. In addition to this our own Indian Remote Sensing Satellite (IRS) system is gradually taking the international market. Now the demand of IRS data is high in foreign countries. The international intellectual property rights feature the protection of competition among all entities producing enhanced data worldwide. Such copyright

protection will benefit producers of enhanced data worldwide due to existence of multilateral copyright agreements.

The private bodies from India being a developing nation may have a conception that the legal protection of processed data is not so much beneficial in India. But this conception will change when the benefits of copyright will outweigh the disadvantages. The effect will be easy availability of processed data with widespread availability and low prices.

Another view is that as there is not so much consciousness of IPR in India, there may be thefts and misappropriation of processed data but a strong copyright regime will safeguard India from the hands of entities of industrialised nations which might use the information to exploit the developing nation's resources.

INTERNATIONAL AGREEMENTS FOR PROTECTION OF IPR OF SPATIAL DATA:

There are a number of international agreements like Outer Space Treaty (1967), the Principles Relating to Remote Sensing of Earth from Outer Space (1986), the Berne Convention (1971), the Universal Copyright Convention (1971) which have some direct or indirect guidelines to protect the IPR of spatial data but finally failed to implement or control the IPR of data.

The final concept of the Outer Space Treaty, 1967 is international cooperation and mutual assistance in space exploration and development. Articles IX, X and XI provide the requirements of cooperation and mutual assistance.

The Principles Relating to Remote Sensing of Earth from Outer Space, 1986 was a remedy of the conflicts between the developing nations and the developed one specially USA. These Principles are nothing but a modest safeguard to control the remote sensing activity.

The Berne Convention, 1971 consists of two principal components. The main body of the agreement defines the functions and operation of international copyright protection for protected works. The second component is the appendix of the Convention which provides special mechanism for developing nations to gain access to copyrighted material. This section is more relevant for India. It provides that works must be "fixed in some material form" for effective protection of copyright. But the 38 articles and the appendix of the Convention are mostly geared towards works of everyday life: remote sensing imagery cannot be protected on the basis of the provisions of this Convention.

The Universal Copyright Convention, 1971 (UCC) has some complimentary points. This Convention itself provides that if a nation is a member of both the Conventions, the terms of Berne Convention will govern. And if a nation is a member of Berne Convention, it cannot withdraw its name to be a member of UCC. So the Berne Convention is the superior one.

There is no such adequate and efficient protection of spatial data in international law. But there are conventions like the Phonogram Convention (1971), the Satellite Convention (1974) which is exclusively for the protection of the radio and satellite broadcasting of literary and artistic works. So one may think for a specific convention when commercialisation and privatisation take place in spatial data sector.

IPR REGIME OF SPATIAL DATA IN INDIA:

India being a developing country is not well aware of the intellectual property rights previously but as the time passes on, the country feels the need and requirement of IPR.

The Copyright Act, 1957, the Patent Act, 1970 etc came in the due course of time. All of us are more conscious about IPR than our predecessors in India. To know the IPR regime of spatial data, we have copyright and trade secrecy.

COPYRIGHT

There are two possibilities for copyrights of spatial data. Under the Copyright Act, 1957, it was difficult to establish who the author was as the data collected by a machine did not involve human intervention like the creation of other literary works. The second possibility is in the case of public undertakings – the provision to section 17 states that in the case of a work made or first published by or under the direction or control of any public undertaking in the absence of an agreement to the contrary, the first owner of the copyright therein would be the public undertaking. As the satellites in India are all government owned and controlled i.e., it is fully dominated by Indian Space Research Organisation (ISRO), the spatial data are owned by ISRO.

TRADE SECRETS

As the space research is fully under government controlled in India, so the trade secrets of spatial data would come under the Indian Official Secrets Act, 1923. The Right to Information Act, 2005 takes entry into this domain and creates sometimes a conflict against the public queries.

INDIAN PRACTICE

The National Remote Sensing Centre (NRSC) has Remote Sensing Data Policy which has no reference to IPR but IPR includes in the agreements with buyers/partners. Basically the government monopoly exists in the spatial data industry and this is the only reason for not implementing or even considering a separate legal regime for IPR. But the day will come very soon when Indian space activities does not necessarily mean ISRO.

Already there are many private and corporate organizations who are working with ISRO simultaneously. So who knows that there will be private satellite as data providers in future India?

CONCLUSION:

The satellite imageries or data are very vital now-a-days. And the demand is quality and cost-effective data. But the technology of India is so much progressed that it is easily available. Hence the government should look after the interest of the sectors creating spatial data for the economic development of India. In this journey, the first initiative should be to take steps to create a separate provision for spatial data in the existing IPR laws or to make a separate law for spatial data.

INDIA'S TELECOM SECTOR AND NEED FOR IPR PROTECTION

India is amongst the fastest growing telecommunications markets across the globe. The average monthly mobile subscriber growth over the past year has been 15-17 million customers. Currently, the mobile subscriber base is approximately 671 million (as of August 2010). The overall teledensity for India has already surpassed 60 percent and the market continues to exhibit unabated growth.

With the successfully concluded auctions of the 3G and BWA spectrum, this growth is set to become even more aggressive. Indian telecom operators have very effectively worked with rest of the telecom ecosystem to enable India emerge as the country which offers the lowest mobile tariffs across the globe2. All these achievements have helped India emerge as one of the most attractive investment destinations for all international players looking to win a share of the second largest mobile market in the world. These players can also look at leveraging on the successful low-cost model that India has pioneered.

During the past year, several telecom players in India have made tremendous efforts to establish themselves on the global level through cross border mergers and acquisitions. These strategic alliances are a step towards the globalization of the Indian telecommunication industry.

The credit for the growth witnessed by the sector has to be attributed to the well-defined regulatory provisions designed by the government. The government has been instrumental in making key policies to drive the rural growth which is expected to keep this bullish phase going strong over the next decade. Within the rural area, there is additional focus to enhance the penetration of broadband and data usage. The aim is to wirelessly connect villages and remote areas through broadband and provide access to basic facilities for health, education, banking and others. The government, along with TRAI and DoT, has been making tremendous efforts to achieve the desired results. TRAI is considering plans to roll-out a national optical fi ber cable network which will act as a backbone to broadband services across the country. The funding for this project is likely to be routed through the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) for non-skilled work and from the Universal Services Obligation Fund (USOF) for material and equipment cost. The Indian government has unveiled a prototype tablet computer that would sell for a mere INR 1,500 or USD 354 thus increasing affordability of the end user device which is essential to access the broadband services. The government is considering making broadband connections along with other equipments such as computer, printer and telephone more affordable to every gram panchayat. These initiatives, which are intended to provide universal broadband access to the rural residents of the concerned gram panchayats, are likely to be funded through the Universal Services Obligation Fund.

All these steps are clear indicators of the efforts that are being directed towards achieving strong broadband growth in India. The private telecom players are also expected to play an important role to achieve the objective of 'Broadband for All', by covering the key aspects of relevant content, seamless connectivity and affordable end user device by introducing innovative business models for their broadband service offerings. Due to the rich diversity in India, locally relevant content is essential to make an impact and enhance penetration of telecom services, especially in the rural areas.

The regulatory environment in India has been extremely supportive for the telcos to have achieved such phenomenal growth in the past years. The industry is now eagerly awaiting the roll-out of 3G and BWA which is expected to have a significant impact on the sector and its growth in the next few years.

The Indian telecommunication industry is at the brink of entering a fresh round of growth, to be stimulated by the launch of wireless data services. The policy makers and the private players have successfully come together with various initiatives to ensure that the industry continues to remain a shining star for India.

The Indian telecommunications market has continued to show consistent growth during the last one year, with exciting developments such as rollout of newer circles by operators, successful auction of 3G and BWA spectrum, growing push by telecom operators to rollout network in semi-rural areas and increased focus on the value added services market.

Telecom continues to be one of the fastest growing sectors of the Indian economy, becoming a strong contributor to India's overall GDP and is expected to grow further. Overall teledensity in India has risen to the levels of ~59.6 percent (as of August'10)1. With a large part of the population yet to obtain access to the telecommunication market, there is immense potential for the sector to grow, especially in non-urban areas, where wireline and internet services are yet to make significant in-roads. Wireline services have shown relatively slow growth with low teledensity of approximately 7.6 percent and 1.1 percent2 in urban and rural regions respectively. Even the mobile services space which has seen exponential growth in urban areas, has not yet reached the vast majority in rural areas with rural teledensity of approximately 27.8 percent3, indicating huge untapped potential for the sector. Broadband is yet to reach a critical mass despite rapid growth; the numbers have risen from 6.98 million in August 2009 to 10.08 million by August 2010, registering a growth of 55 percent on an annual basis4. With subscriber penetration under 2 percent5, the sector has potential for aggressive growth in the future.

TYPES OF TELECOM SERVICES

Mobile Services

The Indian mobility market can be characterized as one with a very large subscriber base4 (~671 million as of August 2010), high growth5 (addition of 16-18 million subscribers every month in last six months), low ARPUs (~INR 122 per month in June, 2010) and signifi cant churn rates. In the prepaid segment, ARPU declined by 6.2 percent from INR 113 in March, 2010 to INR 106 in June, 20105.

The Calling Party Pays regime was introduced in 2003-04 which allowed free incoming calls for the subscribers.

This revolutionary change can be designated as one of the watershed milestones in the growth of the Indian telecom sector.

The 22 telecom circles in India have been classified into 4 categories viz. Metros, Category A, B and C. With penetration rates in metros touching 100 percent, the market in Metros is nearly saturated. However, there is still immense potential in other circle categories, particularly B and C. The Government of India opened up mobile services to private participation in 1994-95 by inviting bids for providing services in the four metropolitan cities and 18 non-metro circles. Services were introduced in 1995 with the high tariffs resulting in poor demand. The National Telecom Policy 1999 moved the industry to a revenue share model from the fixed license fee and the lower tariffs resulted in the addition of ~ 12 million subscribers during the 1999-03 period as compared to less than a million subscribers added during the 1995-99 period. During this period the government also setup the Telecom Regulatory Authority of India (TRAI) in 1997 and 'Telecom Dispute Settlement and Appellate Tribunal (TDSAT) 'in 2000.

The current subscriber base of 707 million (August 2010) comprises 476 million urban subscribers (teledensity of ~134 percent) and 230 million rural subscribers (teledensity of ~28 percent). The market is highly competitive with some of the telecom circles having more than 10 operators. Competitive intensity in the market has contributed to reduction in tariffs and launch of innovative schemes like lifetime prepaid and low cost handset bundling which further reduced the entry cost for a new subscriber. With downward spiraling ARPUs, changing economic profile of subscribers and the need to meet the aggressive roll-out targets, the operators have been under tremendous pressure to bring in operational efficiencies. Operators have been realizing efficiencies through extensive outsourcing across the telecom value chain. This has resulted in large scale opportunity for players belonging to all the categories within the telecom ecosystem.

Some of the prominent categories include network equipment vendors, tower infrastructure companies, telecom implementation vendors and IT vendors. Active sharing is a newer area which is being looked at by telcos to reduce costs of rollout further.

It has been observed that the past subscriber growth has been skewed in favor of the urban market. The large rural population base of around 590 million5 and low rural teledensity 27.76 percent4 indicates that there is still large untapped opportunity in the Indian market. With urban markets nearing saturation, operators are actively seeking to tap growth in rural India. The entire telecom ecosystem of operators, network equipment players and passive infrastructure players are expected to evolve low-cost delivery solutions such as significant reduction in telecom network rollout costs as well as key operating costs such as energy charges, which would make the business case for serving the large but potentially low ARPU rural opportunity increasingly viable. As a testimony to this growth potential, rural teledensity has increased from 17 percent5 in June, 2009 to the current 26 percent5 in June 2010 which translates into addition of 83 million rural subscribers in the last one year. We expect to see continued heightened activity in this direction in the near future as well.

Wireline services

While wireless has seen consistent growth over the years, wireline over the last few years has actually seen a decline in the subscriber base. The total number6 of fixed line connections in India increased from 5.81 million in 1991-92 to 40.8 million in 2006-07. During 1999-2000 to 2001-02, approximately 5-6 million customers were added to fixed-line services each year. However, with the drop in mobile tariffs and increase in coverage of mobile services, net additions in fixed-line subscribers started slowing down from 2.5 million in 2002-03 going down to 0.5 million in 2004-05. Due to mobile substitution and lower tariffs, the fixed line subscriber base actually decreased by 3.5 million between 2006-07 and 2008-09. This decline was aggravated by slow rollout of fixed line services by Telcos due to the significantly higher total cost of service provision for fixed line services compared to mobile wireless services.

However, the potential for wireline services remains large due to very low penetration in the wireline industry and the ability of wireline to deliver broadband at lower operating costs than wireless broadband. New players in the telecom space had hitherto concentrated on wireless space leading to low competition and promotion of wireline services. Greater pan-India expansion by private players can signifi cantly lead to growth of wireline services. In addition, with combined offering of internet/ broadband and allied services like IPTV, the sector can bounce back in the future. But, the aggressiveness of mobile operators in rural areas due to easier and cheaper rollout and newer offerings

on BWA spectrum can further slow down the wireline penetration. Broadband and internet services Internet subscriber base in India, though currently at a low level, has been experiencing signifi cant growth over the last 2-3 years. This growth is being driven by the growing popularity of broadband, increasing user comfort with usage of internet applications, continuous fall in PC prices and decreasing costs of internet/broadband access plans.

Value added services

Currently, the VAS market is worth INR 110-120 billion, which translates into approximately 10 percent of wireless industry revenues. The share of VAS in wireless revenue is likely to increase to 12-13 percent by 20118. This growth would be driven by increased operator focus on VAS due to continuous fall in voice tariffs, increasing penetration of feature rich handsets, availability of vernacular content and increased user adoption of VAS applications.

Prior to 2008, majority of VAS revenues were attributable to SMS and that too peer-to-peer (P2P) text messages. Over the last few years, non-P2P SMS VAS has been gaining importance and is likely to become a dominant contributor to VAS revenue over the next few years. In 2009, non-P2P SMS VAS accounted for 5-6 percent8 of operator revenues.

This is expected to go up further, as operators focus more on VAS, especially with the launch of 3G services and with the availability of differentiated and customized content. The addressable market for non-P2P SMS VAS has historically been dominated by ringtones and caller ring back tones (CRBT), but its contribution has been fading gradually and was within the range of 35-37 percent8 of VAS revenues in 2010.

REGULATORY AND POLICY ENVIRONMENT

Over the years, the Indian Telecommunication Policy and Regulatory framework has evolved into a well developed framework that facilitates effective policy formation and execution. The government has been making constant efforts to ensure that the regulatory framework is benefi cial for the consumers as well as the licensed operators.

The policy and regulatory framework for telecommunications in India consists of, among others, the following key bodies:

• The Department of Telecommunication (DoT): DoT is the central governing body for the telecommunication industry. It is entrusted with the task of formulating policies for the development of the sector, awarding telecom licenses and is also accountable for spectrum management. It also includes the Telecom Commission, which is an exclusive policy-making function

• The Telecom Regulatory Authority of India (TRAI): TRAI is the Regulator for the sector and has a mix of mandatory and recommendatory powers. It mandates in areas related to tariffs, interconnection and standards for quality of service. TRAI has recommendatory powers in areas related to licensing, timing, licensing terms and conditions, license revocation, competition, facilitation

• The Telecom Disputes Settlement and Appellate Tribunal (TDSAT): The TDSAT was set up to resolve all disputes between a licensor and a licensee; two or more service providers; and between a service provider and a group of consumers

• Wireless Planning Commission (WPC): WPC is primarily assigned the task of spectrum management

• Group on Telecom and IT (GoT – IT): This was formulated to take care of ad-hoc issues.

National Telecom Policy (NTP)

The National Telecom Policy was instituted in 1994, to initiate and sustain aggressive growth for the telecom sector and ensure on-demand access to a telephone for every Indian. The policy's key objective was to establish telecom infrastructure across all remote locations of the country. It also encouraged privatization of the telecom equipments industry to help India emerge as a telecom manufacturing hub. World class service quality and special redressal of customer complaints are the other essential pre-determined objectives of the policy.

A fresh round of reforms was introduced by the government in 1999 when it enforced the New Telecom Policy. This policy was an improvisation over the NTP 1994, to help achieve stronger growth by escalating the control to a regulatory body.

The key objectives of the policy were:

• Availability of affordable telecom services for all. Ensure penetration of integrated multimedia services including ISDN services, remote database access, and government and community information systems

• Ensure coverage of all areas including rural, for universal services. Services should encompass high-level services and endeavor to achieve economic development

• Set up a modern integrated infrastructure which would enable the convergence of IT, media, telecom and consumer electronics

• Build world-class telecom facilities in India by encouraging privatization and offering a level playing field

• Safeguard the national security of the country: A further addendum to NTP 1999 was made in November 2003. This amendment permitted a licensee to make available wireline and wireless services using any technology in pre-determined license area after conversion to a Universal Access Service License (UASL).

Telecom FDI policy

India is the fastest growing telecommunications market across the globe. The urban teledensity has already breached the 100 percent mark. Rural India, which has nearly 27.76 percent teledensity as of August 2010, has shown impressive growth over the past.

India has achieved such aggressive growth primarily through urban areas, which account for only 30 percent of the total population. Rural India, which accounts for 70 percent of the population, holds immense potential and remains relatively untapped. This makes the Indian telecommunications sector one of the most attractive investment destinations for global players.

Recent reports revealed that during the first two months of this financial year, India's telecommunication sector attracted almost USD 891 million in FDI, the highest amongst all sectors. On the other hand, during the same period last year, the sector attracted USD 612 million worth of FDI8. Overall, this sector has attracted FDI of about USD 9.98 billion (from April 2000) as of June, 20109.

The regulations governing Foreign Direct Investments have gone through different phases of transition to ensure market attractiveness for globally recognized players along with safeguarding the interests of the Indian counterparts. The well-defined regulatory policy has been the fundamental reason for the inflow of huge international investments into the Indian telecommunication sector.

New and upcoming regulations

The Indian Telecommunication sector has seen remarkable growth and is designated as one of the fastest growing markets in the world. It is also the second largest wireless network across the globe, after China10. The aggressive growth has resulted in saturation of the urban markets and the Indian telecommunication authorities are looking to introduce new technologies to sustain the market growth rate.

3G Services

The government recently concluded the 3G and BWA auctions in June, 2010. The auctions were initially estimated to raise INR 350 billion and help the government contain the fiscal deficit. However, the government received approximately INR 1,060 billion as spectrum fees for 3G and BWA, cumulatively.

3G technology has been highly anticipated over the past few years and is expected to drive the next round of sustainable growth for the Indian telecom market through convergence of entertainment, infotainment and voice communications into one single device. The anticipation around 3G services can be gauged from the fact that the 3G auctions was concluded after 183 rounds of bidding over a period of 34 days. Inspite of a huge amount being generated through the auctions, none of the participating operators were able to win a pan-India license. Many of the spectrum winners have announced that they will be ready to roll out 3G services within the next few months.

The key drivers for the growth of 3G in India will be innovative content, improved customer services and increased affordability of handsets as well as availability of VAS. These drivers will help ensure growth of 3G not just in urban areas but in rural areas as well. The rural expansion will help in the progression of tele-density and broadband penetration which will in turn have a positive impact on the overall economic growth of the country.

Broadband Wireless Access (BWA)

The auction of the BWA spectrum helped the government raise as much as INR 385 billion after 117 rounds of bidding that lasted 16 days. At the end of the auction, only one company managed to successfully bid for a pan-India license.

Broadband Wireless Access is expected to provide an effective solution to the challenge of low broadband penetration. The launch of this technology is expected to bring India closer to the

achieving the target broadband connectivity to Gram Panchayat level by 201214. Presently, India has a broadband subscriber base of only 10.08 million.

BWA is expected to bridge the urban-rural digital divide and help address concerns of delivering essential services like education, fi nance and healthcare in rural areas.

MVNO

The Indian Government is in the process of reviewing the draft guidelines for the introduction of MVNO. TRAI had issued a draft proposal for MVNO in August, 2008 and the DoT had accepted the proposal in February, 2009.

The present landscape is considered to be ripe for MVNOs to be introduced in India since it will allow the telcos, who did not manage to win any 3G spectrum, to offer these data services via the MVNO route. A few companies have already made inroads into the MVNO market by leveraging the franchise agreements.

VoIP

The growing telecommunication industry has necessitated the demand for low cost domestic and international calls. This is where Voice over Internet Protocol (VoIP) will make its impact with a technology that allows the exchange of voice over internet protocol packet switches. The primary requirement for this low cost option to deliver impeccable quality is high bandwidth.

This technology can be used to effectively communicate between two personal computers, a personal computer and a conventional phone as well as between two conventional phones.

Recent reports reveal that the internet subscriber base in India has risen from 13.54 million in March 2009 to 16.72 million in June 2010. These numbers suggest a 23 percent growth in internet subscriber base, which also implies greater propensity to utilize VoIP based services. The only major deterrent for the adoption of these services will be the costs involved in setting up these services, especially in rural areas across the country. VoIP has received significant regulatory attention over the past decade. In 2002, TRAI had recommended to DoT to open up this sector in a restricted manner. In 2005, DoT permitted unlimited internet telephony to all access providers in India.

In 2006, limited access was also given to internet service providers, who were asked for 6 percent of their revenues as license fee and were restricted from termination and carriage in India.

<u>New security requirements</u>

On July 28, 2010, DoT released a set of amendments to the telecom licenses, under which certain specific obligations were imposed upon the operators in the interest of the national security of the country. This move was intended to address the security concerns that were raised by the Home Ministry, regarding the telecom equipment being imported from other countries.

Some of the key points covered in the notification were:

• Security Policy: Within thirty (30) days of the date of the Notification, the telecom operators were asked to submit their organizational policy on security and security management to DoT

• Network Audit: Telcos were asked to engage international accredited agencies to conduct audit and certify core equipment such as routers, switches, firewall, intrusion detection and prevention systems and all software associated with telecom operations and services.

Operators are also required to ensure that such audit agencies should not be from the same country as that of the vendors of the telecom operators

• Minimal dependence on foreign engineers: Telcos were asked to ensure that dependence on foreign engineers would be made minimal and/or almost nil within a period of two (2) years from the date of the Notification

• Location Details: Operators would be required to ensure upgradation of existing equipment within one year from the date of notification, in order to ensure that the telecom operators are able to provide location details of mobile customers within a precision of upto fifty meters

• Security and Business Continuity: DoT has approved the template of a Security and Business Continuity agreement which will need to be executed by the telecom operators and their vendors. The agreement requires the vendors to transfer their intellectual property to a third party. The telecom operator and the vendor are required to enter into an agreement with an escrow agent authorized by Controller of Certifying Agencies (CCA) or the National Informatics Centre, Department of Information Technology, Government of India. As per the terms of the agreement, CCA will create an encryption key for the escrow materials and the decryption key will remain with the escrow agent.

INTELLECTUAL PROPERTY IN BROADBAND MOBILE TELECOMMUNICATIONS: PREDICTIONS ON 4G WIMAX

Introduction

The second (2G) and third generation (3G) of mobile telecommunications have provided excellent examples of the deep tension between intellectual property rights (IPRs) and standardization. While this issue has always been on the agenda of industry and IP scholars, special characteristics of the mobile telecommunication market have amplified this tension and made the "IPR question" a decisive factor for future mobile systems.

Now, industry has begun to standardize 4G systems, intended as a "converging" technology, which combines the wireless communication world and the internet world. One of 4G's expected radio access technologies is "Mobile WiMAX", which has been standardized in IEEE 802.16e-20051 (4G WiMAX). This paper addresses the question of the role IPRs in this new generation of broadband mobile technologies. This paper summarizes factors which have turned out to be of high significance for standardized technologies in general and 2G and 3G systems in particular, and maps this framework to analyze 4G WiMAX. I conclude that the striking argument of WiMAX's supporters that its technological basis on OFDMA as a new radio access technology (compared to TDMA or CDMA as in former standards) is likely to turn out counterproductive and WiMAX will be plagued by a very thorny patent thicket: High fragmentation among the holders of IPRs, the dominance of vertically-integrated companies and the existing presence of upstream companies will lead to high transaction costs and weak competitiveness.

The Role of IP in Complex Industries

In 1998, Heller published two significant papers examining the "tragedy of the anti-commons", based, inter alia, on a case study about empty stores in Moscow while streets full of thousands of metal kiosks flourished, and later addressing patents in biomedical research. Prior to Heller's analyses, the "tragedy of the commons" was known as the issue of too many people jointly owning access to a specific, limited resource; no one having the right to exclude another, and thereby leading to overuse of said resource (fishing in the seas leading to dying out of species is one of the mostly used examples). Heller explained the "tragedy of the anti-commons" as a situation "where multiple owners each have a right to exclude others from a scarce resource and no one has an effective privilege of use." Applied to biotechnology, the "spiral of overlapping patent claims in the hands of different owners" has the potential to create a situation where "each upstream patent allows its owner to set up another tollbooth adding to the cost, and slowing the pace of downstream biomedical innovation."

Extending Heller's idea, in 2001, Shapiro introduced the idea of a "patent thicket": a "dense web of overlapping intellectual property rights, that… can have the perverse effect of stifling, not encouraging, innovations," which is especially dangerous in standards-dependent industries like telecommunications: First, by referring to Cournot's "complements problem" from 1838, he reveals that distributed monopoly power, i.e., each company exclusively controlling one good, is more harmful to consumers and producers than one single supplier's monopoly over all goods. Second, he points to the danger of "step[ping] on a land mine". This is referred to as the "hold-up" or "holdout" issue: Patentees wait until a standard is set and compatible products manufactured using their patents, and ex post, demand negotiations for high royalty payments, thereby additionally increasing transaction costs and burdening innovation.

Both Heller and Shapiro describe how a vast number of complementary patents in the hands of many different patentees (i.e. a highly fragmented patent landscape) and within this landscape, companies focused on IP income generation, can jeopardize innovation, in particular in standards-driven industries like mobile telecommunications.

However, on the other side of the coin, there are scholars who perceive a different situation: The market and the legal instruments enable IPRs to foster instead of jeopardizing innovation, which is also the case for standards-driven industries.

For instance, in 2004, Epstein and Kuhlik argued against the anti-commons in the domestic field of biomedical research, positing that Heller and Eisenberg "have overstated the case against patent protection". They suggest that it is in patent owners 'interests to recapture the investment in their patent, especially when one takes into account the limiting factors of time, competing patents and new technologies; they propose that "[t]hose who will not deal, will not prosper."

Similarly, Ziedonis finds that the market already provides a successful answer to highly fragmented patent landscapes. While empirically analyzing the semiconductor industry from 1980-1994, she shows that fragmentation is the driving factor for an organization to increase its own patenting activities. To avoid being "fenced in", companies "acquire patents more aggressively than otherwise expected when markets for technological inputs are highly fragmented." Following her line of

argumentation, increased patent ownership does not primarily increase royalty stacking effects, but rather fosters cross-licensing which again has positive effects on innovation.

Finally, in a 2006 paper, Geradin and Rato exhaust the conflict of IP standardization and competition law and clearly advise against loosening IPR protection as implied by scholars like Heller and Shapiro. In one example, they deal with the consequences for a company having made a FRAND commitment during a standardization process: If this commitment meant that the patentee thereby renounced its right to apply for injunctions (the so-called "waiver theory"), the patentee would be in a weak position since he has no effective means for enforcing his right to a reasonable royalty, and, thereby he would have to accept low and non-(F)RAND compliant royalties in order to avoid going through lengthy and expensive court-proceedings, a situation they call an "inverse patent hold-up."

To put in a nutshell, following the line of argumentation as provided by this group of scholars, they offer the question of whether at the end of day, if patentees 'received royalty rates, whether negotiated or obtained by court, have diminished to such an extent that it is not worth the effort of taking risk and undergoing investment – what is the value of a patent system?

Experiences of the Mobile Telecommunication Industry

With the establishment of 2G (TDMA based) GSM in Europe in the late 1980s, the telecommunication industry experienced a "serious clash between IPRs and standardization,"8 forming the starting point for the "painful history of GSM patent licensing [which] left a lingering resentment within the industry." Besides loosing the romantic idea of reaching generous "Gentlemen's Agreements", the industry also spent more than five years on finding a binding IPR policy. And, even worse, in 1998, the ITSUG authored a complaint to the European Commission in which it summarized the GSM licensing problems in stating that the inability to acquire timely licenses coupled with the uncertainty of essentials lead to "costly and complex licensing negotiations" and "excessive cumulative royalty rates", thereby creating substantial transaction costs and high barriers to entry to the GSM market. In addition, the ITSUG alleged the existence of "a low/zero club for established European telecommunications players" while others have to pay royalties up to 40% of the ex-works selling price. Proof of this alleged "closed market" is found on terminal devices, as it took several years, until Asian and American companies succeeded in obtaining licenses enabling them to capture "some part of this huge market".

Almost ten years later, in 2007, Fairfield Resources International presented an analysis of "declared" and "judged" essential patents for the GSM standard. The analysis found 554 patent families declared essential to GSM, among which only 149 patents, i.e., 27%, were judged essential by technical experts. Whereas many companies have declared to own essential IPR, taking into account their shares, fragmentation appears very low: Four companies (Nokia, Motorala, Ericsson, Qualcomm) hold 74% of the declared essential families; in addition, the first three possess 75% of the judged essential patents.

In contrast to the heavily disputed GSM standard, other 2G standards have not created so much debate about IPRs. For example, in the US, CDMA based technologies evolved, and these were heavily dominated by QUALCOMM. With comparably lower fragmentation and the dominance of an

upstream company, CDMA based standards did not seem to suffer the royalty stacking issues as described in the ITSUG's complaint.

While the need for more applications drove technical development towards 3G, IPR considerations formed part of the dominating strategies. The evolutionary developments from 2G to 3G made it unfeasible to agree on a unique air interface; in fact, the ITU had to standardize five interfaces, whereby each 3G technology has evolved from one or more 2G technologies: While existing GSM systems led to the establishment of WCDMA, CDMA based standards resulted in CDMA2000; China pursued its own technological development referred to as TD-SCDMA, to reduce dependency from Western technology. However, the companies 'contributions became so mixed that related IP finally created an "ill-fitting jigsaw puzzle."

To eliminate the problems that burdened GSM, the UMTS IPR Group proposed in January 1999 to set up a "Patent Platform", which aimed to strike a balance between a rather rigid "Patent Pool" and completely free bilateral negotiations. Among its core paradigms, the Group proposed that the platform should retain the flexibility of individual bilateral licenses, while the participants should agree on a common evaluation mechanism and a maximum cumulative royalty rate. This time, the US Department of Justice (DOJ) demanded that each individual 3G technology must be governed by an independent Platform Company, explicitly referring to potential inter-technology competition. However, as of the date of this paper and to the knowledge of the author, the only existing 3G patent platform is the "3G Licensing – W-CDMA Patent Licensing Programme," encompassing twelve companies, holding altogether 188 W-CDMA essential patents. It offers "Standard License Agreements" for five different product categories and a "Joint License Agreement" for handsets, having set the "maximum cumulative royalty" for different categories of 5.0% of the net sales value.

In 2005, Goodman and Myers presented their evaluation of 3G relevant patents.19 Their startling analysis showed a huge gap between patents "declared essential", and patents "judged essential" by their technological experts. First, they showed that for both major standards, 3GPP (WCDMA) as well as 3GPP2 (CDMA2000), "nearly 80% of the patents declared essential are probably not essential for practicing the standard," i.e., out of 732 patent families for WCDMA, the experts judged only 157 as being essential.20 Second, they showed that for WCDMA, "although the patents declared essential are assigned to 41 companies, the patents judged essential are assigned to 20 companies." Their findings were particularly negative for QUALCOMM, in that they showed that it is not dominating the WCDMA standard, rather QUALCOMM stands number three, behind the vertically integrated NOKIA and ERICSSON.

However, this report did not remain without a response from QUALCOMM's external advisors Martin and De Meyer, published one year later. They accurately analyzed all limitations of the study and attacked the informative value of the findings since "simple patent counting […is] a poor predictor of patent valuation". To make their point clear in simple words, they ask: "If all parts of a car were covered by patents, would the ashtray or the windshield wipers command the same royalty as the engine or the gearbox?"

To evaluate the impacts of the 3G patent thickets, in particular in comparison with the 2G GSM issues, there is still a lot of uncertainty: CREDIT SUISSE FIRST BOSTON (CSFB) published a

detailed market report, substantially based on IPRs, in particular on the analysis by Goodman and Myers, which assumes for WCDMA from 2005 to 2010 an average royalty rate of "17.3% for those vendors without an IPR position to trade off", which is still far beyond average royalty rates as known before the take-off of GSM.22 But once again, there is another side: Geradin et. al concluded in 2007 that there is "no evidence of a significant royalty stacking in the 3G telecoms industry". Besides statistical methods, they make out three factors which are necessary (but not sufficient) for royalty stacking: (1) complementary instead of substitutable patents, (2) a high number of patents required for one product, and (3) high fragmentation. According to their report, 86% of all essential patents 'prior art listings are held by four companies. Consequently, they state that the requirement of high fragmentation is unmet.

After all, business reality might have shown the truth: APPLE's late but successful release of its IPHONE shows that there is still a highly competitive market which does not suffer from insuperable barriers to entry. While not owning "essential" IPRs, APPLE launched– in 3G's upturn phase – a 2.5G phone with a focus on other convincing aspects, like design and UI. Similarly, RIM succeeded with its BLACKBERRY handheld device several years earlier.

Although there is not (yet) a single accepted definition relating to 4G, the most commonly shared idea consists of the idea of enabling wireless network access to different networks, in particular to the Internet "anytime, anywhere, and at a wide range of speeds". Irrespective of where the user is located, whether sitting at home or traveling in a high speed train, he always has access to the right mobile connection for all his needs, including broadband Internet, voice services, GPS services, etc.

IPRs in New Broadband Mobile Telecommunications

The ITU intends to define 4G within its IMT-Advanced process by 2009, expecting the deployment starting commercially in 2011. It is expected that several air interfaces will become part of the 4G definition, besides WiMAX, in particular LTE (3GPP's WCDMA successor) and 3GPP2's successor UMB, as both underlying technologies are already part of the IMT-2000 framework.

To clarify, when referring to "WiMAX", this report refers to "Mobile WiMAX", as standardized in IEEE 802.16e-2005. It is implemented as extension to the "fixed WiMAX" (IEEE 802.16-2004) standard, however, it aims at full mobility and is therefore "4G's WiMAX". While many features of the older "fixed" version are present in the newer mobile version, e.g., the OFDMA implementation, more features have been added for mobile WiMAX, e.g., like the requirement of handover.

While in the subsequent section this paper establishes a general evaluation framework for broadband mobile telecommunications, the empirical analysis in Section 4 is restricted solely to WiMAX as 4G's radio solution. Several indicators suggest WiMAX being successfully deployed in future.

With the aforementioned theoretical, historical and technical background in mind, this section constructs a 4G patent evaluation framework which is used to analyze the effects of royalty stacking and burdened innovation, or, respectively, the establishment of improvements compared to former standards 'problems and the creation of certainty and incentives to invest. This framework is partly based on Geradin et. al's factors from 2007 comprising (1) complementary instead of substitutable

patents, (2) the number of patents, and (3) fragmentation, but it goes further and takes (4) the business model of the involved player into account.

The first factor that fosters the risk of royalty stacking is the issue of complementary patents without substitutes. While usually a company's single patent does not block competitors in complex industries, the situation changes when there is no substitute, i.e., a specific patent cannot be designed around as it has become an "essential" patent within a given standard. Accepted theories suggest that before a standard is set (ex ante), there is substitutability, while afterwards (ex post), there is only a long list of complementary "essentials", all required to implement the standard. Even though this is a simplification in many ways, it should be accepted that all standardized mobile technologies consist of the same degree of complementary, irreplaceable patents.

The second critical factor consists in the number of patents. While it is usually obvious that a huge number of patents fosters the risk of significant transaction costs and royalty stacking, there is an interesting argument to dispute this fateful relationship: Lichtman argues that a high number of patents accompanied with a high share of fragmentation is beneficial for reducing the risk of holdouts and high royalties.31 Primarily, Lichtman's argument is more dependent on fragmentation rather than on sheer numbers; but furthermore, he ignores some dynamics, i.e., that only if all participants follow non-royalty based business models can the scheme work.32 However, if some companies (have to) rely on income generated by IP royalties, they will not behave as Lichtman predicts which may result in an unpleasant situation; more likely, concentration in the IP market will take place, e.g., by patentees joining together and forming a unified pool,33 or through the appearance of patent holding companies. Hence, despite Lichtman's argument, the higher the number of patents, the higher the risk of a "thorny" patent ticket.

A third factor, as discussed with respect to 2G and 3G, looks to patents fragmentation. In addition to the above rejection of Lichtman's argument in favor of fragmentation, Shapiro shows that high fragmentation creates in particular two dangerous effects: (1) receiving licenses from dozens of players has higher transaction costs over "one-stop-shopping" (or at least a "few-stop-shopping"), and (2) the more players that are involved, the higher the risk that there are holdouts. As outlined above, Ziedonis demonstrates that a functioning market offers companies the best answer to increased fragmentation by increasing their own patenting activities. This principle of "cause and effect" may apply for future developments (and Ziedonis makes use of backwards citations) but with respect to evaluating broadband mobile standards the dispersion of essential IPR is inseparably connected to the expected transaction costs, as can be seen for GSM.

These considerations point to a fourth factor: the patent owners 'business models. The original GSM standard was primarily covered by patents of vertically integrated holders; it took years until foreign manufacturers could enter this "closed" market. Upstream companies, in particular QUALCOMM, play an important role in WCDMA, leading arguably to higher licensing costs, but also to a more competitive downstream market. Companies pursuing conflicting interests (as depicted in Table 1), and situations which benefit one patentee may have drawbacks for others. The following evaluation will analyze the influence of the different players, drawing conclusions on the efficiency of 4G WiMAX.

The results of the above factors will be given values in the next section and are finally weighed in the conclusion. Based thereon, this paper draws implications for IP's role in 4G WiMAX in particular and broadband mobile telecommunications in general.

Analysis of 4G WiMAX

As discussed, complementary and non-substitutable patents must ex post be regarded with the definition of "essential" patents36: To make this report more straightforward, it is (realistically) assumed that there is no significant difference between former 2G or 3G standards and 4G WiMAX with regard to the degree of complementary and non-substitutable patents.

Turning to the second factor, the number of essential patents, it has always been difficult to establish a complete list for one specific standard, let alone the issue of evaluated essentials. At the time this paper is written, it is just impossible to provide a complete declared list for WiMAX, since the present IEEE's IPR policy does not require specific disclosure. Syputa, a frequently quoted analyst from a broadband wireless research institute, posits that there are 550 essential (single) patents for WiMAX and – in total – 320 judged essential patent families for WiMAX, LTE and UMB.38 As of August 1, 2007, 34 different companies have made declarations to the IEEE (20 of those companies provided a "Blanket Letter of Assurance", 11 having issued a "Letter of Assurance" including the disclosure of specific patent numbers, 3 companies did both). Aggregating all specific disclosures, the 14 companies have furnished 337 patents, patent applications and filed applications – for IEEE 802.16 and its amendments. These single patents result in 152 patent (and application) families. Consequently, if patents were equally distributed among "specific disclosers" and those providing blanket letters, 370 patent families would be listed.

As there are more reasons for companies to overstate their portfolios than to hide patents from the SSO, a question as to the scope of "real" essentials remains. Goodman and Myers have shown the existence of a wide gap between declared essentials and judged essentials which remains undeniably true irrespective of all valid criticisms. On the basis of their three analyses, they detect values for the ratio of declared to evaluated essentials of approximately 25%. In contrast, 3G LICENSING's published numbers of judged WCDMA essential patents through their professional evaluation mechanism are significantly higher, about three times as high as Goodman and Myers figures.

The question with respect to the number of essential patents cannot be answered statistically with a concrete number, but rather with two important conclusions: First, the initial version of Mobile WiMAX shows significantly fewer patents declared essential than later versions of GSM and WCDMA, whereby the number is likely to increase over time. Second, even though WiMAX essentials may only constitute a small fraction of the IP required of future converging "4G devices", this fraction may become the decisive one: Many other parts do not suffer the standardized "substitutability" problem, like e.g., user interfaces, and, moreover, among the standardized blocks, no royalty market has undergone a development like the mobile telecommunications IP market, leading to a several billion $ turnovers per year on which companies heavily rely. As a result, within a 4G device, the group of patents required for mobile WiMAX (or any other interface) may not form the highest number, but may, in point of fact, constitute the most expensive group.

It is necessary to establish the dispersion of the mobile WiMAX relevant IPR to evaluate fragmentation and the impact of various business models. The absence of a publicly available complete list of "essentials" as well as the inability to judge single patents out of thousands of patents with respect to their true essentiality forecloses the use of some well-known 2G and 3G analytic methods. Moreover, long time periods from filing to grant hamper precise analysis of fast-growing technologies in early stages, such as WiMAX at the time of this paper: For example, at the European Patent Office the average time from filing to grant was. 3 months in 200644, plus 12 months priority for many patents, i.e. most patents granted in 2006 were for inventions made in 2001.

Thus, this paper takes into account all granted patents and applications as filed, and uses a method called the "probability approach" which is accomplished through a four-part analysis. First, all 337 specifically disclosed patents and patent applications are examined, and their corresponding 152 patent families isolated. Second, since the companies that disclosed specific patent numbers are mixed with regard to their business (network, handset, chipsets, service providers), one must assume that their innovations cover the entire relevant technological spectrum; consequently, the IPC class dispersion of the 152 patent families is assessed. As this leads to several IPC classes which have a very low number of hits, the third step excludes all classes below 1.0 %, leading to 26 IPC classes covering more than 70% of all inventions. In the fourth and last step, these 26 classes are combined with all 34 companies which have submitted a "Letter of Assurance" to the IEEE until August 1, 2007, and a search is conducted on all patent families, including patent applications. The result is shown in Figure 2 below.

Fragmentation is directly connected to transaction costs – the higher the former, the higher the latter. Even though this result is based on a different approach from the comparable GSM and WCDMA evaluations whose results have been cited above, and the "Probability Approach" suffers various limitations, 4G WiMAX shows significantly higher fragmentation than former standards. GSM in 1998, as argued by ITSUG, showed high fragmentation since at least 17 companies have declared owning essential patents, however, as, GSM (in the meantime) is dominated by three companies. With regard to 3G WCDMA and CDMA-2000, Goodman and Myers found that "four companies own the rights to three quarters of the patents"; similarly Geradin et al. did not ascertain much fragmentation either. The findings here are in line with several arguments, most importantly that WiMAX possesses a "vendor-neutral IPR regime", and therefore not suffering from IPR "burdens" and being "very buyer-friendly". Contrary to the advertised conclusions drawn by the "champions of WiMAX", the evidence provided in sections two and three suggests that high fragmentation is followed by an increase in transaction costs, thereby pushing royalty stacking, and, moreover, hampering competition in the market by creating high barriers to entry.

Conclusion

This paper provides a four-factor framework to evaluate the role of IP in broadband mobile telecommunications. This framework is used to analyze 4G WiMAX, thereby introducing the "probability approach" to obtain an objective result on the fragmentation of essential patents. Supporters of WiMAX argue for a "very buyer-friendly and vendor-neutral IPR regime"55, as it is based on new radio access technology and no company could leverage an existing dominating IPR position into WiMAX. By contrast, the study shows that WiMAX is plagued by a "thorny thicket":

First, high fragmentation increases the impact of royalty stacking due to transaction costs. Second, the IPRs share domination of vertically integrated companies creates barriers to entry and weakens competitiveness. Third, the influence of upstream companies makes reduced royalty costs unlikely. These negative effects cannot be compensated for by the presently still smaller number of essential patents compared to 3G, neither do the upstream companies possess enough share to make the market more open. Here, it would be of special interest to analyze the situation for the competing technologies, LTE and UMB. Consequently, to have Mobile WiMAX successfully deployed in the future as a 4G broadband mobile technology, it will require well-balanced licensing policies of all players involved as well as prospective conduct of courts and antitrust authorities.

IPR AND SPACE ACTIVITIES – INDIAN PERSPECTIVES

We are well aware that India has taken a lead to put our country into space age. Exploration of space has opened a new scene for the people of India and indeed, the benefit of space technology have become greater relevant in India's efforts at sustainable development. As a result of advanced technology and commercialization of space activities, IPR protection of space related activities has turn out to be a burning issue in today's world. Basically, Intellectual property protection is proposed to motivate the creativity of the human mind for the benefit of the public, by assuring that the advantages derived from the exploitation of the creation will, if possible, benefit the creator himself, in order to encourage the creative activity and to permit investors in research and development a fair return on their investments.

Despite the fact that proliferations of space activities are moving in a big way, there is no specific space legislation in India. Space and space -related matters in India are regulated by legal rules belonging to different areas of the domestic law.

Keeping in mind the national and global developments which include the active involvement of the private sector and commercialization of space activities, the agreements concluded nationally and globally with various agencies, governments and international and intergovernmental organizations, it is high time for India to come up with specific legal framework.

NEED FOR IPR PROTECTION

Need Provision in Patent Act?

The development of commercialization of space activities has broadened the gap between the slowly evolving legal framework and the rapidly evolving legal problems arising from private enterprise and commercial exploitation in India. It is important for a developing country like India, to have a provision in its Patent Act, because after huge amounts are invested in inventing a particular object, and if later some other country takes a patent over it, then it will be again a problem. If any outsider comes and takes a patent, then all the investment we had put and the amount of work would go waste. This would be possible if we don't have protective mechanism. Thus, it is high time for India to come up with proper patenting laws relating to outer space activities so as to safeguard the inventions.

Copyrights

Copyright[1] gives protection for the expression of an idea and not for the idea itself. India is a member of the Berne Convention, an international treaty on copyright. Under this Convention, registration of copyright is not an essential requirement for protecting the right. It would, therefore, mean that the copyright on a work created in India would be automatically and simultaneously protected through copyright in all the member countries of the Berne Convention. The moment an original work is created, the creator starts enjoying the copyright. However, an undisputable record of the date on which a work was created must be kept. The need for copyright arises when the issues regarding the protection of remote sensing data and satellite transmissions come forward. India having very strong and active remote sensing programmes in place should have greater legal protection of data. If there is no copying of the data, infringement is not possible.

The first owner of the literary work is the author of the work.[2] However, under the Copyright Act, it is very difficult to ascertain the author of the work because the data being collected by a machine does not involve human intervention. Since the author means the person who cause the work to be created under section 2 (d) (vii), the owner of the satellite would be the author.

Industrial Design[3]

For the design to be protected, it has to be independently created and qualify the test of novelty. So, the design law should be referred when the question of the protection of space vehicular designs materializes. However, there is no expressed provision in India that purports to protect the space designs.

Trademarks

A trademark[4] is a distinctive sign, which identifies certain goods or services as those produced or provided by a specific person or enterprise. A trademark provides to the owner of the mark by ensuring the exclusive right to use it to identify goods or services, or to authorize others to use it in return for some consideration. The growing competition in satellite business in space is beyond doubt that satellite trademarks are gaining prominence that requires IPR protection.

Trade Secret

Protection of undisclosed information is least known to players of IPR and also least talked about, although it is perhaps the most important form of protection for industries. Laws relating to all forms of IPR are at different stages of implementation in India, but there is no separate and exclusive law for protecting undisclosed information or trade secret or confidential information. The moment the product is in the market, many people will know how to copy the product and the moment the product

[1] The Copyright Act 1957 as amended up to 1999 along with Copyright Rules 1958 and International Copyright Order 1999; 2005

[2] Section 17 of the Copyright Act, 1994.

[3] The Design Act 2000 along with Design Rules 2001.

[4] The Trademarks Act 1999 along with trade Marks Rules 2002: Enactment of the Indian Trademarks Act 1999 is a big step forward from the Trade and Merchandise Marks Act 1958 and the Trademark Act 1940.

is copied the trade secret associated with the copied aspects will no longer remain valid and secret, hence the protection will be lost and the term of the protection will be over.

Space Achievements and IPR

- Satellite Technology
- Satellite Communications
- Meteorology
- Launch Vehicles
- Remote Sensing

With the growth in satellite technologies, there is immense need of IPR protection of such activities in India. The launch of IRS-P6 (Resourcesat-1) in October 2003, provided an excellent opportunity to obtain high resolution multi-spectral data and moderate resolution data in 10-bi, while providing continuity of data. IRS-P5 (Cartosat-1), launched on May 5, 2005, catapulted the Indian Remote Sensing program into the world of large scale mapping and terrain modeling applications. India has proved to be one of the leaders in satellite based remote sensing providing the service on end-to-end basis.

However, in India, the existing legal provisions are not specific enough to space activities like remote sensing and other space technologies. India has a Remote Sensing Data Policy in place, but it does not talk about the IPR issues. But the IPR policy is addressed in the agreement to be signed for obtaining remote sensing data from the National Remote Sensing Agency (NASA), Hyderabad.[5]

Thus, we can see that Indian Remote Sensing programmes is the strongest in today's world but it is regrettable to notice that IPR protection of such activity is really weak. There is a need for protection of data through legal means as well as through technical means. The Copy right Act does not expressly provide for the protection of the Remote Sensing activity therefore, there is need for specific provision to this effect.

ISRO AND INDIAN SPACE ACTIVITIES: NEED FOR IPRS PROTECTION?

The Indian Space Research Organization (ISRO) was established in 1969 under the Department of Atomic Energy. Changes in the Intellectual Property Right (IPR) regime in the international scenario have impact on the Indian space programmes. In line with the international developments, ISRO has taken steps towards safeguarding the technologies or products developed within ISRO. Several initiatives were taken to increase the awareness and to deliberate on relevant policy and implementation measures to protect the intellectual property generated by ISRO.

The India Space Research Organization (ISRO) viewed that since the space technologies development are not freely available to transfer, states wishing to establish the autonomous programmes are bound to develop the technologies *de novo* even if such technologies have been developed previously. As per

[5] Refer Section 4 of the NASA Product Purchase Agreement available at: www.nrsa.gov.in

ISRO's viewpoint, the remote sensing data is protected by copyright law and usually belongs to the satellite owners.

So, Intellectual Property Laws should be in a position to enable the states to develop the technologies. The other aspect on which it put down the stress is the universal fact that the concept of introducing the Intellectual Property Right would amount to exposure of technology to the world at large.

Need for alternative models or equitable property right regime?

So far as India is concerned, the space activities have demonstrated to be one of the strongest in the world which requires greater IPR protection. Though infringements IPR related issues would be covered within the ambit if IPR legislations like Patent law and Copyright Law etc., there is no specific provision that addresses the IPR issues of space related activities in India. It is worthwhile to suggest alternative models of working out an efficient as well as equitable property right regime in outer space which would take into account the interests of both the developed and developing nations at the same time. Furthermore, a more concrete legal framework should be established in order to promote commercialization that has changed the very approach towards space activities.

What need to be done?

To adequately face with the current IPR related issues in space activities, I strongly propose following suggestions:

1. While the need for establishment and development of a unified and uniform Intellectual Property protection regime for space is justifiable, the interest of the developing country like India should not be compromised.

2. Over the years the concepts of Intellectual Property Rights have altered its thrust from protection to inventors and service to society to protection to investments and trade oriented interests. Industrial and intellectual activities in outer space need in-depth conceptualization of a proper regime of property rights as it holds promise to the future of mankind.

3. The real question is not whether there will be property rights in space, but when and what kind of property rights will exist. It is always better to identify and address the issue concerning property rights in space and the guidelines and constraints to which entities may be subjected in a timely fashion before problems arise.

4. The goals of a legal regime for outer space should be to continue to preserve outer space for peaceful purposes and for the benefit of all human kind while at the same time not discouraging private enterprise.

5. The absence of any clear cut provision either in space laws or in Intellectual Property laws for dealing with Intellectual Property generated in the Outer Space tends to create a legal vacuum that could possibly have a degenerating effect on space commerce. Hence, clear cut provision to this effect is called for.

6. It is to be noted that the *res communis* nature of the outer space offers free and equal opportunities for all nations. In addition, it is also established that cooperative efforts in space ventures involving government agencies and non-government entities are inevitable. Therefore, there is need for a proper

legal instrument for effective determination of Intellectual Property Rights amongst the partner states or parties.

7. India needs to set up exclusive judicial courts to deal with intellectual property rights (IPR) issues, which are on the rise, according to the noted legal expert and patents judge so that the infringement of IPR in general and in respect to space activities can be well adjudicated and protected. India has moved from the developing to a developed country status as far as IPR is concerned.

8. India should come up with an Act providing and establishing a system for the regulation of space activities carried on either from India or by Indian nationals outside India and for matters connected therewith.

or

9. The Patent and Copyright Laws has to be amended thereby incorporating new and specific provision dealing with IPR in space activities.

Why India needs a separate legal framework for IPRs issues and concerns in space activities—a critical study:

Every Indian law is made for the common people of India. Laws regarding IPRs are not an exception to this general rule. But until now, there are no separate provisions for IPRs related with space activities in our national law. So common people of India are not safeguarded for their "intellectual properties" related with space.

A non-legal person can easily put a question regarding the issue that Indian government spending cores of national budget for ISRO without safeguarding our intellectual property rights. Is ISRO so much reluctant regarding IPRs issues? To answer this question, we have to go back in the past activities of ISRO in space activities.

ISRO is formed in 1969.At that time the space activities mean the activities of U.S.S.R. and U.S.A. The question of intellectual properties related with space activities does not arise for other countries. The situation changes with the passage of time. There are so many successful experiments done by India after 1969.The story after 1992 (establishment of ANTRIX) is success story of commercialization of space activities. India is the service providers regarding space activities to so many countries like U.S.A. and also builds good space crafts with own technological know-how. ANTRIX corporation, commercial wings of ISRO, made a turnover of Rs.900 cores having a profit of Rs.150 cores from commercial satellite launches. And sale of remote sensing data during the last financial year and the revenues are growing at 25%."We have launched 16 satellites for other countries so far and another four are on the anvil" says Mr. G.Madhavan Nair. Dr. Job Kurian, who heads aerospace engineering department at IIT-MADRAS, said 'We are going to get more orders than a lot of other countries. When they deliver the satellites, they are going the orders will increase". India ,the first country in the world, successfully launched a large number of satellites (10) at a time with CARTOSAT-2A in 2008.Another is obviously chandarayan-1.Fromthe commercial point of view, the success of chandrayan-1 is related with optimization of cost. Its cost is only about 4% of ISRO budget." There are some tests the Americans would have done six times and we did only three" said Mr.G.M.Nair. Now no one can question about India's intellectual properties related with space. Though we have the status of developing countries like Bangladesh, Pakistan, Sri Lanka, Nepal etc.

who are neighboring countries of India also. But space activities of these countries are just like India in past. Their IPRs related space activities may be silent. India cannot be silent over this matter to promote the space activities commercially.

Moreover, common man questions are: what is the utility to the society on spending large amount of public money? Like-Chandrayana-1 386 crores, Chandrayan-2 425 crores, manned moon mission 1200 cores when the prices of rice, vegetables and other essentials have become difficult to purchase making the life of ordinary citizens miserable. Every rupee in the hands of the government should have been spent in seeing to it that the people get foodstuff at a subscribed rate. No one is interested in viewing the pictures of the moon which foreign countries have already taken.

If ISRO builds the framework for IPRs issues and concerns, at least these common people will get their answer. Because then they know what is our 'intellectual property" database in space and what ISRO earns from these database. There may be no confusion in their mind regarding this issue.

Dr. Sridhar Murti stated, in his article (Current Science,vol.93,No.12,Dec.2007), that 'Development of human resources has been a key strategy of ISRO from the very beginning of space programme.ISRO has been very careful in spotting and recruiting the very best quality manpower to take up its challenging tasks." In the same article further he stated that "Key to success in space commerce by India is the human capital created over the past decades, coupled with reliable performances and cost effectiveness of the systems." A question automatically comes in the mind that when ISRO is so much cautious about its human resources, what strategy they have taken so far to safeguard these "invaluable human resources" as per IPRs?

Just like NASA, the future of ANTRIX may be making tie up with private bodies or companies like TATA, RELIANCE etcSuppose, ISRO provides funds to some universities or colleges or non-profit making organization or some small business entrepreneur, now when they invent new technology or idea, who get the IPR? So IP of these private parties could be at risk because of their improper title. So if there is no specific provision for IPRs related with space commercialization in India, then none but ISRO welcomes national debate regarding its huge investment in future days.

Finally, India reached the moon. The journey started in 1969 with the establishment of ISRO under Department of Atomic Energy. Though India takes the help of other space faring developed nations but now we can claim to be independent in space activities. During this year the first success comes with the launching of CARTOSAT-2A.It is for the first time in the world that so many small satellites have been launched at a time successfully. The next is obviously CHAND+RAYANA-1 which not only shows technical development but optimization of cost, even U.S.A. is defeated in this regard. In line with this extreme national development, ISRO has taken steps towards safeguarding the technologies or products developed by itself. But there is no legal protection as enacted by national law to safeguard the intellectual properties related with space activities in India. Though ISRO hold the first conference on intellectual property matters in the last years with participants from developing and developed countries, but there is no such legal initiative taken by government on space related intellectual property matters. Absence of china in this conference is an interesting point. Because China is our nearest country who wants to compete with India in coming years. A space race between India and china has already started dormantly.So if we do not enact laws on IPRs related with space, nobody except India will suffer a huge loss both in technology and economy.

Numerous fields related with IP protection in India's space activities

The following sectors of space activities require IP protection. Something. India has already achieved but some is pending.

1. Satellite Technology
2. Satellite Communications
3. Meteorology
4. Launch Vehicles
5. Remote Sensing
6. Space debris Removal
7. Space transportation(space cargo)
8. Space Real estate business
9. Commercial products manufactured in space (space medicine)
10. Space Fuel
11. Space Robots(Artificial intelligence)

PRESENT PROBLEMS OF ISRO RELATED WITH IP PROTECTION

Related with Chandrayana-1

As Prof. U.R.Rao says" everybody in the world is trying to find out things about the moon. India will gain experience in undertaking something of the moon. Also we are thinking of using moon's resources".

Rs.386 cores are already invested by India to satisfy the statement of Prof.Rao.

No provisions are available in patent act if water and helium3 will be available on moon.

Primary Objectives of C-1(as given in ISRO website)

Objective 1: Expand the scientific knowledge about the moon

Will ISRO want to share the scientific knowledge to all foreign countries or even within developing countries?

If yes, what safeguards they have taken to disseminate the scientific knowledge?

(Besides the data collected by China & Japan on the moon has not been shared but the data collected from Chandrayan-1 would be shared)

Objective 2: To upgrade India's technological capabilities

With the up gradation of India's technological capabilities, other developed or developing countries are also interested in India's space activity (or may be envious).So government should protect it by enacting proper IP laws.

➢ Regarding the joint collaboration of works with other countries

In C-1, Russia is no way related. But C-2 will be a joint collaboration with Russia.C-2 will be developed from the knowledge and experience of C-1.The other countries related with C-1 may raise objection regarding transfer of technology. Not only that if some space mission is developed by so many countries, then there must be clear cut provision for proprietary rights.

➢ Regarding Trade secrets

Individual countries do not share crucial data with others. ISRO also follows the principal. But there is no law to protect undisclosed information or trade secrets.

➢ Regarding spacecraft designs

Each space powers want to manufacture small weighted spacecraft small weighted spacecrafts. Low price and no need to carriers 'rocket. India also joins in this venture.

FUTURE PROBLEMS

1. Manned Mission to Moon/ Space Tourism

Russia already started space tourism and ISRO also filed a project of manned mission to moon before the parliament. Will ISRO allow a foreign astronaut to use the technology of India? If allow, definitely there is a provision for safeguarding IP regarding space activities in India.

2. Problem of Geomagnetic Equator

Thumba, Sriharikota have the special facilities due to its geographical position to launch the spacecraft. In coming years very few places may or may not be added in the list. Because the geomagnetic equator cannot be changed. So space related activities will be restricted within this area.

3. Private / Government & Private Collaborated Space Activities

Though in U.S.A. and Europe, space activities are privatized, but India is still awaiting. But when private operators come, IPR issues will become more complex.

4. Utilisation of Robots in Space

With the advancement of technology, robots will be made for sending them in space. This matter will happen in near future but ISRO must have a plan to safeguards this intellectual properties.

5. Improper utilization of government funds by ISRO

Now the present investment of ISRO is 36 % in satellite communication& meterology, 39 % in space vehicles, 6 % space science, 5 % other programs.

- ✓ Investment on C-1 – Rs.386 crs.
- ✓ Investment on C-2---Rs. 425 crs.
- ✓ Investment on manned mission (2015)-Rs.1200 crs.
- ✓ Annual budget of ISRO—Rs.5000 crs. ($1 billion)
- ✓ Revenue earned by ANTRIX – Rs. 900 crs.
- ✓ Growth rate of ANTRIX ------25%

From the above financial analysis, it is shown that the present and future investment of ISRO is huge though ANTRIX also earns huge revenues.

If there are no clear cut provisions for IPR protection, there may be possibility of huge loss of government fund and also revenue earned by ANTRIX.

(India must suffer this financial problem because as per customs when an Indian spacecraft is launched from Indian soil, there is no need to insure its whole investment on C-1 OR C-2 or the manned mission. If the mission fails then ISRO have to face same situation like NASA after COLOMBIA'S disaster.)

IPR Protection for Space Activities

Over the years the concepts of Intellectual Property Rights have changed its thrust from protection to inventors and service to society to protection to investments and trade oriented interests. WTO/ TRIPS regimes indicate the need for new framework for universal justice in face of existing geo-political disparities and economic distribution. Industrial and intellectual activities in outer space need in-depth conceptualization of a proper regime of property rights as it holds promise to the future of mankind.

The space industry is unusual, compared to typical terrestrial activities, because of its research and development funding mechanisms on the one hand, and a sort of fishbowl promiscuity on the other hand. Due to a limited number of programmes and players, competitors on one programme will be partners on another, customers or main contractors on another, subcontractors on still another, in every imaginable combination. Research and development funding is most often from government or intergovernmental agencies, with concomitant contractual reserves on IPRs.

Individual and the group of states need intellectual Property (IP) standards in the second generation of space exploitation when space is subject to commercial activities. The progress of space science and technology will bring further benefits to the world community in the

decades ahead. New inventions, discoveries and products will be made for which individuals; states and international organizations need recognition of intellectual property rights. Completely agree with what professor, Stephen Gorove says, "This law was needed because many businesses were not going to invest in any activity in space unless they were certain that they were going to get the fruits of their investments".

The 21st century realized the potential of space activities and thereby, demonstrated that it has a bright future and holds the potential of a multi-billion dollar industry. The advent of space station, with the increased orbital time shall provide for all space activities, and this will herald a blossoming of commercial space activities. At this juncture, the role of IPRs in protecting the intellectual property of each company/government etc., had been inevitable. Although many issues remain to be resolved for the commercial potential of space to be achieved, protection of data and products and ideas and inventions had become crucial to the industry. The law effecting space activities has evolved over three decades primarily in response to governmental activities. With the shift towards private entrepreneurial space ventures foreseen for the next few decades, industry will be looking for, and the law will evolve toward, means to protect private creative endeavors in space.

Private entities investing in commercial space ventures will spend large amounts of money over long periods of time before a return on investment can be expected. Those entities shall require assurance that they can protect the ideas and inventions (the intellectual property) resulting from their space station activities. Without strong protection for patents, trade secrets, and copyright, companies will not have the incentive to invest in developing the commercial potential of a space station.

Many nations have systems for protecting the intellectual property on earth. Protection of intellectual property on space will undoubtedly be based in part on the existing international space agreements and in part on extension of national law, practice and regulation. In addition, developing case law nationally and perhaps internationally will set precedents for resolution of intellectual property issues in space.

The contrasts and possible conflicts between space law and IPR law are numerous and manifest. They are;

- Space law is extraterrestrial, IPR law is terrestrial;
- Space law is the same for all states, IPR is different from state to state; and
- Space law says share benefits, IP law grants a monopoly to the inventor.

INDIAN PERSPECTIVE

Intellectual Property Rights (IPRs) have assumed greater importance today throughout the world. Earlier the subject was in the WIPO, mainly concerned with copyrights, trade marks and patents. Today WTO agreement of TRIPS covers wide range of subjects, including copyrights and related rights, trademarks, geographical indications, industrial designs, patents, lay-out designs of integrated

circuits and rights relating to protection of undisclosed information. Member states were obliged to bring their municipal law into conformity with the provisions of TRIPS agreement. Being a member of the TRIPS agreement India has also amended and in the process of amending our IPR laws. Example the Trade and Merchandise Marks Act, 1958 is replaced by Trade Marks Act 1999; The Designs Act, 1911 was replaced by the Designs Act, 2000. New acts like Geographical Indication of Goods (Registration and Protection) Act 1999 and the Semiconductor Integrated Circuits Layout Designs Act 2000.

At this point, it is important to emphasize the words of professor Doyle, who observed, "Waiting for clarification of international legal rules relating to use of resources beyond the earth may be self-defeating. The prevailing legal regime is permissive and clearly influencable by future action. The longer one waits, the more likely it is that constraints will emerge. The sooner action is taken to demonstrate what can be used and how it can be used, the sooner the sooner the international community is likely to move forward to establish appropriate rules to regulate the use and exploitation of extraterrestrial resources."

Thus, India being a developing country should be cautious in its approach, but decision that is more desirable could be to have a specific provision like the US, so that for the time being it shall stop the damage that could happen at a future date.

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